Assessing the relationship between classroom interaction and perceived student learning in videoconferencing remote sites: A social learning approach

Kevin M. Hankinson

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Assessing the Relationship Between Classroom Interaction and Perceived Student Learning in Videoconferencing Remote Sites: A Social Learning Approach

by

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Dissertation

Submitted to the Department of Leadership and Counseling

Eastern Michigan University

in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

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July 25, 2012

Ypsilanti, Michigan
Dedication

The following work is the direct result of many participants. However, no one deserves more credit than my wife, Jennifer. Her continuous support and encouragement gave me the time, direction, and focus necessary to complete one of the most difficult writing exercises of my life.

Thank you, Jenny.
Acknowledgements

My committee deserves more recognition than I can convey here. Dr. Anderson, Dr. Copeland, Dr. Marx, and Dr. Berry, my chair, have continued to offer constructive feedback throughout my entire dissertation process. Their collective commitment to my success was evident from the beginning, and their willingness to enable me to move at my own pace while maintaining an acute sense of thoroughness is a testament to their integrity as educators.

In addition to my committee, I would also like to acknowledge all of the individuals who aided in the facilitation of data collection. Administering a nationwide online survey to high school students would have been impossible without the help of teachers, principals, and technology directors from various parts of the United States. While I may never be able to thank any of you in person, I hope to take this space to recognize your willingness to assist a simple doctoral candidate.
Abstract

In distance education via videoconferencing, students at classroom remote sites learn without the physical presence of their teacher and other classmates at the host site. As a result, the learning experience of remote site students differs from host site students. Therefore, instructional leaders should make every effort to minimize the adverse effects of videoconferencing on the learning of remote site students.

This study invited Advanced Placement and International Baccalaureate Diploma Programme remote site students who participated in videoconferencing to share their perspectives on the role of interactions on their learning. Specifically, this study explored the presence and strength of relationships between and among variables forged by videoconferencing technology. In effect, this study provides assistance to all instructional leaders, principals and teachers, who manage or facilitate videoconferencing in high schools in hopes of better serving their students. Furthermore, the study presented an idea of the type and quantity of Advanced Placement and International Baccalaureate Diploma Programme courses offered via videoconferencing.

A quantitative method of investigation was used. Data were collected nationally from voluntary participants, and results were analyzed using a variety of statistical measures. The dependent variable was the perception of student learning among the participants. Independent variables included two types of interaction, that is, learner-learner and learner-instructor (tutor), as well as group and class size, gender, and race.

Correlational analyses revealed statistically significant relationships between learner-learner interaction and perceived student learning as well as learner-instructor interaction and perceived student learning. Multiple regression analyses further confirmed the previous
findings. First, approximately 53% of the variance within perceived student learning in the sample was accounted for by interactions. Second, when combined with other environmental determinants (i.e., group and class size) and personal determinants (i.e., gender and race), only group and class size became an additional statistically significant predictor. Further analysis indicated significant moderation effects between interaction type and group and class size.

With these findings, a teacher or principal committed to promoting increased perception of student learning in Advanced Placement and International Baccalaureate Diploma Programme videoconferencing learning environments should regularly evaluate the extent to which productive interactions are occurring in the classroom.
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Chapter 1: Introduction and Background

Funding for Michigan public education has steadily declined over the last three years. For the better part of a decade, public schools in Michigan received increases in student foundational allowances. With $139 average annual increases from 2000 to 2008 (Michigan State Senate Fiscal Agency, 2011), schools hired more teachers and support staff, enhanced curriculum and course offerings, and trialed educational initiatives. However, the days of increasing public aid for schools are behind us (Michigan State Senate Fiscal Agency, 2010), and public schools have responded in myriad ways, including firing teachers and support staff, eliminating course offerings, and avoiding unnecessary educational initiatives. The recent economy has left many public school districts in survival mode, each year trying to devise a budget to meet its needs while minimizing withdrawals from its general fund equity.

As a result of dwindling financial resources, each school district asks itself where money can be saved. Simultaneously, schools carefully determine which decisions will have the least detrimental effect on their public perception. Among high schools that pride themselves in the number of graduates attending postsecondary institutions, curriculum rigor and preservation are essential components to its survival (Robert, 2010). For example, Advanced Placement (AP) and International Baccalaureate Diploma Programme (IBDP) courses represent the defined pathway for college-bound students who seek adequate preparation for college while still in high school. However, amid these turbulent financial times, administrators struggle to justify the staffing of courses, either advanced or general, with low student enrollments (Roza, 2009). Therefore, in efforts to meet shrinking budgets without jeopardizing class choices for students, school districts have become increasingly more creative.
The influx of reliable and cost-effective educational technology has made online learning more common across the United States. Online learning is “teacher-led education that takes place over the Internet, with the teacher and student separated geographically” (Watson, Murin, Vashaw, Gemin, & Rapp, 2011, p. 11). Typically, online learning entails one of the following formats: computer-based, Internet-based, or remote teacher online. Computer-based learning requires a student to utilize a computer equipped with specialized software or access to a local server to learn content. Internet-based learning, similar to computer-based learning, replaces teacher-provided instruction with computer-provided instruction, but the computer accesses software through the Internet from a remote server to educate students. Finally, remote teacher online learning removes the teacher from the same physical space of the student and requires the teacher to engage students through the Internet, with assistance from online media, instant messaging, shared applications, and so on. However, schools across the country also couple face-to-face or virtual teacher interactions with these formats to create other hybrid formats of online learning (e.g., blended learning; Van Beek, 2011). Across the country, participation in online learning is on the rise, with many virtual schools reporting annual growth rates between 20% and 45% (International Association for K-12 Online Learning, 2011). Online learning enables school districts to effectively offer the same curriculum, if not more courses, while trimming the operating budget. For instance, Florida and Pennsylvania operated some virtual schools at a lower per-pupil cost than conventional brick-and-mortar schools (Van Beek, 2011). Thus, for schools that need to continue to offer advanced courses like AP and IBDP despite low enrollments, online learning may hold the answer (Roza, 2009).

Despite the potential of online learning, some districts are hesitant to embrace this mode of teaching and learning because of its associated anxiety in the community (Anastasiades,
Vitalaki, & Gertzakis, 2008). The anxiety arises as a result of online learning’s transformation of the age-old definition of classroom. That is, a classroom has long been defined as a room where students are taught by a human teacher. However, online learning has the ability to challenge what a teacher and a classroom are. Perhaps, a teacher no longer needs to be a person and a classroom no longer needs to be a shared brick-and-mortar space. Without the physical presence of a teacher in a classroom, parents may begin to question whether their children are learning as well as they could in a conventional face-to-face classroom. However, data suggest that online learners may surpass traditional learners in academic performance. In 2010, the U.S. Department of Education published a meta-analysis of 51 online learning studies and revealed “students in online conditions performed modestly better, on average, than those learning the same material through traditional face-to-face instruction” (p. xiv). While communities and school districts may be reluctant to consider changes to traditional instructional delivery, student enrollments in online and blended learning programs continue to rise. From the 2007-2008 school year to the 2009-2010 school year, United States K-12 enrollments rose from approximately 1.0 million to 1.5 million (Wicks, 2010). This 50% increase in student participation of online learning over two years may suggest that the public is becoming more comfortable with the consideration of online learning as a viable educational format for teaching and learning.

The online learning format, perhaps, with the least resistance in communities is remote teacher because it represents only one degree of separation from the customary classroom. In a remote teacher online learning environment, the teacher communicates with students via the Internet in real time, or synchronously. A teacher who typically conducts class with a range of instructional activities supplemented with a variety of handouts can offer the same curriculum to
students at a distance. While more preparation time may be needed by a teacher to properly upload documents and adjust activities for smaller groups, transitioning instruction from a host site (i.e., the space where the teacher is physically present) to a remote site (i.e., the space where the teacher is not physically present) can be relatively seamless.

A medium in which remote teachers can select to deliver instruction is known as interactive video or videoconferencing. Videoconferencing can be defined as synchronous aural and visual communication between two or more physically distinct locations via computer or telephone networks (Cole, Ray, & Zanetis, 2009). With videoconferencing, school districts that face low enrollments in advanced courses can maintain their course offerings while lessening anxiety among community members over online learning. In comparison to computer-based and Internet-based learning, videoconferencing “provides a physical, visual presence to learners who are located at remote sites” (Motamedi, 2001, p. 391). After all, videoconferencing enables teachers to establish productive relationships with remote site students, comparable to those forged between the teacher and host site students, and it creates opportunities for host site and remote site students to engage in real-time discussions over course content. Therefore, parents and students should feel less concern, overall, if a school district must transition instruction delivery from a traditional medium to something more virtual in order to meet budgetary constraints.

The effects of videoconferencing, as a means of online learning and distance education, on teaching and learning have been researched and analyzed for almost 30 years. While the roots of distance education may trace back more than 150 years with early correspondences occurring through mail, technological advancements have steadily enabled schools across the world to offer educational opportunities to increasingly more students through radio, television,
and the Internet. Scholarly research examining the impact of videoconferencing on student learning has revealed mixed results. Some research (Anastasiades et al., 2010; Doggett, 2008; Gerstein, 2000; Lawson & Comber, 2005) revealed that students participating via videoconferencing find the medium suitable for learning. However, other studies (Brown, Rietz, & Sugrue, 2005; Negash, 2010; Wheeler, 2000) suggested videoconferencing has adverse effects on student learning. Regardless, the research is unclear to what extent videoconferencing impacts the relationship between classroom interaction and perceived student learning in AP and IBDP courses.

The expansion of both AP and IBDP courses in the United States is a testament to their popularity. The AP program began as an opportunity of “engaging and challenging the highest-achieving students at the best US high schools” (Schneider, 2009, p. 813). In 1954, the first year of AP exams, 532 students participated. Thirty years later, in 1985, 205,650 students sat for at least one exam. By 2010, 853,314 seniors, almost 30% of the nation’s senior class, from around the United States graduated from high school having taken an AP exam (College Board, 2011b). From 1969 to 2011, the percentage of high schools offering the AP program increased from 14% to nearly 60% (Mo, Yang, Hu, Calaway, & Nickey, 2011; Schneider, 2009). Like the AP program, the IBDP has long been sought as a program rich with perceptions of rigor and academic credentials (Fox, 1998). In 1976, the first high school in the United States was authorized in New York to offer the IBDP. Within four years, the number of schools increased to 20. Nearly 270 schools were offering the curriculum by 2000. However, the United States quickly became the premiere host to the IBDP eight years later as its number of participating schools exploded to 616, five times more than any other country in the world (Bunnell, 2008). According to the International Baccalaureate Organization (2012a), the United States currently
tops the world with 751 IBDP schools, 543 more schools than the country with the second greatest frequency.

In spite of their recognition in presenting students with a challenging curriculum across many disciplines, some school districts struggle to develop and maintain these renowned programs. Given the current economic situation with fewer dollars going toward K-12 education, building level leadership must sometimes eliminate courses with lower enrollments in order to better allocate scarce resources (Roza, 2009). If an AP or IBDP course faces lower enrollments because of low student interest, a high school must carefully weigh its options. Certainly, these advanced programs incur additional financial costs due to authorizations, general operations, and examinations, leading some schools to abandon them as a result (Spahn, 2001). However, the benefits deserve adequate attention as well. AP courses, for example, have been found to provide distinct advantages for students seeking college admissions (Brelan, Maxey, Gernand, Cumming, & Trapani, 2002; Mo et al., 2011; Santoli, 2002). Moreover, once attending college, graduation rates within six years exceed 80% for students with strong performances in IBDP coursework (International Baccalaureate Organization, 2012b), whereas 58% of the general college student population graduates from college within six years (Schneider, 2010). In addition, parents who consider their children college bound typically elect to send their children to schools with a strong academic curriculum (Robert, 2010). However, one wonders to what extent AP and IBDP courses are delivered via videoconferencing across the United States.

Statement of Problem

In distance education via videoconferencing, students at classroom remote sites learn without the physical presence of their teacher and other classmates at the host site. As a result, the learning experience of remote site students differs from host site students. Therefore,
instructional leaders should make every effort to minimize the adverse effects of videoconferencing on the learning of remote site students.

Because videoconferencing first entered postsecondary educational institutions before moving to K-12 schooling, the bulk of the literature on videoconferencing focuses on university experiences (Lawson, Comber, Gage, & Cullum-Hanshaw, 2010). Despite the research already conducted, there exists a need to further investigate the role of videoconferencing as it relates to teaching and learning. Specifically, a gap in the literature lies in how videoconferencing affects student learning in high school advanced courses at remote sites.

**Purpose of Study**

With school districts annually facing bleaker financial outlooks, each will confront the task of eliminating costs. Reducing curricular offerings is one way to shrink expenditures. Because AP and IBDP courses generally face lower enrollments, these courses will most likely face elimination first. However, videoconferencing may enable school districts to maintain their AP and IBDP courses, and consequently preserve their communal image, at a fraction of the cost by replacing teachers in some classrooms with a technology suite, capable of transmitting high definition video and audio.

This study invited AP and IBDP remote site students who participated in videoconferencing to share their perspectives on the role of interactions on their learning. In effect, this study provides assistance to all instructional leaders, principals and teachers, who manage or facilitate videoconferencing in high schools in hopes of better serving their students. Furthermore, the study presented an idea of the type and quantity of AP and IBDP courses offered via videoconferencing.
Significance of Study

The outcomes of this study contribute to the pool of scholarly research examining the role of videoconferencing in academic settings, especially high schools. While teachers working in videoconferencing classrooms gain further insight into how their remote site students perceive their learning from the context of interaction, principals acquire a deeper understanding of what pedagogical practices promote increased perception of student learning. In fact, district-level technology personnel may use this investigation as a means to develop and implement best practices for distance education programs facilitated within or between school districts.

Research Questions

The following questions and null hypotheses were addressed in this study:

Q 1. What is the distribution of Advanced Placement and International Baccalaureate Diploma Programme courses delivered via videoconferencing?

Q 2. What is the relationship between learner-learner interaction and perceived student learning?

Null Hypothesis: There is no statistically significant relationship between learner-learner interaction and perceived student learning.

Q 3. What is the relationship between learner-instructor interaction and perceived student learning?

Null Hypothesis: There is no statistically significant relationship between learner-instructor interaction and perceived student learning.

Q 4. Is there a relationship between learner-learner interaction and learner-instructor interaction that correlates with increases in perceived student learning?
**Null Hypothesis:** There is no statistically significant relationship between learner-learner interaction and learner-instructor interaction that correlates with increases in perceived student learning.

**Q 5.** Is there a relationship between environmental determinants (i.e., learner-learner interaction, learner-instructor (tutor) interaction, and group and class size) and personal determinants (i.e., gender and race) that correlates with increases in perceived student learning?

**Null Hypothesis:** There is no statistically significant relationship between environmental determinants (i.e., learner-learner interaction, learner-instructor (tutor) interaction, and group and class size) and personal determinants (i.e., gender and race) that correlates with increases in perceived student learning.

**Conceptual Framework**

In order to address the research questions, the researcher used a conceptual framework based upon Bandura’s (1977) work in articulating social learning theory and its core components of environmental, personal, and behavioral determinants (Figure 1). The framework enabled the researcher to discuss the relationships between and among all variables under investigation and examine all of the research questions.
Figure 1. Conceptual framework based upon social learning theory.

*The variable course was analyzed only for descriptive purposes.*
Chapter 2: Literature Review

Distance education has been a mode of facilitating teaching and learning for more than 150 years. While the medium of delivery has changed tremendously from print-based correspondences sent by mail to computer-mediated exchanges delivered through fiber-optic systems, the objective has remained the same: to educate students. The evolution of technology, moreover, revolutionized the exchange of teaching and learning as it built upon the unidirectional transfer of knowledge from instructor to students to enable a multidirectional construction of knowledge between the instructor and students and among the students, themselves. Furthermore, as technology fostered two-way communication, the ability of the learner to react to instruction promoted interaction and learning effectiveness.

Distance Education

At the origins of distance education, there was a need to educate learners yearning for teachers willing to mail them instructional materials. In 1840, Sir Isaac Pitman developed correspondence courses in England as he devised a method of delivering instruction to anyone interested in learning his variation of shorthand for a nominal fee (Verduin & Clark, 1991). Almost 35 years later, in 1873, Anna Ticknor founded the Society to Encourage Studies at Home in the Boston area in order to provide a liberal education to women by women through the mail, complete with a curriculum, lending library, and regular correspondences (Bergmann, 2001). Soon thereafter, distance education expanded quickly. Toward the end of the 19th century, universities across Europe, the United States, and Canada provided distance education courses (Sumner, 2000); and by the early 20th century, learners of all levels of education, including elementary, secondary, postsecondary, and vocational training, benefited from correspondence study offered by private schools and universities (Willis, 1994). While bidirectional
communication became possible within correspondence study, the slowness of the postal process inevitably inhibited the learner to acquire timely feedback and resulted in largely isolated learning experiences (Sumner, 2000).

As modes of delivering instruction changed as a result of newer and cheaper technologies, distance education evolved as well. The second generation of distance education arose from the creation of multimedia as an instructional tool. For the first time, radio, television, audio and video cassettes, and computers (to a limited degree) were utilized to establish learning pathways (Nipper, 1989). From the 1920s to the 1950s, educational institutions increased their variety of delivery technologies as television broadcasts supplemented radio transmissions (Froke, 1994; Webber, n.d.). The Open University became the acme of distance education in 1971 when it fulfilled a contemporary idea of establishing a “University of the Air” by welcoming its first class of 25,000 adult learners seeking a baccalaureate degree without the requirement of physically attending the university (Open University, 2012). With science home experiment kits and evening television broadcasts, a new population of learners entered the collegiate realm. Amid the improvements in technology during the second generation of distance education, however, authentic bidirectional communication remained unattainable as a direct result of the inability to establish social learning experiences.

In the third generation of distance education, the computer embodied the essence of knowledge transmission and creation. With the aid of the Internet, data transfer became easier, more reliable, and more powerful. Computer conferencing, for instance, became a possibility under this developmental phase of distance education, where teachers and students had the opportunity to exchange ideas through email, digital bulletin boards, news groups, and electronic journals (Garrison, 1997). From the latter half of the 20th century through the early part of the
21st century, collegiate institutions, private corporations, and open source networks established electronic platforms to foster computer-mediated discourse (Webber, n.d.; Wise, 1987). Garrison (1997) posited that computer conferencing had “the potential to radically reshape learning at a distance” if educators were willing to replace a paradigm of learning where the instructors provide knowledge for students to one where they participate in the collaboration of constructing it alongside their students (p. 9). In the wake of this shift, social learning became possible for distance learners as the isolating barriers of correspondence study and multimedia distance education erased.

Opportunities for social learning in distance education increase as the frequency of interactions between the instructor and students and among the students, themselves, increases. Within the domain of distance education, the latest generation of delivery technologies has expanded upon the previously limited band of teaching and learning mediums in order to establish a broader spectrum. Asynchronous learning represents one end of the spectrum with activities such as sending emails, contributing to discussion boards, listening to audio, and viewing video. Synchronous learning, signifying the opposite end, includes activities such as videoconferencing, instant messaging, and application sharing (Hrastinski, 2008). The latter type of learning, specifically videoconferencing, has the potential to enable “one to achieve full interaction in teaching, and with it teachers and learners can see and learn from each other” (Offir & Lev, 1999, p. 132). Therefore, videoconferencing presents exceptionally unique learning prospects within distance education and the context of social learning. The skill to which any instructor employs this technology to create conducive learning environments, however, becomes the predominant challenge.
Transactional Distance

Videoconferencing emerges as a means of distance education capable of maintaining the visual and aural characteristics of a conventional classroom. With powerful video and audio functionality, remote site students can engage their instructors and peers in a way other mediums of distance education, especially asynchronous modes, cannot. In respect to this possibility of minimizing the perceived distance between the host site and remote site, videoconferencing events enable interactions between and among its participants more comparable to face-to-face exchanges.

As a result of instructors and remote site students operating in different spaces in videoconferencing classrooms, an element of distance arises in need of attention. Moore’s (1993a) Transactional Distance Theory addressed this distance factor and attempted to elucidate its implications within the teaching and learning environment. Transactional Distance Theory posits that distance education is a pedagogical concept “describing the universe of teacher-learner relationships that exist when learners and instructors are separated by space and/or by time” (Moore, 1993a, p. 23). The distance between learners and teachers complicates both teaching and learning because it creates a degree of separation whereby a space of new possibility filters all transmissions between sites, thus increasing the potential for misunderstanding. This newly-formed space represents the “psychological and communications space that is the transactional distance” (Moore, 1993a, p. 23).

In an attempt to conceptualize transactional distance within or between educational organizations, three sets of variables serve as markers: dialogue, structure, and learner autonomy (Figure 2). Dialogue refers to positive, purposeful interactions between a teacher and students and among students, themselves, in order to foster improved understanding. Structure describes
the extent to which an educational program is designed and executed to accommodate the diverse needs of learners. Learner autonomy expresses the point to which the learner, as opposed to the teacher, makes executive decisions regarding educational goals, instructional activities, and assessment metrics. These three factors contribute to the creation of transactional distance.

![Diagram](image)

**Figure 2.** Three-dimensional representation of transactional distance created by dialogue, structure, and learner autonomy. Adapted from *The effects of instructor-learner interactions on learner satisfaction in online masters courses*, by A. C. McLaren, 2010, p. 15.

An independent study with personal tutorials on a high school campus and a self-directed independent online course at home can serve as examples with relatively low and high transactional distances, respectively. In an independent study with personal tutorials on a high school campus, a student works alongside a teacher, delving deeper into a topic of specialized interest. Heightened levels of dialogue occur as each tutorial guides the student closer to understanding. There is minimal structure as a result of the teacher having the capacity to attend to the student’s total needs without the presence of other students. Moreover, there is low learner autonomy because the teacher still manages learning objectives, experiences, and assessments.
A self-directed independent online course at home, however, reveals a completely different
dynamic. Minimal levels of dialogue transpire as a direct result of the self-directed nature of the
experience; that is, there is no instructor or peers to engage. Similarly, the lack of a teacher
contributes to more structure because the course materials must provide complete guidance for
student learning to occur. Furthermore, learner autonomy greatly increases because the student
ultimately controls when, where, and to what extent materials are digested and assessed.

The levels of dialogue, structure, and learner autonomy in videoconferencing range from
program to program. However, unlike other modes of distance education, especially
asynchronous, videoconferencing has the potential to drastically reduce transactional distance as
a result of its ability to increase overall dialogue. In addition to facilitating real-time interactions
between the instructor and learner, students also have an increased power to engage other
learners. These heightened levels of interaction within and among participants in the
videoconferencing environment may lead to “enormously significant implications” for student
learning (Moore, 1993a, p. 33).

Types of Interaction

Interaction becomes inherently different in distance education in comparison to
traditional classroom environments as a result of transactional distance. Interactions are
“reciprocal events that require at least two objects and two actions . . . [and] occur when these
objects and events mutually influence one another” (Wagner, 1994, p. 8). Certainly, these events
still happen within distance education courses, but they are different. The communications
media utilized for the teaching and learning experience impacts the extent and quality of
interaction (Moore, 1993a). For example, a one-way correspondence course eliminates the
possibility of interaction between the student and teacher and among students. In effect, the
learner has the potential to interact only with the content. In a two-way videoconferencing course, however, the learner has the potential to interact with the instructor, other students, and content.

In an attempt to establish a shared understanding of interaction distinctions in the realm of distance education, Moore (1993b) suggested three types: learner-content, learner-instructor, and learner-learner. In the first type of interaction, the learner interacts with the content or curricular materials. This type of interaction embodies the core of education as it opens the opportunity for the learner to acquire new understanding of a particular topic or skill. The second type of interaction invites an instructor into the teaching and learning exchange. With the presence of an instructor, the learner no longer faces isolation and simultaneously gains access to all the content knowledge and skill of the instructor. This type of interaction lends itself to increased student learning outcomes because the instructor can design instruction, build assessment, and confirm educational attainment. Finally, the third type of interaction depicts the exchange among learners. When learners interact with other learners, they have the chance to collaboratively succeed in reaching course objectives. The learners, themselves, obtain the responsibility to comprehend, analyze, and evaluate content.

Videoconferencing environments enable students to engage in all types of interaction. While some modes of distance education restrict or remove certain types of interaction, videoconferencing embraces the potential to maximize all three forms. With the assistance of an instructor and other learners, a student can maximize the likelihood of achieving genuine understanding. The social dynamic forged in a teaching and learning context where all actors work in a synchronistic manner toward a unified goal represents a powerful force capable of prevailing over any shortcomings incurred by the technology itself.
Social Learning

Learning in a traditional classroom is a social endeavor by its nature. Both teachers and students alike constantly make decisions regarding what is said and what is heard. Furthermore, each actor similarly decides what is remembered and what is forgotten, and only actions remembered have the potential to be learned. Within any given teaching and learning space, numerous factors simultaneously operate to create an environment overflowing with stimuli. Teachers and students, therefore, constantly engage in an active process of filtration in order to avoid exhaustion. For example, if a student views an event as valuable, then the event will be remembered, whereas if a student views an event as worthless, then the event will be forgotten.

In the context of a math classroom, a teacher may write the Pythagorean Theorem on the board, and a student who recognizes its value in order to earn a good grade on the next assessment will scribble the theorem on notebook paper. However, a teacher’s account of Pythagoras’s developments toward his theorem will not be on the next assessment and earn no record in a student’s lecture notes. The reciprocity of actions and responses between actors are ceaseless in the social context of a classroom. Therefore, social learning theory serves as an appropriate paradigm in viewing the influence of interaction on perceived student learning in educational environments.

Bandura’s (1977) work in articulating the social learning perspective represents a foundation for interaction and perceived student learning in the classroom. At the core of social learning theory, “psychological functioning is a continuous reciprocal interaction between personal, behavioral, and environmental determinants. The term reciprocal is used in the sense of mutual action between events rather than in the narrower meaning of similar or opposite counterreactions” (Bandura, 1977, p. 194). Bandura’s clarification of reciprocity in the context
of interaction further supported Wagner’s (1994) definition of interaction. Among these interacting components, reciprocal determinism emerges as the terminology for describing these three factors combining to instill learning (Figure 3).

**Figure 3.** Social learning theory as described by reciprocal interaction of personal, behavioral, and environmental determinants.

A classroom can produce these exchanges of stimuli and responses quite easily. First, a student makes a personal decision to learn new content knowledge or develop a new skill set. Then, the student behaves in a manner that is in alignment with improving the likelihood of achieving the desired learning outcomes by attending class with a pencil and paper. Finally, the student operates within the environment of the classroom to minimize diversions and maximize focused attention. While these steps may appear sequential, each event is a reaction to some other preestablished stimulus. In considering the previous example, the student makes a personal decision to learn as a result of being in a classroom. The student is in a classroom because the student is capable of exhibiting behavior appropriate for the context; that is, the student is not disruptive. Finally, the student can demonstrate school-appropriate conduct as a result of repeated personal observations of what teachers expect and accept in the classroom setting.

Bandura (1977) reminded spectators of these exchanges that tracing a point of origin is necessarily difficult:

Although the reciprocal sources of influence are separable for experimental purposes, in everyday life two-way control operates concurrently. In ongoing interchanges, one and the same event can thus be a stimulus, a response, or an environmental reinforcer
depending upon the place in the sequence at which the analysis arbitrarily begins. (p. 204)

Therefore, student learning is not a simple pathway from teacher to student or from student to student. Instead, the process of learning is an ever-negotiating development brought on by a multitude of determinants.

In social learning theory, three processes assume a significant role in negotiating these exchanges: symbolic, vicarious, and self-regulatory. Symbolic processes enable students to "process and preserve experiences in representational forms" as symbols to "serve as guides for future behavior" (Bandura, 1977, p. 13). For example, a student who demonstrates success in the classroom is capable of categorizing that event if it is essential to meet educational objectives in order to duplicate that behavior at a later time, for example, in homework problem sets or on major assessments. Likewise, a student who engages in behavior that fails to meet educational goals will similarly preserve the experience in hopes of preventing its occurrence in the future.

Vicarious processes enable learning to transpire without direct participation in the behavior. By learning through observation, students maintain the ability to learn without risk of failure. In fact, more complicated tasks demand adequate observation of modeled events in order to match performances (Bandura, 1977). A student hoping to solve volume optimization problems using differential calculus on the next assessment, for example, must most likely participate in observational learning through degrees of vicarious processes. First, the student will maintain steady focus on the teacher's computation in order to accurately perceive it. Then, the student will retain the procedure through symbolic coding. Prior to the next assessment, the student will attempt to reproduce similar computations in homework, making adjustments based on feedback. Finally, motivated by the desire to earn a good grade, the student will demonstrate understanding
on the next assessment. Self-regulatory processes, moreover, enable students to exercise control over their behavior (Bandura, 1977). Students develop a sense of what is appropriate and inappropriate behavior and accordingly select their actions. In a classroom, for instance, students quickly ascertain conduct expectations, and they ultimately determine whether to follow them based on their goals.

Students learn through a variety of means in the educational setting. Whether it is direct experience or observation that provides the context for the new behavior, students constantly find themselves amid countless exchanges of stimuli, responses, and reinforcers. The interactions among these components establish an atmosphere conducive for learning if students can navigate the bombardment of nonessential data in order to discover the behaviors necessary to meet communicated learning outcomes.

**Major Components of Videoconferencing**

Videoconferencing can be defined as synchronous aural and visual communication between two or more physically distinct locations via computer or telephone networks (Cole et al., 2009). For the most part, videoconferencing research revolves around three components: usage, participation, and technology. Together, aspects of these components come together to define a particular videoconferencing event where teaching and learning transpire.

When an educational institution first considers videoconferencing as a form of distance education, it must determine how it will use the technology. Lawson and Comber (2010) found four models of videoconferencing usage (i.e., familiarization, substitution, enhancement, and adaptation) after reviewing data collected over seven years from a variety of funded and unfunded projects. In a familiarization model, videoconferencing participants become familiar with the technology and engage in simple exchanges. For example, a teacher might host an
informal social meeting between the host site students and remote site students, where each group asks questions related to interests, activities, and so on. In a substitution model, an educational organization utilizes videoconferencing to offer a course or other learning opportunity that would otherwise be immensely difficult. For example, a local high school might embrace videoconferencing as a means to offer a particular course to its students where there is a relatively low demand. In an enhancement model, schools employ videoconferencing to supplement regular course activity. For example, a middle school science class in Oklahoma might use videoconferencing technology to acquire access to an astronaut stationed in Cape Canaveral at the Kennedy Space Center. Finally, in an adaptation model, schools experiment with videoconferencing in hopes of discovering novel uses for the technology. For example, a high school might enable students to use videoconferencing technology more autonomously in order to chat with other students somewhere else in the world during their lunch time.

In addition to how an educational organization uses videoconferencing technology, a body of research exists that examines the participants in the teaching and learning exchanges. Regarding the substitution model, that is, where schools utilize videoconferencing to offer curriculum otherwise not available, most research recognizes four major stakeholders in videoconferencing events: the teacher (at the host site), the host site students, the tutor (at the remote site), and the remote site students. In a course taught via videoconferencing, similar to the traditional classroom, teachers enact pedagogies ranging from lecture-based, a one-to-many approach, to student-centered, a many-to-many approach (Smyth, 2005). Additionally, the new teaching and learning medium required teachers to plan and prepare differently for instructional delivery as teachers thought about the needs of the technology (e.g., the camera’s viewing window, the access to the technology’s controls, etc.; Cárdenas, 1998). In regard to host site
students, they typically forged stronger relationships with the instructor and maintained sharper focus during instruction than their remote counterparts. Likewise, they were found to be more engaged during group activities (Furst-Bowe, 1997; Knipe & Lee, 2002). While remote site students reported some positive benefits of videoconferencing, research more often reflects their negative experiences. For example, Pitcher, Davidson, and Goldfinch (2000) reported lower participation among remote site students; and Carville and Mitchell (2000) found these students exerting more effort to maintain attention. Finally, Pitcher et al. (2000) found the remote site tutor to serve a vital role in student learning by answering additional questions after videoconferencing sessions with the host site teacher ended.

The final significant component of videoconferencing research rests in the technology itself. Over the last 30 years, the technical features of videoconferencing equipment have changed tremendously (Nefsis, 2012). Audio and video communication, for example, became clearer and more reliable as a result of a series of technological advancements. Furthermore, video and audio quality represented a significant factor in determining the success of videoconferencing (Hooper, Miller, Rose, & Veletsianos, 2007). As the number of participants increased, for instance, the demand for a clearer picture and improved sound audibility followed (Hearnshaw, 1998). Similarly, Laouénan and Stacey (1999) and Yang and Chen (2007) found student learning to be negatively impacted if time delays occurred as a result of cheap technology or poor connection. In addition to technical capacity, important differences in videoconferencing transmission and mode should be recognized as well (Lawson et al., 2010). Regarding transmission, two categories comprise a majority of videoconferencing: desktop and studio-based (Pitcher et al., 2000). In desktop videoconferencing, teachers and students generally use personal computers and webcams to participate, whereas in studio-based
videoconferencing, teachers and students use an entire room equipped with advanced audio and video inputs and outputs to facilitate teaching and learning. With respect to mode, Smyth (2005) identified four types of interaction: one-to-many, one-to-one, one-to-some, and some-to-some. In the first three types, a single teacher or student shares information while one person or more people receive it. In the final type, students engage other students in order to increase interactivity and learner-centeredness.

**Role of Social Learning in Videoconferencing**

Social learning in the context of an educational setting can be described as the integration of information contributed by teachers and students and encountered through a variety of social experiences in order to influence the behavior and development of both teachers and students (Grusec, 1992). In order to examine the role social learning plays in a videoconferencing approach to educational delivery, the researcher used a diagram (Figure 4). To construct the diagram, the researcher examined the role of videoconferencing participants through the lens of three predominant social learning components Hill, Song, and West (2009) identified as “promising opportunities for extending and enhancing the design, development, and implementation” of Web-based learning environments (p. 100): classroom context, culture and community, and participant characteristics. Each component enables a slightly different perspective on the learning under constant development in a videoconferencing course. However, these components and their subfactors, as presented by Hill et al. (2009), have been reorganized into the context of Bandura’s (1977) proposed social learning theory under the factors of personal, behavioral, and environmental determinants. In addition, student learning objectives have been included to describe desired course outcomes (Hiltz, 1994).
Although Hill et al. (2009) do not identify age as a cultural characteristic, the literature presents various perspectives as to what extent age is a factor in the success of videoconferencing events.

**Classroom context.** Context shapes the way one develops knowledge (Brown, Collins, & Duguid, 1989). According to Bandura (1977), psychological functioning is a continuous reciprocal interaction of various determinants. Therefore, in videoconferencing, the classroom context, that is, the space in which teaching and learning occur, is integral to facilitating teaching and learning as it shapes the arena in which “behavior, other personal factors, and environmental factors all operate as interlocking determinants of each other” (Bandura, 1977, p. 9–10). Within the classroom context, interactions, group and class size, and resources help to define the environment.

Interactions aid students in acquiring knowledge by enabling them to engage in learning activities and receive feedback from the teacher or other students (Henning, 2004). In a classroom, a teacher often creates interactions between the students and teacher and among the
students in order to assist in the learning process. In a videoconferencing classroom, creating fruitful interactions becomes inherently more difficult as the transactional distance between the learning sites causes obstacles to learning (Moore, 1993a). Nonetheless, teachers can effectively facilitate strong student interactions in videoconferencing, comparable to face-to-face instruction (Comber, Lawson, Gage, Cullum-Hanshaw, & Allen, 2004; Ertl, Reiserer, & Mandl, 2005; Smyth, 2005).

Regarding group and class size, Husu (2000) found student learning retards as a result of higher student enrollment at a videoconferencing remote site because more students led to the need to repeat more instructions, questions, and comments in order for everyone to hear them. In addition, Brown et al. (2005) found larger class sizes had significant detrimental effects on overall student learning. Furthermore, with smaller class sizes, managing the locations of the camera and microphone to ensure good video and audio quality became tremendously easier, yielding more positive interactions overall (Thorpe, 1998).

Finally, videoconferencing has the potential to offer its participants a variety of resources to assist in the acquisition of knowledge. “Using diverse resources, learners can explore different ways of knowing as well as use resources that might better match their learning styles, goals, and preferences” (Hill et al., 2009, p. 92). With multiple video and audio inputs and outputs, teachers and students can readily share visual aids, multimedia clips, and more with ease. In fact, Ertl, Fischer, and Mandl (2006) found additional resources, like shared applications via the Internet, to foster successful collaborative learning among research participants. However, the capability of numerous resources is not sufficient to generate genuine understanding. Teachers must plan and implement lesson plans carefully to maximize the use of resources by unlocking their potential (Amirian 2002; Heath & Holznagel, 2002).
**Culture and community.** In addition to classroom context, culture and community also play significant roles in teaching and learning through videoconferencing. While Hill et al. (2009) did not define either culture or community, they attempted to describe some of their factors. The effect of culture on learning via videoconferencing largely focuses on two subcategories: gender and ethnicity. In surveying 60 participants, Wheeler (2000) found females to respond more positively than males to videoconferencing as evidenced by experiencing less self-consciousness and anxiety and reporting more optimism in regard to the technology’s functionality and usefulness. Perhaps, “males may concentrate more on the effects of the technology rather than the reason for the technology and this may create a psychological barrier to good communication, by raising arousal levels” (Wheeler, 2000, p. 36). Therefore, women may be better suited for videoconferencing because of their stronger inclination to view the technology as a means of social interaction, thus capitalizing on their skills of greater verbal ability (Hyde & Linn, 1988). However, Comber et al. (2004) found differences between genders negligible. In regard to ethnicity, numerous researchers (Marek, 2008; Ramirez, 1998; Sanders, 1997) have delved into the potential of videoconferencing to improve language and cultural understanding between students in the United States and other countries, including Taiwan, Mexico, and Germany. After exchanges with students from different cultures, American students generally report positive results and desire to participate in similar videoconferencing events in the future. Finally, although Hill et al. (2009) did not include age as a characteristic of culture, one may assume that differences in regard to cultural understandings of what is valued exist as a result of age. With respect to age, academic writing reaches mixed conclusions in regard to videoconferencing events. On one hand, K-16 students find videoconferencing a meaningful, valuable medium for learning (Anastasiades et al., 2010; Doggett, 2008; Gerstein,
2000; Lawson & Comber, 2005). However, Negash (2010) and Wheeler (2000) reported that younger groups of learners, aged 16–30 years old, exhibited higher senses of anxiety and self-consciousness and expressed the least preference for videoconferencing. Consequently, the question of whether videoconferencing is a suitable learning medium for K-12 students remains a question to be answered.

While understanding culture is a critical component of maximizing student learning in videoconferencing, community similarly plays a significant role, as well. In a videoconferencing environment, Amirian’s conference paper (as cited in Greenberg, 2004) found high quality interactions among participants to yield genuine social learning as stakeholders negotiated meaning across physical space, forming a sense of community. Generating and supporting a sense of community within videoconferencing is paramount to the social learning perspective (Palloff & Pratt, 1999). Furthermore, a variety of opportunities for social interactions among peers, such as occasional face-to-face meetings during a course, may encourage a stronger feeling of community (Gillies, 2008; Hill et al., 2009). In addition, Gillies (2008) found that intermittent visits by the teacher to the remote site boosted a sense of community among remote site students. Ultimately, a shared impression of community within a classroom promotes social learning because students feel more comfortable and confident in constructing knowledge.

**Participant characteristics.** The final major social learning component is participant characteristics. The constitutions of the teacher and learner contribute immensely to the overall success of student learning via videoconferencing. In regard to the teacher and learner, three prominent characteristics foreshadow the learning outcomes of videoconferencing: learning styles, self-efficacy, and motivation.
Understanding the principal learning style(s) of students can enable teachers to maximize the learning potential of all students (Zapalska & Brozik, 2007). A learning style is “the preference or predisposition of an individual to perceive and process information in a particular way or combination of ways” (Zapalska & Brozik, 2007, p. 8). Because videoconferencing entails a visual medium, one may anticipate greater learning among right brain individuals, but Wheeler (2000) found his data analysis of right brain and left brain individuals and their respective levels of satisfaction with videoconferencing to be inconclusive. Saw et al. (2008) found students preferred screen displays of slides, documents, and graphics as opposed to an image of the teacher. Moreover, Irele’s conference paper (as cited in Greenberg, 2004) and Hill et al. (2009) reported that the capability of videoconferencing, with its access to a range of multimedia, could easily be accommodated to a range of learning styles. Regarding teachers, videoconferencing presents a need to reevaluate traditional teaching styles (Comber et al., 2004). In effect, the medium of videoconferencing transforms the role of the teacher (Amirian, 2002), and it requires the teacher to adapt teaching and learning practices to effectively integrate the technology.

Regarding self-efficacy, the most important factor is confidence (Bandura, 1993). If teachers and students feel confident in their ability to complete a particular task, then they are more likely to repeat it. Therefore, the degree to which teachers and students view their teaching and learning potential as a result of videoconferencing can shape student learning outcomes. Comber et al. (2004) found that self-consciousness by staff can be overcome by proper briefing of and preparation for videoconferencing. Gage, Nickson, and Beardon (2002) found 60% of students more confident in their mathematical skills as a result of videoconferencing and 60% of students felt more inclined to pursue mathematics at a higher educational level. In addition,
some research (Wheeler, 2000) demonstrated females have a stronger self-efficacy than males in a videoconferencing learning environment.

Similar to how increased self-efficacy can lead to improved student learning, motivation can also increase student learning. Comber et al. (2004) reported that low motivation toward videoconferencing, among teachers, generally arose as a result of improper time to effectively integrate the technology. Brown et al. (2005) found students with higher levels of motivation succeed in traditional and videoconferencing learning environments, but they also reported that students with low motivation struggled markedly more with videoconferencing as opposed to the conventional teaching medium. However, videoconferencing has shown in numerous studies (Cavanaugh, 2001; Marek, 2008; Yamada, 2009) to increase overall motivation in learners.

**Perceived student learning.** The assessment of perceived student learning is central in determining whether students have achieved desired objectives. The role of self-assessment is of particular interest when considering whether it is a valid measure of student performance. Self-assessment describes “the involvement of learners in making judgements about their own learning, particularly about their achievements and the outcomes of their learning” (Boud & Falchikov, 1989, p. 529). Self-assessment by students would increase in validity as it increases in agreement with teacher assessments. In his examination of research conducted on self-assessment, Ross (2006) found evidence of mixed results. However, the research does identify trends in improving validity. For example, students are more likely to either become more in alignment with teacher assessments or tend toward increasing underestimation of their performance as they (a) become high achieving students, (b) complete later courses of their programs of study or graduate, and (c) realize self-assessments are not part of their overall evaluation (Boud & Falchikov, 1989).
In her development of a questionnaire to measure course effectiveness, Hiltz (1994) completely relied upon subjective student assessments of four dimensions: course content, characteristics of the teaching, course outcomes, and comparisons of process in the virtual and online formats. Her data items were rooted in “the basis of a review of the literature on teaching effectiveness” (Hiltz, 1994, p. 153). Her dimension of course outcomes is of primary importance because it addresses the crux of self-assessment in terms of predicting student performance. Recognizing potential shortcomings in her methodology of measuring course outcomes, she ultimately concluded, “The students were probably in a better position than anyone else to report on the extent to which they had or had not experienced various positive or negative outcomes from a course” (Hiltz, 1994, p. 154).
Chapter 3: Methodology

Previous chapters have established the landscape of educational videoconferencing with an examination of its origins, developments, and current practices. This chapter will explore the methodology employed by the researcher to investigate remote site students’ perspectives on their learning in a videoconferencing learning environment.

Study Design

This study was descriptive in nature as it aimed to “describe and characterize the situation that exists in the relevant target population with respect to some phenomena of interest” (Tatsuoka & Silver, 1988, p. 678). The target population was remote site students, and their perception of learning represented the phenomena of interest within the situation of distance education via videoconferencing. With assistance from descriptive and inferential statistics, the researcher tested a variety of null hypotheses in order to evaluate the relationship between classroom interaction and perceived student learning.

Study Type

A quantitative method of investigation was used. Data were collected from voluntary participants, and results were analyzed using a variety of statistical measures. While descriptive statistics summarized important characteristics of the data gathered from remote site students, inferential statistics served as the foundation to establish inferences regarding an assortment of variables (Mendenhall & Beaver, 1994). The dependent variable was the perception of student learning among the participants. Independent variables included two types of interaction, that is, learner-learner and learner-instructor (tutor), as well as group and class size, gender, and race.
Sources of Data

This study was conducted across the United States. The researcher initially used a videoconferencing site directory maintained by the Center for Interactive Learning and Collaboration (CILC) (n.d.) to aid in the identification of high schools that deliver AP or IBDP courses via videoconferencing technology. In March 2012, the CILC videoconferencing site directory had a reported database of 3,837 sites that used videoconferencing technologies in some capacity. In addition, the researcher used Google’s and Bing’s search engines to find other high schools with advanced programs that use videoconferencing to facilitate teaching and learning. The search terms included the following phrases: distance education network, distance education association, distance learning network, distance learning association, and advanced placement videoconferencing. Furthermore, the researcher considered all virtual schools in the United States found in a list maintained by Wikipedia (2012).

In order to compile a list of schools that offered AP or IBDP courses through videoconferencing technology, the researcher sent an introduction email, found in Appendix A, to each prospective contact person found via CILC’s videoconferencing site directory, Google’s and Bing’s search engines, and Wikipedia. At the conclusion of the introductory email, in the event a district delivered or received instruction for AP or IBDP courses via videoconferencing, the researcher humbly asked the contact person to complete a short survey using Google Docs (Appendix B). The survey asked participants to (1) state their names and email addresses, (2) share what types of advanced courses (i.e., AP or IBDP) their districts offer via videoconferencing, and (3) indicate approximately how many remote site students in AP or IBDP courses their districts reach or have.
As individuals completed the initial survey, the researcher sent a follow-up email seeking further assistance (Appendix C). The content of the second email provided an overview of the research study and the online survey URL hosted by SurveyMonkey. Most importantly, the follow-up email asked contacts to share the survey URL with all students who were at least 18 years old. As an attachment to the second email, the researcher included a copy of the survey instrument for contacts to peruse and determine whether to share the survey with their students.

After two weeks elapsed, the researcher sent two additional emails to all established contacts. The first email presented the recipient with an update on data collection and continued to encourage the contact to share the survey URL with all students who were at least 18 years old. In addition, the email presented new information regarding the possible inclusion of minor students as research subjects (Appendix D). The second email offered a message directed toward minor students with the intent that the contact would either forward the message to all students younger than 18 or post the message on a classroom website (Appendix E). In essence, the researcher desired to make the task of reaching minor students as easy as possible.

After another two weeks, the researcher sent a final email reminder to all contacts (Appendix F). The primary purpose of the last email was to ensure a minimum number of participants were gathered for statistical purposes. While the researcher monitored the number of subjects who started the survey and steadily watched as in excess of 65 participants supposedly took the survey over the course of the previous weeks, the researcher eventually realized that only a fraction of the participants had completed the survey in its entirety. In fact, at the time of the final email reminder, only 43 students had finished both parts of the survey. Therefore, the researcher took one final step in order to make an appeal to all established contacts in encouraging their students to complete the five-minute online survey.
Population and Sample

Only students who were at least 18 years old initially had the opportunity to participate in the research. However, after successfully petitioning the University Human Subjects Review Committee for the opportunity to include minors in the subject pool, the researcher acquired the means necessary to incorporate minors as subjects in the study. Prior to providing assent to participate, the interested students who were younger than 18 had to have a parent or guardian provide informed consent. In order to do so, the students had to (1) print off the doctoral research overview and informed consent document (Appendix G), (2) ask a parent or guardian to read and sign the document, (3) scan the document, and (4) email it to the researcher. Upon receiving the signed parental consent form, the researcher responded by providing a URL different from the URL that took 18-year-old students to the online survey. Upon receiving an invitation to participate, all students, regardless of age, had the voluntary decision to choose whether to complete the survey. Participants at least 18 years of age provided informed consent while younger participants provided assent prior to viewing the first survey question (Appendix H; Appendix I). No data items on the survey instrument required completion, and a refusal to participate involved no penalty. In addition, the survey enabled participants to discontinue participation at any time by exiting the survey. The following criteria were used in selecting final participants: The students must have been actively enrolled in either AP or IBDP courses and must have been actively participating in either AP or IBDP courses via videoconferencing.

Instrumentation

The survey instrument, found in Appendix J, resembled an instrument Sher (2009) utilized in his investigation of the relationship of student-instructor and student-student interaction to student learning and satisfaction in Web-based online learning programs. The
instrument for this study contained a baseline of 24 items, composed of both questions and statements, broken into two parts. The response to some questions, such as whether there were students at the host site or whether there was a tutor present at the remote site, enabled the participant to respond to follow-up questions. Participants responded to a maximum number of 34 items. The first part of the survey asked students to share general information regarding their course, gender, race, date of birth, and group and class size. The second part of the survey asked students to mark the extent to which they disagreed or agreed with a statement. A 5-point Likert scale was used: strongly disagree, disagree, neither agree nor disagree, agree, strongly agree.

Multiple data items were selected to address each variable under investigation in the research. Table 1 displays the data items paired with their respective variable. Moore’s (1993b) work primarily served as the foundation for data items related to interaction, and Sher’s (2009) work derived from Johnson, Aragon, Shaik, and Palma-Rivas’s (2000) instrument embodied his ideas. Alavi’s (1994) work adapted from Hiltz’s (1988) questionnaire in measuring course outcomes as a means to determine course effectiveness represented data items related to perceived student learning because students in AP and IBDP courses are more likely to accurately estimate or underestimate student performance based upon self-assessment measures (Boud & Falchikov, 1989). The researcher acquired permission from both Johnson et al. (2000) and Hiltz (1988) in order to use aspects of their original instruments. In addition, permission was sought and granted from Sher (2009) and Alavi (1994) to use their adaptations of the aforementioned instruments (Appendix K). Finally, Bandura’s (1977) work related the differing variables as it contained a means in which environmental determinants (i.e., learner-learner interaction, learner-instructor (tutor) interaction, and group and class size) and personal determinants (i.e., gender and race) related to behavioral determinants (i.e., perceived student
Statements addressing the same variable were grouped together in order to “minimize the respondent’s ‘mental set’ changes” potentially resulting from switching between variables (Krathwohl, 2009, p. 581). Table 2 shows what variable each item addresses and the respective measurement scale for each variable.

Table 1

Pairings of Data Items with Respect to Interaction and Perceived Student Learning Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Data item</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner-learner interaction</td>
<td>I was able to share learning experiences with other students.</td>
<td>(Johnson et al., 2000; Sher, 2009)</td>
</tr>
<tr>
<td></td>
<td>I was able to communicate with other students in this course.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased contact with fellow students helped me get more out of this course.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A sense of community existed with fellow students taking this course.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This course encouraged me to work in small groups/teams.</td>
<td></td>
</tr>
<tr>
<td>Learner-instructor (tutor)</td>
<td>The instructor (tutor) informed me about my progress periodically.</td>
<td>(Johnson et al., 2000; Sher, 2009)</td>
</tr>
<tr>
<td>interaction</td>
<td>The instructor (tutor) treated me as an individual.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I was able to interact with the instructor (tutor) during the course discussions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The instructor (tutor) provided me feedback on my work through comments.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The instructor (tutor) encouraged me to become actively involved in the course discussions.</td>
<td></td>
</tr>
<tr>
<td>Perceived student learning</td>
<td>I learned to interrelate the important issues in the course material.</td>
<td>(Alavi, 1994; Hiltz, 1988)</td>
</tr>
<tr>
<td></td>
<td>I gained a good understanding of the basic concepts of the material.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I learned to identify the central issues of the course.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I developed the ability to communicate clearly about the subject.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I learned a great deal of factual material in the course.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I improved my ability to integrate facts and develop generalizations from the course material.</td>
<td></td>
</tr>
</tbody>
</table>
Table 2

Variable Under Investigation in Each Survey Item and Respective Measurement Scale

<table>
<thead>
<tr>
<th>Determinant</th>
<th>Variable</th>
<th>Item number</th>
<th>Measurement scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td>Gender</td>
<td>2</td>
<td>Nominal</td>
</tr>
<tr>
<td></td>
<td>Race</td>
<td>3</td>
<td>Nominal</td>
</tr>
<tr>
<td>Environmental</td>
<td>Course</td>
<td>1</td>
<td>Nominal</td>
</tr>
<tr>
<td></td>
<td>Group and class size</td>
<td>5&lt;sup&gt;a&lt;/sup&gt;, 6, 7&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Nominal / Ratio</td>
</tr>
<tr>
<td></td>
<td>Learner-learner interaction</td>
<td>8, 9, 10, 11, 12</td>
<td>Interval (Ordinal)</td>
</tr>
<tr>
<td></td>
<td>Learner-instructor interaction</td>
<td>13, 14, 15, 16, 17</td>
<td>Interval (Ordinal)</td>
</tr>
<tr>
<td></td>
<td>Learner-tutor interaction</td>
<td>24&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Nominal / Interval (Ordinal)</td>
</tr>
<tr>
<td>Behavioral</td>
<td>Perceived student learning</td>
<td>18, 19, 20, 21, 22, 23</td>
<td>Interval (Ordinal)</td>
</tr>
</tbody>
</table>

<sup>a,b,c</sup> These items contain at least one subquestion in the event the participant responds in the affirmative.

Issues of reliability and validity can undermine the degree to which a researcher attempts to generalize findings. Because all statement data items in the survey instrument have been tested for reliability and validity by numerous scholars (Alavi, 1994; Alavi, Yoo, & Vogel, 1997; Arbaugh 2000; Arbaugh & Rau, 2007; Bailey, 2002; Hiltz, 1994; Johnson et al., 2000; Sher, 2009), the researcher was confident in the instrument’s ability to collect valid and reliable data. Regardless, Cronbach’s alpha coefficients were computed for each set of items to measure internal consistency reliability. Moreover, Carini, Hayek, Kuh, Kennedy, and Ouimet (2003) concluded that self-reporting promotes validity when the following five conditions are met: (a) participants are capable of answering questions, (b) the items address recent experiences, (c) the items are clearly phrased in order to avoid confusion, (d) the participants consider the items to warrant thoughtful responses, and (e) the respondents’ honest answers do not threaten, embarrass, or jeopardize privacy. As a result, the researcher anticipated a high degree of validity because (a) all data items asked for either basic information or student observations of simple
exchanges or personal learning, (b) students were actively enrolled in AP or IBDP courses, (c) no data items were negatively framed, (d) student responses could lead toward improved learning conditions for future students, and (e) all responses were collected anonymously.

**Ethical Issues**

Participant privacy was of the utmost importance in this study. By ensuring privacy, the researcher hoped to promote a sense of safety and confidentiality among the participants. Therefore, the survey did not collect any identifying information, such as participant names, email addresses, or IP addresses, to foster anonymity. The researcher did his best to keep student responses confidential. All data were stored in a password-protected electronic format.

**Data Analysis**

Prior to data analysis, participant responses were recoded as necessary. Items that asked participants to mark the extent to which they disagree or agree with statements were changed to numerical scores. Each response was replaced with a number from one to five. For example, a response of strongly disagree earned a score of one while a response of strongly agree received a score of five. Once all recoding was complete, the researcher used SPSS 16.0 to compute four mean scores for each participant to describe an overall perception of each variable, that is, learner-learner interaction, learner-instructor interaction, learner-tutor interaction, and perceived student learning, under investigation in this study. A mean score was derived by averaging all items related to a particular variable. In addition to computing means, SPSS 16.0 was employed to conduct principal components analysis for all variables as well as to perform all other statistical analytics.

The researcher utilized numerous metrics for data analysis. Pearson product-moment correlation analyses and multiple regression analyses were conducted to examine the presence
and strength of relationships between and among variables forged by videoconferencing technology. It was anticipated that correlations between learner-learner interaction and perceived student learning and between learner-instructor interaction and perceived student learning existed and that instructors who facilitated more interaction, despite the transactional distance present in videoconferencing learning environments, increased the perception of student learning. After all, Wagner (1994) stated “an instructional interaction is effective when the environmental response changes the learner’s behavior” toward an educational goal (p. 8). Therefore, increased perception of student learning should arise as a result of fruitful interactions. In addition, the student perception of the role of tutors may provide insight into the value of whether high schools should consider the employment of additional personnel at remotes sites when delivering instruction via videoconferencing. Furthermore, the researcher expected a significant relationship between environmental determinants (i.e., learner-learner interaction, learner-instructor (tutor) interaction, and group and class size) and personal determinants (i.e., gender and race) that correlated with increases in perceived student learning.

**Timeline**

The researcher began sending initial contact emails in September 2011 and continued to send introduction emails through April 2012 as more potential contacts were identified. After receiving approval for the research study from the University Human Subjects Review Committee on April 10, 2012 (Appendix L), the researcher immediately began sending follow-up messages to all contacts in order for them to disseminate the Internet-based survey to all 18-year-old students. Once the University Human Subjects Review Committee granted the researcher the capacity to collect data from minors (Appendix M), subsequent reminder messages to all contacts included a process in which students younger than 18 could participate.
The survey was accessible from April 10 to May 10, 2012. After data collection, the researcher spent the remainder of May and June analyzing the data and completing the study.

Definition of Terms

- Videoconferencing can be defined as synchronous aural and visual communication between two or more physically distinct locations via computer or telephone networks (Cole et al., 2009).

- Interactions are “reciprocal events that require at least two objects and two actions . . . [and] occur when these objects and events mutually influence one another” (Wagner, 1994, p. 8).

- Social learning theory describes psychological functioning as “a continuous reciprocal interaction between personal, behavioral, and environmental determinants. The term reciprocal is used in the sense of mutual action between events rather than in the narrower meaning of similar or opposite counterreactions” (Bandura, 1977, p. 194).

- Perceived student learning can be viewed as parallel to self-assessment, which can be defined as “the involvement of learners in making judgements about their own learning, particularly about their achievements and the outcomes of their learning” (Boud & Falchikov, 1989, p. 529). Furthermore, perceived student learning was bounded by a student’s ability to interrelate the important issues, understand the basic concepts, identify the central issues, communicate clearly, learn facts, and integrate facts and develop generalizations (Alavi, 1994; Hiltz, 1988).

Limitations and Delimitations of Study

The following potential weaknesses are admitted for this study: (a) the study did not examine an equal number of AP and IBDP courses, (b) the study did not survey students from all
types of AP and IBDP courses, and (c) there was no ethnographic research conducted to confirm student responses. In addition, this study did not access quarter or semester academic grades for students, which may have been a better indicator of student learning, in hopes of minimizing the risk incurred by collecting sensitive information.

The following delimitations mark the scope for this study: (a) the study examined students actively enrolled and participating in AP and IBDP courses, and (b) the study explored settings where videoconferencing was the central mode of communication.
Chapter 4: Results

This study explored the relationships among a variety of environmental, personal, and behavioral determinants within the context of a videoconferencing remote site. The primary focus was to assess the presence and strength of the relationship between interaction and perceived student learning. However, the researcher was also invested in evaluating the existence of a relationship between environmental determinants (i.e., learner-learner interaction, learner-instructor (tutor) interaction, and group and class size) and personal determinants (i.e., gender and race) that correlated with increases in a specific behavioral determinant, that is, perceived student learning. The following results reveal and synthesize data collected in order to address the aforementioned intentions.

Study Participants

After exhausting all potential avenues in search of possible subjects for this study, the researcher sent an introduction email to more than 2,700 unique email addresses across the United States. From those initial introduction emails, 58 people, including instructors, principals, directors of technology, and outreach specialists, completed the four-question survey asking for participants to (1) state their names and email addresses, (2) share what types of advanced courses (i.e., AP or IBDP) their districts offer via videoconferencing, and (3) indicate approximately how many remote site students in AP or IBDP courses their districts reach or have. From Georgia to Wisconsin and North Carolina to Oregon, the researcher identified school districts and organizations with videoconferencing sites that stated having as few as one remote site student and as many as 350. In total, the 58 contacts identified approximately 1,819 remote site students enrolled in AP and IBDP courses delivered via videoconferencing technologies.
Despite the large potential sample size of remote site learners, 135 students accessed the online survey hosted by SurveyMonkey during its availability in late spring of 2012. Of the 135 students who accessed the survey, 25 participants were eliminated prior to data analysis. Two students elected to decline participation after reading the electronic informed consent document. One student failed to complete any questions on the survey instrument after initially agreeing to participate in the study. Over 20 students were removed from the study as a result of completing the survey without adequately meeting the age requirement to provide active informed consent. That is, eight students’ responses were deleted for failing to provide a date of birth, and 13 students’ responses were deleted for entering a date of birth that suggested they were younger than 18 years old. Finally, the researcher deleted the responses of one student who stated he was 21 years old. Of the 110 remaining students who began the survey, 29 students exited the survey prior to part two and 81 students completed it in its entirety.

Given the circumstances of data collection in the context of this study, the researcher identified numerous reasons potentially responsible for the lower than anticipated subject participation rate. First, the researcher was solely dependent upon contacts to share the survey URL with all students who were at least 18 years old. The possibility exists that contacts failed to appropriately distribute the URL. However, the contacts may have managed to share the survey with all prospective subjects, but upon receiving the invitation to participate in the study, the students may have elected to decline participation. Second, the sample size of approximately 1,819 remote site students included students of all ages, and minor students had additional mandatory steps in order to participate in this study. The multistep process of (1) printing off the doctoral research overview and informed consent document, (2) asking a parent or guardian to read and sign the document, (3) scanning the document, and (4) emailing it to the researcher may
have discouraged minor students from participating due to its complexity. Finally, the survey was administered during the period immediately preceding the AP and IBDP exam schedules. Students may have chosen to avoid participation in this study simply to avoid any additional commitments outside of preparing for their AP and IBDP exams.

Although the number of participants in this study represented a small percentage of the reported possible participants, the researcher found the number of respondents to be sufficient for statistical and analytical purposes. This research was largely an examination of correlation and multiple regression. Consequently, a minimum sample size of 50 participants was necessary in order to derive appropriate findings for correlation and $50 + m$ participants, where $m$ is the number of independent variables, for multiple regression (Harris, 2001). Because the maximum number of independent variables for any specific research question did not exceed six, there was an expected minimum sample size of 56 participants for this study. The researcher met the original expectation as a result of 81 students completing the online survey.

**Demographic Analysis**

In the context of this study, two demographic markers were collected from all participants: gender and race. Both demographic components were compared to national averages among students enrolled in AP and IBDP courses. The researcher analyzed comparisons in order to determine whether the sample was representative of the population.

An examination of participant gender by percentage revealed results different than national averages (Table 3). Among the 110 subjects, 30.91% were male while the remaining 69.09% were female. According to the College Board (2011a), 44.01% and 55.99% of the students who took AP exams in the spring of 2011 were male and female, respectively.

Regarding IBDP examinees, the International Baccalaureate Organization’s Statistics
Department (personal communication, May 9, 2012) reported that 42.07% and 57.93% of the students who took IBDP exams in the spring of 2011 were male and female, respectively. Similar to population characteristics, this study’s sample had a smaller percentage of males than females; however, the disparity between gender percentages in this study’s sample was dramatically greater than the population. With respect to the AP and IBDP student populations, there were approximately 12% and 15% more females than males. Yet, the sample’s differential between females and males was almost 40%. Consequently, the findings of this study are limited as a result of its overrepresentation of females and underrepresentation of males based upon population characteristics.

Table 3

<table>
<thead>
<tr>
<th>Variable</th>
<th>Research Sample (N = 110)</th>
<th>AP Population (N = 1,926,204)</th>
<th>IBDP Population (N = 60,936)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>30.91</td>
<td>44.01</td>
<td>42.07</td>
</tr>
<tr>
<td>Female</td>
<td>69.09</td>
<td>55.99</td>
<td>57.93</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Race was divided into six subcategories for this study: American Indian or Alaskan Native, Asian, Black or African American, Hispanic, Native Hawaiian or Other Pacific Islander, and White. With one exception, subcategory determination was based upon the U.S. Census Bureau’s race classifications in adherence to the U.S. Office of Management and Budget (1997) standards. According to the U.S. Census Bureau (n.d.), Hispanic is not considered a race; in fact, it purported Hispanic to be an ethnicity, claiming “people who identify their origin as Hispanic, Latino, or Spanish may be of any race” (What is Race section, para. 2). In deviation from the U.S. Census Bureau, the researcher decided to include Hispanic as a race subcategory as a result of not collecting information on participant ethnicity. Furthermore, the researcher considered
Hispanic as a possible racial subcategory because the U.S. Census Bureau frequently reports Hispanic alongside other racial subcategories within its publications focusing on race.

Similar to gender, an exploration of participant race by percentage exposed results largely dissimilar to national averages (Table 4). Both Asian and Hispanic race subcategories, for example, were underrepresented in the sample. While the Asian and Hispanic population percentage averages were 13.07% and 14.51%, respectively, the sample percentages were 6.36% and 5.46%. Whites, on the other hand, were overrepresented in the sample. The White sample percentage was 78.18% while the population percentage average was 54.82%. Once again, the preceding deviations from the population parameters called into question the generalizability of this study’s findings. In some instances, however, race subcategory sample percentages were comparable to population characteristics. The percentage of Black or African American students in the sample, for example, was within 1.00% of the population percentage average. Likewise, the percentage of sample students who identified themselves as American Indian or Alaskan Native was within 1.50% of the population percentage average.
### Table 4

**Participant Race by Percentage with Respect to Sample and Population**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Research Sample (N = 110)</th>
<th>AP Population (N = 1,926,204)</th>
<th>IBDP Population (N = 60,936)</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Indian or Alaskan Native</td>
<td>1.82</td>
<td>0.51</td>
<td>0.43</td>
</tr>
<tr>
<td>Asian</td>
<td>6.36</td>
<td>11.82</td>
<td>14.31&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Black or African American</td>
<td>8.18</td>
<td>7.84</td>
<td>9.89&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Hispanic</td>
<td>5.46</td>
<td>15.84&lt;sup&gt;c&lt;/sup&gt;</td>
<td>13.18</td>
</tr>
<tr>
<td>Native Hawaiian or Other Pacific Islander</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>White</td>
<td>78.18</td>
<td>57.38</td>
<td>52.25&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Other</td>
<td>—</td>
<td>3.24</td>
<td>3.23</td>
</tr>
<tr>
<td>Not Stated</td>
<td>—</td>
<td>3.37</td>
<td>6.71&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

*Note.* Cells containing a dash indicate that data were not obtained or not reported.

<sup>a</sup>This percentage included Pacific Islander.  
<sup>b</sup>This percentage specified non-Hispanic.  
<sup>c</sup>This percentage included Mexican American, Other Hispanic, and Puerto Rican.  
<sup>d</sup>This percentage specified non-Hispanic.  
<sup>e</sup>This percentage largely resulted from the International Baccalaureate Organization collecting race data from only public schools.

The primary purpose in reviewing demographic data of participants in research is to determine the extent to which sample characteristics mirror population characteristics. When characteristics of the sample closely reflect those of the population, then the likelihood increases that research findings may be generalizable to the larger population under genuine investigation. The demographic markers collected in this study, that is, gender and race, unveiled mixed results. Some trends were similar. For instance, females and students who reported their race as White were the predominant gender and race subcategory in both the sample and population. A closer inspection of these demographic groups, however, presented considerable differences. Both groups were overrepresented by approximately 12% and 23%, respectively. While all of the subsequent analyses of the study may not be generalizable to the population, the researcher suggests that one remembers the principal motivation behind the study was to examine how
remote site students perceive their learning from the context of interaction and not whether organizations around the country utilizing videoconferencing technologies to deliver or receive instruction in AP or IBDP courses contain a particular type, with respect to gender or race, of student.

Analysis of Study

Demographic analysis serves as an important lens in research as it provides an opportunity to compare a sample to its respective population. However, this study sought to explore a series of research questions extending beyond demographic characteristics. The subsequent section seeks to address the questions raised earlier by the researcher to, ultimately, provide assistance to all instructional leaders, principals and teachers, who manage or facilitate videoconferencing in high schools in hopes of better serving their students.

Research question one. Prior to delving deeper into the relationships among variables, the researcher initially investigated the distribution of AP and IBDP courses delivered via videoconferencing. Schools seeking rigorous academic opportunities for their high school students have a plethora of choices within the AP and IBDP course lists. The College Board provides 33 different courses while the International Baccalaureate Organization offers more than 100.

In May 2011, the College Board (2011a) and International Baccalaureate Organization’s Statistics Department (personal communication, May 11, 2012) reported that more than 3.5 million exams were taken by almost 2 million AP and IBDP students across the United States. The average exams per AP student were 1.78 while the average exams per IBDP student were 2.78. Table 5 showcases the top 10 course choices within each advanced curricular program. In addition, the table shares the percentage of examinees that tested in a particular course. In both
lists, English was the most popular course with 12.08% and 16.61% of AP and IBDP students, respectively, testing in each subject area. Other similarities between the curricular programs include high student participation in history, calculus, and psychology. Moreover, biology was the most prevalent science course while Spanish was the most common second language course.

Table 5

*Population Top 10 AP and IBDP Course Choices Based Upon Participation Percentage*

<table>
<thead>
<tr>
<th>AP Course</th>
<th>Participation (N = 1,926,204)</th>
<th>IBDP Course</th>
<th>Participation (N = 60,936)</th>
</tr>
</thead>
<tbody>
<tr>
<td>English Language &amp; Composition</td>
<td>12.08</td>
<td>English A1</td>
<td>16.61</td>
</tr>
<tr>
<td>United States History</td>
<td>11.97</td>
<td>History</td>
<td>14.52</td>
</tr>
<tr>
<td>English Literature &amp; Composition</td>
<td>10.71</td>
<td>Spanish B</td>
<td>10.20</td>
</tr>
<tr>
<td>Calculus AB</td>
<td>7.30</td>
<td>Biology</td>
<td>9.13</td>
</tr>
<tr>
<td>Government &amp; Politics: United States</td>
<td>6.68</td>
<td>Mathematics b</td>
<td>8.77</td>
</tr>
<tr>
<td>Psychology</td>
<td>5.74</td>
<td>Mathematical Studies</td>
<td>7.36</td>
</tr>
<tr>
<td>World History</td>
<td>5.54</td>
<td>Psychology</td>
<td>5.07</td>
</tr>
<tr>
<td>Biology</td>
<td>5.33</td>
<td>Chemistry</td>
<td>4.42</td>
</tr>
<tr>
<td>Statistics</td>
<td>4.13</td>
<td>Physics</td>
<td>3.70</td>
</tr>
<tr>
<td>Spanish Language</td>
<td>3.61</td>
<td>Visual Arts</td>
<td>3.47</td>
</tr>
</tbody>
</table>

*This course offers two pathways of study. One focuses on the history of Europe and the Islamic world from 500 to 1570 while the other explores world history of the 20th century.*

*This course includes numerous units that examine calculus concepts.*

The distribution and popularity of AP and IBDP courses found within the research sample are both similar to and different than national data trends. Table 6 displays all courses reported by participants and the percentage of examinees that tested in a particular course.

Similar to national data, the sample yielded more participants enrolled in AP courses as opposed to IBDP courses. However, the ratio of AP students to IBDP students in the population (i.e., 32:1) was much larger than the ratio in the sample (7:1). In total, participants identified their enrollment in 20 different AP courses and 3 different IBDP courses. With respect to the AP students, English literature and composition was the most common course received through
videoconferencing technologies, whereas mathematics was the most frequently received course for IBDP students. The two courses, in both instances, had notably higher participation percentages than national trends. A closer examination of the AP sample data revealed that four of the national top five courses, including English language and composition, United States history, calculus, and English literature and composition, were all offered through videoconferencing and moderately populated. In addition, three of the national top five IBDP courses, including English A1, mathematics, and biology, were available to remote site learners.

Table 6

*Sample AP and IBDP Course Choices Based Upon Participation Percentage*

<table>
<thead>
<tr>
<th>AP Course</th>
<th>Participation (n = 97)</th>
<th>IBDP Course</th>
<th>Participation (n = 13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>English Literature &amp; Composition</td>
<td>32.99</td>
<td>Mathematics</td>
<td>76.92</td>
</tr>
<tr>
<td>Statistics</td>
<td>9.28</td>
<td>Biology</td>
<td>7.69</td>
</tr>
<tr>
<td>Calculus AB</td>
<td>8.25</td>
<td>English A1</td>
<td>7.69</td>
</tr>
<tr>
<td>United States History</td>
<td>8.25</td>
<td>Not Stated</td>
<td>7.69</td>
</tr>
<tr>
<td>English Language &amp; Composition</td>
<td>6.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macroeconomics</td>
<td>6.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>4.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>French Language &amp; Culture</td>
<td>4.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Art History</td>
<td>3.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics B</td>
<td>3.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychology</td>
<td>3.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>European History</td>
<td>2.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music Theory</td>
<td>2.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology</td>
<td>1.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Science A</td>
<td>1.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Science</td>
<td>1.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government &amp; Politics:</td>
<td>1.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government &amp; Politics:</td>
<td>1.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microeconomics</td>
<td>1.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spanish Language</td>
<td>1.03</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Moreover, the type of content available to interested remote site students expanded beyond any one particular discipline. Consider, for instance, the following six groups of content knowledge and skill development the International Baccalaureate Organization (2012c) uses to organize its various subjects: Group 1 (studies in language and literature), Group 2 (language acquisition), Group 3 (individuals and societies), Group 4 (experimental sciences), Group 5 (mathematics and computer science), and Group 6 (arts). A typical interpretation of this organization as evidenced by a student’s course schedule might be the following set of classes: English (Group 1), Spanish as a second language (Group 2), history (Group 3), biology (Group 4), mathematics (Group 5), and visual arts (Group 6). Table 7 reorganizes the sample course offerings by group. A review of the table reveals that AP course availability covers all six groups. In fact, all of the groups have at least two different courses while two groups have at least four different courses. This finding suggested that there was ample breadth as well as depth concerning videoconferencing AP course availability. Regarding IBDP course availability, the sample contained fewer choices overall. However, the three reported choices covered three different academic groups.
Table 7

*Sample AP and IBDP Course Choices Reported by Group*

<table>
<thead>
<tr>
<th>Category</th>
<th>AP Course</th>
<th>Frequency</th>
<th>IBDP Course</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>English Language &amp; Composition</td>
<td>2</td>
<td>English A1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>English Literature &amp; Composition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td>French Language &amp; Culture</td>
<td>2</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Spanish Language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 3</td>
<td>European History</td>
<td>7</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Government &amp; Politics: Comparative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government &amp; Politics: United States</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Macroeconomics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Microeconomics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Psychology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>United States History</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 4</td>
<td>Biology</td>
<td>4</td>
<td>Biology</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Chemistry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental Science</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 5</td>
<td>Calculus AB</td>
<td>3</td>
<td>Mathematics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Computer Science A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Statistics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 6</td>
<td>Art History</td>
<td>2</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Music Theory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>20</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Prior to this study, there had been no exploration of the distribution of AP and IBDP courses delivered via videoconferencing. The results indicated that a wide variety of advanced curricular offerings exists for remote site learners who seek a rigorous academic course load yet cannot physically attend such classes. While some classes, such as English and mathematics,
were more common than others, at least a few programs around the country committed their resources to offering less popular courses to desiring and deserving students.

**Research question two.** The second research question was the first question to examine a relationship between two variables. In particular, the researcher wondered whether there was a relationship between learner-learner interaction and perceived student learning. The null hypothesis posited there was no statistically significant relationship between learner-learner interaction and perceived student learning.

Prior to the correlation computation, each participant’s responses to the survey were recalculated to determine a learner-learner interaction and perceived student learning mean score and factor score. Mean and factor scores were only calculated for subjects who completed part two of the survey, where subjects marked the extent to which they disagree or agree with a specific statement. From the subject pool of 110 students who started the survey, only 81 students completed part two of the survey. The learner-learner interaction mean score was found by averaging a participant’s responses to five questions (i.e., statements 8–12), whereas the perceived student learning mean score was found by averaging a participant’s responses to six questions (i.e., statements 18–23). A review of the Cronbach’s alphas, that is, $\alpha = 0.86$ and $\alpha = 0.93$, respectively, for each set of questions indicated good and excellent internal consistency regarding the learner-learner interaction and perceived student learning indices (George & Mallery, 2003). In the event a participant neglected to respond to one of the statements, the total score was divided by one fewer number. For example, if a student recorded a response for four out of the five learner-learner interaction statements, then the student’s mean score was the sum of the four recorded responses divided by four. Learner-learner interaction and perceived student learning factor scores were estimated utilizing a regression method across the same sets of
statements. However, if a participant neglected to respond to one of the statements, the missing value was replaced with the mean. For example, if a student failed to record a response for the third learner-learner interaction statement, then the student was assigned a score equivalent to the mean score across all other participant responses for that particular statement.

The descriptive statistics of learner-learner interaction and perceived student learning enabled the researcher to assess the degree to which the subjects viewed the value of each respective variable (Table 8). The participants’ mean score for learner-learner interaction, for instance, was 3.56. Because the mean score was above 3.00, the researcher concluded that the average subject found the learning environment to promote learner-learner interaction. Likewise, the participants’ mean score for perceived student learning was 3.84, which similarly suggested that the average subject found the learning environment to promote the perception of student learning. Finally, the standard deviations for both variables fell below 1.00, or a whole unit of measure on the original scale. Because the perceived student learning standard deviation ($SD = .84$) was smaller than the learner-learner interaction standard deviation ($SD = .93$), the researcher concluded there was less dispersion, and consequently more concentrated agreement, around the perceived student learning variable.

Table 8

<table>
<thead>
<tr>
<th>Variable</th>
<th>$M$</th>
<th>$SD$</th>
<th>$N$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner-learner interaction</td>
<td>3.5642</td>
<td>.92535</td>
<td>81</td>
</tr>
<tr>
<td>Perceived student learning</td>
<td>3.8407</td>
<td>.84385</td>
<td>81</td>
</tr>
</tbody>
</table>

A correlation coefficient was computed between learner-learner interaction and perceived student learning based upon factor scores. With an alpha of 0.05, the results of the correlational
analysis presented in Table 9 shows that the correlation \( r = 0.56 \) was statistically significant, \( p < 0.001 \). Furthermore, the power was greater than 0.995 as determined by the significance criterion, effect size, and sample size (Cohen, 1988). Therefore, the null hypothesis that there is no statistically significant relationship between learner-learner interaction and perceived student learning was confidently rejected. In general, the result suggested that students perceived an increased sense of learning as the classroom environment promoted learner-learner interaction.

Table 9

*Correlations: Learner-Learner Interaction and Perceived Student Learning*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learner-learner interaction</td>
<td>—</td>
<td>.564***</td>
</tr>
<tr>
<td>2. Perceived student learning</td>
<td>.564***</td>
<td>—</td>
</tr>
</tbody>
</table>

*Note. N = 81.*

*** \( p < .001 \), two-tailed.

Interaction among students is integral to learning in the social learning paradigm. As students interact with one another, they forge new opportunities to improve their understanding, demonstrate their proficiency, and adjust their schemas. The exchange between environmental determinants (e.g., learner-learner interaction) and behavioral determinants (e.g., perceived student learning) creates an unceasing reciprocity capable of leading students toward content mastery and productive relationships. Recognizing the utility of the social aspect of learning, Smyth (2005) encouraged instructors to unpack the potential of videoconferencing in order to promote student-to-student engagement in learning. After all, learning is an undulating process whereby students achieve learning objectives by constantly negotiating the exchanges with their environments and their identities.
Learner-learner interaction is a vehicle for learning. After all, the medium enables students another avenue toward knowledge acquisition (Henning, 2004). The effect size revealed in Table 9 is large as operationalized by Cohen (1988). With such an effect size, a researcher might expect to safely observe with the naked eye the relationship between learner-learner interaction and perceived student learning. Because this relationship is, perhaps, so noticeable, its absence might be easily identified by both instructors and principals alike who seek to support maximum student learning potential.

**Research question three.** The third research question continued to explore the presence, or lack thereof, of a relationship between two variables. Similar to the second research question, the researcher was interested in perceived student learning. In this case, however, the second variable under investigation was learner-instructor interaction. The null hypothesis speculated there was no statistically significant relationship between learner-instructor interaction and perceived student learning.

The construction of participant mean and factor scores for learner-instructor interaction mirrored the methodology executed for the learner-learner interaction and perceived student learning variables. The researcher computed learner-instructor interaction mean and factor scores based upon responses to five questions (i.e., statements 13–17). These questions evoked reliable responses from participants as evidenced by their good internal consistency (George & Mallery, 2003), that is, $\alpha = 0.89$.

Both learner-instructor interaction and perceived student learning were affirmatively recognized by subjects. Table 10 reports mean scores near 4.00. These elevated mean scores imply that participants collectively perceived a prevalence of interaction between the instructor and themselves as well as student learning. Similar to learner-learner interaction and perceived
student learning, the standard deviation of learner-instructor interaction \((SD = 0.94)\) resided below 1.00. In addition, comparable to learner-learner interaction \((SD = 0.93)\), learner-instructor interaction had a higher standard deviation than perceived student learning \((SD = 0.84)\).

Participants, in effect, expressed more dispersion within their collective reporting of learner-instructor interaction than perceived student learning.

Table 10

Descriptive Statistics: Learner-Instructor Interaction and Perceived Student Learning

<table>
<thead>
<tr>
<th>Variable</th>
<th>(M)</th>
<th>(SD)</th>
<th>(N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner-instructor interaction</td>
<td>3.8494</td>
<td>.93627</td>
<td>81</td>
</tr>
<tr>
<td>Perceived student learning</td>
<td>3.8407</td>
<td>.84385</td>
<td>81</td>
</tr>
</tbody>
</table>

With a new pair of variables, the researcher calculated the Pearson product-moment correlation using factor scores to examine whether an association existed between them. The analysis displayed in Table 11 reveals a large effect size, \(r = 0.61\). This correlation, moreover, was statistically significant, \(p < 0.001\), with alpha set at 0.05. Once again, the combination of the significance criterion, effect size, and sample size enabled a power analysis to reveal a power greater than 0.995 (Cohen, 1988). Consequently, the null hypothesis that there is no statistically significant relationship between learner-instructor interaction and perceived student learning was assertively rejected in favor of the alternative hypothesis. This finding suggested, overall, that if teachers effectively facilitated learner-instructor interactions then students increased their perception of learning.
Interaction between students and their instructors is paramount to fostering assured understanding in the videoconferencing classroom setting. After all, without an instructor to gauge comprehension, students are left to their own peril in determining whether they honestly know something. By incorporating another individual into the learning process, the opportunity for the teaching and learning reciprocation between learner and instructor arises (Henning, 2004). Moreover, an instructor embodies an invaluable resource capable of wielding content knowledge and skill sets quintessential for student academic success. For example, prompt feedback in the context of interaction activities can increase the likelihood that students meet educational outcomes in distance learning environments (Gillies, 2008).

Effective instructional leaders can challenge students to meet high expectations. Conversely, with poor learner-instructor interaction, Comber et al. (2004) found educational potential to be lost. Similar to the effect size found in the association between learner-learner interaction and perceived student learning, the large effect size in Table 11 indicates a significant relationship between learner-instructor interaction and perceived student learning. Likewise, the strength of the correlation suggests that its occurrence would be difficult to miss in the learning environment.

Table 11

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learner-instructor interaction</td>
<td>—</td>
<td>.612***</td>
</tr>
<tr>
<td>2. Perceived student learning</td>
<td>.612***</td>
<td>—</td>
</tr>
</tbody>
</table>

*Note. N = 81.***p < .001, two-tailed.

*Correlations: Learner-Instructor Interaction and Perceived Student Learning*
**Research question four.** The fourth question was the first question to examine multiple regression with respect to the dependent variable perceived student learning. Building upon the previously calculated correlational analyses, the following multiple regression analysis set out to investigate the cumulative relationship of two independent variables, that is, learner-learner interaction and learner-instructor interaction, on a single dependent variable. Hence, the null hypothesis tested whether there was a relationship between learner-learner interaction and learner-instructor interaction that correlated with increases in perceived student learning.

The results of the multiple regression analysis based upon factor scores indicated a series of important relationships among the variables. In fact, learner-learner interaction and learner-instructor interaction represented a statistically significant amount of the perceived student learning variability, $F(2, 78) = 43.85, p < .001$ (Table 12). These results suggested that an increase in learner-learner interaction and learner-instructor interaction tended to yield a higher perception of student learning. Moreover, the high sample multiple correlation coefficient ($R = 0.73$) revealed that approximately 53% of the variance within perceived student learning in the sample can be accounted for by the combination of learner-learner interaction and learner-instructor interaction (Table 13). Finally, learner-instructor interaction was found to have a slightly higher impact on perceived student learning than learner-learner interaction (Table 14). Because the scales for all three variables were similarly measured, their unstandardized coefficients were sufficient in determining the magnitudes of the independent variables on the dependent variable. A one unit change in a student’s reported learner-learner interaction score led to a 0.41 change in the corresponding perceived student learning score, whereas an equally reported change in a learner-instructor interaction score increased perceived student learning by
Therefore, with alpha set at 0.05, the null hypothesis was safely rejected with a power greater than 0.995 (ES = 1.15).

A review of the underlying assumptions of regression was completed after analysis. Histograms of learner-learner interaction and perceived student learning revealed normally distributed variables while the histogram of learner-instructor interaction was negatively skewed. The low bivariate correlation between independent variables ($r = .31$) suggested that the variables were independent of each other. Finally, the scatterplot of the standardized residuals against the dependent variable exposed heteroscedastic residuals. Because some underlying assumptions of regression were not met, the predictive power of the regression model was limited.

Table 12

**ANOVA as a Component of Multiple Regression Examining Relationship Between Interactions (IVs) and Perceived Student Learning (DV)**

<table>
<thead>
<tr>
<th>Model</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>42.339</td>
<td>2</td>
<td>21.170</td>
<td>43.845</td>
<td>&lt;.001$^a$</td>
</tr>
<tr>
<td>Residual</td>
<td>37.661</td>
<td>78</td>
<td></td>
<td>.483</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>80.000</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$^a$Predictors: (Constant), Learner-learner interaction, and Learner-instructor interaction

Table 13

**Model Summary: Multiple Regression Examining Relationship Between Interactions (IVs) and Perceived Student Learning (DV)**

<table>
<thead>
<tr>
<th>Model</th>
<th>$R$</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>SE of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.727$^a$</td>
<td>.529</td>
<td>.517</td>
<td>.695</td>
</tr>
</tbody>
</table>

$^a$Predictors: (Constant), Learner-learner interaction, and Learner-instructor interaction
Table 14

**Coefficients: Multiple Regression Examining Relationship Between Interactions (IVs) and Perceived Student Learning (DV)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>95% CI for B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>B</td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>.000</td>
<td>.077</td>
<td>.000</td>
</tr>
<tr>
<td>Learner-learner interaction</td>
<td>.414</td>
<td>.082</td>
<td>.414</td>
</tr>
<tr>
<td>Learner-instructor interaction</td>
<td>.483</td>
<td>.082</td>
<td>.483</td>
</tr>
</tbody>
</table>

*Note. N = 81. CI = confidence interval; LL = lower limit; UL = upper limit.*

Human beings are social creatures. Unsurprisingly, perhaps, students in the research sample perceived heightened levels of learning as a result of increased learner-learner and learner-instructor interactions. In a typical classroom, students learn in the company of their peers and instructors. When a student is removed from the traditional classroom, as in the case of distance learning, the learning dynamic inherently changes. However, Greenberg (2004) concluded, “With videoconferencing, the real-time, two-way visual and verbal interaction of the bricks-and-mortar classroom could be simulated by technology — creating a ‘virtual classroom’ whose boundaries were limited only by the extent of the videoconferencing network” (p. 6). In effect, the distance education learning environment established through videoconferencing, as opposed to other mediums, retains one of the more essential characteristics of learning endeavors, that is, interaction. Furthermore, Darabi, Sikorski, and Harvey (2006) suggested that distance education students meet learning objectives when instructors remain “keenly aware of the significance of interaction as the building block of distance education” (p. 115).
Interaction drives education. Whether an individual interacts with a text, another learner, or an instructor, learning occurs as the direct result of effective exchanges (Wagner, 1994). Based upon the preceding multiple regression analysis, learner-learner interaction and learner-instructor interaction bore statistical significance in shaping perceived student learning. Even though the latter was, perhaps, more influential on perceived student learning, both forms of interaction are central to effective pedagogy and should be carefully considered when operating within or managing outside a videoconferencing learning environment.

**Research question five.** The final research question, once again, examined multiple regression. Similar to the three previous research questions, perceived student learning remained the dependent variable. The independent variables, however, changed to include two sets of predictors as opposed to one set. The first set of predictors included environmental determinants (i.e., learner-learner interaction, learner-instructor (tutor) interaction, and group and class size). The second set of predictors included personal determinants (i.e., gender and race). Consequently, the null hypothesis assessed whether there was a relationship between environmental determinants and personal determinants that correlated with increases in perceived student learning.

Before the null hypothesis could be tested, the researcher addressed three issues arising from data collection as it related to the new variables under investigation. First, an early peripheral interest of the researcher was to explore the role of the tutor at the remote site, specifically learner-tutor interaction. However, a limited number of participants ($n = 17$) reported having a tutor present at the remote site. The researcher, consequently, removed learner-tutor interaction as a potential environmental determinant in the subsequent regression analysis. Second, the group and class size variable represented an amalgam of three reported
values on the survey instrument (i.e., questions 5a, 6, and 7b). Group size referred to the number of students present at the remote site, whereas class size additionally included the number of host site students and the number of other remote site students. Therefore, the researcher calculated a total group and class size value \( (M = 19.77, SD = 14.89) \) for each participant based upon the sum of the values recorded for group and class size. Third, race represented a nominal variable with more than two levels. Unlike the dichotomous distinction found in gender, the researcher had to take additional steps to recode race prior to analysis. Thus, new variables were created for race subcategories where the value of one represented one race (e.g., White) and the value of zero represented other races (e.g., non-White). Because White was the only race subcategory with a substantive number of participants \((n = 64)\), it became the single race subcategory entered in the multiple regression model. With the three previous issues resolved, the researcher proceeded to address the final research question.

With more variables involved in the final regression model, the researcher assessed the underlying assumptions of regression prior to analysis. In addition to the previously examined variables, that is, learner-learner interaction, learner-instructor interaction, and perceived student learning, group and class size became the last remaining variable to be explored for normal distribution. Upon checking the initial histogram, the researcher noted one issue of concern. There was one outlier that indicated a group and class size of 100. The outlier was removed from the data set in order to enable a more suitable measure of central tendency \((M = 18.71, SD = 11.74)\) and to improve the normal distribution. The bivariate correlations among the independent variables remained low \((r < .40)\) and confirmed independence between variables. Lastly, the scatterplot of the standardized residuals, once again, unveiled heteroscedasticity.
Therefore, the violation of some underlying assumptions of regression restricted the predictive power of the regression model.

A multiple regression analysis based upon factor scores was conducted in order to understand environmental and personal determinants as they related to perceived student learning. The linear combination of environmental and personal determinants was significantly related to perceived student learning, $F(5, 70) = 10.22, p < .001$ (Table 15). However, a closer examination of the analysis revealed that the set of environmental determinants was the significant set of predictors accounting for 64.67% of the variance within perceived student learning while personal determinants represented 0.25% of the variance. Personal determinants, hence, offered negligible predictive power beyond that contributed by environmental determinants. Therefore, even though the significance criterion ($\alpha = 0.05$), sample size ($N = 76$), effect size ($ES = 1.85$), and power greater than 0.995 enabled the null hypothesis to be confidently rejected, one must cautiously do so.
### Table 15

**Predictors of Perceived Student Learning**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 B</th>
<th>Model 2 B</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.58***</td>
<td>-0.45</td>
<td>[-1.00, 0.10]</td>
</tr>
<tr>
<td>Environmental determinants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner-learner interaction</td>
<td>0.24**</td>
<td>0.24**</td>
<td>[0.06, 0.41]</td>
</tr>
<tr>
<td>Learner-instructor interaction</td>
<td>0.63***</td>
<td>0.64***</td>
<td>[0.47, 0.80]</td>
</tr>
<tr>
<td>Group and class size</td>
<td>0.03***</td>
<td>0.03***</td>
<td>[0.02, 0.05]</td>
</tr>
<tr>
<td>Personal determinants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>-0.10</td>
<td></td>
<td>[-0.41, 0.21]</td>
</tr>
<tr>
<td>White</td>
<td>-0.07</td>
<td>[-0.47, 0.34]</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.65***</td>
<td>0.65***</td>
<td></td>
</tr>
<tr>
<td>$F$</td>
<td>-43.93***</td>
<td>25.90***</td>
<td></td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta F$</td>
<td>0.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. N = 76, four students failed to report their group and class size and, consequently, were removed from this statistical test. CI = confidence interval.

**$p < .01. \quad **p < .001.**

Learning environments harbor an unceasing flow of exchanges among their elements.

The act of learning, therefore, is a product of numerous actions and reactions. These determinants, composed of environmental, personal, and behavioral characteristics, channel particular exchanges to enable learning (Bandura, 1977). As previously discussed, interaction performs a pivotal role in leading toward perceived student learning. Perhaps, Greenberg’s (2004) remark that “interactivity is king” within videoconferencing contexts was not a hyperbole after all (p. 4). While the researcher attempted to study the effects of a wider range of predictors of perceived student learning in the final research question, only a few new conclusions were unveiled.

By exploring group and class size as an environmental determinant, the researcher realized that there was statistically significant value added to explaining perceived student learning. Unlike the findings of other scholars (Brown et al., 2005; Husu, 2000), larger group
and class sizes were found to increase perceived student learning. Regardless, with a third significant predictor within environmental determinants, the researcher conducted a series of additional investigations to determine whether there were any meaningful interaction effects. Further analysis indicated statistically significant interaction effects between learner-learner interaction and group and class size ($p = .011$) as well as between learner-instructor interaction and group and class size ($p = .008$). In an attempt to understand the interaction effects, the researcher compared standardized coefficients of learner-learner interaction and learner-instructor interaction. Using the first and third quartile values of group and class size (i.e., 8 and 26.75), the researcher examined the respective interaction effects by executing two separate multiple regression analyses, where the dependent variable was perceived student learning and the independent variables were learner-learner interaction and learner-instructor interaction (Table 16). The results of the first test, where the researcher selected all participants who stated group and class sizes greater than eight, yielded statistically significant standardized coefficients for learner-learner interaction ($B = .216, p = .035$) and learner-instructor interaction ($B = .629, p < .001$). Likewise, the second test, where the researcher selected all participants who stated group and class sizes less than 27, revealed statistically significant standardized coefficients for learner-learner interaction ($B = .374, p < .001$) as well as learner-instructor interaction ($B = .522, p < .001$). A comparison of the coefficients between the two models showed an increase in learner-learner interaction from larger to smaller group and class sizes and an increase in learner-instructor interaction from smaller to larger group and class sizes when studying their effects on perceived student learning. These findings suggested that (1) learner-learner interaction was more important in smaller group and class sizes than in larger group and class sizes and (2)
learner-instructor interaction was more important in larger group and class sizes than in smaller group and class sizes.

Table 16

*Standardized Coefficients: Multiple Regressions Examining Interaction Effects of Group and Class Size Between Interactions (IVs) and Perceived Student Learning (DV)*

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>p</th>
<th>95% CI for B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1^a (Constant)</td>
<td>.257</td>
<td>.078</td>
<td>3.308</td>
<td>.002</td>
<td>.101</td>
</tr>
<tr>
<td>Learner-learner</td>
<td>.184</td>
<td>.085</td>
<td>.216</td>
<td>2.160</td>
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<td>.629</td>
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<td>-.946</td>
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<td>Learner-instructor</td>
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Note. N = 76. CI = confidence interval; LL = lower limit; UL = upper limit.
^a n = 54, where group and class sizes were more than eight.  
^b n = 56, where group and class sizes were less than 27.

The value of research rests as much in discovering statistically significant findings as not statistically significant results. While the former may be more glorious and satisfying, the latter is equally important. The preceding analysis showed gender and race held little additional predictive power, which the former was similar to the conclusion of Comber et al. (2004). Nonetheless, these findings possibly indicated a pathway, or at least a particular set of predictors, no longer in need of further examination when exploring potential causes of perceived student learning.
learning among remote site students enrolled in AP and IBDP courses delivered through videoconferencing technologies.
Chapter 5: Conclusion

The preceding study examined relationships among a variety of factors related to perceived student learning within the context of a videoconferencing remote site. Participants represented an exclusive pool of high school students, that is, students enrolled in AP or IBDP courses, gathered from around the country. This final chapter presents the analysis of the findings, importance of the findings, conclusions, implications, and recommendations for further research.

Analysis of Findings

Statistically significant results become meaningful when additional facets of their interpretation are considered. In particular, internal and external validity always represent areas of concern that deserve further analysis prior to reaching final conclusions and making recommendations. Without exercising caution when evaluating internal and external validity, a researcher may severely limit a study’s capacity to offer valuable information.

Internal validity attempts to showcase the relationship between the independent and dependent variable as objective truth. Gay and Airasian (2000) defined internal validity as “the condition that observed differences on the dependent variable are a direct result of the independent variable, not some other variable” (p. 345). In the context of research, there are numerous threats to internal validity. Of the more than 20 threats identified by Onwuegbuzie (2000), as displayed in Table 17, many of them pose no risk in affecting the internal validity of this study.
Table 17

Threats to Validity

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<td>Selection x Treatment Interaction</td>
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<td>Treatment Diffusion</td>
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<td>Time x Treatment Interaction</td>
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<tr>
<td>History x Treatment Interaction</td>
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</table>

For example, history, mortality, and other potential threats were not likely as a result of the study occurring across single five-minute blocks of time when the subject participants completed the online survey. In addition, because this study did not include interventions, implementation bias, multiple-treatment interference, as well as other potential threats did not surface. Finally, differential selection of participants, matching bias, and similar threats were not realistic because the participants were not broken into control or experimental groups. However, despite the decrease in possible threats, there still remained possible factors that potentially inhibited the desired connection between the independent and dependent variables. First, the instrumentation could have had a higher internal consistency among the statements measuring learner-learner
interaction ($\alpha = 0.86$) and learner-instructor interaction ($\alpha = 0.89$). While both sets of statements had good reliability as categorized by George and Mallery (2003), other statements may exist that measure the same constructs with excellent reliability. Second, participants may have displayed reactive arrangements in response to simply completing the survey. By taking the survey and, thus, acknowledging their participation in doctoral research, subjects may have reacted to particular statements in a way other than their typical responses. In effect, this threat could alter the reliability of the findings by eliciting inaccurate responses during data collection. Regardless of which threat manifests itself during the research process, any threat can confound the findings.

External validity bridges the connection between the sample and the population. Johnson and Christensen (2000) described external validity as “the extent to which the results of a study can be generalized to and across populations, settings, and times” (p. 200). Similar to internal validity, there are a multitude of sources from which threats to external validity may arise. Once again, even though Onwuegbuzie (2000) classified 12 threats to external validity, as stated in Table 1, some are not realistic concerns given the methodology of this study. For instance, because this study did not include interventions, potential threats including order bias, treatment diffusion, as well as many others did not arise. Population validity represents the first relevant threat. To increase population validity, researchers typically employ large, randomized samples in order to promote the likelihood that the sample findings mirror the hypothetical characteristics of the population. However, limited resources make this type of sampling difficult. In this study, 81 students completed the second part of the survey, and there was no way to ensure that the students who completed the survey represented a randomized sample from across the United States. Therefore, population validity was a potential risk in this study. Second, ecological
validity addresses the degree to which the sample findings are independent of a particular setting or context. By nationally administering the survey, the researcher hoped to capture a broad swath of the population of interest; yet, it was possible that survey respondents overrepresented a particular school, state, or geographical region. Third, temporal validity arises as a concern when findings become bound to a specific time. Because this study examined participant responses after a single survey completion, there may be temporal validity concerns until duplicate studies are performed. Finally, the specificity of variables also poses a plausible risk to external validity. Because this study was conducted at a specific time, based upon specific operational definitions, and shaped by a specific instrument to measure all variables, the researcher may only generalize findings to comparable circumstances. For example, this study explored perceived student learning as the dependent variable. Therefore, generalizing the findings to a theoretical dependent variable of student learning or academic achievement would be dangerous.

A lack of prudence with respect to the assessment of internal and external validity can jeopardize the significance of a researcher’s entire work. Conversely, a researcher’s keen awareness of a study’s limitations has the potential of clearly communicating findings valuable to a desired audience. In this latter effort, the researcher of this study hoped to meet a reputable standard of validity in order to ensure promising results.

Importance of Findings

Videoconferencing in K-12 classrooms harnesses immense potential. While the adopted model of videoconferencing (i.e., familiarization, substitution, enhancement, and adaptation) may change based on context (Lawson & Comber, 2010), the medium continues to offer genuine opportunities for student learning. In the United States, the implementation of
videoconferencing in public schools systems is on the rise. Greenberg (2009) reported that approximately 29,200 public school districts have been equipped with videoconferencing technologies as of early 2009, a more than 30% increase from early 2006. With videoconferencing adoption increasing, careful analysis of effective practices must be conducted. Moreover, as the fiscal resources available for the preservation or expansion of curricular offerings diminish, school districts must continue to explore other means of meeting students’ academic needs (Roza, 2009). Therefore, the importance of this study’s findings lie in their ability to disclose significance in predicting perceived student learning.

Correlational analyses revealed statistically significant relationships between learner-learner interaction and perceived student learning as well as learner-instructor interaction and perceived student learning. In both cases, the significance criterion, sample size, effect size, and power were sufficient in rejecting the null hypotheses that there was no relationship between variables. With this finding, a teacher or principal committed to promoting increased perception of student learning should regularly evaluate the extent to which productive interactions are occurring in the classroom. If an evaluation reveals low interaction with respect to learner-learner or learner-instructor, proper steps must be taken to encourage an increase in meaningful interaction. At a minimum, this study highlighted that a simple increase of specific interaction activities can improve perceived student learning.

Multiple regression analyses further supported the previous findings. First, approximately 53% of the variance within perceived student learning in the sample was accounted for by the union of learner-learner interaction and learner-instructor interaction. If the large effect size for correlation was not enough to persuade teachers and principals of the value of interaction, then the similarly large effect size for multiple regression hopefully quelled any
remaining doubts. In its respective model, learner-learner interaction and learner-instructor interaction were statistically significant predictors. Second, when combined with other variables, learner-learner interaction and learner-instructor interaction retained their statistical significances. The inclusion of group and class size as another variable, furthermore, illustrated a key finding related to these types of interaction. That is, learner-learner interaction became more important of a predictor of perceived student learning in smaller courses than in larger courses while learner-instructor interaction was more important in larger courses than in smaller courses. Therefore, regardless of statistical robustness, both correlational and multiple regression analyses concluded learner-learner interaction and learner-instructor interaction were strongly linked to perceived student learning.

Conclusions

Students in search of academically rigorous course offerings in high schools have numerous options. AP and IBDP courses exemplify two of the more popular tracks. In districts where budgetary constraints challenge administrators to maintain a respectable breadth of advanced curricular choices, distance education may serve as a suitable alternative. The results of the first research question revealed that a wide variety of AP and IBDP courses delivered via videoconferencing already exists across the United States, but there still remains room for further expansion. As the number of available courses increases, more remote students will have the opportunity to pursue their academic desires.

In Cavanaugh’s (2001) meta-analysis on the effectiveness of interactive distance education technologies in K-12 learning, she reminded her audience that “interaction is the core of teaching” (p. 75). Teaching and learning signify a perpetual reciprocity in any classroom, and effective instructional leaders manage the reciprocal exchanges in ways that maximize student
understanding. Bandura (1977) posited that these exchanges could be categorized into three groups, namely, environmental, personal, and behavioral determinants, but he simultaneously warned his readership of hastily identifying the root cause of any one event.

In videoconferencing learning environments, remote site learners are removed from the same physical space as their instructors. However, the perceived student learning of the remote site student is no less important than that of the host site student. The question naturally emerges as to how instructors teaching at a distance maintain a reliable focus on the perceived student learning of remote site students. Interaction represents a pathway in which instructors may monitor this valuable component of teaching and learning. Moreover, the conclusions of the second, third, and fourth research questions highlighted two specific solutions, that is, the promotion of both learner-learner interaction and learner-instructor interaction. The fifth research question shared how a certain type of interaction became increasingly more important when considering group and class size. In fact, school personnel who manage or facilitate videoconferencing in high schools and hope to better serve their students will most likely find significant impact on perceived student learning through the vehicle of interaction as opposed to other factors, including gender and race.

The conclusions reached in this dissertation foremost address the descriptive nature of its inquiry. As a direct result of limited participants, accepting this study’s findings as genuine predictive research would be an error. The results, nonetheless, provide an empirical study from which some speculation may be entertained in order to address potential implications for theory and recommendations for further research.
Implications

The statistical findings in this study cannot be ignored. Interaction was a significant predictor of perceived student learning among remote site students enrolled in AP and IBDP courses distributed through videoconferencing technology. Therefore, practitioners in the videoconferencing field must recognize the degree to which they facilitate learner-learner interaction and learner-instructor interaction. All teachers hope their students are confident in their learning. Consequently, host site instructors should take every step to promote interaction as a means to improve the perception of learning among their students. Depending upon group and class size, instructors should also pay special attention to whether they should increase the facilitation of learner-learner interaction or learner-instructor interaction.

As measured by the survey instrument, the researcher identified five areas in which instructors can promote both types of interaction necessary to increase perceived student learning. Learner-learner interaction pertained to (1) the ability to share learning experiences with other students, (2) the ability to communicate with other students in the course, (3) increased contact with fellow students that helped students get more out of the course, (4) a sense of community that existed with fellow students taking the course, and (5) opportunities to work in small groups or teams. Principal components analysis of the learner-learner interaction construct revealed reasonably high component loadings ($r > .74$) across all five data items (Appendix N). The highest correlation coefficient ($r = .87$) existed between increased contact with fellow students that helped students get more out of the course and learner-learner interaction. Therefore, instructors who have limited time to implement effective learner-learner interaction should place a primary focus on facilitating this particular type among students.

Learner-instructor interaction included whether (1) the instructor informed students about their
progress periodically, (2) the instructor treated students as individuals, (3) students were able to interact with the instructor during the course discussions, (4) the instructor provided students feedback on their work through comments, and (5) the instructor encouraged students to become actively involved in the course discussions. Similar to learner-learner interaction, principal components analysis of the learner-instructor interaction construct uncovered strong component loadings ($r > .77$) across all five data items (Appendix N). The highest correlation coefficient ($r = .87$) was shared by two data items: the instructor informed students about their progress periodically and students were able to interact with the instructor during the course discussions. As a result, these two examples of learner-instructor interaction should be of foremost importance for instructors who attempt to maximize perceived student learning. Moreover, many of these aspects of learner-learner interaction and learner-instructor interaction have been shown to create positive learning experiences for participants (Comber et al., 2004; Darabi et al., 2006; Gillies, 2008; Greenberg, 2004; Henning, 2004; Smyth, 2005; Palloff & Pratt, 1999). Again, these areas of interaction simply represent a starting point. There may very well be other interactive exchanges that similarly promote perceived student learning.

In addition to implications for practice, this study provided further insight into the original conceptual framework. While innumerable exchanges transpire in any educational setting, some determinants in this study bore greater statistical significance in predicting others. In effect, the conceptual frame may be strengthened by reassessing the directional relationships among the determinants as displayed in Figure 5. Because the relationship between environmental and behavioral determinants was more significant than those between other determinant pairings, for example, the bidirectional arrow should be larger and darker. Furthermore, learner-learner interaction, learner-instructor interaction, and group and class size
should be bolded, as well, in order to recognize their especially strong roles within exchanges between environmental and behavioral determinants. The resulting implications for theory, then, include a sharper emphasis on the relationship between environmental and behavioral determinants. In addition, as group and class size increases, there must be added emphasis to the facilitation of learner-instructor interaction. On the contrary, when group and class size decreases, there must be increased encouragement of learner-learner interaction. While other exchanges and specific determinants, such as learner-tutor interaction, gender, and race, may be statistically significant in future studies with larger sample sizes, this study concluded that not all exchanges are equally meaningful for practioners.

![Revised conceptual framework based upon social learning theory.](image)

*Figure 5. Revised conceptual framework based upon social learning theory.*

*The variable course was analyzed only for descriptive purposes.*

Moreover, this study and its respective literature review offered a unique opportunity to posit theoretical arguments surrounding two facets of the statistically significant predictor of group and class size in the final multiple regression analysis. First, the suggestion that an
increase in group and class size would yield an increase in perceived student learning initially seemed counterintuitive. In fact, Brown et al. (2005) and Husu (2000) found larger group and class sizes to decrease perceived student learning. After all, one would expect smaller group and class sizes to enable teachers to promote heightened levels of both learner-learner interaction and learner-instructor interaction, thus improving the perception of student learning, as a result of managing fewer overall exchanges among participants. However, Moore’s (1993a) theory of transactional distance and Bandura’s (1977) work on social learning, perhaps, provides an explanation for this provocative phenomenon. As group and class size increases, transactional distance inevitably increases, as well, from less dialogue and more structure. Yet, a larger group and class size may simultaneously decrease transactional distance as the teacher exercises more control over student learning and, consequently, lessens learner autonomy. In effect, teachers may employ different pedagogy when instructing larger group and class sizes as opposed to smaller group and class sizes. This change in pedagogy may be sufficient in not only negating increased transactional distance derived from less dialogue and more structure but also shrinking it overall. As a consequence of more structure and less dialogue and learner autonomy, students may more successfully gravitate toward symbolically preserving vicarious processes and demonstrating increased self-regulatory behavior to ensure learning. Second, the moderation effects between interaction type and group and class size may also be explained through these teacher and student adaptations. In larger group and class sizes, learner-instructor interaction became increasingly more valuable as it related to perceived student learning. This finding appears plausible given the previously mentioned hypothesis that teaching styles and instructional practices may more closely resemble direct instruction, for example, when group and class sizes increase. On the contrary, in smaller group and class sizes, there was an
increased value on learner-learner interaction as it related to perceived student learning. With a small group and class size, teachers more than likely produce more dialogue, encourage more learner autonomy, and provide less structure. In addition, students probably rely less on vicarious processes because there is increased opportunity for direct participation. These components of transactional distance and social learning, perhaps, address why students in smaller group and class sizes, in comparison to larger group and class sizes, considered learner-learner interaction more important.

Because distance education is more than likely a permanent fixture in the educational landscape, effective instructional leaders must prepare themselves for consequential implications. This study’s explicit focus on videoconferencing as a medium for teaching and learning convinced the researcher to remain particularly mindful of learner-learner interaction and learner-instructor interaction as opportunities arise for the researcher either to mentor instructors who teach in these settings or to act as a resource for other districts that begin to entertain the expansion of their curriculum through the means of videoconferencing technologies.

**Recommendations for Further Research**

No single research study is in itself the beginning and end of any worthy topic of authentic investigation. While this study reached numerous statistically significant findings, its ultimate purpose was to provide a springboard for further research from which to delve deeper into understanding student learning among remote site learners in advanced curricular offerings, specifically, AP and IBDP courses. Some of the following questions may serve as future potential research topics:
• Are there some AP or IBDP courses more likely to lead toward increased perceived student learning than others?
• What other significant environmental, personal, and behavioral determinants are operating within the contexts of videoconferencing learning environments?
• What role does learner-content interaction play in relationship to perceived student learning?
• What role do remote site tutors serve in relationship to perceived student learning?
• How do dialogue, structure, and learner autonomy change depending upon group and class size? What impact do these changes have on the perception of student learning?
• How do symbolic, vicarious, and self-regulatory processes change depending upon group and class size? What impact do these changes have on the perception of student learning?
• What roles do learner-learner interaction and learner-instructor interaction serve in relationship to student achievement (as opposed to perceived student learning)?

The growth of student participation in distance education and videoconferencing in K-12 schools is indisputable. The area of debate entails how school districts will respond to such an environment that challenges the very foundation of the traditional brick-and-mortar education experience. With proper preparation, however, administrators can equip their instructors with the skill sets necessary to promote a heightened perception of student learning regardless of whether the teaching and learning medium transforms from conventional face-to-face interaction to videoconferencing.
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## Appendices

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Appendix A: Introduction Letter

To Whom It May Concern:

I am a doctoral student and am conducting dissertation research on the impact of videoconferencing on students who are learning at remote sites. As an organization that uses videoconferencing, I am curious whether students in your respective district currently receive instruction for Advanced Placement (AP) or International Baccalaureate Diploma Programme (IBDP) courses via videoconferencing.

In distance education via videoconferencing, students at classroom remote sites learn without the physical presence of their teacher and other classmates at the host site. As a result, the learning experience of remote site students differs from host site students. Therefore, instructional leaders should make every effort to identify and minimize the adverse effects of videoconferencing on the learning of the remote site students.

Videoconferencing first entered postsecondary educational institutions before moving to K-12 schooling. The bulk of the literature on videoconferencing focuses on these university experiences. Despite the research already conducted, there exists a need to investigate further into the role of videoconferencing as it relates to teaching and learning. Specifically, a gap in the literature lies in how videoconferencing affects student learning in high school advanced courses (that is, AP or IBDP) at a remote site.

I received your contact information from the Internet. I am curious whether your respective district currently delivers or receives instruction for AP or IBDP courses via videoconferencing.

In the event your district does currently deliver or receive instruction for AP or IBDP courses via videoconferencing, I humbly ask for you to complete the short (four-question) survey at the link below:

https://docs.google.com/spreadsheet/viewform?formkey=dDV5cGpkWm94cUpuV3NIZndOMU5FdFE6MQ

Thank you for your time.

Sincerely,
Kevin Hankinson
Appendix B: Introductory Survey

Figure 6. Introductory survey as displayed by Google Docs.
Appendix C: Message to Contact

Dear ________________________.

Thank you, again, for your interest in helping me with my doctoral research. Your assistance is invaluable as I attempt to examine the relationship between classroom interaction and perceived student learning at videoconferencing remote sites. In particular, I am interested in the perspectives of students who are enrolled in Advanced Placement or International Baccalaureate Diploma Programme courses across the United States.

At this point, I have received permission from the University Human Subjects Review Committee at Eastern Michigan University to proceed with data collection. Essentially, I am asking for your help in sharing the URL at the end of this paragraph with your students, who are at least 18 years old. The URL will take the students to a survey hosted by SurveyMonkey.

https://www.surveymonkey.com/s/8HBNFBG

I believe the total time to complete the survey will be approximately five minutes. Regardless of findings developed during the course of research, student participation will terminate upon submitting the survey. The survey has two parts. The first part of the survey will ask students to share some general information regarding their course, gender, race, date of birth, and group and class size. The second part of the survey will ask them to please mark the extent to which they disagree or agree with a statement regarding classroom interaction and perceived student learning. The survey in its entirety can be found as an attachment to this email.

The results of this research will be compiled and analyzed primarily for the purpose of completing a doctoral dissertation. However, it is possible that the results may be used to write an article for an academic journal or produce a presentation for a conference. Regardless of how the data are disseminated to the public, only aggregated data will be reported. Therefore, confidentiality will be preserved.

There are no foreseeable risks or discomforts for students who choose to participate in this research. Yet, potential benefits include providing a better understanding of the value of classroom interaction, as it relates to perceived student learning, in videoconferencing remote sites for instructors.

Participant privacy is of the utmost importance in this study. By ensuring privacy, I hope to promote a sense of safety and confidentiality among the participants. Therefore, this survey will not collect any identifying information, such as students’ names, email addresses, or IP addresses, to foster anonymity. I will do my best to keep student responses confidential. All data will be stored in a password-protected electronic format.

Participation in this research is completely voluntary. Refusal to participate will involve no penalty. Furthermore, students may discontinue participation at any time.

Sincerely,
Kevin Hankinson
Doctoral Candidate
Appendix D: Reminder Message to Contact

Dear _____________________,

Thank you, again, for your interest in helping me with my doctoral research. Your assistance is invaluable as I attempt to examine the relationship between classroom interaction and perceived student learning at videoconferencing remote sites. As I complete my data collection and defense of my dissertation, be assured that I expect to share all of my results and findings with you and your organization.

At this time, I have identified 1,819 students across the country who learn in Advanced Placement and International Baccalaureate Diploma Programme courses delivered via videoconferencing. Of those students, 51 have completed my online survey. Please continue to share the following URL with your students who are at least 18 years old:

https://www.surveymonkey.com/s/8HBNFBG

I have been contacted by numerous teachers around the country whose students are not at least 18 years old yet express sincere interest in participating in my research. After speaking with the University Human Subjects Review Committee at Eastern Michigan University, it has agreed to permit me the opportunity to include these students in my study. However, because they are not legally old enough to provide informed consent for themselves, they must follow a slightly different procedure.

[Note: At no time, do I expect you to distribute, collect, scan, or email the signed parental consent forms described below. You have already been extremely helpful in enabling me to reach students for my study.]

First, interested students who are younger than 18 must have a parent or guardian provide informed consent. In order to do so, these students must (1) print off the “Doctoral Research Overview and Informed Consent” attachment to this email, (2) ask a parent or guardian to read and sign the document, (3) scan the document, and (4) email it to me. Upon receiving the signed parental consent form, I will respond by providing a URL different from above. With the new survey URL, students may choose to participate in the study.

Immediately following this email, I will send an additional email that could be forwarded directly to your students younger than 18 or posted on a classroom website.

Once again, thank you for your time and support. If I can be of any assistance, please do not hesitate to contact me.

Sincerely,
Kevin Hankinson
Eastern Michigan University
Doctoral Candidate
Appendix E: Message to Minor Students

Dear Student,

I would like to invite you to participate in my doctoral dissertation research. The intent of my research is to examine the relationship between classroom interaction and perceived student learning at videoconferencing remote sites. In particular, I am interested in the perspectives of students who are enrolled in Advanced Placement or International Baccalaureate Diploma Programme courses across the United States.

I would like all students at your school able to participate in my research to do so, but you can only participate if your parent or guardian signs the attached informed consent form and you return the form to me via email (khankins@emich.edu).

If your parent or guardian agrees to provide consent, I will give you a URL to complete a short online survey that will take approximately five minutes of your time.

Sincerely,
Kevin Hankinson
Eastern Michigan University
Doctoral Candidate
Appendix F: Final Reminder Message to Contact

Dear _____________________,

I wish your Advanced Placement or International Baccalaureate Diploma Programme students the best of luck during this week’s exams.

After reviewing preliminary student data this weekend, I discovered only 43 students from a possible 1,819 identified around the country have completed my five-minute online survey in its entirety. In order to proceed with my dissertation, I need at least 56 participants for statistical purposes.

I humbly ask for your assistance at this time more than any other.

Please continue to share the following URL with your students who are at least 18 years old:

https://www.surveymonkey.com/s/8HBNFBG

Students younger than 18 must have a parent or guardian sign the attached informed consent form and return the form to me via email in order to receive access to a different URL.

Once again, thank you for your time and support.

Sincerely,
Kevin Hankinson
Eastern Michigan University
Doctoral Candidate
Appendix G: Doctoral Research Overview and Informed Consent

Dear Parent or Guardian,

My name is Kevin Hankinson, and your child may be able to help me with my dissertation research. The intent of my research is to examine the relationship between classroom interaction and perceived student learning at videoconferencing remote sites. In particular, the researcher is interested in the perspectives of students who are enrolled in Advanced Placement or International Baccalaureate Diploma Programme courses across the United States.

The researcher believes the total time to complete this survey will be approximately five minutes. Regardless of findings developed during the course of research, student participation will terminate upon submitting the survey. The following survey has two parts. The first part of the survey will ask students to share some general information regarding their course, gender, race, date of birth, and group and class size. The second part of the survey will ask students to please mark the extent to which they disagree or agree with a statement.

The results of this research will be compiled and analyzed primarily for the purpose of completing a doctoral dissertation. However, it is possible that the results may be used to write an article for an academic journal or produce a presentation for a conference. Regardless of how the data are disseminated to the public, only aggregated data will be reported. Therefore, confidentiality will be preserved.

There are no foreseeable risks or discomforts for students who choose to participate in this research. Yet, potential benefits include providing a better understanding of the value of classroom interaction, as it relates to perceived student learning, in videoconferencing remote sites for instructors.

Offering Advanced Placement and International Baccalaureate Diploma Programme courses via videoconferencing is not a common practice. Because students enrolled in Advanced Placement or International Baccalaureate Diploma Programme courses are vastly distributed across the United States, the researcher selected an online survey instrument to represent the most appropriate means to collect the desired data.

Participant privacy is of the utmost importance in this study. By ensuring privacy, the researcher hopes to promote a sense of safety and confidentiality among the participants. Therefore, this survey will not collect any identifying information, such as names, email addresses, or IP addresses, to foster anonymity. The researcher will do his best to keep your child’s responses confidential. All data will be stored in a password-protected electronic format.

With questions about the research and subjects’ rights, please feel free to contact Kevin Hankinson, the researcher, at the following email address: khankins@emich.edu. This research protocol and informed consent document has been reviewed and approved by the Eastern Michigan University Human Subjects Review Committee for use from April 10 to May 10, 2012. If you have questions about the approval process, please contact Dr. Deb de Laski-Smith.
(734.487.0042), Interim Dean of the Graduate School and Administrative Co-chair of UHSRC, human.subjects@emich.edu).

Participation in this research is completely voluntary. Refusal to participate will involve no penalty. Furthermore, your child may discontinue participation at any time.

CONSENT: Please select your choice and sign below.

Checking the "Agree" box below indicates that (a) you have read the above information, (b) you have understood the above information, and (c) you voluntarily agree to enable your child to participate. **If you agree to provide consent for your child, he/she will be given a URL to complete the online survey.**

If you do not wish for your child to participate in the research study, please decline participation by checking the "Disagree" box.

Sincerely,

Kevin Hankinson  
Eastern Michigan University  
Doctoral Candidate

☐ Agree

☐ Disagree

Student’s Name:  __________________________________________________________________________

Parent’s Name:  _______________________________________________________________________

Parent’s Signature:  __________________________________________________________________
Appendix H: Overview and Informed Consent

Dear Student,

Thank you for your consideration in participating in this doctoral research. The intent of this research is to examine the relationship between classroom interaction and perceived student learning at videoconferencing remote sites. In particular, the researcher is interested in the perspectives of students who are enrolled in Advanced Placement or International Baccalaureate Diploma Programme courses across the United States.

The researcher believes the total time to complete this survey will be approximately five minutes. Regardless of findings developed during the course of research, student participation will terminate upon submitting the survey. The following survey has two parts. The first part of the survey will ask you to share some general information regarding your course, gender, race, date of birth, and group and class size. The second part of the survey will ask you to please mark the extent to which you disagree or agree with a statement.

The results of this research will be compiled and analyzed primarily for the purpose of completing a doctoral dissertation. However, it is possible that the results may be used to write an article for an academic journal or produce a presentation for a conference. Regardless of how the data are disseminated to the public, only aggregated data will be reported. Therefore, confidentiality will be preserved.

There are no foreseeable risks or discomforts for students who choose to participate in this research. Yet, potential benefits include providing a better understanding of the value of classroom interaction, as it relates to perceived student learning, in videoconferencing remote sites for instructors.

Offering Advanced Placement and International Baccalaureate Diploma Programme courses via videoconferencing is not a common practice. Because students enrolled in Advanced Placement or International Baccalaureate Diploma Programme courses are vastly distributed across the United States, the researcher selected an online survey instrument to represent the most appropriate means to collect the desired data.

Participant privacy is of the utmost importance in this study. By ensuring privacy, the researcher hopes to promote a sense of safety and confidentiality among the participants. Therefore, this survey will not collect any identifying information, such as your name, email address, or IP address, to foster anonymity. The researcher will do his best to keep your responses confidential. All data will be stored in a password-protected electronic format.

With questions about the research and subjects’ rights, please feel free to contact Kevin Hankinson, the researcher, at the following email address: khanks@emich.edu. This research protocol and informed consent document has been reviewed and approved by the Eastern Michigan University Human Subjects Review Committee for use from April 10 to May 10, 2012. If you have questions about the approval process, please contact Dr. Deb de Laski-Smith.
(734.487.0042, Interim Dean of the Graduate School and Administrative Co-chair of UHSRC, human.subjects@emich.edu).

Participation in this research is completely voluntary. Refusal to participate will involve no penalty. Furthermore, you may discontinue participation at any time.

ELECTRONIC CONSENT: Please select your choice below.

Clicking on the "Agree" button below indicates that (a) you have read the above information, (b) you have understood the above information, (c) you voluntarily agree to participate, and (d) you are at least 18 years of age.

If you are NOT at least 18 years of age, please do not continue with the study.

If you do not wish to participate in the research study, please decline participation by clicking on the "Disagree" button.

○ Agree

○ Disagree
Appendix I: Overview and Informed Assent

Dear Student,

Thank you for your consideration in participating in this doctoral research. The intent of this research is to examine the relationship between classroom interaction and perceived student learning at videoconferencing remote sites. In particular, the researcher is interested in the perspectives of students who are enrolled in Advanced Placement or International Baccalaureate Diploma Programme courses across the United States.

The researcher believes the total time to complete this survey will be approximately five minutes. Regardless of findings developed during the course of research, student participation will terminate upon submitting the survey. The following survey has two parts. The first part of the survey will ask you to share some general information regarding your course, gender, race, date of birth, and group and class size. The second part of the survey will ask you to please mark the extent to which you disagree or agree with a statement.

The results of this research will be compiled and analyzed primarily for the purpose of completing a doctoral dissertation. However, it is possible that the results may be used to write an article for an academic journal or produce a presentation for a conference. Regardless of how the data are disseminated to the public, only aggregated data will be reported. Therefore, confidentiality will be preserved.

There are no foreseeable risks or discomforts for students who choose to participate in this research. Yet, potential benefits include providing a better understanding of the value of classroom interaction, as it relates to perceived student learning, in videoconferencing remote sites for instructors.

Offering Advanced Placement and International Baccalaureate Diploma Programme courses via videoconferencing is not a common practice. Because students enrolled in Advanced Placement or International Baccalaureate Diploma Programme courses are vastly distributed across the United States, the researcher selected an online survey instrument to represent the most appropriate means to collect the desired data.

Participant privacy is of the utmost importance in this study. By ensuring privacy, the researcher hopes to promote a sense of safety and confidentiality among the participants. Therefore, this survey will not collect any identifying information, such as your name, email address, or IP address, to foster anonymity. The researcher will do his best to keep your responses confidential. All data will be stored in a password-protected electronic format.

With questions about the research and subjects’ rights, please feel free to contact Kevin Hankinson, the researcher, at the following email address: khankins@emich.edu. This research protocol and informed consent document has been reviewed and approved by the Eastern Michigan University Human Subjects Review Committee for use from April 10 to May 10, 2012. If you have questions about the approval process, please contact Dr. Deb de Laski-Smith.
(734.487.0042, Interim Dean of the Graduate School and Administrative Co-chair of UHSRC, human.subjects@emich.edu).

Participation in this research is completely voluntary. Refusal to participate will involve no penalty. Furthermore, you may discontinue participation at any time.

ELECTRONIC ASSENT: Please select your choice below.

Clicking on the "Agree" button below indicates that (a) you have read the above information, (b) you have understood the above information, and (c) you voluntarily agree to participate.

If you do not wish to participate in the research study, please decline participation by clicking on the "Disagree" button.

○ Agree

○ Disagree
Appendix J: Instrument

General Information

While completing both parts of this survey, please select a single course for which you are actively enrolled and using as your frame of reference. (A student may complete a separate survey for each course that uses videoconferencing as its central medium of delivery.)

1. Please indicate your course.

Advanced Placement

Art History
Biology
Calculus AB
Calculus BC
Chemistry
Chinese Language and Culture
Computer Science A
Macroeconomics
Microeconomics
English Language and Composition
English Literature and Composition
Environmental Science
European History
French Language and Culture
German Language and Culture
Government & Politics: Comparative
Government & Politics: United States
Human Geography
Italian Language and Culture
Japanese Language and Culture
Latin: Vergil
Music Theory
Physics B
Physics C: Mechanics
Physics C: Electricity and Magnetism
Psychology
Spanish Language
Spanish Literature
Statistics
Studio Art
U.S. History
World History
International Baccalaureate Diploma Programme

Biology
Business & Management
Chemistry
Classical Languages
Computer Science
Design Technology
Economics
English A1
English A2
English B
Environmental Systems & Societies
Film
French A1
French A2
French B
Further Mathematics
Geography
German A1
German A2
German B
History
Information Technology in a Global Society
Language A1 (except English, French, German, and Spanish)
Language A2 (except English, French, German, and Spanish)
Language B (except English, French, German, and Spanish)
Mathematical Studies
Mathematics
Music
Philosophy
Physics
Psychology
Social & Cultural Anthropology
Spanish A1
Spanish A2
Spanish B
Sports, Exercise, & Health Science
Theatre
Visual Arts
World Religions

Higher Level
Standard Level
Ab initio Standard Level (for Language B only)
2. Please indicate your gender. Male ____ Female ____

3. Please indicate your race. American Indian or Alaskan Native ____
   Asian ____ Black or African American ____ Hispanic ____
   Native Hawaiian or Other Pacific Islander ____ White ____

4. Please state your date of birth (mm/dd/yyyy; for example, 09/25/1993).

5. Please indicate whether there are students present at the host site (where you instructor is located).
   Yes _____ No _____ (If "yes," the survey continues to subquestion.)
   a. Please identify the number of students at the host site. (Your entry should be a whole number of 1 or greater.) _____

6. Please identify the number of students at your remote site. (Your entry should be a whole number of 1 or greater.) _____

7. Please indicate whether there is a remote site, other than yours, connected to the host site during instructional time.
   Yes _____ No _____ (If "yes," the survey continues to subquestions.)
   a. Please identify the number of remote sites, other than yours, connected to the host site. (Your entry should be a whole number of 1 or greater.) _____
   b. Please identify the number of total students at other remote sites. (Your entry should be a whole number of 1 or greater.) _____

Survey

Please select your most accurate response from the following options: Strongly disagree (SD), Disagree (D), Neither disagree or agree (N), Agree (A), and Strongly agree (SA).

8. I was able to share learning experiences with other students.
9. I was able to communicate with other students in this course.
10. Increased contact with fellow students helped me get more out of this course.
11. A sense of community existed with fellow students taking this course.
12. This course encouraged me to work in small groups/teams.
13. The instructor informed me about my progress periodically.
14. The instructor treated me as an individual.
15. I was able to interact with the instructor during the course discussions.
16. The instructor provided me feedback on my work through comments.
17. The instructor encouraged me to become actively involved in the course discussions.
18. I learned to interrelate the important issues in the course material.
19. I gained a good understanding of the basic concepts of the material.
20. I learned to identify the central issues of the course.
21. I developed the ability to communicate clearly about the subject.
22. I learned a great deal of factual material in the course.
23. I improved my ability to integrate facts and develop generalizations from the course material.
24. Please indicate whether there is a tutor at your remote site.
   Yes _____ No _____ (If "yes," the survey continues to subquestions.)
Please select your most accurate response from the following options: Strongly disagree (SD), Disagree (D), Neither disagree or agree (N), Agree (A), and Strongly agree (SA).

a. The tutor informed me about my progress periodically.
b. The tutor treated me as an individual.
c. I was able to interact with the tutor during the course discussions.
d. The tutor provided me feedback on my work through comments.
e. The tutor encouraged me to become actively involved in the course discussions.
Appendix K: Permission to Use Survey Instruments

From: Scott Johnson <sdj001.mac.com>
Subject: Re: Dissertation Assistance Request
To: Kevin Hankinson <khanikin@emich.edu>

Thu, Apr 25, 2012 01:45 PM

Yes, you certainly have permission to use the instrument.
Scott

Scott D. Johnson
Professor Emeritus
College of Education
University of Illinois

On Apr 25, 2012, at 10:50 AM, Kevin Hankinson <khanikin@emich.edu> wrote:

Hello Dr. Johnson,

In Dr. Sher's article "Assessing the relationship of student-instructor and student-student interaction to student learning and satisfaction in Web-based online learning environment" (2009), he adapted a learning environment instrument of yours, found in "Comparative analysis of learner satisfaction and learning outcomes in online and face-to-face learning environments" (2000), in order to measure student-to-instructor and student-to-student interactions. May I have your permission to use aspects of your instrument to collect data for my dissertation?

Sincerely,
Kevin Hankinson
Doctoral Candidate
Eastern Michigan University

Figure 7. Correspondence from Dr. Johnson granting permission to use survey instrument.
Figure 8. Correspondence from Dr. Hiltz granting permission to use survey instrument.
Hello Kevin,

You are free to use my survey tool.

Good luck on your dissertation!

Sincerely,
Ali Sher, D.Sc.

---

From: Kevin Hankinson [khankins@emich.edu]
Sent: Thursday, April 26, 2012 9:02 PM
To: Dr. Ali Sher
Subject: Dissertation Assistance Request

Hello Dr. Sher,

In your article "Assessing the relationship of student-instructor and student-student interaction to student learning and satisfaction in Web-based online learning environment" (2009) you adapted a learning environment questionnaire from Johnson, Aragan, Shahk, and Palma-Rivas’s "Comparative analysis of learner satisfaction and learning outcomes in online and face-to-face learning environments" (2000) in order to measure student-to-instructor and student-to-student interactions. May I have your permission to use this instrument to collect data for my dissertation?

Thank you for your time.

Sincerely,
Kevin Hankinson
Doctoral Candidate
Eastern Michigan University

Figure 9. Correspondence from Dr. Sher granting permission to use survey instrument.
Re: Fwd: Dissertation Assistance Request

Barbara Wonneberg <Barbara_Wonneberg@bus.emory.edu> Thu, May 31, 2012 at 10:50 AM

Kevin:

I was able to discuss this with Dr. Alavi yesterday afternoon. She indicated that this publication completed was such a long time ago that she has moved on to other areas of research and no longer has any of the information connected with the instrument you are referencing. Other than that she would be willing to let you use the instrument for your data collection.

Let me know if you have any questions.

Best,

Barbara

On Wed, May 23, 2012 at 2:23 PM, Barbara Wonneberg <Barbara_Wonneberg@bus.emory.edu> wrote:

Kevin:

Unfortunately Dr. Alavi is currently out of the country and will be returning next week. I will bring this to her attention when she returns. Things have been very busy over the past several weeks because of Emory’s Commencement week and traveling schedules.

Best,

Barbara

Barbara Wonneberg
Human Resources Associate
Assistant to Vice Dean Maryam Alavi
Goizueta Business School
Emory University
1300 Clifton Road
Atlanta, GA 30322

Dissertation Assistance Request

From: Kevin Hankinson <khankins@emich.edu> Mon, May 21, 2012 10:37 AM
Subject: Dissertation Assistance Request
To: Maryam Alavi <Maryam_Alavi@bus.emory.edu>

Hello Dr. Alavi,

In your article “Computer-mediated collaborative learning: An empirical evaluation” (1994) you adopted a post-course questionnaire from Hillz’s "Virtual classroom: A virtual classroom ETES: Final evaluation report. Volume 1" (1988) in order to measure students’ perceptions of their learning. May I have your permission to use this instrument to collect data for my dissertation?

Thank you for your time.

Sincerely,
Kevin Hankinson
Doctoral Candidate
Eastern Michigan University

Figure 10. Correspondence from Dr. Alavi’s assistant granting permission to use survey instrument.
Appendix L: Human Subjects Review Initial Approval

EASTERN MICHIGAN UNIVERSITY

Education First

April 11, 2012

To: Kevin Hankinson
Educational Leadership and Counseling

Re: UHSRC#120311 Category: EXEMPT #2
Approval Date: April 10, 2012

Title: "Assessing the Relationship Between Classroom Interaction and Perceived Student Learning in Videoconferencing Remote Sites: A Social Learning Approach"

The Eastern Michigan University Human Subjects Review Committee (UHSRC) has completed their review of your project. I am pleased to advise you that your research has been deemed as exempt in accordance with federal regulations.

The UHSRC has found that your research project meets the criteria for exempt status and the criteria for the protection of human subjects in exempt research. Under our exempt policy the Principal Investigator assumes the responsibility for the protection of human subjects in this project as outlined in the assurance letter and exempt educational material.

Renewals: Exempt protocols do not need to be renewed. If the project is completed, please submit the Human Subjects Study Completion Form (found on the UHSRC website).

Revisions: Exempt protocols do not require revisions. However, if changes are made to a protocol that may no longer meet the exempt criteria, a Human Subjects Minor Modification Form or new Human Subjects Approval Request Form (if major changes will be required) can be found on the UHSRC website.

Problems: If issues should arise during the conduct of the research, such as unanticipated problems, adverse events, or any problem that may increase the risk to human subjects and change the category of review, notify the UHSRC office within 24 hours. Any complaints from participants regarding the risk and benefits of the project must be reported to the UHSRC.

Follow-up: If your exempt project is not completed and closed after three years, the UHSRC office will contact you regarding the status of the project and to verify that no changes have occurred that may affect exempt status.

Please use the UHSRC number listed above on any forms submitted that relate to this project, or on any correspondence with the UHSRC office.

Good luck in your research. If we can be of further assistance, please contact us at 734-487-0042 or via e-mail at human.subjects@emich.edu. Thank you for your cooperation.

Sincerely,

Deb de Laski-Smith, Ph.D.
Interim Dean
Graduate School
Administrative Co-Chair
University Human Subjects Review Committee
Appendix M: Human Subjects Review Exempt Modification Approval

EASTERN MICHIGAN UNIVERSITY

Education First

April 18, 2012

To: Kevin Hankinson
Educational Leadership and Counseling

Re: UHSRC #120411M
Approval Date: April 16, 2012
Category: EXEMPT#2

Title: "Assessing the Relationship Between Classroom Interaction and Perceived Student Learning in Videoconferencing Remote Sites: A Social Learning Approach"

The Eastern Michigan University Human Subjects Review Committee (UHSRC) has completed their review of your modification of a previously approved exempt project. I am pleased to advise you that your research modification has been deemed as exempt in accordance with federal regulations.

The UHSRC has found that your research project modification meets the criteria for exempt status and the criteria for the protection of human subjects in exempt research. Under our exempt policy the Principal Investigator assumes the responsibility for the protection of human subjects in this project as outlined in the assurance letter and exempt educational material.

Renewals: Exempt protocols do not need to be renewed. If the project is completed, please submit the Human Subjects Study Completion Form (found on the UHSRC website).

Revisions: Exempt protocols do not require revisions. However, if changes are made to a protocol that may no longer meet the exempt criteria, a Human Subjects Minor Modification Form or new Human Subjects Approval Request Form (if major changes will be required) are required (see UHSRC website for forms).

Problems: If issues should arise during the conduct of the research, such as unanticipated problems, adverse events, or any problem that may increase the risk to human subjects and change the category of review, notify the UHSRC office within 24 hours. Any complaints from participants regarding the risk and benefits of the project must be reported to the UHSRC.

Follow-up: If your exempt project is not completed and closed after three years, the UHSRC office will contact you regarding the status of the project and to verify that no changes have occurred that may affect exempt status.

Please use the UHSRC number listed above on any forms submitted that relate to this project, or on any correspondence with the UHSRC office.

Good luck in your research. If we can be of further assistance, please contact us at 734-487-0042 or via e-mail at human.subjects@emich.edu. Thank you for your cooperation.

Sincerely,

[Signature]

Deb de Laski-Smith, Ph.D.
Interim Dean
Graduate School
Administrative Co-Chair
University Human Subjects Review Committee

University Human Subjects Review Committee · Eastern Michigan University · 200 Boone Hall
Ypsilanti, Michigan 48197
Phone: 734-487.0042 Fax: 734-487.0050
E-mail: human.subjects@emich.edu
www.ord.emich.edu (see Federal Compliance)

The BMU UHSRC complies with the Title 45 Code of Federal Regulations part 46 (45 CFR 46) under FWA00000050.
Appendix N: Component Loadings for Principal Components Analysis of Interaction Type

Table 18

*Correlations Between Interaction Data Items and Respective Component*

<table>
<thead>
<tr>
<th>Data Item</th>
<th>Component</th>
<th>Learner-Learner Interaction</th>
<th>Learner-Instructor Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was able to share learning experiences with other students.</td>
<td>.837</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I was able to communicate with other students in this course.</td>
<td>.771</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased contact with fellow students helped me get more out of this course.</td>
<td>.873</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A sense of community existed with fellow students taking this course.</td>
<td>.777</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This course encouraged me to work in small groups/teams.</td>
<td>.743</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The instructor informed me about my progress periodically.</td>
<td>—</td>
<td></td>
<td>.872</td>
</tr>
<tr>
<td>The instructor treated me as an individual.</td>
<td>—</td>
<td></td>
<td>.797</td>
</tr>
<tr>
<td>I was able to interact with the instructor during the course discussions.</td>
<td>—</td>
<td></td>
<td>.870</td>
</tr>
<tr>
<td>The instructor provided me feedback on my work through comments.</td>
<td>—</td>
<td></td>
<td>.770</td>
</tr>
<tr>
<td>The instructor encouraged me to become actively involved in the course discussions.</td>
<td>—</td>
<td></td>
<td>.856</td>
</tr>
</tbody>
</table>