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ON-DEMAND TUTORING IN DISTANCE EDUCATION:
INTRINSICALLY-MOTIVATED, SCALABLE INTERPERSONAL INTERACTION
TO IMPROVE ACHIEVEMENT, COMPLETION, AND SATISFACTION

By

Peter B. Williams

A dissertation submitted to the faculty of

Brigham Young University

In partial fulfillment of the requirements for the degree of

Doctor of Philosophy

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BRIGHAM YOUNG UNIVERSITY

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As chair of the candidate's graduate committee, I have read the dissertation of Peter B. Williams in its final form and have found that (1) its format, citations, and bibliographical style are consistent and acceptable and fulfill university and department style requirements; (2) its illustrative materials including figures, tables, and charts are in place; and (3) the final manuscript is satisfactory to the graduate committee and is ready for submission to the university library.

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ABSTRACT

ON-DEMAND TUTORING IN DISTANCE EDUCATION: INTRINSICALLY-MOTIVATED, SCALABLE INTERPERSONAL INTERACTION TO IMPROVE ACHIEVEMENT, COMPLETION, AND SATISFACTION

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Doctor of Philosophy

The purpose of the study was to test an intrinsically-motivated interaction approach, designed to increase distance education support, for both content and motivation, in a cost-effective manner. The literature summarized shows that distance education students desire content and motivational support beyond course materials and are limited in their success without it. Further, while researchers explore increased interaction as a solution, professors usually do not have time for it and attempts to provide it are often restricted by institutions' limited resources. Very little has been published on the effects of distance education tutors and the need for more research in this area has been noted, especially with regards to cost-effective, scalable service models. Even when attempts to increase interaction are successful, they are usually achieved by requiring participation in online discussion boards, making them mechanical

and frustrating to students. The proposed solution is an on-demand tutoring service to increase (a) achievement, (b) completion, (c) satisfaction and (d) cost-effectiveness.

Participants included Brigham Young University Independent Study students enrolled in a college algebra (MATH 110) course. A quasi-experimental research design, multivariate analysis of variance (MANOVA), graphing techniques, correlation, and chi square analyses were used to determine the effects of the on-demand tutoring intervention. No statistically significant differences were apparent in the midterm scores, final exam scores, satisfaction ratings, or completion rates. However, despite unexpectedly low usage, the tutor appears to have been an adequate substitute for the professor in answering students' questions, and the potential for providing cost-effective on-demand tutoring services seems attainable. A summary of the study's strengths and weaknesses provides insights for improved practice and future research.

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Introduction

Distance education is now characterized by at least six reasonably well-accepted traits: (a) a separation of the teacher from the learner, (b) the influence of an instructional institution, (c) technical media to connect teachers and learners, (d) two-way communication, (e) the possibility of occasional meetings, and (f) an industrialized form that utilizes principles such as division of labor and mass production (Keegan, 1983). Although the idea of using communication technology to deliver instruction is at least as old as the postal system, the technological advances of the last several decades have amplified the idea and brought distance learning to the serious consideration of the educational mainstream (Kinley, 2001; Moore, 2003; Phipps & Merisotis, 1999). In ever-increasing numbers, learners are drawn to the flexibility and accessibility of distance education (Howell, Williams, & Lindsay, 2003). However, education, including its distance form, will ever pose challenges to be addressed by researchers and practitioners.

In 1938, at the first conference of the International Council for Distance Education (ICDE)—which was one of the first and has become one of the best respected distance education associations—Chair Knute Broady stated the purpose for which they had met: to enlarge ideas and decide on new directions. He further stated the motivation that brought them together and the values upon which they were founded:

By equality of educational opportunity we mean extending education of equal [or better] quality to every one, no matter how humble his birth, no matter where he may live, and no matter what his reasonable aspirations may be. We think that is a very practical ideal—an ideal to which we can all subscribe, and I trust that

everything that we do in this conference will be evaluated in terms of it. (Bunker, 2003, p. 60)

It is my intent to contribute to this cause and uphold the criteria set forth in this foundational statement. The first ICDE conference also set goals to improve “interaction with learners, applications of communications technologies, and support for learners” (Bunker, 2003, p. 61). Although much progress has been made, there could be few statements more appropriate in describing the research still needed in the field of distance education.

Problem Statement: Content and Motivational Support for Distance Learners

One distance education challenge, and the focus of this dissertation, is that distance students often desire content and motivational support beyond what is provided by course materials (Phipps & Merisotis, 1999; Shea & Lewis, 2001; The Institute for Higher Education Policy, 2000). Materials come in many formats and are as varied as communications technology itself. The materials are usually produced by faculty, instructional designers, editors, testers, and a whole production crew as a team effort. Although one of the principal goals of the team effort is to provide instruction that effectively communicates the content in a motivational way, learners—inquisitive by human nature and embarking from a variety of experiential pasts—will always have questions. Further, with increased autonomy and flexibility, distance learners also inherit increased responsibility that only magnifies the already-crucial need for motivation in learning (Garrison, 2003; Jung, Choi, Lim, & Leem, 2002).

It reasonably follows that inadequate support impedes students’ success. Specifically, when learners are left with unanswered questions about the course content,

fail to see the relevance of what is being presented, or are otherwise frustrated by course requirements, their achievement, course completion, and satisfaction suffer (Brady, 2001; Jung et al., 2002; Moore & Kearsley, 1996). These fundamental learning outcome variables have been the focus of many program evaluations in distance education and are of primary interest in this study as well (Gunawardena & McIsaac, 2004). Virtually all distance education research seeks to motivate students and help them better understand the content. While changes in instructional strategy or presentational format are examples of interventions worth research pursuit, the particular focus of this study is the instructional and motivational interpersonal interactions available to students through tutors or TAs. The author hypothesizes that careful provision for such interactions is a key to fulfilling distance learners' need for more content-specific and motivational support.

Conceptual Context and Literature Review

The statements made by Phipps and Merisotis (1999), Kinley (2001), Moore (2003), and others about distance education's well-established past were intentional reminders and should not be ignored. As is far too often the case, "when distance educators believe they are using new media in a new field, important theories, research, and practices from the past are overlooked" (Bunker, 2003, p. 60). Accordingly, this report begins with a brief review of the conceptual foundations and literature that form the basis for providing content and motivational support for distance learners. These include interaction, the use of teaching assistants, scalability, computer mediated communication, student motivation, and a call for empirical inquiry. Once this context has been established, the report presents the research questions, method, and results for

an attempt to provide such support and answer the associated call for research in this area.

Interpersonal interaction in distance education. Many have advocated increased interaction as a solution to the demand for support. Shea and Lewis (2001) are among those calling for more interaction; they found that students' top two needs were quicker feedback and more student-instructor interaction. Others have supported this assertion and noted that student-instructor interaction is often a focus of accreditation reviews (Paulson, 2002). Further, while so much of the buzz surrounding distance education seems focused on technology, interaction has been identified as a more critical predictor of success (Cheney, 2002; Wilkins, 2002; Xin, 2002).

The term *interaction* in an educational context traditionally refers to “classroom-based dialogue between students and teachers” (Anderson, 2003, p. 129). However, the term has expanded in a distance context to include synchronous and asynchronous mediated dialog, simulated dialog, and even responses and feedback from interactive programs and television (Anderson, 2003; Holmberg, 1983; Moore, 1989). As discussed further in the *Proposed Solution and Hypotheses* and *Method* sections, this study focuses on two-way student-tutor communication, irrespective of media. To maintain a tight focus, the scope of this study does not include student-student interaction, although this is certainly another domain of interaction worthy of further exploration.

Student interaction with faculty and other students is recognized as an essential characteristic of quality education (The Institute for Higher Education Policy, 2000), and attempts have been made to incorporate it into distance education theory. In fact, distance education scholars have long understood this concern, and several learning theories and

models based on interaction have emerged (see Anderson, 2003; Baath, 1980; Holmberg, 1983; Moore, 1989). Moore's (1989) three types of interaction have had the most impact on distance education literature and also constitute a foundational pillar for this study. The potential for trade-offs between the three is a particularly important foundation for independent study models, as noted by Anderson (2002):

Sufficient levels of deep and meaningful learning can be developed as long as one of the three forms of interaction (student-teacher; student-student; student-content) is at very high levels. The other two may be offered at minimal levels or even eliminated without degrading the educational experience. High levels of more than one of these three modes will likely deliver a more satisfying educational experience, though these experiences may not be as cost or time effective as less interactive learning sequences. (p. 4)

While the term *interaction* is touted by most distance education providers, few studies have focused on the effects of increased interaction in distance education. Recognizing this paucity, Phipps and Merisotis (1999) expressed the concern that distance education has not yet been able to offer the “crucial element of interchange... that prepares students for a lifetime as knowledge workers” (see also Shifter, 2000). Similarly, some assert that computer conferencing—a primary attempt at increased interaction—has become mainstream with little evidence that it supports the higher order learning intended by increased interaction (Garrison, Anderson, & Archer, 2003; see the *Computer Mediated Communication in Distance Education* section for more discussion on this special case of interaction).

Instructors and teaching assistants in distance education. One major factor precluding results describing the effects of interaction may be that many professors do not have time for much personal interaction in high-enrolling distance courses. The need seems clear: “we must incorporate the strengths of specific technologies into sound instructional design, remembering to keep the intimacy of the teacher-student relationship foremost in our practice” (McIsaac, 1998, p. 33; see also Holmberg, 2003). Yet, many professors do not feel they have time. At the end of a six-year benefits-and-risks analysis of web-based distance education, LaCost, Iserhagen, and Dlugosh (2000) reported that faculty must conduct research and teach their normal load and have little time for distance offerings. Similarly, Markel (1999) noted: “Tenure, promotion, and release-time policies at most institutions fail to acknowledge the considerable time—measured in months, not days or weeks—needed to create a distance course” (p. 209). Although Markel’s statement specifically concerns the time needed to develop distance courses, maintenance responsibilities after development often require considerable time as well. A survey of over 400 higher-education faculty conducted by the National Education Association (2000) suggests that “more than half of distance learning faculty spend more hours on their distance learning course than [on] traditional classes. In spite of this, 84% do not get a corresponding reduction in workload, and 63% are compensated for their distance learning course as if it were part of their normal course load.” If faculty want to participate in distance offerings, they often must do so with inadequate incentives. True, there are some faculty who participate in distance courses on-load—such as faculty at University of Phoenix, Capella, Walden, and British Open University—they certainly have more time for distance offerings. However, on-load distance faculty are still a

minority and as courses scale beyond a few thousand enrollments more help is needed to maintain interaction with students, especially if cost-effectiveness is a factor (see *Scalability in distance education services* section for more about cost-effectiveness).

One trend that is certainly associated with strained faculty load concerns the definition of an instructor in distance education (Howell et al, 2003). As Paulson (2002) remarked, “rather than incorporating the responsibility for all technology- and competency-based functions into a single concept of ‘faculty member,’ universities are disaggregating [the role of] faculty... and [assigning] them to distinct professionals” (p. 124). Doing this involves a “deliberate division of labor among the faculty, creating new kinds of instructional staff, or deploying nontenure-track instructional staff (such as adjunct faculty, graduate teaching assistants, or undergraduate assistants) in new ways” (Paulson, 2002, p. 126).

The current study focuses on one of the disaggregated functions of the traditional instructor role, namely that of teaching assistant (TA)—specifically, TAs or tutors that interact on a personal level with students but who do not have any control over the development of course content or managerial duties such as grading. The tutor in this study is a part-time undergraduate student who monitors learners’ progress; provides invitations, study tips, and deadline reminders; answers questions; and offers encouragement (see *Proposed Solution* section for more details). Notably, this study builds on the work of Wilkins (2002), who focused on TA training for moderating online threaded discussion boards. As witnessed by an internet search for “online tutor,” seemingly-related advertisements abound—at least in the commercial realm (i.e. *Smarthinking.com*, *Tutor.com*, etc.). Further, academic distance education theorists and

practitioners such as Holmberg (2003) and Moore (1983) note the need for interpersonal interaction and even occasionally use words like *tutor* to describe what is needed.

However, very little has been published on the effects of distance TAs or tutors in terms of student achievement, completion, satisfaction, or motivation. Further, the few publications that do report distance TA-tutor inquiry, such as Salmon (1999), Wilkins (2002), Sax (2003), and Lentell and O'Rourke (2004), confirm the need for more research in this area, especially with regards to cost-effective, scalable service models.

Scalability in distance education services. Non-subsidized distance learning institutions must operate within the bounds of sustainable scalability to survive in a modern educational economy; were it not so, there would be comfortable tutor-to-student and even faculty-to-student ratios at distance institutions everywhere. As the distance education market will likely exceed \$10 billion within a year and government funding is very limited, the competition is becoming increasingly fierce (Bates, 2000; Kariya, 2003). Accordingly, "IT [information technology] Funding Challenges has become the number-one IT-related issue in terms of its strategic importance to the institution, its potential to become even more significant, and its capture of IT leaders' time" (Crawford, Rudy, & the Educause Current Issues Committee, 2003, p. 12). Some distance education providers have certainly demonstrated the power of technology integration, industrialized education, and economies of scale (Laws, Howell, & Lindsay, 2004; Peters, 1983); however, many institutions have not yet achieved these benefits (Branigan, 2003). Although technology allows greater student access, many are finding that technology *alone* is not reducing the costs of instruction as they had hoped (Brady, 2001).

Institutions must decide “to what extent courses [should] be made scalable without compromising interaction between instructors and students” (Saba, 2003a).

Scalability, in the context of distance education, can be defined as “increasing enrollments while still being profitable, or at least financially self-sustaining” (Laws, Howell, & Lindsay, 2004). Although this may seem intuitive now, it is an all-too-painful realization for many higher education institutions whose distance efforts have consisted of cost shifting. “Reports from online programs across the country . . . consistently indicate that the cost per student of a high-quality online learning program is the same as or greater than the per-student cost of [traditional] education” (Branigan, 2003, p. 1). The reason is that the biggest costs in education are for staffing, “so the savings that come from eliminating school buildings is miniscule and often is less than the cost of developing eLearning curriculum” (p. 1). As they make major decisions, “IT leaders must explore cost savings, understanding the differences between cost savings and cost shifting” (Crawford et al., 2003, p. 20).

Computer mediated communication in distance education. Given faculty and cost constraints, many attempts have been made to increase scalable distance-learning interaction using computer-mediated communication (CMC), particularly online discussion boards and synchronous text chats. This information-age capability can be viewed as the natural result of the allure of technology and call for more interaction. As noted by Garrison et al. (2003), online learning is different from other forms of distance education in that it allows collaborative learning regardless of time and place. Rumble (2001) noted the effects of CMC on pedagogy as a shift “from a transmission model of education towards a constructivist model exploiting computer-mediated communication”

(p. 31; see also Miller, 2001, p. 314). As in many aspects of modern distance education, the British Open University (OU) may serve as a pioneering example of this phenomenon (Salmon, 1999). As one of the first and most widely-recognized distance-only universities (established in 1960s), OU launched their pioneering CMC efforts in 1988 (Salmon, 1999).

Although some, such as OU have succeeded in increasing distance learning interaction with CMC, the prognosis of current approaches is not as ideal as many would hope. One unsurprisingly prominent symptom apparent in a CMC approach is the cost-effectiveness barrier discussed earlier (Bates, 2000; Kariya, 2003). Although CMC provides participants with greater flexibility and may decrease facility costs, the biggest costs in education are for staffing and CMC still requires people. Admittedly, some consider frequently-asked-question boards and knowledgebases to be part of CMC; these approaches may require fewer staff to maintain. However, CMC alone—without other institutional reforms and effective delivery models to accompany it—constitutes cost-shifting. Thus, notwithstanding CMC approaches to scalable interaction, there is still a need for further research in this area.

Another symptom is that the current use of online threaded discussion boards often results in mechanical, artificial student posts that frustrate students and may have little impact on achievement (Garrison, Anderson, & Archer, 2003). Many online courses *require* a minimum number of posts to assure interaction via online forums. However, as Berge (1999) explains, if students perceive interaction requirements as too heavy, it “can lead to loss of the student's attention, boredom, information overload, and frustration” (p. 10). One common result to such extrinsic motivators is for students to post enough to get

credit, but not become fully engaged in a distance conversation. For example, while relating to and building upon others' posts has been identified as an indicator of interaction quality (see Xin, 2002, p. 160), typical posts in online course forums often show little influence by others' comments (Stevens, 2003). As Stevens' findings suggest, requiring interaction on discussion boards may increase posts significantly (i.e. from 27% to 137%), however, they are often "brief, *non-interactive* posts"—an ironic result for an attempt to increase interaction. Some, such as Xin (2002) and Wilkins (2002), have focused research efforts on improving the quality of collaborative discourse and training for online moderators; such efforts are promising and are certainly worthy of further investigation.

Motivation and satisfaction in distance education. Students' motivation to participate in distance learning interaction appears to be a critical factor determining the instructional quality of the interaction (Stevens, 2003; Wilkins, 2002, Xin, 2002). This is not surprising, since motivation has long been established as a critical element of learning in any context (Smith & Ragan, 1999). Further, many would argue that distance education only accentuates the central function of motivation in learning (Jung et al., 2002; Laws, Howell, & Lindsay, 2003; Otton, 2003). As Otton noted, "students used to instructor-directed learning may feel somewhat lost in an environment that relies heavily on individual initiative and independent learning" (p. 28). Where distance learning motivation is not addressed, course completion and achievement suffer (Jung et al., 2002).

Initial motivations among distance students vary, with some fulfilling degree requirements, others getting electives not convenient through a traditional institution, and

still others seeking career development. However, Oblinger (2000) asserts that “most [distance] students are seeking a degree or credential” (p. 38). While self-directed approaches allow for flexibility, providing learners—especially nontraditional students—with opportunities to progress at their own pace, place, and time, it is difficult to earn a degree in isolation. Successful distance educators acknowledge this challenge and assert that “students seeking a degree in an open entry-exit system must have a great deal of self-motivation in order for it to work” (Laws, Howell, & Lindsay, 2003, ¶ 25).

Many models have been advanced to help incite and maintain student motivation—for example, Keller’s ARCS model (see Smith & Ragan, 1999), Garrison (2003) and Pintrich’s (see Dunigan, 2003) work on self-directed and self-regulated learning, and Cornell and Martin’s seven principles of motivation for online learning (see Peters, 2003). Although an in-depth focus on any one of these theories of motivation is beyond the scope of this study—and is, incidentally, the focus of numerous other studies, such as Dunigan’s (2003)—the following statement by Holmberg (2003) may best describe the current study’s approach to increase students’ motivation:

Central to learning and teaching in distance education are personal relations between the parties concerned... and empathy between students and those representing the supporting organization. Feelings of empathy and belonging promote the students' motivation to learn and influence the learning favorably. Such feelings are fostered by... supplementing the course [materials with] friendly mediated interaction between students [and] tutors. (pp. 81-2)

Although this dissertation does not focus precisely on students’ feelings of empathy and belonging elicited by tutors, it is supported in part by Holmberg’s theory.

Holmberg asserts that a tutor representing the supporting institution can supplement course material with additional interactions and support that can promote student motivation. Providing tutors to promote motivation is a notably different approach from requiring participation on discussion boards. If intrinsically-motivated (i.e. non-required) interactions with a tutor can increase motivation, perhaps it would be manifest by an increase in completion and satisfaction. However, little research has been done to examine the effects of intrinsically-motivated student-tutor interactions in distance education.

Call for empirical inquiry grounded in distance education's past. As is apparent in the following statement by McIsaac and Gunawardena (1996), there is a call for research to more authoritatively fill its proper place as a guiding influence in the field of distance education:

Distance education relies heavily on technologies of delivery... to promote student-teacher interaction and provide necessary feedback to the learner at a distance. Because technologies as delivery systems have been so crucial to the growth of distance education, research has reflected rather than driven practice.
(p. 403)

Among the trends that emerge over the history of distance education is the call for more research into its methods and practices (Bunker, 2003). This theme has been reiterated by all of the leading voices in the field with an admonition to situate research within the context of foundational distance education theory and literature (Gunawardena & McIsaac, 2004; Moore, 2004; Saba, 2003). Further, it is not just a hearkening to literature that is needed: "There is a relative paucity of true, original research dedicated to

explaining or predicting phenomena related to distance learning” (Phipps & Merisotis, 1999, p. 2), especially with regards to interaction (Bannan-Ritland, 2002; Garrison & Anderson, 2003). In the report of her exhaustive literature review, Banna-Ritland (2002) also noted that there were more case studies in distance education research than any other method and articulated the need for more experimental and mixed-method studies with generalizable results. Such research may provide guiding principles for practice and help solidify a coherent discussion for future research and incremental advances in the field.

Proposed Solution and Hypotheses

Purpose of the study. This study is an attempt to build on past efforts to improve the support available to distance education students, both in terms of content and motivation, by *allowing for* (not requiring) increased interpersonal interaction. Further, it is presented in answer to the call for more empirical studies grounded in distance education’s past and sensitive to cost-effectiveness and scalability demands. The literature summarized in this report shows that distance students desire support beyond course materials and can be hindered in their success without it. Further, while researchers explore increased interaction as a solution, professors usually do not have time for it and attempts to provide it are rarely scalable. Even when attempts to increase interaction are successful, they are usually achieved by requiring participation in online discussion boards, making them mechanical and frustrating to students. Hence, the purpose of this study is to test an intrinsically-motivated interaction approach, designed to increase distance education support for both content and motivation in a sustainable, scalable way.

Proposed solution. The proposed solution was an on-demand tutoring service. Student tutors are not difficult to find in a dual-mode (campus and distance) institution and are not as expensive as professors. Therefore, assuming they are capable of providing the support needed, they can be a more cost-effective means of providing students with interpersonal interaction than trying to do so with busy professors. Of course, within these bounds, helping students is what matters most. Thus, as Holmberg (2003) noted, “When tutors find that certain parts of a course cause particular difficulties, supplementary explanations can be given... In the same way, additional information, suggestions for consideration, and so forth can supplement preproduced learning materials” (p. 81). Further, unlike many required interaction approaches, an on-demand model promotes *sincere* interactions that result in empathetic relationships crucial to student satisfaction and achievement (Holmberg, 2003). The on-demand model also accommodates students as they face the tension observed by Sener (2003), “between learners wanting the perceived benefits of [interaction], and learners having a high need for maximum flexibility and convenience” (¶ 18).

The on-demand model entails inviting students to contact a tutor, using whatever medium they find most convenient and effective, any time they have questions or concerns about the course or just want to discuss it. A part-time student tutor monitors learners’ progress; provides invitations, study tips, and deadline reminders; helps organize study groups where students express the desire; answers questions; and offers encouragement (see an example of the training provided in Wilkins, 2002). Tutors email students their office hours and responds to all emails and messages within one business

day. As they work with students, tutors collect frequently asked questions and responses in a knowledgebase to improve future support, course quality, and scalability.

The author recognizes that the *on-demand tutor support model* is comprised of specific tutoring strategies, and personal skills implemented by the tutor in conducting the services just delineated. Further, it is important to consider the possibility that *how* the specific tutoring procedures are implemented and the particular tutor providing the support in this study may be more directly responsible for the outcome than the model as a whole. However, while tutors do receive training and are required to follow basic guidelines for effective tutoring, it is not within the purview of this study to focus in more depth on these particular training items. Rather, the author assumes for the current study that the procedures mentioned constitute the critical features of the program and focuses instead on the broader issue of their combined impact, as a whole, on distance courses that otherwise include virtually no interpersonal interaction for content support or motivational support. It has been the work of previous endeavors (Wilkins, 2002; and unpublished pilot studies conducted by the current author) to explore tutoring guidelines and will likely be the work of follow-up studies to more carefully inspect tutor service quality and the particular tutoring procedures' effectiveness and efficiency.

Potential significance. A successful on-demand tutoring model would advance several important implications for distance education. To begin with, it would show that it is possible for tutors to provide the individualized, personable content and motivational support that the professor does not have time to provide in high enrolling distance courses. Implicit in this conclusion is the assertion that undergraduate, part-time tutors

can be knowledgeable enough to answer most content questions likely to be posed within the context of at least some introductory courses.

In addition to student and tutor benefits, successful on-demand support may offer promising options for institutions rightly concerned with cost effectiveness in a modern distance education market. The on-demand model assists students who need and want support in a given course without imposing burdensome interaction requirements on other students who neither need nor want it to meet course learning objectives. Since students may choose to use or not use the service, the resulting interaction is sincere, focused on pertinent issues, and socially and instructionally balanced. On-demand support can efficiently serve students who are self-motivated to use it, with minimal strain imposed on the tutor by those less likely to benefit, making the model sustainable and scalable. Since students are likely to only use the service to the extent they feel it is helpful, the amount of actual use, when compared with other measures of the demand, may also become an indicator of quality for the service. Finally, as tutors assist students and build course- and content-specific knowledgebase entries, they may improve the service for future students, provide feedback for continually improving the course, and lighten future tutor load.

Research questions. The criteria established as themes throughout this study—achievement, completion, satisfaction, and scalability—are not only common indicators in distance education research, but they were also independently identified by stakeholders as the specific desired outcomes, consequently driving this study. If distance education research is to drive practice rather than reflect it as it has in the past (McIsaac & Gunawardena, 1996), guiding questions must be informed by practitioners.

Consequently, stakeholder representatives were chosen from among practitioners, including the director and assistant directors of Brigham Young University (BYU) Independent Study as well as members of the BYU Division of Continuing Education Deans Office. Members of the Independent Study Student Services staff—who take hundreds of calls each day from students seeking support—were also asked to represent the needs of students and help identify courses with the highest demand for support (see the *Setting and Participants* section for a more detailed description of the sponsoring institution). When asked what they cared about, their responses may be summarized as follows:

1. Do tutor-using students learn the content better than non-tutor-using students? How much? (Achievement)
2. Are tutor-using students more likely to complete the course than non-tutor-using students? (Completion)
3. Are tutor-using students more satisfied with their distance learning experience than non-tutor-using students? How much? (Satisfaction)
4. Do tutor-using students feel the tutor was helpful? (Tutor Helpfulness)
5. Is the model scalable and cost efficient? (Scalability)

These stakeholder responses constitute the primary research questions for this study. The practitioner stakeholders not only identified the research questions they care about, they provided the criteria for determining acceptable responses to these questions. For example, they helped to identify a predicted fee of \$30 per student for tutoring services, based on seven months of 20 hour-per-week tutor time at \$10 per hour, divided among a predicted 200 students. Further, the Director of Independent Study reported a

desire to see that at least three-quarters of the students reporting that their tutor was helpful and that at least two-thirds of them being willing to pay the predicted fee.

Accordingly, keeping with the empirical research format of this study, the research questions may be phrased as following hypotheses:

1. Tutor users' mean score on the final exam will be greater than non users'.
2. Tutor users' completion rate will be greater than non users'.
3. Tutor users' satisfaction rating will be greater than non users'.
4. At least 75% of tutor-users will report that their tutor was helpful.
5. At least 67% of students will report a willingness to pay the predicted fee for tutoring services.

Method

Approach Rationale

As implied, the approach for this study was quasi-experimental. There are certainly other methods worth pursuit given the instructional challenges and research questions that have been presented. For example, questions of empathy, student motivation, and satisfaction surely involve the complexities of human nature that may be most appropriately explored with naturalistic inquiry and qualitative data. However, while a diversity of approaches could well be focused on the complex issues at hand, the approach and scope had to be selectively chosen. Related literature suggests the need for more empirical studies with generalizable implications, especially in distance education interactions. While the current study entailed natural groups and was therefore quasi-experimental, the literature reviewed suggests that it may still be a step in the right direction. Further, as presented previously, an effective, scalable on-demand tutoring model for distance education would certainly have generalizable implications, the potential of which justify the present approach.

The approach was also chosen as most appropriate given the setting for the study. All researchers must work within the constraints of feasibility, their sponsoring institution, and available resources. Accordingly, the setting for this study was an introductory college math course offered through Brigham Young University's (BYU) department of Independent Study in the Division of Continuing Education. Independent Study has the appropriate environment and provides agreeable circumstances for a semi-controlled quasi-experimental study in terms of enrollment numbers, flexibility to try new

models (i.e. directors who allow experimentation with the established model), and access to data and resources.

Setting and Participants

Independent Study is a non-subsidized, revenue-generating department of Brigham Young University, a research institution and the largest private university in its class. Independent study offers over 450 Web and 600 paper-based courses at both the secondary and university level. It currently serves over 130,000 enrollments a year, with students in every state and 60 other countries. Independent Study courses are open enrollment—so students can enroll at any time—and learners have up to one year to complete a course. They also have the option to extend the course deadline if necessary for an additional three months.

Although Independent Study has worked to facilitate the two-way communication crucial in distance education, the content and motivational support interactions available to students have been limited. Independent Study has been very successful at providing students with personalized, distracter-specific, immediate feedback on computer-graded (*Speedback*) assignments. In addition, web courses include some interaction via threaded discussion forums. If students have questions beyond the interaction provided through these channels, they may also contact Independent Study's responsive Student Services for logistical and technical matters. Although Student Services provides a measure of empathy and works to facilitate resolution of content issues as they arise, there is a clear need for more content and motivational support. Independent Study is always looking to improve the quality of its instruction, the services it offers, and its scalability—allowing the maximum number of students to benefit from quality educational opportunities at the

minimum possible price. As part of this effort it maintains a special projects team, dedicated to research and continual improvement. The author leads this team and has focused on increasing the content and motivational support available to students.

The participants in the study were selected from those enrolled in Independent Study's College Algebra (MATH 110) course. Institutional Review Board approval, including the application for use of human subjects, was obtained as part of the prospectus approval process. Further, early on in the pilot studies preceding this study, the principle investigator met with the instructional design consultant and the department chair of The Mathematics Department with stewardship over the course to obtain their approval and support. The course has enrolled more than 1,400 students during 2004 and consists of 17 lessons, 2 midterm exams, and a final comprehensive exam. All of the lessons and exams are computer-graded with multiple-choice and matching items that require students to work through problems before selecting their answer. The exams come after lessons six, twelve, and seventeen, splitting the course into three nearly-equal segments. The course was selected after consultation with the director of Independent Study (IS), IS Student Services director and representatives, IS content corrections office, and the director of the Bachelor of General Studies (BGS) program. Their report helped to identify a course that elicits a relatively high number of calls for extra content and motivational support.

The students in the course come from a variety of circumstances, but the majority could be considered typical college students. Approximately 46% of the students who enroll in the course are female and a little over half the students are from Utah and California with the other half dispersed across all 50 states. The students' ages range from

mid-teens to 70s, with approximately 16% in their teens, 63% in their 20s, 10% in their 30s, and 10% in their 40s or above. Many of them take the course as a graduation requirement, some as non-traditional BGS students, and many as matriculated BYU on-campus students who find Independent Study convenient.

As mentioned previously, it is not difficult to find a qualified student tutor among the tens of thousands of undergraduate students attending a large dual-mode institution such as Brigham Young University (BYU); for this study it was assumed that the only crucial prerequisites are proficiency and interest in the subject matter, as demonstrated by past grades in math courses, and good communication skills, as identified in the interview. The part-time tutor for this particular study was a BYU on-campus undergraduate student. He was a sophomore with a mathematics major and demonstrated proficiency in math. He had had minimal experience with distance education and tutoring, but seemed insightful. He was selected for his friendly personality, desire to help other students, and ability to explain math concepts in plain terms. At Independent Study, tutors receive basic training for distance tutoring on the job and meet regularly with other tutors to discuss challenges and successes. Incidentally, the current tutor training includes a review of some of the materials produced by Wilkins (2002).

Research Design

The research design can be best described as two studies, each with its own treatment and control group. The reason for this design involves a combination of factors, including the diversity of the research questions to be addressed, the logistics of an open-enrollment system, and the unwieldy timeline that accompanies student flexibility in completing an Independent Study course. The strategy employed was to collect the

necessary data from groups large enough to be representative and to condense the research timeline to a confound-avoiding minimum. It is important to note that condensing the research timeline by looking at multiple groups during different phases of their instruction did not require students' actual course timeline to be adjusted at all. Further, since gathering adequate data to address some variables would interfere with efforts to address others, the two studies were devised to assure fitting conditions to address each research question, some in one study and another in the other.

The first study focused on the effect that the tutor intervention had on achievement, satisfaction, and cost-effectiveness. It was essentially a posttest-only design with one treatment and one control group, as summarized in Table 1. The treatment group was composed of 175 students in MATH 110 who took their first midterm exam during December 2004 or January 2005. Everyone in this group was invited, at the time of their first midterm, to utilize on-demand tutoring services for the remainder of their course and were given all the information necessary to do so (see a copy of the Midterm-1 Invitation in Appendix A). The control group was composed of 156 students who took their first midterm exam during October or November 2004. They received the exact same course materials as the treatment group, were under the same year-to-complete timeline restraints, and were required to complete the same lessons and exams. However, none of the students in the control group was invited to receive tutoring, nor did they have any knowledge that such services would be offered to others. At the time of their final exam, both groups were asked to answer a few evaluation questions. Specifically, they were to rate their satisfaction with the course on a seven point scale, from *exceptionally low* to *exceptionally high*, and the helpfulness of any tutoring they received on the same scale.

These scales were scored from 1 to 7 for statistical analysis. They were also asked to indicate whether or not they would be willing to pay the predicted fee for tutoring services, *yes* or *no* (see a copy of the evaluation items in Appendix C). For this study, the independent variables were the invitation to use the on-demand tutoring service and each student's time with the tutor. No placebo intervention was involved.

Table 1

Research Design

Question	Study	Participants	I.V.	D.V.
1. Do tutor-using students learn the content better than non-users? How much? (Achievement)	1	Oct-Nov midterm (Control $n \approx 160$), Dec-Jan midterm (Treat. $n \approx 150$)	Tutor invitation, tutor min. per student	Midterm 1, Final exam scores
2. Are tutor-using students more likely to complete the course than non-users? (Completion)	2	No midterm by halfway date. (Rand. assigned treat. and control $n \approx 50$ each)	Tutor invitation, tutor min. per student	Course completion rate
3. Are users more satisfied with their learning experience than non-users? How much? (Satisfaction)	1	Oct-Nov midterm (Control $n \approx 160$), Dec-Jan midterm (Treat. $n \approx 150$)	Tutor invitation, tutor min. per student	Course satisfaction ratings
4. Do tutor-using students feel the tutor was helpful? (tutor Helpfulness)	1	Oct-Nov midterm (Control $n \approx 160$), Dec-Jan midterm (Treat. $n \approx 150$)	Tutor invitation, tutor min. per student	Tutor helpfulness ratings
5. Is the model scalable and cost efficient? (Scalability)	1, 2	Oct-Nov midterm (Control $n \approx 160$), Dec-Jan midterm (Treat. $n \approx 150$)	Tutor invitation, tutor min. per student	Willingness-to-pay ratings

The author acknowledges trade-offs in the research design and tried to minimize confounds while maximizing research power and feasibility. For example, the students

work at different paces, suggesting that some students may have requested their first midterm only a few weeks after their enrollment while others may have done so with only a few weeks until their expiration. However, it is assumed that such disparity and the effects of other individual differences are not systematically related to the definition of the groups and can therefore be accounted for in statistical analyses (see Data Collection and Results sections). Further, the treatment and control groups were not randomly assigned in an attempt to maximize the number of students in each condition. Again however, benefits and risks were carefully considered in the design. First, students' materials and distance course setting may be assumed to be equivalent. Second, it was doubtful that students who would request their first midterm during December 2004 or January 2005 would be systematically different from those requesting their midterm in October or November 2004, thus approximating the effect of true experimental randomization. Finally, the proposed group definition helped to maximize the number of students in each condition while constraining the timeline.

The second study focused on the effect that the tutor intervention had on course completion. It may also be thought of as a posttest-only design, only with randomly-assigned treatment and control groups, as summarized in Table 1. This study involved 122 MATH 110 students (59 treatment and 63 control) whose course was to expire in May or June 2005 but who had not completed their first midterm exam by their official half-way date in December 2004 or January 2005. These students may be thought of as those at risk not to complete the course by their expiration date, in contrast to those in the first study, 80% of which were predicted to complete their course within six months of their first midterm. Those randomly assigned to the treatment group were invited to

utilize on-demand tutoring services for the remainder of their course (see a copy of the Half-Way-Mark Postcard Invitation in Appendix B) while those in the control were not. For this study too, the independent variables were the on-demand tutoring service and each student's time with the tutor. Once again, there was no placebo intervention involved.

The second study also implies trade-offs that were carefully considered and was designed to complement the first study. First, examining the progress of students at risk to not complete their course on deadline implied a strong probability that many students would not complete their final exam or its accompanying evaluation items (regarding course satisfaction, willingness to pay for a tutor, and tutor helpfulness). Further, many of the at-risk students not completing may have become busy and may therefore not have been very responsive to any follow-up inquiries Independent Study may have made. Given this scarcity of data, this study would not likely provide sufficient means to address the questions of achievement and satisfaction—thus, the need for the first study. However, the second study was better suited to address the question of completion, since it targeted the *at-risk* instead of *on-track* students and since participants' expiration dates were comparable. Incidentally, the research timeline would need to have been extended several months to examine the completion rate of students in the first study, since they were chosen based on when they requested their first midterm, not when their course was to expire. Both studies helped to provide tutor load, as treatment-group students used tutoring services, and thus contributed to a test of scalability.

Data Collection

As mentioned previously, several variables were important to the results analysis and ultimately helped respond to the research questions. Variables were selected to help address both the primary research questions (i.e. Did the intervention have an effect?) as well as some of their follow-up corollaries (i.e. How much of an effect did the intervention have?). The primary independent variable for both studies was the invitation to utilize on-demand tutoring services. Its *how-much* corollary independent variable was the time the tutor spent interacting with a given student. The dependent variables matched the research questions, as summarized in Table 1, and included students' scores on their first midterm and final exam, group completion rate, satisfaction rating, tutor helpfulness rating, and willingness-to-pay rating.

The data were collected into two database systems. First, Independent Study's student information system, *RS 6000*, was used for student enrollment records, midterm and final exam scores and dates, and course completion dates. It also collected the satisfaction, tutor helpfulness, and willingness-to-pay ratings obtained at the time of the final (see a copy of the evaluation items in Appendix C). Second, the special project team's database captured tutor minutes—per interaction, per student, and total on the study. The tutors made a record of every interaction they had with a student (see the Tutor Database Interaction Form in Appendix D). The total tutor time spent was important in calculating the actual cost of the service. Although originally collected in the separate databases, the data were merged in the special projects database and connected by means of the students' identification numbers. Then, arranged by student as complete records, the data were exported for statistical analysis in *SPSS*.

Results

The analysis procedures planned were selected, in consultation with statistical analysts from the Department of Instructional Psychology and Technology (IP&T) and the Statistics Department. These techniques were chosen for their ability to account for several variables, detect interaction effects, and predict outcome variables.

Descriptive statistics provide valuable context and therefore precede a presentation of hypothesis-specific results (see Table 2 for a summary of descriptive statistics). To begin with, the size of each group met or exceeded its projected size, indicating that the design was implemented as planned. However, tutor usage was much lower than expected. A few indicators reveal this result. First, treatment students only used 110 hours of tutor time when at least 300 were projected. Second, only one quarter (25.1%, $n = 175$) of Treatment 1 students engaged in interaction with the IS tutor. Incidentally, double this percentage (52.5%, $n = 59$) of the at-risk treatment students had contact with him. Third, only twenty students, 8.5% of all the students invited to participate, used the tutor and completed the final by their expiration date. Fourth, the median tutor time per student used by Study 1 and Study 2 treatment groups was very low ($Mdn_1 = 4.0$ min., $n = 43$; $Mdn_2 = 5.0$ min., $n = 31$; respectively), despite a much higher mean and standard deviation due to a few extreme outliers ($M_1 = 54.2$ min., $SD = 175.1$; $M_2 = 75.8$ min., $SD = 366.2$; respectively). Fifth, most of the tutor's interaction time (79.9%) was spent answering content-related questions, while 5.6% of interaction time was in proactive contacting and only 0.4% in answering logistical questions. Incidentally, the tutor asked students as he worked with them if they would like him to organize a study group, but none of them ever expressed any interest. Finally, the time

was nearly evenly split among email (35.7%), phone (31.3%), and face-to-face (31.2%) interactions, while only 0.5% of the time was spent using Instant Messenger.

A one-way multivariate analysis of variance (MANOVA) was conducted to test the hypotheses that tutor users' mean score on the final exam would be greater than non users' and that tutor users' satisfaction rating would be greater than non users'. There were no statistically significant differences apparent in midterm, $F(1/191) = 1.665, p = .20$; final exam $F(1/191) = .265, p = .61$; or satisfaction means $F(1/109) = 0.057, p = .81$.

A Z-Test of Independent Proportions was planned to compare the Study 2 treatment and control groups to test the hypothesis that tutor users' completion rate would be greater than non users'. However, due to the small number of students who completed in both the Study 2 treatment and control groups ($n = 2$ and $n = 5$, respectively), statistical testing was not appropriate.

Descriptive statistics were used to address the remaining hypotheses. First, it was hypothesized that at least 75% of Study 1 tutor-users would report that their tutor was helpful. Accordingly, most (85.7%, $n = 28$) of the treatment group students who actually did complete the final and respond to the evaluation questions reported their tutor's helpfulness as medium to exceptionally high. However, it is interesting to note that there were nearly as many control-group students who responded to the tutor-helpfulness question ($n = 22$), and all of them (100%) were similarly pleased with whatever non-Independent-Study tutor they found on their own. Finally, it was hypothesized that at least 67% of all students combined would report a willingness to pay the predicted fee for tutoring services. However, only a little more than half (58.9%, $n = 112$) of all respondents reported such willingness.

Table 2

Group Descriptive Statistics

Group / Study	Statistic	Midterm	Final	Tutor Minutes	Satisfaction	Helpfulness	Days Elapsed
Treatment 1 (<i>n</i> = 175)	<i>n</i>	171	98	43	74	28	107
	<i>M</i>	78.9	79.0	54.2	5.0	5.0	70.7
	<i>Mdn</i>	84.0	81.0	4.0	5.0	5.0	63.0
	<i>SD</i>	16.8	13.6	175.1	1.1	1.8	48.5
Control 1 (<i>n</i> = 156)	<i>n</i>	151	96		37	22	97
	<i>M</i>	81.7	78.1		4.9	5.5	60.5
	<i>Mdn</i>	84.0	80.0		5.0	6.0	53.0
	<i>SD</i>	12.5	11.9		1.2	1.2	39.4
Treatment 2 (<i>n</i> = 59)	<i>n</i>	10	2	31	1		2
	<i>M</i>	70.8	60.5	75.8	5.0		73.0
	<i>Mdn</i>	72.0	60.5	5.0	5.0		73.0
	<i>SD</i>	17.5	21.9	366.2			25.5
Control 2 (<i>n</i> = 63)	<i>n</i>	11	5		5	2	6
	<i>M</i>	80.0	81.6		4.2	5.5	25.7
	<i>Mdn</i>	84.0	86.0		4.0	5.5	24.5
	<i>SD</i>	14.1	13.9		1.5	2.1	21.8

In addition to the hypothesis-specific analyses, a multivariate regression analysis and graphing techniques were planned to explore the relationships among variables. The specific goal of these analyses was to predict *how much* tutor time influences achievement, satisfaction, and willingness to pay the predicted fee. Other possible predictors of these dependent variables—such as midterm score, midterm-to-final time lapse, and tutor minutes received by each student—were to be included in the multivariate regression analyses to help isolate the influence of the intervention. Once again, there were insufficient sample sizes to conduct the planned multivariate regression analysis. However, inter-correlations were calculated instead to explore the relationships among variables. The Study 1 treatment group analysis revealed a moderate midterm-final correlation ($r = .392, p = .00, n = 98$) and a final-satisfaction correlation ($r = .456, p = .00, n = 74$). It also showed a significant correlation between the amount of tutor minutes at-risk students received and the number of lessons they submitted during the study ($r = .440, p = .01, n = 31$; see the correlation scatterplot in *Figure 1*). No other significant correlations were apparent involving either of the independent variables, given the small sample sizes and low statistical power.

Chi Square analyses, although not originally planned, were conducted in connection with graphing techniques to help explore patterns among the groups and variables. Specifically, the Chi Square statistic helped to compare observed frequencies of student scores in each quartile with the statistically expected values. Two patterns that emerged with these analyses are noteworthy. First, although the difference is not statistically significant ($\chi^2(3, n = 190) = 2.32, p = .51$), the bar graph shown in *Figure 2* comparing Study 1 treatment and control groups' final exam scores shows more

treatment students in the top quartile and fewer in the lower and bottom quartiles.

Second, the bar graph in *Figure 3* shows that the subgroup of Control 1 students who responded to the tutor-helpfulness question ($n = 22$) finished the course significantly slower and perhaps more consistently than both the treatment group and the remainder of the control group in Study 1 ($\chi^2 (6, n = 226) = 49.9, p = .00$).

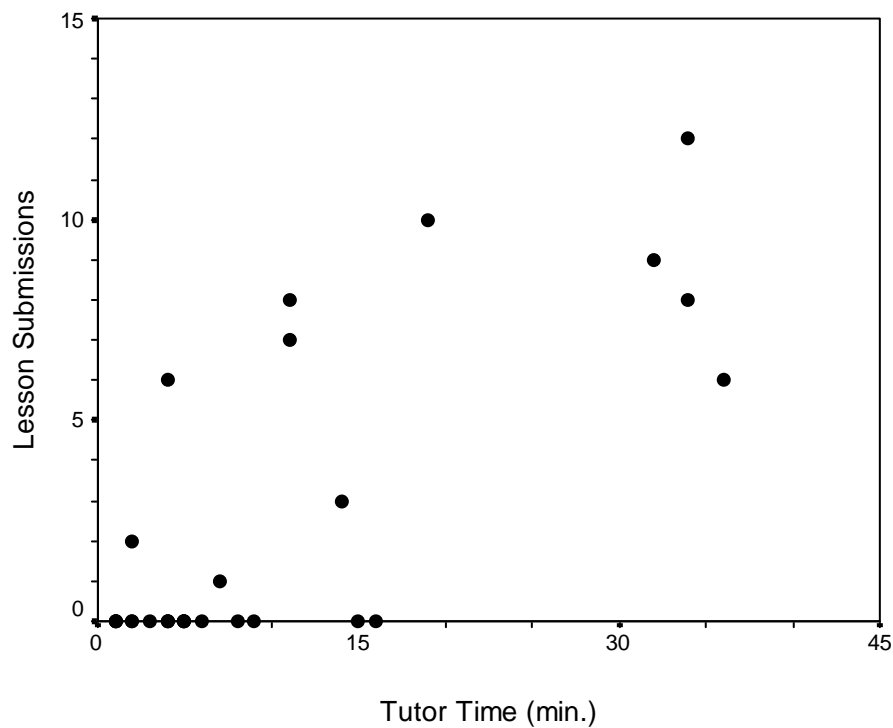


Figure 1. Scatter plot showing the correlation of at-risk student's tutor time with the number of lessons they submitted.

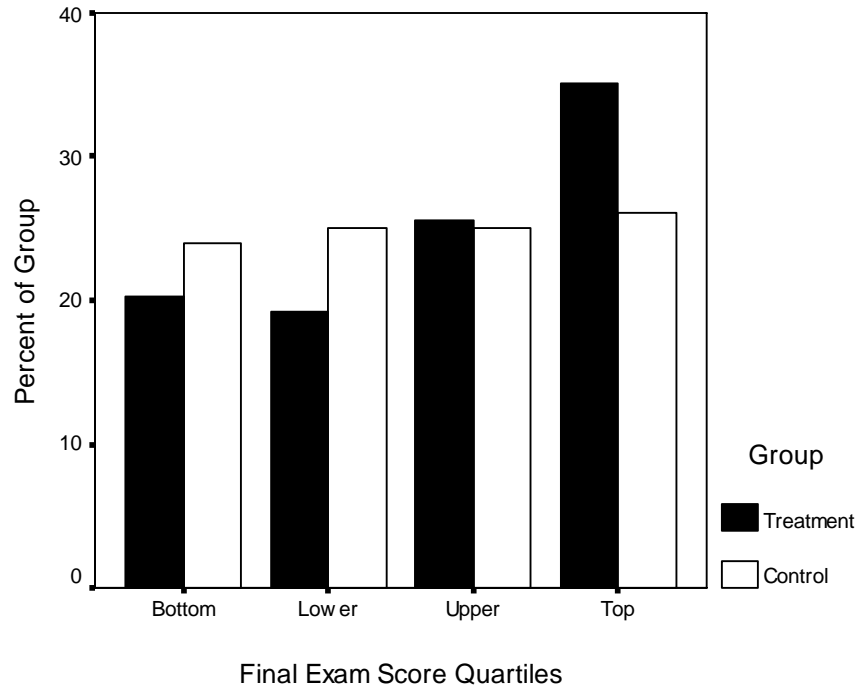


Figure 2. Bar graph showing the quartile distribution of final exam scores for each group.

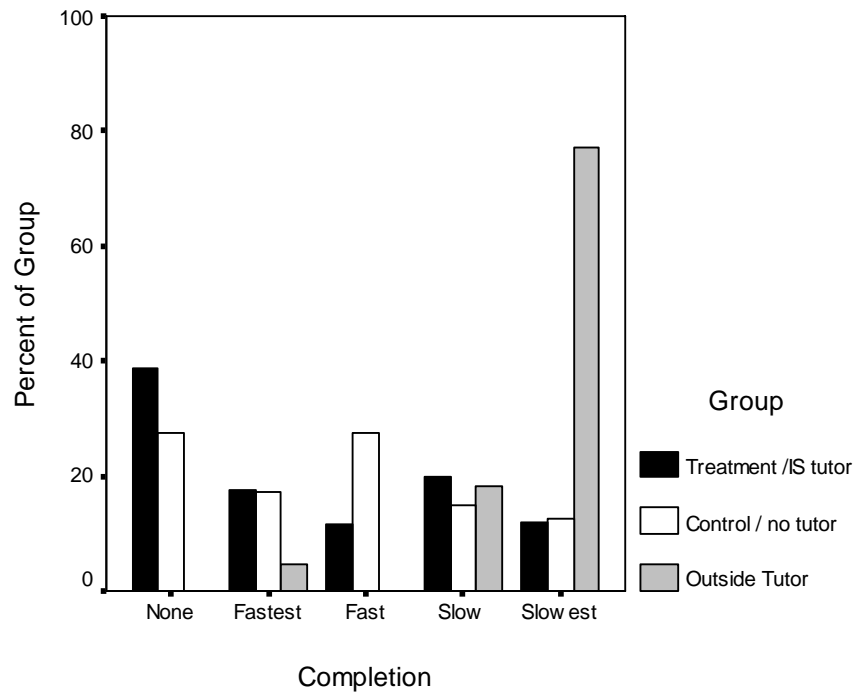


Figure 3. Bar graph showing the completion rate for each group.

Discussion

To summarize the major findings, the effects of the tutor intervention could not be detected as a mean difference in final exam scores or course satisfaction ratings. Perhaps more importantly, the sparse subset of students who used the tutor and completed their course—obtaining a final exam score and responding to the evaluation questions—was so small that if there were an effect, there would not have been sufficient statistical power for it to be detected. Similarly, there were far too few students completing the course in the at-risk study to identify the tutor’s effect on completion rates. Finally, although an acceptable number of those who used the tutor seemed to find him helpful, the number of respondents who reported a willingness to pay the required cost was a little below what was expected.

Conclusions and Implications

The first and perhaps most important conclusion is that the small amount of tutor usage was insufficient to statistically determine the effect of the intervention on students’ achievement, course satisfaction, or course completion. This conclusion is based on the equivalent Study 1 treatment and control mean scores for the final exam and satisfaction ratings, and on the statistically equivalent completion rates of the Study 2 groups. The explanation and implications for this conclusion can be divided into two parts, to be addressed in order: insufficient tutor usage and possible outcome effects.

Insufficient tutor usage is a factor of the research design, the fidelity with which the design was implemented, and the actual student demand for such services. The research design incorporated several measures to assure there would be sufficient sample sizes to accommodate the research questions and the analyses planned. First, although not

the only factor influencing the selection of the course for the study, MATH 110 is currently the highest enrolling university course offered by Independent Study. Further, at the time the study began, the course's highest enrolling month had been June, 2004. This is significant since the Study 2 participants, whose number of completing students was most inadequate, were those from this cohort who had not completed their first midterm by their halfway date in December of that year or January of 2005. Further, for both studies, two-month cohorts were used (e.g. those who took their first midterm exam during December 2004 or January 2005) instead of one, to double the sample sizes.

The study's implementation fidelity involved inviting the predicted number of students to use the tutoring service, providing the tutor, and carefully tracking the necessary data. In other words, before determining the effect of the intervention, it is necessary to confirm that the intervention was executed as planned. Accordingly, as stated in the results, the size of each group met or exceeded its projected size, the tutor was provided and very responsive to all requests, and all the necessary data was collected. The purpose of the study was to "improve the support available to students, both in terms of content and motivation, by *allowing for* (not requiring) increased interpersonal interaction" (see *Purpose of the Study* section). Did the study improve the support *available* to the students? Yes. The intervention provided for but did not require increased interaction. However, sufficient use of the intervention is a prerequisite to determining its effectiveness. Did the invited students use the extra support made available to them? No, certainly not to the extent anticipated.

The actual student demand for tutoring services in MATH 110 was, despite best predictions, much lower than anticipated. Tutoring demand was predicted based on a

model piloted with other Independent Study courses (see *Setting and Participants* section). By all indicators, the projected tutoring demand for MATH 110 appeared to be very similar to that witnessed in a successful tutoring pilot in STAT 221. It too is a high-enrolling, prerequisite course with similar demand for customer service and even a related content domain. About 37% of those invited to use the tutoring services in the statistics course took advantage of the invitation. If that same ratio were applied to the current study, there would have been about 65 tutor-using students in the Study 1 treatment group, instead of 43. Further, it was calculated that 80% of MATH 110 students in previous years who completed their first midterm also completed the course within six months. If that same ratio were applied to the predicted 65 tutor users, there would have been about 50 tutor-using students with a final exam score. This sample size, would have yielded considerably more statistical power than the actual 20 completing tutor-users.

Not only was the percentage of students who interacted with the tutor low (24.6% of Treatment 1, $n = 175$), it is possible that many students who were invited to use the tutor did not even consider themselves tutor users. This may be evident in the fact that only 28 students in Treatment 1 responded to the evaluation question about the helpfulness of the tutor, while 74 of them responded to the course satisfaction question just before it.

There are many possible explanations for the below-prediction usage, all of which are speculative without further investigation. One explanation might be that the Independent Study customer support representatives who reported a need for more support in both statistics and math were not looking at exact counts, they were

subjectively recalling which courses seem to get the most number of calls. Their rating may not have accounted for the fact that there are about 1500 enrollments a year in MATH 110 and only about 1000 in STAT 221. Another explanation may be that the math course is written more clearly. Another explanation may involve the cultural stereotypes that accompany the terms “Math” and “Statistics.” One last explanation that should be mentioned here may be data-tracking errors in the early pilots preceding the current study. The data-tracking database and its integration with Independent Study’s student information system have been greatly improved since the first STAT pilot began in January 2003.

Incidentally, the fact that the percentage of at-risk tutor-using students was double that of the Study 1 treatment suggests there may be higher demand for help among slower and late-starting students. However, notwithstanding this difference, better models for predicting demand must be developed if the intervention’s effect is to be detected in either group (see *Critique and Future Research*).

The second part of the first conclusion—that the small amount of tutor usage was insufficient to statistically determine the effect of the intervention on students’ achievement, course satisfaction, or course completion—concerns possible effects on the specific outcome variables. First, with regards to achievement, since there was not a statistically significant difference between the treatment and control groups’ final exam scores, the results do not suggest that tutor-using students learn the content any better than non-tutor-using students. However, given that only a quarter of the treatment students had contact with the tutor and that they only spent a median of four minutes

interacting with him, the results also seem insufficient to suggest that tutoring does not affect achievement.

Similarly, although there were not enough students who completed the course to detect the tutor's effect on completion, the possibility of an effect cannot be dismissed. One indicator suggesting this might be the case is the number of students who were still actively involved with the tutor at the end of the study. Independent Study students can and often do request an extension to their one-year time limit—just because a student's course is expired, does not mean the student may not yet complete the course. The fact that many of the at-risk students have contacted the tutor shows some commitment to the course and the possibility that they may yet complete.

In partial follow-up to such reasoning, the tracked but previously unplanned dependent variable—number of lessons submitted during the study—was explored. The correlation between tutor time and number of lessons submitted may be interpreted in many ways (see the correlation scatterplot in *Figure 1*). For example, tutor time and lessons submitted may both just be indicators of how actively the student is working on the course. Or perhaps, working with the tutor may motivate students to progress in their coursework and continue to submit lessons. Certainly, to sustain the latter conclusion, there would have to be a difference between the treatment and control's number of submissions. Since there was not a statistically significant difference in the number of lessons they submitted, the former conclusion may be more likely. However, the correlation suggests the need for more investigation and leaves open the possibility of an effect.

Another consideration concerns the results of the Chi Square analyses and graphs, which may show the early indication of a possible effect on achievement. When graphed, the chi square results, although not statistically significant, show more treatment students in the final exam score's top quartile and fewer in the lower quartiles (see *Figure 2*). Although this apparent difference may well be due to chance, it may also be the early detection of an effect on achievement.

The second conclusion is that the tutor may have been an adequate substitute for the professor in answering students' questions. This potential conclusion is based on the finding that the majority of those who used the tutor felt he was reasonably helpful. Further, during the seven-month study, the students did not pose any content-related questions that the tutor was unable to answer. While the study did not show a high demand for the tutoring service, it does support the adequacy of a proficient undergraduate tutor to respond to questions that would have otherwise increased the load of the professor. Although the tutor was certainly underused, he did provide 110 hours of individualized support that most professors would not have time to provide distance students, especially off-load. Further, he developed documents that address frequently asked questions and will be used to revise the course.

In connection with this conclusion, tutoring interactions appear to have been sincere and focused on pertinent issues. This is a comforting contrast to the results of many attempts to increase interpersonal interaction by requiring posts on discussion boards; as mentioned in the *Computer Mediated Communication* section of this report, many such attempts result in mechanical, artificial interactions that frustrate students and may have little impact on achievement. If the sole intent of the study were to increase

interaction, it would not have succeeded—not much more than hosting a discussion board for the course and allowing students to use it at will. Despite low interaction, the 43 students in Study 1 and the 31 students in Study 2 who interacted with the tutor were not bound by any requirement to do so; rather, they were intrinsically motivated by their need for support.

One last discovery related to the helpfulness of the tutor was identified by the unexpected respondents to the tutor-helpfulness evaluation question (see *Figure 3* for a comparison of how this subgroup of control 1 differed from the formal treatment and control). The helpfulness question was designed to elicit treatment students' feedback regarding the quality of the service without upsetting those in the control who were not offered the use of the tutor (see tutor helpfulness evaluation question in *Appendix C*). However, as mentioned in the results, there were nearly as many control-group students who responded to the tutor-helpfulness question as there were treatment students. Apparently, there is a sub population that might be getting help from an outside tutor, not offered by Independent Study. One weakness of the research design was that it did not anticipate this confounding variable. Conversely, one success of the study was that it helped to identify this confounding variable.

The third and final major conclusion was that although students' demand and willingness to pay were below predictions, there still may be some support for the potential of providing cost-effective on-demand tutoring services, if the demand can be more accurately predicted and matched. Although the number of students who reported a willingness to pay \$30 for tutoring services was lower than expected, the cost paralleled the low demand.

Although the study did not yield any significant results regarding the intervention's effect on some of the outcome variables, it did help to address the issue of cost-effectiveness. Specifically, the tutor had students to help and tracked the time it took him to respond to the given demand. Although the demand was lower than anticipated, so was the cost. The predicted fee for tutoring services was based on the tutor working up to 600 hours (20 hrs/wk for 7 months). However, due to the light load, the tutor only worked 110 hours. Since 58.9% of all respondents reported a willingness to pay the fee, this percentage could be applied to total predicted income, or it could be reasonable assumed that a larger percentage would pay something less than \$30. So, for the sake of demonstration, if only half of the invited participants paid \$30 for the service, the income would be \$3,510 ($117 * 30 = 3,510$). This income would more than adequately cover the tutor costs for 110 hours and any overhead costs, especially if the tutors could answer emails at their own location. Granted, more students may *report* a willingness than would actually pay given the opportunity; but, this analysis provides some support for the case of cost-effectiveness and suggests the risk would be acceptable in an actual paying follow-up study.

In addition to the potential for recovering costs by charging students, the tutoring service may decrease costs spent on other services. For example, currently, when students have questions, they send an email to the Independent Study corrections department where student service representatives filter out logistical matters and forward content questions on to instructors. Forwarding questions to busy professors and then following up to see that they are answered and returned to the student in a timely manner is no small task and can be expensive. It is possible that the tutoring service would lighten the

load on the IS corrections staff and the faculty. It may also increase the students' satisfaction since their questions would be answered faster than following up with the professor.

Finally, if successfully marketed, the tutoring service may help increase enrollments and thereby subsidize the service. The low demand witnessed in the study may suggest that most students who currently take Independent Study courses do not want much interaction. Perhaps there are other students who currently do not take Independent Study courses because they are afraid to do it "by themselves." If the latter knew there was a tutor available to help them, they may be more likely to enroll. In other words, one way to achieve a scalable model of interaction may be to tailor the efficiency of the service to the demand. Another way may be to increase the demand by marketing to those who would want the service and then pay for it with the additional enrollments. Although, admittedly, the program's cost effectiveness is only predicted at this point and would certainly require further investigation to confirm, a combination of these factors would suggest the potential for cost-effectiveness exists.

Critique and Future Practice and Research

Most research is admirable in some regards and lacking in others; this study is no exception. Its strengths are centered in process and motive while its weaknesses reflect a context of practicality and authenticity. Combined, a summary of its strengths and weaknesses may provide valuable insights for improved practice and follow-up studies.

One of the project's strengths is its clear position within the context of distance education literature. It lies at the intersecting hub of key issues in distance education, including student support, interaction, and the effective use of communication

technology. However, notwithstanding its appeal to such enormous pillars, it is clearly defined in its focus on tutoring support, a practical and under-treated topic of rising interest. Further, the study was designed to address the oft-neglected facets of motivation and cost-effectiveness as they pertain to the focal point. As was cited previously, “when distance educators believe they are using new media in a new field, important theories, research, and practices from the past are overlooked” (Bunker, 2003, p. 60; see *Conceptual Context and Literature Review* section). By its attentive observance to foundational literature and related contemporary research, this study evades this common pitfall.

Another strength, built on the firm contextual foundation of previous research, is the project’s carefully planned quasi-experimental and experimental design. While, perhaps, commonplace in many disciplines, empirical studies have been sparse in the recent era of distance education literature. This unfortunate trend has been recognized by many of the field’s leaders and expressed as a call for more empirical studies (Phipps & Merisotis, 1999; Bannan-Ritland, 2002; Garrison & Anderson, 2003). Accordingly, the current study has clearly defined hypotheses, carefully tracked data that are directly tied to the hypotheses, and analysis methods appropriate to address the empirical questions. The selection of a high enrolling course and the record of every interaction were particularly critical factors to a successful analysis of the model. Although the analysis was not as successful as planned, every effort was made to assure adequate numbers. Meticulous planning sought to eliminate and control for foreseeable confounding variables while strict ethical standards were observed in the clear disclosure of those unforeseen until the final report.

A final noteworthy strength was the study's attention to the student services that are becoming a competitive edge in the modern distance education market. One motivating theme for this project and its sponsoring institution is that non-subsidized distance learning institutions must operate within the bounds of sustainable scalability to survive in a modern educational economy—and the competition is becoming increasingly fierce (Bates, 2000; Kariya, 2003). Further, some have identified support services as a distinguishing factor, emphasized by leading institutions and unequaled by others; they must be complete, responsive, and customer-oriented (Lott, Laws, Howell, Broxton, Lindsay, & Williams, 2003). Accordingly, this project is one link in a chain of efforts to maximize the cost-effectiveness of the instructional and motivational support available to Independent Study students.

Although the critical challenges and weakness of the current study have been identified to some extent in the *Method* section and even more throughout the *Results* and *Discussion* sections, they may be summarized here as challenges anticipated in the design and weaknesses that became apparent during the implementation and analysis. Some of the more difficult challenges inherent in the authentic setting were the unwieldy year-plus lifecycle of Independent Study courses and its open-entry-exit enrollment model. No doubt, these very features are among Independent Study's most attractive characteristics, drawing students in by the flexibility they provide. However, as a research setting they are nothing if not a double-edged sword. While it is nice to have a constant flow of freshly-enrolling potential study participants, it can be difficult to start and end such studies. Demand for the tutor did not appear in a day, but slowly grew over weeks and months. Then, to discontinue or adapt the study, the reverse process must be endured as

stragglers slowly complete the course. Similarly, to ensure what was planned to be a sufficient number of participants, two-month, natural-group cohorts were used (e.g. those who took their first midterm exam during December 2004 or January 2005) instead of one and the Study 1 treatment and control groups were not randomly assigned.

In addition to these practicality tradeoffs, other weaknesses—such as overestimated tutor demand, non-estimated at-risk completion, invalid contact information, and uncontrolled tutor alternatives—were revealed during the implementation. The overestimated demand for tutoring services was thought to have been avoided by the careful prediction models previously described (see *Setting and Participants* and *Conclusions and Implications* sections). Notwithstanding, it became the most serious weakness. Similarly, there were too few completers in the at-risk study to statistically compare the difference. This was in part due to a failure to predict the completion rate of at-risk students from past years. Perhaps in mild relation to the overestimated demand, the tutor found many of the students' contact information to be invalid—apparently due to the transitory nature of college life between semesters. Fortunately, the tutoring invitation (i.e. initial and most critical communication to students) was included on the last page of the midterm exam for the Study 1 treatment group (see *Appendix A*). However, it is possible that some Study 2 treatment students never received their postcard and email invitations to participate (see *Appendix B*). Further, a final confound was the outside-tutor-using sub population discovered in the data analysis (see *Figure 3*). Accounting for this group is a certain necessity for follow-up studies.

The study's results, strengths, and weaknesses suggest a few concluding insights to improve practice and research. Specifically, this study suggests the need to better define, predict, and match the demand for instructional and motivational support. Further, the study implies the need for follow-up studies designed to identify best on-demand tutoring practices, refine tutor efficiency, and measure tutoring effects with increased power.

There would be no use in providing a tutoring service if there were no demand for it. Few would refute the assertion that learners will always have questions that are not anticipated and answered in the manual—or even that distance students often desire content and motivational support beyond what is provided by course materials (Phipps & Merisotis, 1999; Shea & Lewis, 2001; The Institute for Higher Education Policy, 2000). But perhaps this need for distance learning support is still ill-defined. For example, do distance students really need this support to meet learning objectives or do they just want it as a convenience? Or, for the sake of suggesting alternative explanations, could the reported *lack of support* be more of an excuse to soothe the stretching pains of learning? How does the demand for more instructional support compare with distance learners' desire for increased motivational support? Are students more likely to report a desire for more instructional support than they are to take advantage of it when it is provided? Unanswered questions such as these and the experience gained in this study suggest a need to more carefully define, measure, and predict this demand.

As follow-up studies clarify demand, they could focus increasingly on identifying, refining, and measuring the effects of best on-demand tutoring practices. Best on-demand practices should certainly build on those identified as effective for face-to-face tutors;

however, they should also extend to more setting-specific practices, unique to distance learning. Further, the logistical arrangements necessary to make tutors flexible to demand and an efficient use of resources could also be explored. For example, is it better to load up a few dedicated tutors with enough students that they will spend little down-time waiting for requests; or, is it better to duo-purpose a broader group of service support staff, such as customer support representatives and data entry specialists, with the job of tutoring a smaller group of students as needed? Other efforts could serve to increase the efficiency of the tutor, such as building proactive contacting into course materials, limiting the amount of time each student gets with the tutor to avoid extreme outliers, and allowing tutors to respond to emails from home or campus. Cross-course comparisons of such practices will help to identify which practices are best for certain content domains and which are most generalizeable. Finally, accommodating a full course lifecycle, and increasing the sensitivity of measurements (e.g. inviting students to respond to a few evaluation items after each interaction with the tutor) would increase the statistical power to detect differences in follow-up interventions.

References

- Anderson, T. (2002, May) An updated and theoretical rationale for interaction. Athabasca University: IT Forum Paper #63.
- Anderson, T. (2003). Modes of interaction in distance education: Recent developments and research questions. In M. G. Moore & W. G. Anderson, *Handbook of Distance Education* (pp. 129-146). New Jersey: Lawrence Erlbaum.
- Bannan-Ritland, B. (2002). Computer-mediated communication, eLearning, and interactivity: A review of the research. *The Quarterly Review of Distance Education*, 3, 161-179.
- Bates, T. (2000) Distance education in dual mode higher education institutions: Challenges and changes, Online. Available: <http://bates.cstudies.ubc.ca/papers/challengesandchanges.html>
- Baath, John A. 1980. *Postal Two-Way Communication*. LiberHermodts: Malmo.
- Berge, Z. (1999). Interaction in post secondary web-based learning. *Educational Technology*, 39, 5-11.
- Brady, L. (2001) Fault lines in the terrain of distance education. *Computers and Composition*, 18, 347-358.
- Branigan, C. (2003). Forum addresses virtual schooling myths. *eSchool News*. June 2.
- Bunker, E. L. (2003). The history of distance education through the eyes of the international council for distance education. In M. G. Moore & W. G. Anderson, *Handbook of Distance Education* (pp. 49-66). New Jersey: Lawrence Erlbaum.

- Cheney, D.W. (2002, November) The application and implications of information technology in postsecondary distance education: An initial bibliography. Special Report: National Science Foundation.
- Crawford, G., Rudy, J. A., & EDUCAUSE Current Issues Committee. (2003, November). Fourth annual EDUCAUSE survey identifies current IT issues. *Educause Quarterly*, 12-26.
- Dunigan, B. A. (2003). Motivation and learning strategies of students in distance education. *ProQuest Information and Learning Company*. Microform: 3103653.
- Galusha, J.M. (1997). Barriers to learning in distance education. [Online.] Available: <http://ouln.org/Barriers%20to%20Learning%20in%20Distance%20Education.htm>
- Garrison, D. R. (2003). Self-directed learning in distance education. In M. G. Moore & W. G. Anderson, *Handbook of Distance Education* (pp. 161-168). New Jersey: Lawrence Erlbaum.
- Garrison, D. R., Anderson, T., & Archer, W. (2003). A theory of critical inquiry in online distance education. In M. G. Moore & W. G. Anderson, *Handbook of Distance Education* (pp. 113-128). New Jersey: Lawrence Erlbaum.
- Gunawardena, C. N., McIsaac, M. S. (2004). Distance education. In Jonassan, *Handbook of Research for Educational Communications and Technology* (pp. 355-393). Mahwah, N.J.: Lawrence Erlbaum.
- Holmberg, B. (1983). Guided didactic conversation in distance education. In D. Steward, D. Keegan, & B. Holmberg, *Distance Education: International perspectives* (pp. 114-122). London: Croom Helm.

- Holmberg, B. (2003). A theory of distance education based on empathy. In M. G. Moore & W. G. Anderson, *Handbook of Distance Education* (pp. 79-86). New Jersey: Lawrence Erlbaum.
- Howell, S. L., Saba, F., Lindsay, N. K., Williams P. B. (2004). Seven strategies for enabling faculty success in distance education. *The Internet and Higher Education* 7, 33-49.
- Howell, S. L., Williams, P. B., & Lindsay, N. K. (2003). Thirty-two trends affecting distance education: an informed foundation for strategic planning. *Online Journal of Distance Learning Administration*, 6 (3). Retrieved September, 2003 from <http://www.westga.edu/~distance/ojdla/fall63/howell63.html>.
- Jung, I., Choi, S., Lim C., & Leem, J. (2002). Effects of different types of interaction on learning achievement, satisfaction and participation in Web-based instruction. *Innovations in Education and Teaching International*. 39, 2. 153-162.
- Kariya, S. (2003) Online education expands and evolves. *IEEE Spectrum*. 40(5): 49-51.
- Keegan, D. J. (1983). On defining distance education. In D. Steward, D. Keegan, & B. Holmberg, *Distance Education: International perspectives* (pp. 6-32). London: Croom Helm.
- Kinley, E.R. (2001). Implementing distance education, the impact of institutional characteristics: A view from the department chair's chair. Unpublished dissertation. University of Nebraska-Lincoln.
- LaCost, B.Y., Iserhagen, J., & Dlugosh, L. (2000). Collaborating on web-based instruction in higher education: Benefits and risks. *Educational Considerations*. 28(1): 61-64.

- Laws, R. D., Howell, S. L., & Lindsay, N. K. (2003). Scalability in distance education: Can we have our cake and eat it too? *Online Journal of Distance Learning Administration*, 6 (4). Available Online: <http://www.westga.edu/~distance/ojdla/winter64/laws64.htm>.
- Lentell, H. & O'Rourke, J. (2004). Tutoring large numbers: An unmet challenge. *International Review of Research in Open and Distance Learning*. 5(1).
- Lott, W., Laws, R. D., Howell, S. L., Broxton, H. Lindsay, N. K., & Williams, P. B. (2003). Division of Continuing Education Strategic Plan. Unpublished manuscript. Brigham Young University. Provo, Utah.
- Markel, M. (1999) Distance education and the myth of the new pedagogy. *Journal of Business and Technical Communication*. 13(2): 208-222.
- McIsaac, M. S. (1998) Distance learning: The U.S. version. *Performance Improvement Quarterly*, 12(2): 21-35.
- McIsaac, M.S. (1996). Distance education. In Jonassan, *Handbook of Research for Educational Communications and Technology* (pp. 403-437). New York: Prentice Hall.
- Moore, M. (1983). On a theory of independent study. In D. Steward, D. Keegan, & B. Holmberg, *Distance Education: International perspectives* (pp. 68-93). London: Croom Helm.
- Moore, M. (1989). Three types of interaction. *American Journal of Distance Education*, 3(2), 1-6.
- Moore, M. G. (2003). Preface. In M. G. Moore & W. G. Anderson, *Handbook of Distance Education*. New Jersey: Lawrence Erlbaum.

- Moore, M. G. (2004). Research worth publishing. *American Journal of Distance Education*, 18(3), 127-130.
- Moore, M.G., Kearsley, G. (1996) *Distance Education: A Systems View*. Wadsworth Publishing Company: Belmont, CA.
- National Education Association (NEA). (2000, June). A survey of traditional and distance learning higher education members. Available Online: <http://www.nea.org/he/abouthe/dlstudy.pdf> .
- Ottom, D.H. (2003). Book Review—Teaching and learning at a distance: Foundations of distance education. *Journal of Instruction Delivery Systems*. 17(1): 27-29.
- Paulson, K. (2002) Reconfiguring faculty roles for virtual settings. *The Journal of Higher Education*, 73(1): 123-140.
- Peters, O. (1983). Distance teaching and industrial production: A comparative interpretation in outline. In D. Steward, D. Keegan, & B. Holmberg, *Distance Education: International perspectives* (pp. 95-122). London: Croom Helm.
- Peters, O. (2003). Learning with new media in distance education. In M. G. Moore & W. G. Anderson, *Handbook of Distance Education* (pp. 87-112). New Jersey: Lawrence Erlbaum.
- Phipps, R., & Merisotis, J. (1999). What's the Difference? A Review of Contemporary Research on the Effectiveness of Distance Learning in Higher Education. The Institute for Higher Education Policy (April 1999).
- Rumble, G. (2001) Re-inventing distance education, 1971-2001. *International Journal of Lifelong Education*. 20(1/2): 31-43.

- Saba, F. (2003a) Report on Visiting Brigham Young University: May 28-30, 2003.
Unpublished report. Provo, Utah.
- Saba, F. (2003). Distance education theory, methodology, and epistemology: A pragmatic paradigm. In M. G. Moore & W. G. Anderson, *Handbook of Distance Education* (pp. 3-20). New Jersey: Lawrence Erlbaum.
- Salmon, G. (1999). Computer mediated conferencing in large scale management education. *Open Learning*, 14(2): 34-43.
- Sax, B. (2002). Brief report: New roles for tutors in an online classroom. *Journal of College Reading and Learning*, 33(1): 62-67.
- Schifter, C. C. (2000). Faculty motivators and inhibitors for participation in distance education. *Educational Technology*. March/April: 43-46.
- Sener, J. (2003). Personal communication via email. Sener Learning Services. In Laws, D. R., Howell, S. L., & Lindsay, N. K., Scalability in distance education: Can we have our cake and eat it too? *Online Journal of Distance Learning Administration*, 6 (4). Available Online:
<http://www.westga.edu/~distance/ojdla/winter64/laws64.htm>.
- Shea, T., & Lewis, D. (2001, November/December). Internet-based distance education—The administrator's perspective. *Journal of Education for Business*. 112-117.
- Smith, P. L., & Ragan, T. J. (1999). Strategies for attitude change, motivation, and interest. In P. L. Smith & T. J. Ragan, *Instructional Design 2ed* (pp. 249-271). New York: John Wiley & Sons, Inc.

- Stevens, M. (2003). Distance learning: Pioneering the future. Presentation at the *Conference of the American Association for Collegiate Independent Study (AACIS)*. Sioux Falls, SD, October 23–25.
- The Institute for Higher Education Policy. (2000). *Quality on the Line: Benchmarks For Success in Internet-Based Distance Education*. Washington, DC. Available online: <http://www.ihep.com/Pubs/PDF/Quality.pdf>
- Wilkins, E. (2002). *Facilitating online learning: Training TA's to Facilitate Community, Collaboration, and Mentoring in the Online Environment*. Unpublished thesis. Brigham Young University. Provo, Utah.
- Xin, M. C. (2002). *Validity Centered Design for the Domain of Engaged Collaborative Discourse in Computer Conferencing*. Unpublished dissertation. Brigham Young University. Provo, Utah. Available online at: http://www.textweaver.org/xin_dissertation.pdf.

[Last page of the Midterm 1 Exam]

Free MATH 110 TA/Tutor

Please verify your contact information for your TA by printing it below and returning it with your exam.

Name: _____

Phone: _____

Email: _____

*This form is *not* related to your grade in any way.

✂ Cut/tear here ✂

Keep your TA's contact info

Free MATH 110 TA/Tutor

You have been selected to participate in an Independent Study pilot service. As soon as you complete midterm 1, you are eligible to receive TA services for the remainder of your MATH 110 course at no charge or extra obligation. You may contact your TA any time you have questions or want to discuss the course content. Participants' scores will be analyzed to help us improve our services but will be kept confidential along with contact information.

TA: Brandon Burton
Email: math.ta@byu.edu
MSN IM: math.ta@byu.edu
Toll Free: 1-877-378-3792
Direct: (801) 422-3792

Appendix B: Group C Half-Way-Mark Postcard Invitation

Free MATH 110 TA/Tutor
from **BYU Independent Study**

Please call or e-mail Brandon to sign up.

TA: Brandon Burton
Email: math.ta@byu.edu
MSN IM: [math.ta@byu.edu](msn://math.ta@byu.edu)
Toll Free: 1-877-378-3792
Direct: (801) 422-3792

You have been selected to participate in an Independent Study pilot service for the remainder of your MATH 110 course at no charge or extra obligation. You may contact your TA any time you have questions or want to discuss the course content. Participants' scores will be analyzed to help us improve our services but will be kept confidential along with contact information.

Appendix C: Evaluation Items

[Last page of the Final Exam]

Math 110—College Algebra

Final Exam

Please respond to the following research-related questions for this course; they are *not* related to your grade in any way nor visible to your instructor.

43. Rate your overall satisfaction with this course.
- a) Exceptionally Low
 - b) Very Low
 - c) Low
 - d) Medium
 - e) High
 - f) Very High
 - g) Exceptionally High
44. If you were to take another Independent Study Course similar to this one, would you be willing to pay an additional \$30 for a TA that could answer your questions?
- a) No
 - b) Yes
45. If you received help from a TA or tutor, rate his or her helpfulness.
- a) Exceptionally Low
 - b) Very Low
 - c) Low
 - d) Medium
 - e) High
 - f) Very High
 - g) Exceptionally High

Appendix D: Tutor Database, Interaction Form

Microsoft Access - [Interactions]

File Edit View Insert Format Records Tools Window Help Type a question for help

Interactions

ID

Course

StudentName

Date

Time

Duration (Minutes)

Initiator

Communication Tool

Lesson: After the Fact

Please note changes:
 * Select (or type) student's name
 * End Now calculates duration
 * Record the STUDENT's question(s) (Put yours in notes)
 Thanks, Peter

Check All That Apply and Insert Other Category Only if Necessary

<input type="checkbox"/> Initial Invitation	<input type="checkbox"/> Expires in One Week Reminder	<input type="checkbox"/> Survival Tips and Course Specific Tips/Logistics
<input type="checkbox"/> Exam Reviews	<input type="checkbox"/> Expires in One Month Reminder	<input type="checkbox"/> Surveys and Evaluations
<input type="checkbox"/> Paper Reviews	<input type="checkbox"/> Expires in Three Months Reminder	<input type="checkbox"/> Suggestions/Complaints
<input checked="" type="checkbox"/> Content Interactions	<input type="checkbox"/> Announcements	<input type="checkbox"/> IS Policy
<input type="checkbox"/> Courtesy Contacts	<input type="checkbox"/> [Other category, Description...]	

Student's Question(s):

Notes

Record: of 7696

Form View NUM