

DELIVERY OF ONLINE INSTRUCTION FOR LAND SURVEYING/GEOMATICS
STUDENTS: ISSUES ENCOUNTERED AND BEST PRACTICES

by

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(Under the Direction of Richard A. Smith)

ABSTRACT

Many states, including Texas, now require a bachelor's degree for licensure as a professional land surveyor. Currently, only one university and a hand full of junior colleges in Texas offer land surveying degrees, and none of these offer a fully online degree. In a state the size of Texas this is problematic for individuals seeking licensure, who reside in areas where there is no land surveying program within a reasonable commute. College programs in other professional fields are using such tools as synchronous class meetings, pod casts, and streaming video to reach students in geographic areas far removed from their campuses. Like nursing, land surveying requires a certain amount of hands-on experience using the specific tools of the profession that is difficult to acquire without additional expense of both time and money. Issues that emerge because of the need for this hands-on experience include providing and supervising laboratory instructors and providing the necessary software and hardware to distant sites. This paper examines the issues that must be overcome by any institution that wishes to offer an online degree program in land surveying and will then propose a set of best practices that can be used by these institutions.

INDEX WORDS: land surveying; geomatics; online instruction; synchronous class meetings; pod casts; streaming video; online degree program; best practices.

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A Thesis Submitted to the Graduate Faculty of Texas A&M University – Corpus Christi in
Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE

CORPUS CHRISTI, TEXAS

2014

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DEDICATION

This thesis is dedicated to my loving wife, Cherene. It has been her encouragement and patience that kept me on track during the last four years as I was pursuing my dream, not to mention spending part of our retirement money. While there were a number of times that she was frustrated and probably jealous of the time that I spent locked in the study working my way through the many challenges of this program, she was the encourager when I reached several low points and was asking myself why I was doing this instead of enjoying our retirement. I will gladly spend the rest of my life trying to make up for this sacrifice she made for me.

ACKNOWLEDGEMENTS

I take this opportunity to thank Dr. Richard Smith, chairman of the committee, and Dr. Yuxia Huang and Dr. Phillip Davis for their willingness to serve as committee members. In addition to his gentle words of encouragement throughout this long process, Dr. Smith taught me much about teaching online through his example as my professor in two courses. Dr. Huang helped me to get over my fear, and gain an appreciation of statistics through her leadership as my professor in her class.

I appreciate Dr. Gary Jeffress, whose quiet words gave me the courage to attempt to climb this mountain.

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CHAPTER 1

INTRODUCTION

Purpose of Study

In their textbook on land surveying, Ghilani and Wolf (2008), define land surveying as “the science, art, and technology of determining the relative positions of points above, on, or beneath the Earth’s surface, or of establishing such points”. Ghilani and Wolf continue by explaining that the term ‘geomatics’ is a relatively new term that is often used interchangeably with ‘land surveying’ to apply to the same professional activities. Most, if not all, of the states in the United States have enacted statutes to regulate the practice of land surveying and to protect the public from unqualified practitioners. These statutes are reviewed and revised from time to time by the legislative bodies. In 1993 the Legislature of the State of Texas revised section 1071.254 of the Land Surveying Practices Act to include the requirement of a “bachelor’s degree from an accredited institution of higher education that included at least 32 semester hours in a combination of, civil engineering, land surveying, mathematics, photogrammetry, forestry, land law, or the physical sciences”. The effective date of this new requirement was delayed until January 1, 2003 in-order-to allow the individuals whose applications to sit for the examination had already been approved prior to the 1993 legislative act to complete the examination under the old law, and to allow for planning the implementation of the new requirements.

At the time of the passage of this revision there were not any universities in Texas offering a four-year degree in land surveying and only one junior college offering an associate’s degree in land surveying. In 1995, Texas A & M University-Corpus Christi (TAMUCC) began offering classes for its new Bachelor of Science in Geographic Information Science Program, and this remains the only four-year degree program accompanied by a handful of junior colleges

offering two-year associate's degrees in land surveying. Most of the junior colleges have articulation agreements that allow their students to move into a university to complete a bachelor's degree upon completion of the associate's degree. Students in the TAMUCC program take half of their courses in Geographic Information Systems (GIS) and the other half in land surveying (geomatics). TAMUCC is currently offering all of the GIS courses online, and in the fall of 2014 will also begin offering all of the land surveying courses online. This writer is not aware of any of the junior colleges who are currently offering land surveying courses online. In a state the size of Texas, it then becomes very difficult for an individual, residing in an area where there is no nearby land surveying program, to further their education in-order-to meet the qualifications to sit for the examination to become registered as a professional land surveyor.

The purpose of this paper is to examine the issues that will be encountered with the delivery of online instruction for land surveying students and to develop a set of best practices or guidelines for the implementation of an online land survey program at the junior/community college level. Very little has been written about the issues encountered when a college or university switches from the traditional face-to-face instruction for land surveying to a fully online delivery of course materials. Due to this shortage, this study will examine a number of research papers concerning online delivery of instruction for nursing programs, since it is anticipated that a number of the issues experienced in transitioning nursing programs to an online format should be common with land surveying programs. Additionally, many of the reasons that nursing programs have transitioned to online education are the same reasons that are now pushing land surveying programs to examine online instruction for their students.

CHAPTER 2

LITERATURE REVIEW

Conceptual Framework

The research presented in this section indicates various findings concerning the issues involved in the presentation of college course materials using the internet. The purpose of this paper is to examine these issues and to make specific recommendations for the development of a set of best practices for the online delivery of land surveying courses for students seeking to advance their education in land surveying within the State of Texas. This research will focus on answering the following three questions. Is there a need for online courses for land surveying? What are the benefits of online courses for the student? What is the impact to the professor of teaching online courses, compared to teaching traditional face-to-face classes? Once these questions have been addressed, this thesis will examine a number of papers addressing the issue of best practices for online delivery of course materials. Very little has been written specifically addressing the issues encountered when a college or university designs an online degree program for land surveying students. The existing literature on providing an online four-year degree program in land surveying, along with a number of studies regarding online instruction in various nursing programs, and a few studies addressing online instruction in general are reviewed in this section. The primary reason for including online education for nursing programs in this study is because it is anticipated that many of the issues encountered in those programs will be common to the establishment of online education for land surveying programs.

Need for Online Land Survey Courses

Although the delivery of course materials over the internet has rapidly increased as the technology to facilitate such delivery has matured, the land surveying programs in the nation

have been slow to respond to the existing need for online courses. Perhaps one reason for this slowness is the necessity of a certain amount of hands-on experience using the existing equipment of the profession, which is traditionally obtained in a face-to-face laboratory setting. In this writer's personal experience as an instructor in a large community college systems' land surveying program, another reason is that most of the courses are taught by adjunct instructors who only teach one or two courses during a semester. These adjunct instructors work full time and may not have the time, or even the desire, to develop the necessary skills to teach their courses online. Many states, including Texas, require a bachelor's degree to be eligible to sit for the registration examination as a professional land surveyor. Texas currently requires that beginning, January 1, 2003 an applicant must have earned a bachelor's degree from an accredited institution of higher education that included at least 32 semester hours in a combination of courses acceptable to the board in: 'civil engineering'; 'land surveying'; 'mathematics'; 'photogrammetry'; 'forestry'; 'land law'; and 'the physical sciences'. Although Texas does not currently require that the bachelor's degree be in land surveying, one can never predict what a legislative body will do and there is always the possibility that this requirement could be added in the future.

It is this writer's belief that the degree requirement for registration as a land surveyor, coupled with the fact that there is only one university and a handful of junior colleges in Texas that offer courses leading to a degree in land surveying, is one factor that has begun to bring to a head the demand for online courses in land surveying from at least two groups who have very different needs. The first group is made up of individuals, currently working in land surveying, who have a bachelor's degree in an unrelated field and are wishing to take land survey specific course work to fulfill the requirement of the 32-semester hours of course work acceptable to the

board in-order-to be eligible to sit for the examination. The second group is made up of individuals who have completed some college work in the past while pursuing an unrelated degree, before obtaining employment in land surveying, where these individuals subsequently decided to seek registration as a professional land surveyor. While both groups share the fact that they are currently employed in the field of land surveying and seeking registration as a professional land surveyor, only the second group has a need for a pathway to a bachelor's degree to fulfill the requirements for eligibility. Perhaps another factor that may fuel the demand for online land survey courses in Texas is the declining number of Registered Professional Land Surveyors (RPLS) coupled with their increasing average age. According to records obtained from the Texas Board of Professional Land Surveying (TBPLS) and compiled by Dr. Gary Jeffress, Director of the Conrad Blucher Institute at Texas A&M University-Corpus Christi (TAMUCC), the total number of RPLS's decreased slightly from 2,573 in 2004 to 2,562 in 2012 while the average age increased from 54.23 to 56.20 during the same time period. Additionally the total number sixty-five or older increased from 478 to 585 during the same nine year period.

In the only paper that specifically addresses the use of the internet to provide instruction for land surveying students, Elithorp (2007) argues that exposure to land surveying through employment is a significant source of new members to the land surveying profession. By pointing out that in spite of the best efforts of educators, to recruit land surveying students, the enrollments in residence programs in land surveying continues to be low, Elithorp is making a valid argument for online land survey courses. Since the demand for land survey courses exists within those students already enrolled in residence programs and the current employees in land surveying, there must be other factors that contribute to the low enrollments in the residence programs. Elithorp acknowledges that one such factor may be the failure on the part of the

residence programs to properly communicate information about land surveying to the students of the physical sciences in the surrounding high schools. Perhaps a more realistic reason for these low enrollments in residence programs is that once exposure to land surveying through employment has sparked the desire for professional registration, these employees are often married with other family responsibilities, and the ability to leave ones job and relocate to another area to pursue the required education in a residence program is greatly diminished. It is these candidates who are seeking alternatives to the traditional residence programs.

This same dynamic exists in the nursing field where working professional nurses are seeking more education in-order-to improve their career options. In their paper detailing the development of online nursing education at Drexel University, Cornelius and Glasgow (2007), point out that several factors lead to the development of their fully online degree program. The primary factor was the fact that most of the applicants were married with children and other family responsibilities working full time as registered nurses, thus making a traditional evening program untenable to this group. Another common characteristic shared by land surveyors and nurses is their working hours. Land surveyors almost always work long hours during the daytime, leaving only evening and nighttime available for classes. According to Cornelius and Glasgow, nurses often work 12-hour shifts that rotate, thus making traditional education difficult for them, due to the “the travel involved as well as limited times classes were offered”. Both of these groups would benefit from the flexibility afforded by online courses. Cornelius and Glasgow point out that another factor leading to the development of the online nursing program at Drexel was the location of the school within an area where there were already several nursing schools, thus diluting the pool of students for any one school. The school reasoned that an online degree program would attract more students from other areas in the state by making the

nursing program attractive to more students, while at the same time it would be more convenient and accessible. As mentioned earlier, traditional residence programs in land surveying suffer from low enrollments and an online degree program in land surveying can work in the same way to increase enrollments for schools who offer such a program.

Dunlap, Sobel, and Sands (2007), note that college administrators recognize that presenting course materials using the internet can be a tremendous benefit to their institutions, because of the potential increase of enrollments while at the same time negating the necessity of building newer and larger classroom facilities. While administrators view online courses and programs as a win-win situation for the institution, there are two other groups that must be considered before implementing an online program. These two groups are the students who are enrolled in the courses and the instructors who teach them.

Benefit of Online Courses to the Student

When evaluating the success of an educational program one must determine how well it meets the needs of the individual students who are enrolled in the program. Conversely, it should go without saying that a program that fails to meet the needs of its students will not be successful for very long. Elithorp (2007) points out that for an online course to be successful, the instructor must maintain a “strict focus on the student learner outcomes”. As noted previously by Cornelius and Glasgow (2007), the online nursing students at Drexel University also benefitted by the flexibility of being able to work on their course work during times that fitted into their difficult and often rotating work schedules.

In the small-scale action research project by Watts and Waraker (2008) the authors explored the issues faced by adult learners enrolled in a work-based nursing program who are balancing their roles as employees in a healthcare organization and as distance learning students

enrolled in a university nursing program where they work part of the time as a student and part of the time as an employee in the same work place. This arrangement allows these students to acquire the hands on experience needed for a nursing education within their own workplace. In the four-year degree program in land surveying at Great Basin College, the students having previous survey experience were able to fulfill the requirements for the hands on laboratories in the workplace under the supervision of their employers Elithorp (2007). According to Watts and Waraker, the downside to this arrangement, for the nursing students, is the lack of recognition of their student status by their colleagues whom they have been working alongside for a number of years. They continue by noting that work in ones chosen field is the “basis of an educational process” and that adult learners have an advantage over their younger counterparts who come into the program straight from school with little or no work experience. As previously discussed, a definite benefit of online courses is the access to education that would not otherwise be available for those students who reside a considerable distance, sometimes in other states, from the institution of higher education providing the courses.

Impact to the Professor - Online vs. Traditional Classes

Another factor that must be considered when designing an online program is the affect that teaching online classes has on the professor, compared to teaching traditional face-to-face classes. Issues that are discussed in this section indicate that transitioning from a traditional residence classroom format to an online format requires the complete reevaluation of the existing curriculum for a particular course.

In her white paper, Beason (2005) describes the collaborative effort between the Department of Veterans Affairs (VA) and the Department of Defense (DoD) in the development of a clinical nursing curriculum. This effort was precipitated by the reorganization of the VA

from an inpatient health care system to one based on primary care, with an emphasis on ambulatory care. Another driving force was the anticipated 200% increase in the number of primary care providers to be employed by the VA. This program was taught entirely online with the students obtaining their clinical laboratory experience through approved VA medical centers. Beason reports that the dean and faculty recognized very early in the project that a complete redesign of curricula and lesson plans was necessary to avoid the mistake of simply transferring existing lesson plans directly into a distance course, thus leading to “high levels of dissatisfaction among students”. This complete redesign has to take place upfront and can be stressful to faculty who were struggling with how to redesign the curriculum in such a way that would “communicate content while stimulating student participation”. One question from the beginning was whether clinical skills could be taught in a completely online environment, and Beason reported that it was decided to begin the program by “pilot-testing the Basic and Advanced Health Assessment course” as Phase I. The success of Phase I allowed the continuation of the program into Phase II. The class content for each course consisted of two hours of online lecture followed by one hour of laboratory experience that was supervised by a preceptor at the VA hospital site. The curriculum consisted of twenty-eight credit hours of instruction made up of eight courses with a total of five-hundred and sixty hours of clinical practice. Under the heading of “lessons learned”, Beason readily points out that “a major determinant of successful completion was the student’s commitment to acquiring new clinical skills. The paper also cites superior technology, highly motivated students, well trained faculty, and excellent site support at the VA medical centers utilized for the clinical laboratories, as those traits that insured the success of the program.

The study by DuCharme-Hansen and Dupin-Bryant (2005) identifies six areas of concentration, “assessment, guidance, building community, communication, humanization, and evaluating”, to present online instructors a roadmap for success. DuCharme-Hansen and Dupin-Bryant continue by stating “the transition to an online program from a traditional in-class program requires a paradigm shift and, often, a restructuring of how content is delivered”. Such a paradigm shift requires the faculty “to discover how to adapt their teaching styles and instructional methods, and adapt to a new role to move into this new paradigm” Ryan, Carlton and Ali (2004). Part of this paradigm shift is organizing the students learning space to provide the structure for the students to master the materials Elithorp (2007).

The study by Ryan, Carlton and Ali (2004), examined the experiences of twenty nursing faculty members from eight nursing schools in the United States and Canada to obtain their perceptions of the role of faculty in distance learning and the changes in pedagogies that were required by changing from a face to face to an online method of teaching. Issues raised by all of the respondents was the increased workload caused by the increase in course development time required upfront when a face to face course is redesigned as an online course, the increased communication time between students and teachers, and the increased collaborative time required among instructors in course design. The study revealed that several support systems should be in place prior to a redesign to a fully online program. These are: administrative and technical support, building of partnerships among teachers to support and assist with the design of courses, and technology support in the form of both hardware and software. In their conclusion, Ryan et al. suggests that a tension does exist between an instructors’ desire to provide high-quality and interesting learning opportunities, and the workload and time that is required to provide these opportunities in an online environment.

Mancuso (2009) performed a review of nursing research consisting of eight research papers and nine doctoral dissertations to answer the question: “what are nursing faculty members’ perceptions of distance education in nursing?” The most frequent themes that emerge from this study were: faculty members’ workload; change in faculty members role in distance education; faculty members’ rewards or benefits; faculty members’ concerns regarding academic dishonesty; the development of faculty members’ as distance educators; and the support of faculty members’ by the administration in the areas of, compensation, the current criteria for tenure and promotion and mentoring.

Best Practices for Online Instruction

The popularity of using the internet to deliver instruction has skyrocketed, with more institutions of higher education starting new online programs every year, Allen and Seaman (as cited in Dunlap, Sobel, & Sands, 2007). Often students demand online courses to balance their work schedules and educational needs, (Elithorp, 2007; Dykman and Davis, 2008), while colleges and universities embrace online teaching “due to institutional economics (e.g., lack of physical classroom space, need to attract students from beyond immediate geographic location and assumed economies of scale that can be achieved with more sections of a course and more students per section)”, Dunlap et al. (2007).

In their review of the literature covering online instruction in higher education, Crawford-Ferre and Wiest (2012), reveal three necessary requirements for effective online instruction. Of paramount importance is course design that is compatible with the needs of varied students; followed by interaction among the course participants, with instructors maintaining substantial involvement and interaction with students in online courses, and students collaborating among themselves to assist in their learning; closely followed by instructor preparation and support.

This requires technical support for both instructors and students. Crawford-Ferre and Wiest argue that since instructors start out with little or no formal training in teaching online courses, it is necessary that instructors receive the appropriate training so that they can design the course in a way that will attain effective student collaboration. Instructors also need access to appropriate technology and training in how to effectively use the technology to attain the goals of the online course. This study also points out that an online course takes more time to prepare than a traditional course and that there is a need to reduce teaching loads to accommodate for this time increase.

Boerema, Stanley, and Westhorp (2007) used a qualitative approach from the perspective of the educator to describe two main themes that emerged from reflective conversations with the educators who participated in the design and delivery of an online occupational therapy course entitled 'Perspectives in Health Research 300', taught in the third year of a four year degree at the University of South Australia. These two themes were; arousing students' interest; and working with larger numbers of students in managing discussion groups, and managing assessment.

Sachs (2004) describes the maturing of the Extended Learning Institute (ELI) from its inception in 1975 through the present day. ELI began as a college wide program working within the Northern Virginia Community College System (NVCC), a multi-campus community college system. The three underlying principals of the body of best practices published by the Division for Instructional Development of the Association for Educational Communications and Technology described in the paper are; (1) establishing and periodically evaluating the plans and goals are critical for building a successful program, (2) how the program is organized and administered within the overall environment of the institution is critical to the success of the

program, and (3) the basic decisions for the design of the online courses are made by the faculty teaching the courses within the program. Although ELI has evolved from its inception to become a mature part of the mainstream at NVCC, these three principals remain as a backbone of the ELI program.

The effective delivery of online instruction requires the instructor to fundamentally change how the materials are delivered, taking into consideration the type of course materials, the particular students' ability, and the courses sequence within the curriculum Cornelius and Glasgow (2007). A critical phase in this process is the need for the instructor to clearly identify the student learning outcomes for each online course Elithorp (2007). This type of fundamental change requires additional time on the part of the instructor as the classroom evolves away from the traditional face to face environment into a virtual classroom (White, Brown and Sugar, 2007; Dykman and Davis, 2008; Fish and Wickersham, 2009). White et al. (2007) conclude that the university administration can assist in overcoming this dilemma by allowing for a reduced teaching load for faculty as they "learn, master, or transition course materials and strategies in online learning", thus allowing instructors the needed time to develop resources and contacts among colleagues that will assist them in developing effective online teaching techniques.

The Southern Association of Colleges and Schools (SACS), the regional body responsible for the accreditation of degree-granting institutions of higher education in the southern states, acknowledged the importance of well trained faculty by issuing its policy statement on 'Distance and Correspondence Education' in 2010. This policy statement included the following three criteria regarding faculty teaching online or distance learning courses: (1) When an institution offers distance or correspondence courses, it must ensure that a sufficient number of the faculty who teach such courses are qualified to develop or teach the courses; (2)

that the institution has a clear criteria for evaluating such instructors; and (3) that the faculty who teach such distance or correspondence courses must receive appropriate training.

In spite of the increasing demand for online instruction, colleges and universities often lag behind and are reluctant to engage in the technological development necessary to insure effective online teaching practices (Fish and Wickersham, 2009; Dykman and Davis, 2008). When universities stay current with technological innovations, improved satisfaction with online course development and student satisfaction follows (Cornelius and Glasgow, 2007; Fish and Wickersham, 2009). As the universities push to stay current with the advances in technology, both instructors and students are being pushed to stay current. According to (Appana, 2008; Evans and Champion, 2007 as cited in Fish and Wickersham, 2009) the universities must continue to provide ongoing faculty training and support by offering professional development opportunities so that the instructors can remain current on the technology and software. Remaining current includes understanding the various types of technology (Merrill, 2003) that are available to instructors and students, such as synchronous delivery of course materials using two-way video, instant messaging (IM), text messages and online chat boards, along with asynchronous delivery using email, online bulletin boards, blogs and videotapes. Cornelius and Glasgow (2007) assert that students must also receive online training to insure that the online technology does not interfere with learning, thus reducing student frustration levels.

Li and Irby (2008) propose five things that will help instructors who are embarking on teaching online courses. The first is to consult with other colleagues who are currently teaching online courses to learn how to get course materials prepared before the course begins, and to get instruction on the technology that will be used to present the course materials. Second, one should attend workshops about online education and establish a set of contacts with others

involved in online education to use as consultants. Third, one should contact employees in your institutions division of computer technology training and set up software training for your institutions course management system. The fourth is to set up a survey with a number of students who have taken online courses and teachers who have taught them to gain an understanding of their experiences. Finally, the fifth is for prospective and existing online teachers to complete periodic literature reviews of the current literature concerning online teaching to gain a foundation and understanding of online teaching techniques. In a study conducted to investigate the views of students taking online courses, Young (2006) used a Web-based instrument to collect data from 199 online students. The results of this study yielded seven items that were associated with effective online teaching. These items are: “adapting to student needs, using meaningful examples, motivating students to do their best, facilitating the course effectively, delivering a valuable course, communicating effectively, and showing concern for student learning. The following characteristics of effective online teachers came from students in their open-ended comments: “effective teachers are visible and actively involved in the learning, work hard to establish trusting relationships, and provide a structured, yet flexible classroom environment”.

The Texas Higher Education Coordinating Board (THECB) adopted the *Guide for Incorporating the Principals of Good Practice into Electronically-Based Courses* in 2002. Under the heading “Principals of Good Practice: Curriculum and Instruction” are the following five principals: (1) The learning outcomes are appropriate for the ‘rigor’ and ‘breadth’ of the degree or certificate awarded; (2) the electronic course is understandable and complete; (3) the course includes appropriate instructor to student and student to student interaction; (4) the electronic course is also offered to students residing on the campus of the institution; and (5) the

academic standards are the same for courses offered electronically and those offered to resident students.

After determining that hands-on survey laboratories should be a part of the four-year degree program in land surveying at Great Basin College (GBC), four options were provided for their online students to complete the required laboratories Elithorp (2007). (1) Since these laboratories were taught in a traditional format to their residence students at GBC, the online students could attend these laboratories if convenient. (2) The online students could attend one of the intensive regional laboratories that were scheduled around the state. (3) The online student had the option to select a local land surveyor who had been approved by GBC, and make arrangements with that surveyor to complete the laboratory assignments under his/her supervision. (4) The online student could also satisfy the requirement of the laboratories by completing an equivalent course at one of the two-year colleges offering a survey program. To standardize the instruction for these laboratories, two manuals detailing the learning outcomes, equipment and supplies required to complete the exercises, and the requirements for each exercise were prepared. Elithorp adds that these laboratory manuals should “facilitate the very real opportunity for survey professionals to train and mentor new members into the profession.

When preparing an online course it is important to take into account the experiential differences in the participants. To illustrate this point, Merrill (2003) uses the simple example of helping a twenty year old student and a forty-something year old student log into their first online class. This example illustrates the differences in computer skills between students in their early twenties who grew up using computers and other digital devices with those who are forty-something and grew up without the benefit of such digital devices. Recognizing the importance of computer literacy, THECB included under the heading “Principals of Good Practice:

Institutional Context and Commitment”, principal number four which states “the institution has admission/acceptance criteria in place to assess the extent to which a student has the background, knowledge and technical skills required to undertake the program or course”.

While it is fair to say that many students will benefit from the online presentation of course materials, it is this writer’s considered opinion that not all students will benefit from the online environment without some prior training to prepare them for online courses. According to Magnussen (as cited in Fish and Wickersham, 2009), one way to increase the number of students who will benefit from online instruction is to prepare a comprehensive student online training program that is designed to reduce student frustration levels while taking online courses. After observing that prior computer literacy was important for student success, Beason (2005) reported that computer literacy was made a requirement for admission to the nursing program at the Uniformed Services University. Cornelius and Glasgow (2007), add that such a training program will have the added benefit of ensuring that online technology does not distract the student from learning the desired materials.

CHAPTER 3

METHODS

As stated in the introduction, the purpose of this study was to examine the issues encountered with the delivery of online instruction for land surveying students and develop a set of best practices or guidelines for the implementation of an online land survey program at a junior or community college. Three research methods were utilized to acquire the information necessary to produce this set of best practices and to determine which practices are most applicable to offering land surveying instruction online. Throughout this investigation, online instruction was defined as the delivery of instruction, using the internet, to students who are not physically present in a traditional classroom setting. Three primary questions were examined during this study. (1) Is there a need for online courses in a land surveying program? (2) What are the benefits of online courses to the student? (3) From a professor's point of view, what are the differences in teaching a class online as compared to teaching a traditional face-to-face class?

Part One (Prior Research)

With these three questions in mind, part one of this investigation was to discover what had previously been written about the issues encountered in the delivery of online instruction for land surveying students, and it was soon apparent that almost nothing had been published about the subject. There are perhaps several reasons for this scarcity of research regarding online instruction for land surveying. Using the state of Texas as an example, a quick search of schools offering nursing programs yields a twenty-page list, while only ten schools in Texas have a land surveying program and all but one of them are junior or community colleges. Almost all of the schools offering land surveying programs are located more than forty miles away from the center of the major metropolitan areas like Houston, Dallas, and Fort Worth.

Perhaps another reason for this scarcity of research lies in the fact that there may be very little perceived demand due to the relatively low number of professional surveyors, per capita, compared to the much higher numbers for registered nurses or professional engineers. While these relatively low numbers could be interpreted by some as a low demand for land surveying courses, a case can be made that the low numbers can also be used as evidence to indicate the existence of a demand for online land surveying courses that is not being met by any of the existing programs at this time.

One common characteristic of both land surveying and nursing programs is the need for providing hands-on experience using the particular tools of the profession. While land survey programs have not yet made this transition, many nursing programs have transitioned from a traditional classroom environment to the online delivery of instruction in-order-to meet the needs of their students and the demand for nursing education. While it cannot be said that the need for online instruction in nursing and land surveying programs is directly parallel, there are many similarities, and it is for this reason that it was decided to focus on how online nursing programs are meeting the needs of their students. The only paper that specifically examined the issues involved with the delivery of online instruction for a four-year university program in land surveying along with a number of studies detailing the development of online nursing programs, including several papers that incorporated specific discussion about best practices, were selected for this phase.

Part Two (The Questionnaire/Survey)

The second part involved preparing and disseminating a brief questionnaire (see Appendix A) to approximately one-hundred and eighteen professors in the Business, Education, Nursing, and Science and Engineering programs at Texas A&M University-Corpus Christi

(TAMUCC). Since this survey involved human subjects it was necessary to obtain approval from the Institutional Review Board (IRB) before it could be distributed to the individual instructors. Once IRB approval was granted, a link to the questionnaire was distributed by email to the instructors at TAMUCC with a time limit of two weeks for them to complete and submit the questionnaire. Essentially the items in the questionnaire are designed to address such issues as the time requirements for teaching courses online, whether an instructor is compensated for any additional time required for teaching online, any changes in teaching style when teaching an online class compared to a face-to-face class, whether students undergo any pre-qualification requirements before taking online classes, whether such pre-qualification is deemed necessary, whether an instructor receives any special training before teaching classes online, and whether instructors are compensated for the required training time.

To protect the privacy of the participants, the survey was set up to be completed anonymously. The first question entitled ‘informed consent’ notified the prospective participants about the purpose of the study, their rights to either participate or refuse to participate, who to contact if they had any questions about the survey, who to contact if they had any questions about their rights as a participant before asking the prospective participant to select ‘yes’ if they understood their rights and wanted to participate (of their own free will), or to select ‘no’ if they wished to decline to participate in the study. Questions two through five were designed to substantiate or dispute the hypothesis that teaching online courses requires more of an instructor’s time, and if so did the university make any adjustment to the instructor’s required teaching load to compensate for this increase? Questions six and seven address how the particular instructor handles instruction for laboratories and what adjustments the instructor makes in their teaching style when teaching online classes. Questions eight through ten

addressed the issue of accessing whether a student is ready to take online courses before being allowed to register for an online class and whether such a method should be developed if one is not in place. Questions eleven and twelve address the issue of whether the university offers any special training to instructors who develop and teach online courses and whether any adjustment is made to the instructors expected teaching load due to the time required for this special training. Question thirteen was inserted at the end of the questionnaire to elicit any opinions regarding best practices that the participant wished to volunteer.

Part Three (TAMUCC Geomatics Program Changes)

Students in the Geographic Information Science (GISC) program at TAMUCC take half of their courses in Geographic Information Systems (GIS) and the other half in geomatics (land surveying). The GIS courses have been available online for several years, while (primarily because of the required laboratories providing hands-on experience) the land surveying classes have been taught on campus in a traditional face-to-face setting. Since TAMUCC is scheduled to begin offering the land surveying classes online in the 2014–2015 academic year, part three of this research involved contacting Dr. Gary Jeffress, GISC Professor and Program Coordinator, and Director of the Conrad Blucher Institute at TAMUCC, by email, to determine how the online students living some distance from the TAMUCC campus will receive instruction in the hands-on laboratory portion of a course, and what procedures would be used to preserve the integrity of examinations so that the online students will not have an unfair advantage over the students taking the same course in residence. In a follow-up email, Dr. Jeffress was asked to elaborate on his opinion about the demand for online land surveying courses.

The results from the questionnaire and the email interviews with Dr. Jeffress will be compared to the prior research to propose a set of best practices for implementing an online

degree program in land surveying at Lone Star College-Montgomery (LSC-M). Since there are distinct differences between universities and junior colleges the best practices that are proposed in this study are intended to apply specifically to the latter, although in some instances the same practices can apply equally to a university program. For example, universities are primarily institutions where students reside on or near campus in student housing and attend traditional face-to-face classes, while junior colleges rarely provide student housing and students commute sometimes long distances to campus to attend classes. Another distinction is the fact that the university student is more often a full-time student who may work a part-time job, while the typical junior or community college student is often a part-time student that has a full-time or mostly full-time job. These distinctions are not hard and fast rules and the lines have become somewhat blurred in the past few years. The primary distinction between the two types of institutions is the degrees and programs that are offered. Universities offer courses leading to an undergraduate (bachelor's) degree, or graduate (master's or doctoral) degrees, while junior colleges offer courses leading to an associate of science (AS), an associate of arts (AA), or an associate of applied science (AAS) degree. Both the AS and the AA degrees are intended to be transferred to a university where the student will complete the undergraduate degree, while the AAS degree is considered a workforce degree where the student will enter the workforce upon completion. The land survey program at LSC-M offers courses leading to an AAS degree in land surveying and mapping technology and, upon graduation the student can either enter the workforce or transfer to one of several university programs leading to a bachelor of applied arts and science (BAAS) degree. Since this scenario will satisfy the educational requirements for registration as a professional land surveyor in Texas it is hoped that the recommendations made in this paper will encourage some of the other junior colleges offering land surveying as a

residence program to consider offering the same courses online to students who cannot relocate to attend classes on their campus.

CHAPTER 4

RESULTS AND DISCUSSION

Chapter 3 described three methods that were employed to support the hypotheses that there is a demand for online instruction for land surveying, that most students will benefit from this online instruction and, there are a number of ways that instructors are impacted when they take on the task of designing and teaching online classes. This chapter describes the results obtained from each of the methods and how these results support the conclusion that these hypotheses are true. After supporting these hypotheses, the final part of this chapter will propose a set of guidelines or best practices that can be followed for the implementation of an online land survey program at a junior/community college.

Part One (Prior Research)

Demand for Online Instruction

The first method involved discovering what had previously been written about the delivery of online instruction for land surveying and once it was discovered that in fact very little had been written on the topic, the search was broadened to include online instruction for nursing education. The primary reason for choosing nursing was that both land surveying and nursing require a certain amount of hands-on instruction using the tools of the profession as part of their curriculum.

After completing part one described above, the research by Cornelius and Glasgow (2007) indicated that online instruction is a viable option for full-time nurses returning to school to improve their career options by earning a Bachelor of Science in Nursing (BSN) degree. These candidates are often unable to attend face-to-face classes at a traditional residence program due to their current work schedules as full-time registered nurses, their place of

employment or residence, and other family commitments such as marriage and often children. Elithorp (2007) makes the point that often the most likely candidate as a student in land surveying programs is an adult who has been working in land surveying for some time and has developed the desire to obtain a license as a professional surveyor. This desire coupled with the realization that additional education will be required to attain the goal of professional licensure often creates the same kind of roadblocks that are faced by nurses who are returning to school after working for some time. Since the same set of circumstances making online instruction a viable option for nursing students also exists for potential land surveying students, there should likewise be a demand for online instruction for land surveying. Elithorp states “despite the best efforts of educators and the leadership of our profession, the enrollments at residence programs are typically low”, implying that an online degree program in land surveying can help to increase the enrollments for the schools that choose to offer such programs by reaching into geographic areas, including other states, that a residence program would not normally draw students from.

Benefits of Online Instruction for Students

“The online course can provide greater opportunities for student mastery of the materials than does the traditional residence course” Elithorp (2007). Continuing, Elithorp identifies these advantages as; (1) the ability to “learn the material on their own time within the structure imposed by the course and the learner outcomes”, thus fitting the course work into the students work and family schedule, (2) working students avoid “rush hour traffic” by not having to travel to campus to attend classes, (3) students who have a basic or advanced knowledge of the course materials will not have to “waste time sitting through those parts of a course in residence” that they are already familiar with, (4) quick learners “are not bored or held back by the pace imposed by the instructor in residence” or other learners, (5) “the instructor can provide a greater breadth

and depth of material in an online course than in a residence course”. Since many land surveying students are adult learners, they have the definite advantage of previous experience that younger students coming out of high school do not have. Finally, the research revealed that online courses provide access to education for students who do not reside close to the college or university providing the courses (Elithorp, Cornelius and Glasgow, 2007). Not all students will benefit from the online delivery of instruction Beason (2005). According to Beason, a successful online student is one that is; (a) “vested in using the knowledge” acquired, (b) who can work well in an environment that is not structured, and is willing to “commit the time and effort necessary for successful program completion”. It is this writer’s experience that students that are not prepared to take online classes will require more of an instructor’s time in responding to inquiries and monitoring the student’s progress. Often these students are not successful, in spite of the instructor’s additional efforts, and they often fall behind and drift away.

Impact of Online Instruction on the Instructor

Stating that “faculty members are the core of nursing education”, Mancuso (2009), performed “an integrative review of nursing literature to ascertain the faculty members’ perspective of distance education”. Beginning with seventy-two research articles and twenty-four doctoral dissertations, Mancuso applied several ‘inclusion criteria’ to reduce this number to eight research studies and nine doctoral dissertations. The unanimous consensus resulting from the study by Mancuso was that the workload of the faculty member increased when teaching distance classes. The magnitude of the increase varied with the individual studies examined but each reported a significant increase in faculty workload. In addition to actual teaching and course development that contribute to the increased in workload, Mancuso cites the training time necessary to familiarize faculty with the learning management system, and the fact that most of

the course material must be developed prior to the presentation of the course as contributing factors. The study by Beason (2005) reports that time is one of the significant costs of distance learning, stating that “it took approximately 6 hours of preparation for 1 hour of distance learning instruction, compared with 2 hours of preparation commonly attributed to classroom instruction”. Beason reported an estimate of six to eight hours to transfer just one hour of instruction to the “World Wide Web”. Citing the increase in the time required to develop and teach online classes, (Major, 2010 as cited in Crawford-Ferre and Wiest, 2012) advocates for a reduction in the expected teaching loads or the provision of a teaching assistant for online instructors. All twenty of the participants in the study by Ryan (2004) cited the increase in workload caused by the increase in course development time, with one stating that “it takes about 300 hours to convert a course to the online world”.

According to Mancuso, another impact to the instructor is the change in role for the online instructor from that of a “content deliverer” to that of a “facilitator of the learning process”. Additionally, Crawford-Ferre and Wiest, report that online instructors can become “isolated from their colleagues” due to demands on their time and the methods of instruction, causing them to “miss out on meaningful discussions, constructive feedback, and a sense of collegiality”.

Part Two (The Questionnaire/Survey)

Impact of Online Instruction on the Instructor

A link to the questionnaire (see Appendix A) was sent by email to approximately one-hundred and eighteen professors in the Business, Education, Nursing, and Science and Engineering programs at TAMUCC. Since the survey was sent only to instructors, the questions were designed to assess the impact to the instructor of teaching online courses. Thirteen

anonymous online instructors (an 11% response rate) opened the questionnaire and answered yes to question number one ('informed consent'), thus choosing to participate in the study and each participant was assigned a number from one through Thirteen depending on the date and time that the questionnaire was completed. Table 1 shows the tabulated results of the questions that could be answered with either '**yes**' or '**no**'. The question numbers are listed across the top row and the participant numbers are listed down the left column. With the exception of participant number six who failed to respond to questions four and eight, each of the participants responded to all of the questions that were presented to them; however, not all of the questions were presented to each participant since some of questions were presented only if one of the previous questions were answered a certain way. For example, the anticipated answer to question two was '**yes**' and question three was only presented to those participants who answered yes to question two. Participant number three responded to question two with a '**no**' and questions three, four, and five were not presented to this participant. The shaded squares on the table represent questions that were not presented to a particular participant because of a previous response and the blank squares represent questions that required a text response rather than a yes or no answer. The text responses are summarized below the table by question.

Table 1: Tabulation of Responses to the Questionnaire

		Questions												
		1	2	3	4	5	6	7	8	9	10	11	12	13
Participants	1	Y	Y		N				N			Y	N	
	2	Y	Y		N				N			Y	N	
	3	Y	N						N			Y	N	
	4	Y	Y		N				N			Y	N	
	5	Y	Y		Y				N			Y	N	
	6	Y	Y		N/A				N/A			Y	N	
	7	Y	Y		N				N			Y	N	
	8	Y	Y		N				Y			Y	N	
	9	Y	Y		N				N			Y	N	
	10	Y	Y		N				N			Y	N	
	11	Y	Y		N				N			Y	N	
	12	Y	Y		N				Y			Y	N	
	13	Y	Y		N				N			Y	N	

The twelve responses to question three all tend to agree that it takes from two to three times, or more, to teach an online class, with additional communication time interacting with the students using email, telephone, text messaging, and reading and responding to posts in discussion forums being at the top of the list. One specific difference between online and face-to-face noted in the responses is the fact that the instructor is often answering the same question many times rather than only one time in a face-to-face setting. Also noted by two of the respondents was the fact that since online classes are not confined to a specific three hour period per week, students often view them as twenty-four hour a day courses and expect almost an instant response from the instructor to a question.

The expected response to question four was ‘no’ indicating that their institution does not make any adjustment to an instructors expected teaching load for the additional time required in

teaching online and all but two respondents answered with a ‘**no**’. Participant five answered question four with a ‘**yes**’ and as stated previously, number six did not respond. Question five was displayed to participant five and this participant replied that the class sizes were limited to twenty-five students as the adjustment that is made to their required teaching load. Question five was not displayed to any of the other respondents.

Most of the thirteen responses to question six regarding how laboratories for gaining hands-on experience are handled, indicated that the laboratories were usually located on campus or in a local hospital or clinic, with some indicating the use of virtual websites or WebEx or a platform tutorial. One respondent replied that a faculty or adjunct instructor made visits to the student’s home or workplace on a pre-determined interval. One of the participants replied that only word processing or an internet browser was used for the hands-on labs, one participant replied that they were still developing a policy for hands-on laboratories, one replied that there was one campus visit required for skills check off’s, and one replied “not applicable” implying there were no such labs.

Many of the thirteen responses to question seven, regarding what adjustments do they make in their teaching style when teaching online courses, included the need to be more specific with instructions, spelling out in great detail what is expected since the student will not have the opportunity to get a quick answer if they are confused. One suggested using animated interactive tutorials and utilizing the technology such as WebEx, Skype and several other programs more effectively. One uses a one-hour WebEx session weekly to explain assignments and answers emails within 12 to 20 hours except on weekends. One reported preparing a full PowerPoint presentation with voice added along with typing out the lecture notes and posting them into Blackboard. One instructor responded that he/she was adjusting the teaching style by

incorporating some of the strengths from the face-to-face classes taught in the past. One instructor spells out expectations and instructions more thoroughly and encourages students to utilize the discussion boards when asking questions so that a question need only be answered once, rather than many times. Another instructor described themselves as being very verbose when giving feedback on graded materials and in explanations. Only two participants indicated that they made no adjustment to teaching style, while one of them indicated that no adjustment is made because they only teach online.

The expected response to question eight was ‘**no**’ indicating that the institution has not developed a method to measure whether an individual student is ready to take online courses before being allowed to register for an online course, and all but two answered with a ‘**no**’. Participants eight and twelve answered question eight with a ‘**yes**’ and as stated previously, number six again did not respond to question eight. Question nine was displayed to participants eight and twelve, with participant eight responding that the method that the institution used to determine whether a student is prepared to take online courses is to require all students in the graduate program to take an orientation course, while participant twelve replied that all students are required to undergo an extensive admission process that includes a writing sample done on the computer and a virtual interview. None of the remaining respondents were presented question nine.

Participants six, eight, and twelve were not presented question ten regarding whether the participant believed that developing a method to measure if a student is prepared to take online classes would help improve the success rates of students who take online classes. The responses from the remaining ten participants were seven yes with most of the seven suggesting that the method of measurement be on testing the level of computer literacy. Two of the ten answered no

stating the graduate students are usually adult learners who do not need it unless they have been out of school for a while, one stated “only if you intend to refuse admission based on a score”, and one who stated they were not sure.

Question thirteen was included in the survey to give the participants the opportunity to list which in their opinion were the two most important ‘best practices’ for teaching online courses. All eleven of the participants responded with at least two practices that they believed were the most important. The responses from each participant are itemized below:

1. Well thought out learning objectives. Short, targeted lecture videos. Detailed feedback on assignments.
2. Set aside enough time to interact with message boards and discussion forums. Stress availability of instructor via phone, email and other forums.
3. Department guidelines for course structure (template for organizing material). Reasonable class size.
4. Adequate knowledge of subject matter. Desire to teach online.
5. Methods of Student Engagement. Regular structure to the course to limit procrastination for course content.
6. Take an online course (MOOC) yourself before you teach online so you see things from the student perspective. Talking with peers who have already taught online will help immensely. Not-for-profit groups such as the Teaching, Learning, & Technology Group (TLT) hold FridayLive! Sessions each week that focus on some aspect of teaching and learning online.
7. Instruction for educators to become proficient in the online course development. Availability of the instructor.

8. Opportunities for student engagement. Self reflection of learning.
9. Preplanning the entire online course and uploading the materials prior to actual start of course. Carefully delineating the instructors' expectation of the students and what the student can expect of the instructor at the beginning of the course.
10. Dedicate time to develop a smooth flowing course, with supplement learning aids such as You Tubes and other technologies within the Blackboard learning system.
Listen to students. For example, (a) keep an open anonymous forum throughout the semester for students to voice their concerns, (b) a student-to-student forum of which they enlist aid of peers, and (c) a separate faculty forum to directly ask questions of the instructor, or address the cohort.
11. Faculty are given time to develop the course. Courses reviewed and given constructive critique to promote best practices.
12. Well organized course with frequent faculty/student interaction. Well organized interactive course. Well defined expectations, including schedules and due dates.
13. Need for adequate preparation of the student. Concern about ethics and cheating in online courses. Expressed need to get a better handle on the problem.

Part Three (TAMUCC Geomatics Program Changes)

Since the Geographic Information Science (GIS) program at TAMUCC will be changing its program to begin offering the geomatics/surveying courses online to students wishing to take the courses online rather than commute to the campus to attend the classes in residence, part three of this study involved contacting Dr. Gary Jeffress, GIS Professor and Program Coordinator, and Director of the Conrad Blucher Institute to obtain information about the changes. Of primary interest is how the online students will receive instruction in the

required hands-on laboratory portion of a course, what procedures would be used to preserve the integrity of examinations so that the online students will not have an unfair advantage over students taking the same course in a face-to-face setting on campus, and how much demand he believes there will be for the online courses.

In an exchange of emails, Dr. Jeffress provided the following information regarding the changes that will take place in the GISC program beginning in the fall of 2014: (1) Beginning this fall all GISC courses required for the Bachelor of Science in Geographic Information Science will be offered online as well as in-person, with the goal to offer the online course parallel with the in-class course, so that the online student will receive the same learning experience, program student outcomes, and program educational objectives as the student in the classroom; (2) instructors will be using Blackboard as the learning management system for all in-class and online instruction with lectures being recorded using WebEx software so that all students, both online and in-class, can review the same lecture at their convenience, thus allowing all course students to re-view a lecture over and over as desired; (3) in those classes that have examinations, the online students will be required to make arrangements at an approved testing center to take the exam under secured conditions to ensure the integrity of the examination; (4) online students taking classes having computer labs requiring specific software, such as GIS software, will be issued licenses for the software so it can be installed on their personal computer; (5) for courses having field labs, online students will be required to seek the assistance of a local registered surveyor to provide equipment and supervise the student while they complete the field exercises. In a follow-up email, Dr. Jeffress advised that he had been in contact with Paul Kwan, one of the members of the Texas Board of Professional Land Surveying (TBPLS) and was advised by Mr. Kwan, that he would consider granting up to eight (8)

continuing education units (CEU's) to registered surveyors who provided the supervision and equipment to assist one of the online students to fulfill the field lab requirements of an online course. These earned CEU's can then be used by the registered surveyor toward the required CEU's necessary to renew their professional license each year. Regarding the demand for online land surveying courses, Dr. Jeffress wrote the following: "There is definitely a demand for an online Master's degree in geospatial, which can include surveying." Dr. Jeffress continued that he believes there is only a small demand for online undergraduate courses, but not for degree seeking students trying to complete the entire bachelor's degree online. Dr. Jeffress noted that there is a seven year limit to complete the degree containing forty courses, and a student working a full-time job and completing two online courses per semester would require ten years to complete the bachelor's degree. It is this writer's understanding, based on personal experience and conversations with two academic counselors at Lone Star College-Montgomery, that the only time limit requirement regarding graduation from a junior or community college is the fact that if a student does not graduate within five years they must satisfy the requirements of the latest academic catalogue for their degree plan.

Part Four (Proposed Best Practices)

The intended result of this study is to propose a set of guidelines or best practices that can be followed in the development and delivery of online instruction for land surveying courses at a junior or community college. While these best practices are intended to specifically apply to land surveying programs at a junior or community college, many will apply equally to any university program. For convenience this part will be divided into four sub-sections as follows: (1) Instructors; (2) Course Design; (3) Institutional Support; and (4) Field Laboratories and Testing Procedures. These proposed best practices have also been converted to handouts for

ease of dissemination; with each section referring the reader to the appropriate Appendix to view the handout.

Instructors

See Appendix B for Handout

Although important for face-to-face classes, it is imperative that instructors of online courses clearly identify and communicate the student learning outcomes and the instructor's expectations for each course. With online students sometime waiting a day before sending an email or placing a telephone call to the instructor only to wait for a reply, much time is wasted when learning outcomes and instructor expectations are not clearly articulated in the course syllabus.

One item that all online instructors should include in their syllabi is the expected wait time for a reply from the instructor. As stated previously, since online classes are not confined to a specific three hour per week timeslot, online students have a tendency to view them as twenty-four hour a day classes, and often have an unreasonable expectation about how long it should take for the professor to respond.

Online instructors must possess an adequate knowledge of the subject matter and should actually have a desire to teach online courses. This is particularly true of many adjunct land surveying instructors who, while having the knowledge of the subject matter, may feel that the additional time that is required to develop and teach one class online is more than they are willing or capable of investing, after considering the training time involved on the front end to learn a new system. It may be a situation of simply too much work for the anticipated reward.

Online instructors should be very visible and actively involved in the learning process and must work hard to establish trusting relationships, by establishing several methods

(discussion forums, message boards, chat rooms, blogs, email, etc.) within the online course for students to communicate with each other and with the instructor. By monitoring these different tools within the online course, the instructor can address student's needs and concerns early and communicate with all students at the same time, thus saving the instructor's time as well. This practice has been very helpful to this writer, both as an instructor of land surveying courses and as a student at TAMUCC when it was employed.

Since online students seldom have the opportunity to ask questions during a lecture, instructors should utilize a number of short, targeted lecture videos, rather than delivering one long lecture so that students can assimilate the material in stages. This practice will be very helpful to online land surveying students, since they will have time to re-play the short video several times to gain understanding, rather than waiting to the end of a long lecture to then go back and find the location where they needed clarification.

Online instructors should provide written detailed feedback on assignments to each online student rather than merely sending back a graded assignment, or only a grade, without providing clear information for the student to understand why they received the grade they did. At first glance it would seem that this practice is so basic that it would not require mention, except for the fact that this writer has had to contact an instructor on several occasions in the past to request such feedback.

Since instructors often start out with little or no formal training in teaching online courses it is very important for them to receive appropriate training so they will be qualified to design and teach online courses in a way that will effectively convey the course material in an organized and unambiguous way. This training is absolutely necessary for those professional land surveyors who wish to expand their skills to teach online courses in a junior college land

surveying program, since most of them are adjunct instructors with very little formal training as educators, much less the delivery of online instruction.

Course Design

See Appendix C for Handout

It is very important that online courses be designed so that they are compatible with the varied needs of students. Online courses should provide several avenues for students to actively participate in their own learning by interacting and collaborating among themselves. For example, the course can contain several discussion forums accessible by students and the instructor. One forum can be anonymous so students can voice their concerns without being identified, while another can be a student-to-student forum where students can enlist the aid of their peers on assignments and still receive guidance from the instructor, and a third forum can be established where students can direct questions to the instructor and the instructor's answer will be available to all students.

The instructor should develop the course so that it flows smoothly and contains supplementary learning aids such as You Tube videos, WebEx communications, and other technologies that can be utilized from within the learning management system to enhance the students' educational experience.

As online instructor's work to design their individual courses, they should collaborate with other online instructors during the design so that the collective experience of several instructors can be utilized in the development of an individual instructor's course. Collaboration among all of the instructors in a specific program, such as a land surveying program at a junior college, along with course design and IT specialists, will be very valuable in the creation of a

consistent design or interface that will ultimately assist all of the students in the program, by adding consistency to their online experience as they progress through the program.

One of the respondents to the questionnaire suggested that an instructor who desires to teach an online course should take an online course first, to gain the perspective of a student. As a land surveying instructor in a community college, this writer certainly supports this suggested best practice. In 2008, as a part of the required training before being allowed to teach as an online instructor this writer was required to take an online course taught by a seasoned instructor. While still teaching most of the land surveying courses in-class, this writer developed and began teaching one of the courses as a hybrid class with most of the course taught online and part in-class. Desiring to learn more about teaching online courses, this writer enrolled in the Geospatial Surveying Engineering program at TAMUCC since all of the courses were taught online. During the last four years, this writer has observed first hand, some good online teaching techniques and some that were not so good, incorporating the good practices into the hybrid class to the point where it is now ready to go fully online. Additionally this writer utilizes the learning management system in all of the in-class courses as they are being transitioned into hybrid and then hopefully online courses.

Institutional Support

See Appendix D for Handout

The institution must provide adequate continuing education to online instructors and course developers in the use of the learning management system and other software and hardware that is utilized in the delivery of online instruction. As previously discussed, this is especially important for a land surveying program at a junior college where many of the courses are taught by professional land surveyors teaching only one course as an adjunct instructor.

The institution should develop a policy for reducing the expected workload requirements for full-time instructors who are involved in developing and teaching online courses. A junior college offering a land survey program, where many of the instructors are adjuncts, should be prepared to compensate the adjunct instructors with a stipend while they attend continuing education and develop their course for online delivery on their own time. Such a policy will serve to encourage both full-time and adjunct instructors to teach online classes while compensating them for the additional time required in doing so.

Junior colleges should provide extended hours, if not 24-hour per day, technical support for both instructors and students of online classes. For the reasons stated above, this requirement would be very beneficial to land surveying students taking online courses and the adjunct instructors who teach them.

As the demand for online instruction increases, it is imperative that institutions recognize that not all students are prepared to take online courses. The institution should develop an adequate method to measure a student's readiness to take online courses before they are allowed to register for them. This may be especially necessary for those students who are returning to college, often after spending an extended period of time in the workplace or the military, to pursue new educational goals such as land surveying. Elithorp (2007) noted that many land surveying students return to college to earn a degree in land surveying after developing a strong interest in becoming a professional land surveyor while working in the profession.

Field Laboratories and Testing Procedures

See Appendix E for Handout

Since most junior or community colleges do not offer student housing, most of the students who attend these institutions commute to classes. Even so, many of these students take

online classes and it is expected that land survey students will also be interested in taking online classes to avoid commutes in prime-time traffic periods or to fit the courses into their work schedules. The following guidelines are promulgated to facilitate those land surveying courses that require field laboratories and examinations.

Online land survey students along with traditional in-class students taking a course that requires field laboratories may elect to satisfy the requirements of the field laboratories by; (1) attending the scheduled field laboratory on campus at the regularly scheduled time set out in the course syllabus, or (2) they may make arrangements with a Registered Professional Land Surveyor (RPLS) located near them who is willing to supervise and provide the necessary equipment for the student to complete the assignments during the semester. Students wishing to utilize the second option are solely responsible for making all arrangements with the RPLS, obtaining a signed Field Laboratory Agreement form (See Appendix F) between themselves and the RPLS, and transmitting the agreement to the instructor during the first week of classes. Online students who fail to submit the required field laboratory agreement will be expected to either attend the field laboratories on campus or withdraw from the course. Blank field laboratory agreements and a Field Laboratory Proctor cover letter (See Appendix G) should be made available from the instructor on the course web page and should also be placed on the program's website.

Each field laboratory assignment should be posted on the course web page on the same day that it is handed out to the in-class students, and a copy of the assignment will be emailed to the RPLS designated by the online students. Each laboratory assignment will contain a complete list of the field equipment required for the assignment along with a description of what is expected as a deliverable from the student, and the date when the assignment is due.

Online land survey students in courses that require hands-on laboratories using special software will be issued licenses for the software during the first week of classes and will receive written instruction on how to load the software. It is the students' responsibility to load and test the software.

Online land survey students must provide the instructor with the complete contact information of an approved proctor site, such as an approved testing center located at a local college or university, or an approved commercial testing center, where they intend to take any examinations that will be required for the course. The contact information must include the name of the testing center's manager along with the complete address, telephone number, and email address of the testing center. The testing centers must be equipped with a lock-down browser for electronic examinations that are accessed through the learning management system (LMS) using the internet. The testing center will be provided with a password that will be entered by the testing center employee into the LMS to enable the student to access the examination. For those courses requiring paper examinations, the instructor will provide the designated testing center with written instructions for the proctor, the appropriate number of paper examinations, and pre-addressed, postage-paid return envelope. An online student who fails to notify the instructor of his/her designated testing center, at least one week prior to a scheduled examination, will be presumed to be taking the examination on campus at the designated time.

CHAPTER 5

CONCLUSION

On January 1, 2003, when the revision to the Land Surveying Practices Act passed by the Texas legislature in 1993 requiring a bachelor's degree to be eligible to sit for the examination to become registered as a professional land surveyor took effect, there was only one university and a handful of junior or community colleges that were offering a degree in land surveying. In the time period between 2003 when the revision became effective and 2011, a program offering a bachelor's degree in land surveying at the University of Houston started and then closed its doors, thus leaving the overall situation of one university and a handful of junior or community colleges offering a degree in land surveying essentially unchanged as of 2014. In a state the size of Texas, with so few colleges or universities offering land surveying programs, there are a number of potential candidates for licensure who live and work in areas where their access to these institutions of higher education is sometimes hampered by great distance. It is this writer's belief that a number of these candidates will benefit from an online land survey program that allows them to complete the educational requirements for licensure while keeping their current employment without the necessity of relocating their families.

With the belief that online courses in land surveying can ultimately help to increase the enrollments in land surveying programs along with the number of licensed land surveyors in Texas, this writer undertook to examine the issues involved in the delivery of online instruction for land surveying courses with the goal of proposing a set of guidelines or 'best practices' that can be followed to develop an online land survey program at a junior or community college. This venue was chosen primarily because of this writer's teaching experience at a community

college, and because the requirements inherent at a university regarding the time limit of seven years for completing a bachelor's degree do not apply to a junior or community college program.

After reviewing a number of research papers about online instruction and analyzing the results of the questionnaire sent to online instructors at Texas A & M University at Corpus Christi, this writer concludes that one of the primary investments involved in designing and teaching online courses is the instructor's time. Additionally, there is the increased training time required for the learning management system, and the hardware involved in the presentation of the material. The institutions investment is the training and technological support of the instructor. The proposed 'best practices' presented at the end of the previous chapter are broken down into four areas: (1) Instructors; (2) Course Design; (3) Institutional Support; and (4) Field Laboratories and Testing Procedures. These practices are intertwined to create a guideline for a successful online land surveying program at a community college.

It is this writer's firm belief that any of the community colleges currently offering a land surveying program, will realize an increase in the number of students enrolled in their program, if they choose to offer their land surveying courses online while following the best practices laid out in this thesis. The net result of this increase in land surveying students will ultimately be an increase in the number of well educated candidates who are prepared to enter the profession as Registered Professional Land Surveyors in Texas.

CHAPTER 6

FUTURE WORK

While this thesis is perhaps the only study to date, regarding the presentation of online instruction for a land surveying program at a community college, it certainly leaves some areas that can and should be developed further. One important area that was hinted at but not fully developed concerns the role of adjunct instructors in a typical community college land surveying program, and what can be done to encourage these instructors to develop their skills to be able to teach their course online rather than as a face-to-face class.

Another topic that needs to be developed is that of institutional support. It appears from the research, the results of the questionnaire, and this writer's personal experience as an online instructor at a community college, that an argument can be made that institutions of higher education seem to view their part of the equation as simply providing the hardware and software necessary for the delivery of online instruction along with some training of the instructor in the use of the technology.

One of the methods utilized in this study was an online questionnaire that was sent out to one-hundred and eighteen online instructors at Texas A&M University-Corpus Christi. Unfortunately only eleven percent (thirteen) of the instructors who received the request to complete the questionnaire opened and completed it. It is recommended that any future studies on this topic should reach out to a much larger sample population, perhaps utilizing 'LinkedIn' as the method to distribute such a questionnaire, supplemented with some targeted face-to-face interviews.

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APPENDIX A

QUESTIONNAIRE/SURVEY QUESTIONS

Prior to question 1 is a one-page informed consent form, where the prospective participant is notified about the purpose of the study, their rights to either participate or refuse to participate, who to contact if they have any questions about the survey, and who to contact if they have any questions about their rights as a participant. The following questions are presented after the informed consent information:

1. I have read, understood, and printed out a copy of the above consent form and desire of my own free will to participate in this study. (NOTE) If the answer to this question is **yes** the remaining questions are presented, if the answer is **no** the remaining questions are skipped and the survey is finished.
 - a. Yes _____
 - b. No _____
2. My research so far indicates that the time requirement for instructors is greater for online courses than face to face classes. In your experience, does it take more of your time to teach a course online than face to face? (NOTE) If the answer to this question is **yes** questions 3 and 4 are presented, if the answer is **no** questions 3 and 4 and 5 are skipped and question 6 is presented.
 - a. Yes _____
 - b. No _____
3. Since you indicated that the time requirement is greater for online courses, please elaborate, by including your time spent revising the way you present course materials, along with addressing individual questions from your students using either, discussion forums, email, chat rooms, office visits, or telephone calls. (Please use the text box below for your answer)
4. Since you indicated that the time requirement is greater for online courses, does your institution make any adjustment to your required teaching load to allow for the difference? (NOTE) If the answer to this question is **yes** question 5 is presented, if the answer to this question is **no** question five is skipped and question 6 is presented.
 - a. Yes _____
 - b. No _____
5. What type of adjustment is made? (Please use the text box below for your answer)

6. How does your program handle online instruction for laboratories, so that the students acquire hands on experience using the equipment or software of the industry? (Please use the text box below for your answer)
7. What adjustments do you make in your teaching style to insure your students' success when teaching a course online rather than face to face? (Please use the text box below for your answer)
8. Has your institution developed a method to measure whether an individual student is ready to take online courses before they are allowed to register for such courses?
(NOTE) If the answer to this question is **yes** question 9 is presented and question 10 is skipped, if the answer to this question is **no** question 9 is skipped and question 10 is presented.
 - a. Yes _____
 - b. No _____
9. Please describe the method in detail. (Please use the text box below for your answer)
10. Do you believe that developing such a method would help improve the success rates of students who take online courses in your program? (Please use the text box below for your answer)
11. Does your institution offer any formal training for effectively designing online courses and for teaching online courses to maximize a students learning opportunity?
 - a. Yes _____
 - b. No _____
12. Does your institution make any adjustment to your teaching workload to accommodate for this additional training time?
 - a. Yes _____
 - b. No _____
13. Regarding "Best Practices" for developing and teaching online, please list two things that you believe are most important for successful courses. (Please use the text box below for your answer)

APPENDIX B

HANDOUT 1 – BEST PRACTICES FOR INSTRUCTORS

1. It is imperative that instructors of online courses clearly identify and communicate the student learning outcomes and the instructor's expectations for each course. Much time is wasted when learning outcomes and instructor expectations are not clearly articulated in the course syllabus.
2. One item that all online instructors should include in their syllabi is the expected wait time for a reply from the instructor. Students often have unreasonable expectations about how long it should take for the professor to respond to their inquiries.
3. In addition to having an adequate knowledge of the course material, an online instructor must have a desire to teach online courses. Adjunct land surveying instructors may consider that the additional time required to develop and teach a class online is more than they are willing or able to invest, when they add in their other responsibilities.
4. Online instructors should be very visible and actively involved in the learning process, and must work hard to establish trusting relationships. This can be accomplished by establishing several methods (discussion forums, message boards, chat rooms, blogs, email, etc.) within the online course for students to communicate with each other and with the instructor. The instructor should monitor these different tools and be prepared to respond to the student's concerns or questions.
5. Instructor's should utilize a number of short, targeted lecture videos, rather than delivering one long lecture so that students can assimilate the material in stages.
6. Online instructors should provide written detailed feedback on assignments to each online student rather than merely sending back a graded assignment, or only a grade, without

providing clear information for the student to understand why they received the grade they did.

7. Since instructors often start out with little or no formal training in teaching online courses it is very important for them to receive appropriate training so they will be qualified to design and teach online courses in a way that will effectively convey the course material in an organized and unambiguous way.

APPENDIX C

HANDOUT 2 – BEST PRACTICES FOR COURSE DESIGN

1. Online courses must be designed so that they are compatible with the varied needs of students. Online courses should provide several avenues for students to actively participate in their own learning by interacting and collaborating among themselves.
2. The instructor should develop the course so that it flows smoothly and contains supplementary learning aids such as You Tube videos, WebEx communications, and other technologies that can be utilized from within the learning management system to enhance the students' educational experience.
3. Collaboration among all of the instructors in a specific program, such as a land surveying program at a junior college, along with course design and IT specialists, will be very valuable in the creation of a consistent design or interface that will ultimately assist all of the students in the program, by adding consistency to their online experience as they progress through the program.
4. One of the respondents to the questionnaire suggested that an instructor who desires to teach an online course should take an online course first, to gain the perspective of a student. As a land surveying instructor in a community college, this writer certainly supports this suggested best practice. This instructor has incorporated the good practices observed while a student in the Geospatial Surveying Engineering program at TAMUCC into several courses, by transitioning one hybrid course into a fully online course and beginning the process of transitioning other courses into hybrid courses.

APPENDIX D

HANDOUT 3 – BEST PRACTICES FOR INSTITUTIONAL SUPPORT

1. The institution must provide adequate continuing education to online instructors and course developers in the use of the learning management system and other software and hardware that is utilized in the delivery of online instruction. This training is especially important for a land surveying program at a junior college where many of the courses are taught by professional land surveyors teaching only one course as an adjunct instructor.
2. A junior college offering a land survey program, where many of the instructors are adjuncts, should be prepared to compensate the adjunct instructors with a stipend while they attend continuing education to develop their course for online delivery. Such a policy will serve to encourage these adjunct instructors to teach online classes while compensating them for the additional time required in doing so.
3. Junior colleges should provide extended hours, if not 24-hour per day, technical support for both instructors and students of online classes. This practice would be very beneficial to land surveying students taking online courses and the adjunct instructors who teach them.
4. The institution should develop an adequate method to measure a student's readiness to take online courses before they are allowed to register for them. This may be especially necessary for those students who are returning to college, often after spending an extended period of time in the workplace or the military, to pursue new educational goals such as land surveying. Elithorp (2007) noted that many land surveying students return to college to earn a degree in land surveying after developing a strong interest in becoming a professional land surveyor while working in the profession.

APPENDIX E

HANDOUT 4 – BEST PRACTICES FOR FIELD LABORATORIES AND TESTING PROCEDURES

1. Online land survey students along with traditional in-class students taking a course that requires field laboratories may satisfy the requirements of the field laboratories by; (1) attending the scheduled field laboratory on campus at the regularly scheduled time set out in the course syllabus, or (2) they may make arrangements with a Registered Professional Land Surveyor (RPLS) located near them who is willing to supervise and provide the necessary equipment for the student to complete the assignments during the semester. Students who utilize the second option are solely responsible for making all arrangements with the RPLS, obtaining a signed field laboratory agreement between themselves and the RPLS, and transmitting the agreement to the instructor during the first week of classes. Online students who fail to submit the required field laboratory agreement will be expected to attend the field laboratories on campus or withdraw from the course. Blank field laboratory agreements should be made available from the instructor on the course web page and should also be placed on the program's website.
2. Each field laboratory assignment will be posted on the course web page on the same day that it is handed out to the in-class students, and a copy of the assignment will be emailed to the RPLS designated by the online students. Each laboratory assignment will contain a complete list of the field equipment required for the assignment along with a description of what is expected as a deliverable from the student, and the date when the assignment is due.
3. Online land survey students in courses that require hands-on laboratories using special software will be issued licenses for the software during the first week of classes and will

receive written instruction on how to load the software. It is the students' responsibility to load and test the software.

4. Online land survey students must provide the instructor with the complete contact information of an approved proctor site, such as an approved testing center located at a local college or university, or an approved commercial testing center, where they intend to take all examinations that will be required for the course. The contact information must include the name of the testing center's manager along with the complete address, telephone number, and email address of the testing center. The testing centers must be equipped with a lock-down browser for electronic examinations that are accessed through the learning management system (LMS) using the internet. The testing center will be provided with a password that will be entered by the testing center employee into the LMS to enable the student to access the examination. For those courses requiring paper examinations, the instructor will provide the designated testing center with written instructions for the proctor, the appropriate number of paper examinations, and pre-addressed, postage-paid return envelope. An online student who fails to notify the instructor of his/her designated testing center, at least one week prior to a scheduled examination, will be presumed to be taking the examination on campus at the designated time.

APPENDIX F

HANDOUT 5 – SAMPLE FIELD LABORATORY AGREEMENT

Note: Please **print** the parties names in the blanks provided then **sign** the appropriate spaces at the bottom of the page.

I, _____ insert land surveyor's name _____ a Registered Professional Land Surveyor, agree to act as a field laboratory proctor for: _____ insert student's name _____, a land surveying student at _____ insert the college or university name _____. I understand that the weekly contact hours for these field laboratory assignments will vary, depending on the specific learning outcomes of the course and the requirement of an individual assignment. I understand that it will be the student's responsibility to contact me in a timely manner to arrange specific times to work on these field laboratory assignments. As the designated proctor I understand that I can from time to time appoint one of my full-time employees to act in my stead when I am not available. As the designated field laboratory proctor, I agree to provide the equipment that is required for the completion of the field laboratory assignment to be used by the student during the agreed upon times, and I agree to provide the supervision and instruction necessary to assist the student in understanding the assigned task and the land surveying concepts that are involved in the particular assignment.

Registered Professional Land Surveyor	Date
---------------------------------------	------

Student	Date
---------	------

Instructor	Date
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APPENDIX G

HANDOUT 6 – SAMPLE FIELD LABORATORY PROCTOR COVER LETTER

Dear Colleague,

You are receiving this letter because a land surveying students at _____ insert the college or university name here _____, has asked you to assist them by serving as a field laboratory proctor for the following land surveying course _____ insert the course name here _____, that the student is enrolled in this semester. This particular course has a required field laboratory portion where the student will be required to complete several hands-on assignments during the semester using the equipment of the profession. Attached to this letter is a general list of land surveying equipment that could be required for any of these field laboratories and an agreement form between you, the student, and the school regarding your participation as a field laboratory proctor. Depending on the course learning outcomes, the weekly contact hours for these field laboratory assignments may vary.

As the course instructor, I want to thank you for your willingness to assist the student during this important part of their education as they prepare for a career in land surveying. As a field laboratory proctor, you are agreeing to provide the equipment that is required for the completion of the particular field laboratory assignment and to provide the supervision and instruction necessary to assist the student in understanding the assigned task and the land surveying concepts that are involved in the assignment. As the designated field laboratory proctor, you may at your discretion, assign one of your full-time employees to perform these duties on your behalf.

You will receive a copy of the student's field laboratory assignment from me by email on the day that it is assigned to the student. The email will contain a list of the specific equipment that will be required for the assignment along with a description of what is expected as a deliverable from the student, and the due date of the assignment. As always it is solely the student's responsibility to complete and submit the assignment on time.

Thank you for your assistance in this important task,

John Q. Instructor