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“We’re Definitely on our Own”:

Interaction and Disconnection in a Virtual High School

Abigail Hawkins

A dissertation submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

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Instructional Psychology and Technology

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ABSTRACT

“We’re Definitely on our Own”:

Interaction and Disconnection in a Virtual High School

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Department of Instructional Psychology and Technology

Doctor of Philosophy

Using mixed methods, this study examined the nature of teacher-student interaction in an asynchronous, statewide, self-paced virtual high school. Eight teachers were interviewed to understand their perceptions on the nature of interactions and their role as a virtual school teacher. Interactions were primarily instructional in nature, taking the form of feedback on student assignments. There were few procedural and social interactions. In general, teachers felt disconnected from their students due to the large class sizes and limited interactions. They also felt disconnected from their peers and the role of a teacher as they traditionally defined it. To understand the relationship between perceived interaction and academic performance, 46,089 students were surveyed using an 18-item instrument designed to assess the types and frequency of interaction. Hierarchical linear modeling and hierarchical logistic regression on the 2,269 responses indicated significant differences between completers’ and non-completers’ perceptions of teacher-student interaction. However, there were minimal differences between students based on grade awarded and teacher-student interaction. The results of this study were discussed as well as implications for practitioners and researchers. The full text of this dissertation may be downloaded for free from <http://etd.byu.edu/>

Keywords: virtual schooling, K-12 online learning, online teaching, teacher-student interaction, disconnection

DEDICATION

I dedicate the first page to my father, Dr. John P. Hawkins, who inspired me to start this journey. I dedicate the last page to my mother, Carol Lee Hawkins, who lovingly ensured that I finished it. I dedicate the pages in between to my sons, Samuel and Matthew, who motivated me all along the way.

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DESCRIPTION OF STRUCTURE AND CONTENT

Virtual schooling is a relatively recent phenomenon in K-12 distance education (Cavanaugh, Barbour, & Clark, 2009). Spawned by federal legislation and funding, goals of educational equity, dreams of cost reductions, and research supporting its effectiveness (Barbour & Reeves, 2009), virtual schooling has, in a short amount of time, spread across 48 states (Watson, Murin, Vashaw, Gemin, & Rapp, 2010), reached an estimated 1,030,000 students (Picciano & Seaman, 2009), and penetrated all grade levels (Watson et al., 2010). In as little as fourteen years, virtual schooling has become a viable alternative in the United States K-12 educational landscape.

One of the outcomes of such rapid growth may be evidenced in the high attrition rates many virtual schools face. Attrition rates among virtual schools vary as widely as 10% up to 70% (Roblyer & Davis, 2008). While a multitude of factors contribute to student success or failure online (Willging & Johnson, 2004), one factor that may be central to student success in virtual schools is teacher-student interaction. Teacher interaction has proven to be a significant factor in student success in post-secondary distance education settings (Thurmond & Wambach, 2004, January; Wallace, 2003). Student perceptions of the quality and quantity of teacher-student interaction have been positively correlated to some degree with course satisfaction and perceived learning (Jung, Choi, Lim, & Leem, 2002; Picciano, 2002; Rovai, 2000; Rovai & Barnum, 2003; Shea, Fredericksen, Pickett, Pelz, & Swan, 2001) and academic performance (Jung et al., 2002; Picciano, 2002).

However, the importance of teacher-student interaction at the K-12 level has not been explored as extensively compared to post-secondary distance education (Rice, 2006; Smith, Clark, & Blomeyer, 2005). Two of twelve national standards for quality online teaching authored

by the International Association for K-12 Online Learning (2010) highlighted the role of teacher-student interaction. Yet research examining the nature of teacher-student interactions, teacher/student perceptions around such interactions, and the relationship between interaction and academic performance in virtual school contexts is scant.

In a review of literature, Rice (2006) found “very little research examining relationships between K-12 interaction that directly related to student performance, satisfaction, and retention in distance education contexts” (p. 439). Similarly, Smith et al.’s (2005) synthesis of eight virtual school studies called for more research investigating the relationship between interaction and academic outcomes. A handful of studies (i.e., DiPietro, Ferdig, Black, & Preston, 2008; Mulcahy, Dibbon, & Norberg, 2008; Weiner, 2003) have pointed to the importance of teacher feedback, monitoring, and connectedness, though several of these studies were exploratory in nature. Additionally, several researchers have articulated the need for more research identifying characteristics of successful K-12 online teachers (DiPietro et al., 2008; Smith et al., 2005) and factors related to student success in virtual schooling environments (Barbour & Reeves, 2009). The manuscripts contained in this dissertation attempt to contribute on a small scale to help close these gaps in the virtual schooling literature.

When examining the virtual schooling landscape and literature, it is important to note that there is a great deal of variation in the type of virtual schools in operation. Each different type of program has its own unique challenges when it comes to the design, delivery, and support of learning opportunities for their students. In 2000, Clark identified seven different types of virtual schools. Table 1 describes Clark’s categorization of virtual schools and examples of institutions associated with each.

Table 1

Clark's Seven Categories for Virtual Schools

Category	Description
State-sanctioned; state-based	Virtual schools operated on a state-wide level. Utah example: Electronic High School
College and university-based	Virtual schools operated by universities supplying introductory college-level and preparatory courses to online high school students. Utah example: Brigham Young University Independent Study High School Program
Consortium and regionally-based	Virtual schools operated by a group of states, schools, or school districts to pool and maximize resources. Example: VHS
Local education agency-based	Virtual schools operated by a single school or school district. Utah examples: Alpine online, Davis online, Unitah, and Washington online
Virtual charter school	Virtual schools operated under charter school legislation. These schools are also referred to as cyber schools. Utah examples: Open High School and Utah Connections Academy
Private virtual schools	Virtual schools operated in the same manner as a brick-and mortar private school but delivered online. Utah example: The Park City Independent High School
For-profit providers of curricula, content, tools, and infrastructure	Commercial companies that act as vendors for course delivery and content. Examples: K12 Inc. and APEX Learning

Watson, Winograd, and Kalmon (2004) reclassified the types of virtual schools to include variables related to supplemental versus full-time and geographic scope of virtual school. Table 2 describes these five categories.

Table 2

Watson, Winograd, and Kalmon's Five Categories of Virtual Schools

Category	School Description
Statewide supplemental program	<p>Students take individual online courses and are enrolled in a brick-and-mortar residential school within the state. The program is authorized, operated, and overseen by a state agency.</p> <p>Utah example: Electronic High School</p>
District-level supplemental program	<p>Students take individual online courses and are enrolled in a brick-and-mortar, physical school within the state. The program is operated at the district level.</p> <p>Utah example: Alpine online, Davis online, Unitah, and Washington online</p>
Single-district cyber school	<p>Students enroll full time in courses operated by a single district. This is an alternative to attending a physical school.</p> <p>Examples: St. Claire's Virtual Learning Academy and Dearborn Heights Virtual Learning Academy</p>
Multi-district cyber school	<p>Students enroll full time in the program which is operated by multiple districts.</p> <p>Example: Westwood Cyber School</p>
Cyber charter school	<p>Students enroll full time in the program which is chartered within a single district but can draw students from across the state.</p> <p>Utah example: Open High School</p>

Beyond the operational control, geographical reach, and comprehensiveness of the program, additional dimensions of variation among virtual schools lie in whether they are delivered asynchronously or synchronously, the level interaction (i.e., teacher-student, student-student), and grade level the program supports (Watson et al. , 2010). While the virtual schooling landscape continues to change and these classifications have been refined in recent years, the original labels/taxonomy remain relevant for describing virtual schools particularly given the fact that these terms remain predominate in the literature today.

Structure and Purpose

This dissertation is a compilation of manuscripts that collectively examine the nature of teacher-student interaction in a virtual high school. The three manuscripts contained in this dissertation were written in journal-ready format and provide insights into student and teacher perceptions of interactions in a state-led, supplemental, asynchronous, self-paced virtual high school. This led to three research questions:

1. How do teachers perceive their interactions with students?
2. How do teachers perceive their role as online teachers?
3. What is the relationship between students' perceptions of the quality and frequency of teacher-student interaction and academic performance?

To address these research questions I used a case study methodology that embraced both qualitative and quantitative methods (Yin, 2003).

The article entitled, *Strictly Business: Teacher Perceptions of Interaction in Virtual Schooling*, addressed the first research question. Using data obtained from interviews with eight Utah Electronic High School (EHS) teachers, I learned that teacher interaction was primarily focused on content/instructional exchanges, which were largely student initiated. Structural

barriers such as large class size and limited tracking devices made it difficult for teachers to proactively reach out to and engage students. The next article entitled, *Everybody is Their Own Island: Teacher Disconnection in a Virtual School*, addressed the second research question. Again using interview data from eight EHS teachers, I learned that the changing and fragmented roles of virtual school teachers resulted in a sense of disconnection. Virtual school teachers in this study felt disconnected from their students, profession, and peers. The final article entitled, *Course Completion Rates and Student Perceptions of the Quality and Frequency of Interaction in a Virtual High School*, addressed the third research question. Using survey data from 2,269 former EHS students, I found a significant relationship between students' perceptions of the frequency and quality of teacher-student interaction and academic performance.

This line of inquiry began with an interest in understanding factors influencing attrition in K-12 online programs. As such, I initially examined the variability in how attrition was calculated among virtual schools (i.e., Hawkins and Barbour, 2010). The logical next step was to examine what factors contributed to students' decisions to withdraw or disengage in their online coursework. Since multiple factors, internal and external to the student, contribute to student persistence online (Willging & Johnson, 2004), I chose to examine teacher-student interaction in the virtual school setting as it was identified as a key factor in online student success at the post-secondary level (Thurmond & Wambach, 2004, January; Wallace, 2003).

Research Setting

Virtual schools have varied significantly in the United States. According to Watson et al. (2010) virtual schools fall on a continuum of several defining variables including whether the program is full-time or supplemental, how the school is administered (i.e., district, state, private, etc.), and the degree of teacher-student and student-student interaction. Utah's Electronic High

School was the case for this study. There were several aspects about EHS that made it unique compared to other virtual schools. As such, the following section describes in detail the research setting, providing readers a richer context and lens from which to view the manuscripts contained in this dissertation.

Case

The variety of providers in Utah's virtual school landscape was typical of most states across the United States. Throughout Utah there were nine significant institutions providing online learning for K-12 students, including state, university, private, cyber charter, and district operated systems.

EHS was the largest virtual school in Utah and one of the largest in the U.S. with approximately 36,000 enrolled and active students over the past year (K. Webb, personal communication, April 30, 2009). It was established in 1994, by then Governor Michael Levitt, to address Utah's shortage in brick-and-mortar schools and its growing student population (Center for Educational Leadership and Technology, 2008). Under the direction of Utah's State Office of Education, EHS is the oldest statewide virtual high school in the United States. EHS is primarily a supplemental, independent study, self-paced, asynchronous program.

EHS had experienced exponential growth since its inception. Between 1994 and 2003, 11,204 people requested accounts (Webb, 2008). In 2003-2004, 9,855 people requested accounts. In 2007-2008, 20,850 students created accounts. Such exponential growth far exceeded the annual 2.5% growth rate the legislature projected. Nevertheless, while a large number of enrollment accounts were generated, the number of students completing classes and receiving credit was substantially less. From July 1, 2008 through June 30, 2009 EHS granted 15,663

quarter credits to 7,216 students, an equivalent of 7,530 individual semester class completions (Watson, Gemin, Ryan, & Wicks, 2009).

EHS' mission reflected the diversity of students and the broad aims the school works to accomplish. Their mission was the following:

Our mission is to educate, remediate, accelerate, and graduate Utah's diverse learners with caring, qualified teachers using current technology to provide rigorous curricula, timely access to quality online instruction, and prompt professional feedback to student work (Electronic High School, 2009)

EHS used an open-entry/open-exit model, where students started and finished at any time and were not tied to an academic calendar. Consequently, students proceeded through the class at their own pace with little, if any, student-to-student interaction. Enrollment was free to Utah high-school aged students. Students were responsible for their own computer access and connectivity. Starting in October 2007, students were required to take a proctored final examination for all classes they were enrolled in and had to complete the class within a six-month timeframe. Unlike some virtual schools, EHS awarded credits to students rather than deferring credit granting to the student's residential high school and in some instances was also able to grant diplomas to a limited set of students (i.e., homeschooled exclusively, dropped out and class already graduated, or district referrals) (Watson et al., 2009). However, EHS did not award failing grades.

EHS Curriculum

EHS teachers built their curriculum internally using Utah's *State Core Curriculum Standards*. The curriculum was primarily text-based with students proceeded through the class work at their own pace completing a range of assessments including exams, homework sets,

projects, and papers. Courses had little, if any, student-to-student interaction due to the nature of a rolling-enrollment model.

EHS offered a wide range of classes. From February 1, 2008 to January 31, 2009, there were 66 unique classes that mapped to the following discipline areas:

- computer education,
- electives/career and technology,
- financial literacy,
- fine arts,
- healthy lifestyles and physical education,
- language arts,
- mathematics,
- sciences,
- social studies,
- world languages, and
- driver's education.

Within each discipline area, there were several classes, many of which had multiple sections. For example, in the language arts area included English 9, English 10, English 11, and English 12.

Classes were broken down by quarter credits. Thus, English 9, for example, would have quarters one, two, three, and four. Elective classes, financial literacy, and some social science classes would only have quarters one and two. Within each class (i.e. English 9), there could be multiple class sections taught by different instructors with the curriculum remaining relatively consistent across sections.

EHS Administration and Teaching Staff

At the time of the study, EHS employed four administrative staff, one part-time counselor, and 76 licensed teachers. A large majority of the teachers held full-time jobs teaching during the day and worked part-time at EHS, contracting between 1 to 5 hours a day (Webb, 2008). In 2008 CELT surveyed all 75 teachers at EHS as part of EHS' audit. Sixty-one teachers responded (81% response rate). The respondents' overall teaching experience ranged from less than one year up to 45 years. Teachers averaged 17 years teaching. In contrast, online teaching experience at EHS ranged from less than one year up to eleven years, with teachers averaging four and-one-half years at EHS. Approximately 64% of teachers were employed as teachers somewhere else other than EHS. Of these teachers 90% were employed full time. All of the respondents were certified to teach in their content area. The majority of teachers (i.e., 59%) taught only one class at EHS, while 28% taught two classes and 13% of teachers taught three or more classes.

From February 1, 2008 to January 31, 2009, the student-to-teacher load ranged from 2 students to 3,024 students, with the average student-to-teacher ratio being 233:1. Table 3 displays the frequency count of teachers and the number of classes they taught at EHS.

Table 3

Class Load for EHS Teachers from February 1, 2008 to January 31, 2009

Number of Classes Taught	Number of Teachers
1	55
2	16
3	2
4	3

The majority of teachers taught only a single class, with classes defined as combined quarters one through four or one through two depending on the class type (e.g., one English 9 class was a combination of the quarters one through four of English 9).

EHS Student Population

EHS offered classes to a diverse student body. While EHS offered curriculum for both adults and adolescents seeking high school credits, this study focused on the adolescents at EHS. Ninety-six percent of the student body labeled themselves as minors, and of that only 6% identified themselves as homeschooled or high school dropouts (Webb, 2008). Half of the students enrolled at EHS for credit acceleration purposes, or to free up space for electives at their residential high schools. Thirty percent of students enrolled at EHS for credit recovery purposes or to make up classes they failed or did not complete. Finally, 20% of students enrolled for both credit recovery and credit acceleration purposes. The majority of students at EHS were Utah residents (Webb, 2008).

EHS Completion Rates

Reports on completion rates at EHS varied. The Center for Educational Leadership and Technology's (2008) audit of EHS indicated a 71% retention or completion rate. However, analyzing the 44,089 enrollments from February 1, 2008 through January 31, 2009 found that only 15,755 received credit. This was a 34.2% completion rate. Further examination of student data indicated that almost 36% (n=16,551) of student enrollments failed to turn in a single graded assignment. When filtering out this population of non-starters, the completion rate rose from 34.2% to 49.5%.

Completion rates at EHS also varied across and within disciplines. Table 4 indicates the mean completion rates across disciplines for all of the students (i.e., including the non-starters) enrolled during the timeframe of the study.

Table 4

Mean and Percent Completion Rates by Discipline for Enrollments from February 1, 2008 to January 31, 2009

Discipline	Mean	N	SD	% Completion
Computer science education	0.1027	448	.30388	10.27
Fine arts	0.1486	1393	.35582	14.86
World languages	0.1805	1756	.38473	18.05
Language arts	0.1873	7149	.39018	18.73
Science	0.1980	3031	.39852	19.8
Electives/Career/Technology	0.2672	5337	.44253	26.72
Social studies	0.2677	7082	.44280	26.77
Mathematics	0.2684	2034	.44325	26.84
Driver's education	0.4257	2429	.49455	42.57
Health & PE	0.4776	8776	.49952	47.76
Financial literacy	0.6241	6654	.48438	62.41
Total	0.3418	46089	.47433	34.18

Financial literacy, health and physical education, driver's education had the highest completion rates, while computer science, fine arts, world languages, and language arts had the lowest.

There is much speculation as to why discipline-based completion rates varied so much. For example, mathematics, which some speculate is harder to complete in an online environment

due to the content area and the need to communicate using visual symbols (Haughey & Muirhead, 2004), had the fourth highest completion rate at 26%. Further analysis of the EHS class completion rates indicated that lower-division classes had higher completion rates than upper-division math classes. Table 5 shows completion rates broken down by course.

Table 5

EHS Mathematics Completion Rates by Course

Mathematics Classes	Mean	N	SD	Percent Completion
Calculus	.0000	138	.00000	0.00
Pre-Calculus	.1724	29	.38443	17.24
Geometry	.2636	387	.44114	26.36
Pre-Algebra	.2724	558	.44559	27.24
Algebra I	.2887	672	.45349	28.87
Algebra II	.3720	250	.48431	37.20
Total Completion Rate	.2684	2034	.44325	26.84

Calculus and pre-calculus had the highest attrition rate, which may be due to the fact that the subject matter was more difficult compared to lower-division math classes. Another reason may be that the lower division courses are required for Utah high school graduation.

Course completion and attrition data was further complicated by the fact that EHS dropped students who failed to turn in an assignment after thirty days of inactivity. If these students re-enrolled, they were counted as an additional student enrollment. At the time of this study, EHS did not track the number of students who were dropped and then re-enrolled into the same course. Further, EHS did not have a trial period where students could withdraw within a time period and not be counted in the official attrition statistic. These factors may have made

EHS' attrition rate higher than other virtual schools that employ different enrollment processes and trial period practices.

Summary

Understanding the unique aspects of EHS, as the case selected for this research study, what follows are the three manuscripts and the research question that each address.

1. *Strictly Business: Teacher Perceptions of Interaction in Virtual Schooling*: How do teachers perceive their interactions with students?
2. *“Everybody is Their Own Island”*: *Teacher Disconnection in a Virtual School*: How do teachers perceive their role as online teachers?
3. *Course Completion Rates and Student Perceptions of the Quality and Frequency of Interaction in a Virtual High School*: What is the relationship between students' perceptions of the quality and frequency of teacher-student interaction and academic performance?

ARTICLE 1

Strictly business: Teacher perceptions of interaction in virtual schooling

Article Abstract

This study explored the nature of teacher-student interaction from the perspective of eight virtual school teachers in an asynchronous, self-paced, statewide, supplemental virtual high school. Teacher interviews revealed the majority of interactions were student-initiated and instructional in nature. The main procedural interactions focused on notifications sent to inactive students. Social interactions were minimal and viewed as having little pedagogical value. Institutional barriers such as class size and an absence of effective tracking mechanisms limited the amount and types of interaction teachers engaged in. Study implications and future research are discussed.

Introduction

A recent phenomenon in K-12 education is virtual schooling, the delivery of primary and secondary education through Internet or web-based methods (Clark, 2001). Virtual schools, also referred to in the literature as cyber schools or K-12 online learning programs, have experienced exponential growth. In 1997, only three states had statewide virtual schools. Twelve years later, all but two states had substantial online learning opportunities for students (Watson, Murin, Washaw, Gemin, & Rapp, 2010). The first national survey on K-12 distance education estimated there were 40,000-50,000 K-12 students (Clark, 2000). More recently, Picciano and Seaman (2009) estimated that 1,030,000 K-12 students were enrolled in one or more online courses, representing a 47% increase over a two-year period. This growth is expected to continue.

Attrition in online learning, including at the K-12 level, has been a significant challenge (Berge & Clark, 2005; Simpson, 2004; Zucker & Kozma, 2003). Many factors, both internal and external to the student, likely contribute to persistence. One factor that may be central to student success in virtual schools is teacher-student interaction (Tallent-Runnels, Thomas, Lan, & Cooper, 2006), as it has proven to be a key factor in post-secondary distance education (Anderson, 2003; Fredericksen, Pickett, Shea, Pelz, & Swan, 2000; Wallace, 2003). Student perceptions of the quality and frequency of teacher-student interaction have also been positively correlated with course satisfaction and perceived learning (Jung, Choi, Lim, & Leem, 2002; Picciano, 2002; Rovai, 2000; Rovai & Barnum, 2003; Shea, Fredericksen, Pickett, Pelz, & Swan, 2001).

While a large body of research in distance education in higher education has focused on the role of interaction in relation to outcomes, less is known about its importance at the K-12 level (Rice, 2006; Smith, Clark, & Blomeyer, 2005). It may be speculated that teacher-student

interaction is important in both contexts. However researchers caution generalizing research findings of adult learners to younger learners who often lack the ability to regulate their own learning compared to their adult counterparts (Barbour & Reeves, 2009; Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004; Cavanaugh, Barbour, & Clark, 2009; Rice, 2006).

The purpose of this study was to explore the nature of teacher-student interactions in an asynchronous, self-paced, statewide, supplemental virtual high school. We begin this article by examining what is currently known about interaction in K-12 online learning. Next, we describe four themes that emerged from interviews with eight virtual school teachers. Finally, we conclude by discussing practical changes this particular virtual school can make to improve teacher-student interaction, along with several avenues for future research.

Literature Review

There are many perspectives on interaction in distance education. Moore (1989) was one of the first to deconstruct interaction, identifying three types: learner-teacher (i.e., exchanges serve to motivate, teach, clarify, support, and encourage); learner-learner (i.e., exchanges among students with or without the teacher's presence); and learner-content (i.e., exchanges directly with the subject matter). Later Hillman, Willis, and Gunawardena (1994) added learner-interface interaction characterized by the exchanges the learner has with the technology itself. Finally Sutton (2001) identified vicarious interaction, characterized as students passively observing and learning from the interactions of their peers and/or teacher as another form of interaction in the distance education model. Less common modes of interaction also discussed in the literature include teacher-content interaction, teacher-teacher interaction, and content-content interaction (Anderson & Kuskis, 2007). Though researchers have conceptually described these various types

of interaction, less is known about the nature of interactions that actually occur in online learning, particularly at the K-12 level.

In contrast to a sizable amount of interaction research in higher education distance education (*e.g.*, Anderson, 2003; Fredericksen et al., 2000; Wallace, 2003), less is known about interaction and successful teacher behaviors in K-12 online environments (DiPietro, Ferdig, Black, & Preston, 2008; Rice, 2006; Smith et al., 2005). This section examines the limited K-12 online learning interaction research organized around the three teacher-student interaction types often cited in the literature: instructional, procedural, and social (Heinemann, 2005; Mason, 1991).

Instructional/Intellectual Interactions

Instructional interactions are exchanges related to the subject matter including teaching, clarifying, responding to questions, or providing feedback. Cavanaugh, Barbour, and Clark (2009) examined open-access K-12 online learning literature and found that teacher behaviors related to active learning and feedback were the most frequently cited among online teaching standards. The authors also suggested its frequency in the literature pointed to its perceived value by both the research and practitioner communities. However, the scope of their study was limited to a frequency count of K-12 themes referenced only in the open-access literature, which comprised less than half of the literature on K-12 online learning they initially identified. The study also failed to limit the scope of analysis to literature reporting research. Finally, the authors only conducted a frequency count of articles focusing on these variables. They did not examine the outcomes related to these teacher behaviors.

Research on teacher-student instructional interactions has emphasized the importance of feedback in relation to student satisfaction and persistence. Weiner's (2003) qualitative study of

a cyber charter high school found limited teacher-student interaction was a “major concern for cyberschoolers” (p. 49). Students reported that the lack of timely feedback was frustrating, impeded learning, and led to feelings “ignored, lonely, or lost” (p. 49). While this study captured the importance of interaction from the student perspective, it was a single case study of a full-time program still in its infancy. Additionally, as a full-time program, at the time of the study it accounted for only a small percentage of K-12 online learning programs.

Procedural/Organizational Interactions

Procedural interactions are exchanges related to course policies, procedures, and student progress. Teachers in distance education have to assume a different role in virtual management techniques than those in traditional classrooms (Davis et al., 2007). Several studies highlighted the importance of tracking student progress. According to DiPietro et al.’s (2008) study of sixteen teachers at Michigan Virtual School (MVS), teachers indicated that organized, structured content with clear deadlines helped keep students motivated and on track. MVS teachers also leveraged course data on student participation to help identify who needed to be reached out to. However, a flaw in DiPietro et al.’s study was how participants were selected. “Successful” teachers were identified by the school administration, and no further external variables (*e.g.*, student performance data) were used to justify the “successful” label. Additionally, while DiPietro et al. classified the results of their study as “best practices,” there was no verification made that these practices indeed led to improved student performance or were even implemented.

The Idaho Learning Academy (IDLA) offered another way to monitor and track student progress. IDLA teachers were required to write weekly progress reports for each student and identify teacher support that can help move the student along (Roblyer, 2006). Further, teachers

were required to contact inactive students by telephone, though the study did not indicate how an inactive student was defined or how frequently these calls would occur. While these practices sound valuable, they were not based on systematic research evidencing their effectiveness. Additionally, Roblyer's data were interviews from only three virtual school administrators, and it was thus limited to the opinions of those leaders relative to their own programs.

Social/Supportive Interactions

Supportive interactions are exchanges that offer support, encouragement, and perceptions of immediacy/connectedness. Research in K-12 online environments indicated that supportive interactions are important to virtual high school student motivation and progress (DiPietro et al., 2008; Mulcahy, Dibbon, & Norberg, 2008; Nippard & Murphy, 2007; Roblyer, 2006; Weiner, 2003). Common themes in this literature included the importance of interacting with students to nurture, encourage, motivate, and retain them.

A qualitative study of virtual high school students in a rural Canadian province found that struggling students missed having social interactions with a classroom teacher (Mulcahy et al., 2008). Researchers found that students, feeling too intimidated to approach their online instructors, frequently turned to "real teachers" in their brick-and-mortar classes to ask for help. Nippard and Murphy (2007) also examined students from the same rural province and found that the mediums for social exchanges in the virtual classroom were different between teachers and students. Teachers interacted socially using traditional tools such as two-way audio and whiteboards, whereas students showed social presence and exchanges using instant messaging. While interesting, the transferability of these studies is problematic. Mulcahy's research setting was three rural, isolated high schools in a remote portion of the province where the relationships students had with their face-to-face teachers were likely more intimate than those of most urban

students (Kannapel & DeYoung, 1999), while Nippard and Murphy's (2007) study examined interaction in online courses where 40-80% of the instruction was delivered synchronously—a delivery modality highly uncommon among virtual schools.

A few studies have examined ways teachers can promote social interaction and teacher immediacy in virtual school settings. Teachers in DiPietro et al.'s (2008) study highlighted the importance of continual contact and monitoring. The authors speculated that students interpreted these behaviors as signs that teachers cared about their experience and success in the course. Furthermore, Roblyer's (2006) work provided more concrete actions schools had taken to encourage students through successful completion including: welcome emails, intake interviews, weekly telephone calls, 24 hour turnaround time on student inquiries and assignments, and telephone conversations with students and parents. Again to students, these actions could signal to a student that someone cared about their learning experience. However, neither of these studies tied these behaviors to student performance metrics.

Method

For the purpose of this study, we explored the nature of interaction in an asynchronous, self-paced, supplemental virtual high school from the perspective of the teachers. This led to the following research question: How do teachers perceive their interactions with students? To address this research question we used a case study methodology (Yin, 2003). Case studies are appropriate when one is trying to understand a phenomenon within its own context. As such, Utah Electronic High School (EHS) was selected as the case for this study.

Interviews were the primary means of data collection for this study. From December 15, 2009 through February 13, 2009, we conducted eight semi-structured telephone interviews with selected teachers. While Weiss (1994) stated that telephone interviews were not as effective as

in-person interviews, they were considered the next best option given the logistics of teachers spread across large geographical distances. All interviews were digitally recorded and transcribed verbatim. Following the six-stage data analysis strategy outlined by Ruona (2005), we used constant comparative method to code the content allowing us, through an iterative process, to identify similarities and differences across the data (Ezzy, 2002). As codes emerged, they were grouped and mapped back to the original theoretical constructs of interaction types: instructional, procedural, and social.

Case

Established in 1994, EHS is one of the oldest and largest state-led virtual high schools with 48,112 student enrollments in 2008 (Center for Educational Leadership and Technology, 2008). The majority of students attend brick-and-mortar schools, supplementing their coursework with one or more of EHS' 66 unique courses, with multiple sections taught by 75 mostly part-time teachers. EHS utilizes an open-entry/open-exit model, allowing students to enroll at any point in time. Consequently, courses typically involve asynchronous, self-paced modules with little, if any, student-to-student interaction.

Participants

Participants were selected using intensity sampling (Patton, 2002). Examining class completion data from February 1, 2008 to January 31, 2009, four teacher/subject area pairs were identified from the top 30% and bottom 30% of course completion rates. Table 1 details the teachers who participated in the study.

Table 1

Study Participants and Class Characteristics

Teacher / Class Characteristics	Discipline							
	English		Mathematics		Science		Social Science	
High/Low Completion	H	L	H	L	H	L	H	L
Quarter 1 course/grade	Eng. 12	Eng. 9	Lower-Division	Upper-Division	Elective	Elective	U.S. Hist.	U.S. His
Teacher	Molly	Sandra	Holly	Kristine	Brian	Tamara	Carl	Mark
Quarter 1 completion rate	20.8%	5.1%	15.2%	0.0%	30.2%	18.5%	21.0 %	20.6 %
Course completion rate*	39.2%	7.5%	22.6%	0.0%	45.1%	47.4%	37.4 %	33.8 %
Quarter 1 course size	106	985	197	108	116	135	62	155
Course size (quarter units combined)	183	1821	388	138	161	197	126	417
Face-to-face teaching (n= years)	14	14	15	14	32	18	22	18
EHS teaching (n= years range)	3-5	10-15	3-5	10-15	3-5	10-15	10-15	3-5

*EHS offered courses by quarter credit. Thus the English 9 course consists of English 9 quarter 1, quarter 2, quarter 3, and quarter 4.

All participants were highly qualified teachers according to *No Child Left Behind*. Six of the eight teachers worked part-time for EHS and full-time in face-to-face schools during the day, while one worked full-time for EHS and another worked part-time for EHS and nowhere else. The English 9 teacher had significantly higher student numbers as she worked full-time at EHS compared to the part-time teachers. To protect the anonymity of the participants, pseudonyms, date ranges, and generic course names were used.

Results and Discussion

Several patterns emerged from the data. In this section, we organized the themes we discovered under the broader theoretical constructions of instructional, procedural, and social interactions discussed in the research literature.

Instructional/Intellectual Interactions

The majority of interactions teachers described were intellectual/instructional in nature. The primary instructional interaction took the form of teachers giving students feedback on their assignments, followed by teachers responding to student questions. Teachers reported spending 60% to 95% of their time on these types of interactions. In describing their workflow, all teachers responded first to student questions and then proceeded to grading student submissions. Brian's description reflected that of the other teachers':

It's probably just going to boil down to they'll ask me and I'll respond back if they have a specific question. Or if the assignments come in that aren't up to the quality or there are mistakes in them, then I'll interact back with them....So that is mainly what I deal with as far as the interaction: questions they ask or feedback on the assignments.

This was consistent with Ferdig et al.'s (2009) review of national standards and best practices in online teaching where she discussed the importance of prompt, meaningful feedback in virtual settings.

Initiation of interaction. Clear patterns emerged regarding who initiated contact. Student-driven contact was the case for almost all interactions, and teachers reported the majority of these interactions were instructional in nature. This interaction pattern matched teachers' expectations for online interaction. Teachers expected students to initiate contact through submitting assignments or when they had problems with understanding the material. This

expectation began when the student first enrolled. Only one teacher sent out a welcome email indicating next steps, while the remaining teachers relied on the student to read the course welcome bulletin and complete the first, ungraded assignment (i.e., a brief student biography providing an introduction). As Mark, a U.S. History teacher said, “I don’t really take any action until they start doing their work.” This sentiment was echoed by Brian, “Typically my communication back to them is only when they ask me questions. . . . I don’t have contact otherwise.” When asked whether they treated struggling student differently from more successful students, Carl articulated it best:

It would be the same as any of the other students. I just, you know, well, if they ask for extra help. That’s not a problem. If they do that, I’ll give them the extra help that they need. But if they don’t let me know that they are having a problem, I treat them like any other student.

Essentially teacher interaction was reactive, not proactive. There was no “pushing” or “harping” on students to participate in the course. Instead, “They [the students] have to initiate the interaction.” Conversely, Murphy and Rodriguez-Manzanares’ (2009a) found that students feel less isolated and greater motivation when teachers establish “a personal relationship and personal connection so students understand that there is a person behind the computer and not a robot” (p.8). These relationships are formed when virtual school teachers are able to establish initial and ongoing contact and provide encouragement to maintain student motivation as opposed to relying solely on student-initiated contact

Understanding the context of EHS is helpful to understanding why teachers took this approach to interaction. From February 1, 2008 to January 31, 2009, the student load for teachers ranged from 2 students to 1726 students, with the average student-to-teacher ratio being 233:1.

Although, on average, almost half of the students had not submitted a single assignment, it was still a high volume of students that teachers had to attend to. The increased workload is consistent with Coffin and Stevens' (2002) evaluation of a supplemental, Canadian virtual school, who recommended that due to the additional time and work required to interact with students that virtual teachers have a lower student-to-teacher ratio than in their walled classrooms. Holly, an EHS math teacher, recounted that three days prior to our interview, she received 138 assignment submissions. The following day she received 131 to grade. With the volume of students and an absence of an automated tracking system, teachers relied on the students to monitor their own progress through the course.

When asked to describe successful students at EHS, teachers repeatedly used the terms “self-motivated” and “independent” learners who can work without a fixed deadline. Student progress through the course was his/her responsibility. When students in her face-to-face program said they wanted to drop out and take the course online, Holly responded with the following:

I'll say, you know you can do it, but it is tough. You have to be so self-motivated because there is no one telling you, “Okay today this assignment is due.” And you really have to care, and you have to learn on your own and there is no one there to explain it to you. You have to read the material. If you don't get it you can ask questions but there are a lot of times your teacher is not available there 24/7. We check our email. We check our messages, but we aren't there. So if you are working on an assignment, you've got to have the know-how to find the information—get online, go to the library. They have to be really self-motivated. Well, it's not a remedial class. It's tough.

We know from DiPietro et al. (2008) that this level of self-discipline was difficult for young

learners to achieve. At EHS it appeared to be no different from the teachers' perspectives.

Unfortunately, students who likely needed help the most were the least likely to receive it in this system. Research shows that struggling students are less inclined to ask for help and have fewer help-seeking strategies compared to their more successful counterparts (Barbour, 2007). EHS served a large population of students seeking credit recovery. Credit recovery courses are often taken by at risk students (Barbour, 2009), where at-risk students are defined as those students likely to “drop out, flunk out, be pushed out, or ‘age out’ before successfully completing their course or schooling” (Watson & Gemin, 2008, p. 4). The implications of this approach to interaction may be that struggling students fall through the cracks at higher levels than students more prone to contact their instructor.

Promptness of interaction. In spite of the large volume of students, teachers articulated interaction behaviors described by Nippard and Murphy (2007) and DiPietro et al. (2008). Teachers recognized the importance of being responsive and prompt to student-initiated contact to help them advance through the course. As Holly stated, “The most important single thing the teacher can do is give very prompt feedback and prompt answers to questions.” Teachers expressed trying to turn around student work within 24-hours, if possible. As twelfth-grade English teacher Molly stated, “I think that they appreciate that I’m on top of it and I check their work so that they can move on and I’m not holding them back.” However, the ideal wasn’t always possible given the reality. Carl, a social studies teacher expressed this well:

I have some students that will send in an assignment, and if you don’t have it graded that day, they are sending emails all over the place and “how come there is no score yet?” And so I have to tell them, “Well, when you have 500 students you take them as they come in. You have to be a little bit patient.”

Sheer logistics, such as class size, impeded these interactions and response times.

Additionally, half of the teachers allowed students to resubmit assignments that were not up to grade-level performance. While this may be evidence of a lack of clear expectations for performance in an online environment, it also spoke to teachers' focus on mastering the material and caring more that students understood the content than self-preservation through reduced workloads. This activity reflects in practice Ferdig et al.'s (2009) online teaching standard of accommodating student differences.

Absence of face-to-face feedback. Teachers also missed the physical sense of immediacy when interacting with the students. The absence of non-verbal cues was something that several commented on missing that would help the teacher re-clarify, teach, or explain feedback or content. The US History teacher, Mark, made a comment that was typical of many teachers in the study:

One thing that I miss is the face-to-face exchange because I see in their eyes or in their facial expression or body language if they have given up on this. If whatever we are talking about is boring and I should move on. My mostly handicapped son is among other things profoundly deaf. So we communicate with him in sign language. So one of the things I teaching in my day class, is the sign for boring. So they sign it out instead of hollering out "Oh this is boring." Instead they can give me a subtle sign that this is boring, and I can move on to something else. If a student doesn't get it [at EHS], I don't see that. And I'm not sure, or I just proceed on, or they proceed on through the course, and I *think* that they have understood it. (emphasis added)

The absence of the physical cues made it difficult for teachers to know why students were disengaged and thus the appropriate intervention to re-engage students was never selected. While

Nippard and Murphy (2007) spoke of teacher immediacy, from the teachers' perspective, student immediacy was just as critical. The absence of the physical meant an absence of signposts to student understanding.

Overall, teachers expressed that the majority of their time was spent on instructional interactions, namely providing feedback on assignments. Students were expected to initiate interaction, followed by teachers responding as promptly as possible. Class sizes and volume of assignments forced teachers into reactive, as opposed to proactive, modes of interaction with all types of students. The absence of visual cues to express confusion further compounded the absence of teacher responsiveness.

Procedural/Organizational Interactions

Teachers identified procedural interactions as the next most common form of interaction at EHS. Common procedural interactions included fixing broken links, answering questions about grading criteria, responding to questions about course navigation, and sending out reminder to remain active in the course messages. Teachers reported spending from 2% up to 25% of their time on these types of interactions. Of the various procedural interactions, the teachers stressed notifying students of being dropped.

Automated progress alerts. While the majority of interactions were student initiated, there was one exception. Teachers initiated email contact before a student was automatically dropped from the course due to inactivity. Inactivity was defined as not submitting an assignment for over a 30-day period. These “warnings,” or “reminders” as different teachers called them, were automatically set up to encourage the students to progress through the class. As Tamara put it, “There are some students that are enrolled that I never see their work. And those are the ones we end up dropping, but we notify them first that they’ll be dropped from the

class.” Extended inactivity triggered teacher interaction. However, in all but one instance, the notification was an impersonal statement warning of their being dropped with no inquiry as to the reasons for inactivity on the part of the student. Additionally, the single email to engage with the course came as students neared the 30-day mark as opposed to several emails sent periodically over the course of the 30-day period of inactivity. The level of teacher engagement with inactive students was far less than what Roblyer (2006) found at three successful virtual schools where communication policies for active and inactive students included reaching out by telephone, email, and student/parent consultations.

Several issues also surfaced as a result of the “you need to get going” emails. One teacher noticed that many of the emails were undelivered as student email addresses were invalid. As Molly noted, “at school, you’d see them or you could talk to their other teachers. [But at EHS,] I didn’t really have any other way to track them down.” Consequently, teachers were limited in their ability to follow up with students and understanding/discussing why they were inactive. Murphy and Rodriguez-Manzanares’ (2009b) research with 42 virtual high school teachers echoed a similar sentiment. They found teachers struggled to reach out to inactive, struggling students and the strategies they could use to diagnose student problems in a face-to-face setting (i.e., approaching the student in the hallway or talking with another faculty member in the lounge) were not the same ones in an online setting.

Once students passed the 30-day inactivity threshold, they were automatically dropped from the course. However, several teachers reported that students who had completed some work in the course and were later dropped due to inactivity often approached them to ask to be re-enrolled. This took additional teacher time to reinstate the student—time that could be spent on more pedagogical interactions.

Social/Supportive Interactions

Social interactions were the least common form of interaction among EHS teachers, and often took the form of personal comments students made in their assignments or teachers' responses to such comments. Additionally, if the email notification included words of encouragement, could also be viewed as form of social interaction.

Mechanisms for social interaction. Ways for teachers to get to know their students were limited to students completing an "about me" assignment and any personal information they revealed in subsequent assignments. Similarly, students were able to get to know their teacher through an online teacher biography. However, not all of the teachers knew where the tool to create their biography was or if it was fully functional in the new learning management system. Students also got to know their teachers if they revealed personal facts in response to the student's initial self-disclosure (*e.g.*, "I like to read too", "You have a great name. I have a daughter-in-law named Mindy", "We have a Labrador too," etc.). Nippard and Murphy (2007) argued the importance of teachers establishing social presence in the form of humor, self-disclosure, and informal language to help foster a sense of connection and community.

Barriers to social interaction. One reason for the absence of social interaction was the absence of time on the part of the teacher. As Tamara, a science teacher, put it, "I make sure that I comment about something that they wrote. . .so that they know I've read it. . . .But I won't go into too much detail. I don't have time for it but I do want them to know that I read what they wrote." Lai and Pratt (2009) found teachers often regarded social exchanges as unproductive in a synchronous online learning program. While in Lai and Pratt's study time was constrained by limited access to the technology, EHS' constraints were due to a high volume of students (*i.e.*, a 233:1 student-to-teacher ratio for mostly part-time teachers). Regardless of differences, teachers

in both settings intentionally limited social interactions, favoring those more instructional in nature.

Another possible explanation for the absence of social interaction was that teachers might not consider it an important part of the instructional process in the online environment. When asked how students got to know the teachers, Carl stated, “Um. [pause] Wow, I don’t really have anything on the website or the program to let them know really anything about me! [laugh] To tell you the truth I don’t even know if there is a spot for that.” It was as if this teacher had never considered it important for the student to get to know him. Mark perceived these “chit-chat” interactions as a waste of student’s time saying, “They want to get through it and not chit-chat with the teacher and so I try to keep it more of a professional and business approach to their online education.” Another teacher felt that if he spent time being “personal” and “connecting” it would take up all of his time and “the return on investment, I don’t think would be good enough to justify it.” These quotes illustrated that teachers did not perceive social interaction as an important part of the online teacher-student relationship. From a constructivist viewpoint, social interaction is central to instruction and fuses the content and participants together as a community (Bransford, Brown, & Cocking, 1999). It is also paradoxical to note that these were the very types of interactions teachers enjoyed in the face-to-face classroom. For example, Mark expressed it well by saying, “For me, I’m a person that likes to meet one-on-one with kids because I like to know who they are.”

Furthermore, teachers who did see the value of social interactions expressed hesitation about revealing too much or having their physical and virtual worlds collide. Molly recounted the feelings she had meeting in person at her brick-and-mortar school one of her online students whom she had taught for over a year.

It worried me when that student wanted to meet me face-to-face. I was really uncomfortable. These are my online students, and they are different. Well it turned out great. And I'm glad I did it. But it is kind of a mental thing. These are my online kids, and they are removed from me personally. They don't see me, and they don't know my life kind of a thing.

Ironically, while teachers hesitated to reveal information about themselves, they simultaneously lamented not getting to know with their students. Teachers felt "removed" from their students who were too often "nameless" and "faceless" when the only interactions were instructional in nature. As Brian put it:

I don't know exactly how to word this. I care if they are passing. I care if they are understanding. But I don't know them to care. So it's not a personal caring. It's a generalized, "I hope you do well." And once in a while a student will [reveal] by the way they word things, you can just tell they struggle in general in school, and I kind of feel hopeful that they make it through and survive and accomplish those goals. But I don't actually put a face to anybody. They don't know me and I don't know them. We're just connecting through a cyber space here.

This quote illustrated Brian's desire to get to know his students better and his hopefulness for their well-being, a common theme among the EHS teachers. They wanted their students to succeed, recognizing that for many this may be the student's last chance to "salvage" their education. However, the majority of their interactions were limited to content-based instructional exchanges, as opposed to motivational ones. Bransford, Brown, and Cocking (1999) illustrated the importance of the social exchanges, describing it as the glue that connects the content and participants together to create a rich learning environment.

Conclusions and Implications

The majority of interactions were instructional in nature with most contact being initiated by the students. Teacher interactions focused on providing feedback on assignments and answering student questions, with promptness being seen as particularly valuable. The main procedural interaction teachers reported focused on notifications sent to inactive students. Teachers viewed social interactions as having little pedagogical value and were often concerned about boundaries in the student-teacher relationship. Finally, barriers such as class size and an absence of effective tracking mechanisms limited the amount, and types of interaction teachers engaged in. Consequently, teachers had a limited view or capacity to engage in interactions beyond those focused on content. The absence of interactions beyond those instructional in nature caused teachers to feel that their role had been reduced to that of a grader or tutor.

Based upon these themes, along with the limitations of EHS' instructional model, there are four implications for practitioners in this and similar environments. First, teachers need to take proactive measures to reach out to students on a weekly basis through an email sent out to all of the students asking how they are doing, specifically asking if they are struggling with anything in the course and inquiring if there are actions the teacher can take to support them for in the coming week (DiPietro et al., 2008). Second, smaller class sizes and a space within the learning management system for teachers and students to talk beyond instructional exchanges could help both groups feel a greater sense of immediacy and connectedness. EHS could also implement onsite mentors to support students and be on the ground if EHS teachers needed help reaching struggling students (Davis & Roblyer, 2005). Third, teachers should take measures to provide a certain level of self-disclosure to students regularly (Nippard & Murphy, 2007). This could be included in the weekly email, or in the feedback provided to students on their

assignments. Finally teachers should make students more aware of different ways in which students can communicate with their teacher, such as chat and discussion forums within the learning management system (Davis et al., 2007). These practices may help to reduce both teachers' and students' sense of isolation, distance, and anonymity.

In addition to these implications for practice, there are also three areas of future inquiry. First, researchers can examine teacher-student interactions from a more ethnographic perspective to understand what teachers and students are actually doing online. While this study was limited to teacher-reported behaviors, more research could examine interactions actually occurring in the distributed space as intended behaviors and implemented behaviors are not always aligned (Fishman, Marx, Best, & Tal, 2003; Schneider, Krajcik, & Blumenfeld, 2005). Second, this study focused solely on the teachers' experience. Future research could examine from the students' perspective interactions and what is valuable in an online setting (Cavanaugh et al., 2009). Finally, due to the fact that EHS has such a high population of non-completers, it would be wise to focus on the experiences of this population of students to uncover reasons for disengagement, withdrawal, and dropping out (Barbour, 2009; Barbour & Reeves, 2009). Understanding the experience from the point of view of these students can assist in modifying the design and delivery on online instruction that should benefit all students.

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ARTICLE 2

“Everybody is their own island”: Teacher disconnection in a virtual school

Article Abstract

Virtual schooling is a recent phenomenon in K-12 online learning. As such, the roles of the online teachers are emerging and differ from those of the traditional classroom teacher. Using qualitative interviews of eight virtual high school teachers, this study explored teachers' perceptions of their online teaching role. Teachers expressed a sense of disconnection from their students, the profession, and their peers as a result of limited interactions due to significant institutional barriers such as large class sizes. The implications of this disconnection as well as future avenues for research are discussed.

Introduction

Virtual schooling is a recent and growing form of distance education at the K-12 level. Since its inception in 1994 with Utah's Electronic High School (Center for Educational Leadership and Technology, 2008), U.S. online learning programs have spread to all but two states (Watson, Murin, Vashaw, Gemin, & Rapp, 2010). Several organizations, including states, universities, school districts, consortia, charters, and private enterprises, direct and manage virtual schools (Clark, 2001; Watson & Kalmon, 2005). However, the exact number is unknown as there is no central repository of programs and some states do not track programs by delivery model (Watson & Ryan, 2007). For example, Kansas (a state that does track K-12 online schooling in their state), saw the number of online programs grow from less than five in 2000-01 to more than 25 in 2006-07 (Watson & Ryan, 2007). While this example may not be indicative of all states, it does illustrate the potential rapid growth that has occurred in some jurisdictions.

The explosive growth of virtual schooling can be attributed to several factors. A major driving force is the educational promise of virtual schooling. Research on student achievement has indicated that online instruction is as effective as face-to-face instruction (Cavanaugh, 2001; Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004; Means, Toyama, Murphy, Bakia, & Jones, 2009). This "no significant difference" finding has helped educators and parents overcome the fear of a lack of quality in distance education and promoted greater adoption of online learning as a viable educational alternative. The expansion of virtual schooling has also been accompanied by an expansion of virtual school teachers' roles in an online environment. While the characteristics and behaviors of good face-to-face teachers are similar for virtual teachers (Davis et al., 2007), there are new teacher roles, responsibilities, and instructional strategies that need to be employed in an online environment to support student learning (Davis, 2007,

November; Davis & Roblyer, 2005; Murphy & Manzanares, 2008; Murphy & Rodriguez-Manzanares, 2009b). However, due to the nascency of K-12 online learning, research has only begun to explore teacher roles in these distributed environments.

The purpose of this study was to explore how teachers perceived their role in a supplemental, asynchronous, self-paced, statewide virtual high school. We begin by examining teacher roles in K-12 online learning. Next, using interview data from eight virtual high school teachers, we explore how the limited interactions teachers had with their students resulted in teachers feeling isolated and a disconnection from their traditional view of their role as a teacher. Finally, we conclude by discussing the three changes institutions can make to improve teachers' perceptions of their role through enhanced interactions, along with three avenues of potential research.

Literature Review

Teaching online is a relatively new phenomenon for most virtual school teachers. A survey of 178 virtual school teachers found that 93% had five years or less teaching experience online. In contrast only 37% of respondents had five years or less teaching experience face-to-face and a larger percentage (43%) had between 5 years and 15 years of teaching experience (Rice & Dawley, 2007). Another, more recent survey of 595 virtual school teachers found that over 77% were female and 23% were males. Ninety-two percent of teachers had bachelor's degrees and 62% indicated they had earned a master's degree (Archambault & Barnett, 2010). While we have some understanding of who is teaching at virtual schools, we know less about how the teaching occurs, and, more specifically, how teachers and students interact in online environments. A useful way to examine teacher interaction and the role of the teacher in a

K-12 online environment is the Community of Inquiry (COI) framework (Garrison & Arbaugh, 2007).

COI is a conceptual framework that emphasizes the interplay of three key constructs to create deep, meaningful learning experiences in distance education. These constructs work together to create a community that facilitates critical thinking and learning. According to the framework, the absence or imbalance of any one construct impacts both the learning and sense of community as a whole. The three interplaying constructs (see Figure 1) include:

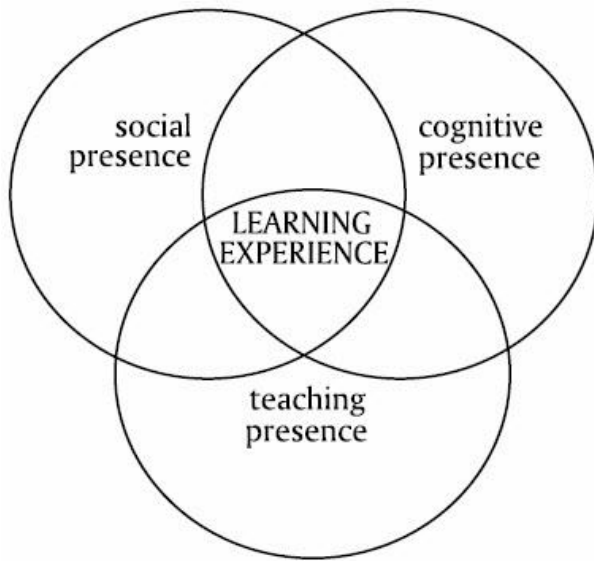


Figure 1. Community of Inquiry Constructs. This figure illustrates the interplay of teaching, social, and cognitive presence to create a learning experience.

1. *Teacher presence* is the “design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes” (Anderson, Rourke, Garrison, & Archer, 2001). Indicators of teaching presence are teachers who clearly communicate course objectives and instructions, facilitate student progress and learning, and provide meaningful feedback.

2. *Cognitive presence* is the ability of participants “to construct and confirm meaning through sustained reflection and discourse” (Garrison & Arbaugh, 2007 p. 161). Indicators of cognitive presence include events that trigger exploration of the subject, integration where meaning is constructed, and resolution where learners apply their new knowledge in contexts outside of the classroom.
3. *Social presence* is the ability for participants to project their personality and conversely feel a sense that others in the community are real people as well. Others identify with the community and develop relationships with others (Garrison, Anderson, & Archer, 1999). Social presence is not a property of the medium but the individuals’ ability to move past the medium and establish a sense of immediacy, connection, and co-presences between participants (Nippard & Murphy, 2007). Indicators of social presence include humor, self-disclosure, and the use of informal language to show affection.

The role of interaction is found in the social presence and teacher presence constructs, emphasizing the importance of teacher-student interaction through clear expectations, group collaboration, productive discourse, and meaningful feedback. Typically, social presence emphasizes more student-student interactions and community building, while teacher presence emphasizes teacher-student interaction. However, in rolling enrollment models where there is little, if any, student-to-student interaction the teacher often assumes the role of facilitating the social presence as well (DiPietro, Ferdig, Black, & Preston, 2008; Roblyer, 2006). Bransford, Brown, and Cocking (1999) aptly described these interactions as the glue around the content that creates a sense of community in any learning environment. These constructs of social, cognitive,

and teacher presence translate to into core behaviors many virtual school teachers exemplify in the online classroom.

Teacher Roles in Virtual Schools

Many of the same characteristics that make teachers successful in the physical classroom make them successful in the virtual classroom (Davis & Roblyer, 2005; Davis et al., 2007). However, teacher roles have expanded (Ferdig, Cavanaugh, DiPietro, Black, & Dawson, 2009) and require modification for an online environment (Davis & Roblyer, 2005; Murphy & Manzanares, 2008; Murphy & Rodriguez-Manzanares, 2009b). Davis et al. (2007) described three roles teachers undertake in a virtual school environment, while Ferdig et al. (2009) extracted eight potential roles based on published standards and research of online teaching (see Table 1).

Table 1

Taxonomies of Teacher Roles and Responsibilities in Virtual Schools

<u>Davis (2007, November) Taxonomy</u>		<u>Ferdig et al.'s (2009) Taxonomy</u>	
Roles	Responsibilities	Roles	Responsibilities
Teacher	Presents activities, manages pacing, rigor, etc. Interacts with students and their facilitators Undertakes assessment, grading, etc.	Teacher Course facilitator	Teach students within the online context including interacting with, teaching content, classroom management, and course management. Provides student support within the virtual school.

Table 1 (Continued)

Designer	Designs instructional materials Collaborates with team of teachers to construct online course(s)	Instructional designer	Create the course online using effective learning and design strategies.
Site facilitator	Local mentor and advocate for students(s) Proctors & records grades, etc.	Local key contact Mentor Technology coordinator Guidance counselor Administrator	Assists student in registering and accessing virtual courses Provides academic tutoring and assistance to students Facilitates technical support for both educators and students Acts as an academic advisor to students enrolled Provides the instructional leadership

Focusing upon the role of the teacher (Davis, 2007, November) or teacher and course facilitator (Ferdig et al., 2009), we examine this literature through the lens of the three COI constructs.

Teacher Presence

The vast majority of literature related to the role of virtual school teachers is focused on teacher presence (see Ferdig et al., 2009). Davis and Roblyer (2005) articulated that course planning/organization, verbal and non-presentation skills, collaborative course design, effective question strategies, and involving and coordinating student activities among different sites as all roles that online teachers have to assume and modify for an online environment.

DiPietro et al.'s (2008) study of best practices found that teachers demonstrated managerial and communication skills that helped them establish a sense of presence in the online environment. Interviewing sixteen Michigan Virtual School (MVS) teachers, DiPietro et al. found teachers in distance education had to assume a greater managerial or technical role in online learning environments than in traditional classrooms to prevent students from getting lost or forgotten. Additionally she found that feedback and teacher presence were central to student motivation. Analysis of the interviews indicated that successful teachers established a strong presence in the course by logging in regularly, providing prompt feedback, engaging in the discussion board, and monitoring students' progress. However, DiPietro et al.'s study failed to verify if these reported behaviors were actually implemented or if students consequently perceived a greater sense of community.

Roblyer (2006) echoes DiPietro et al.'s (2008) findings. Interviewing administrators from three successful virtual high schools, she identified specific policies regarding feedback and regular student-teacher interaction. At Florida Virtual School teachers were required to respond to student inquiries within a 24-hour period and contact, by phone, every student and parent in their class once a month. Similarly Idaho Digital Learning Academy required that teachers telephone inactive students. Thus, teacher presence was established through student

communication. This study constituted interviews from three administrators at three virtual high schools and thus may be limited to their specific institutions.

Cognitive Presence in Virtual Schools

Of the three COI constructs, cognitive presence is the one that has the least amount of literature. A false assumption that some online teachers make is that students want to be left alone to do their work. Drawing on the American Psychology Association's framework for learner-centered principles for online teaching, McCombs and Vakili(2005) found it critical that teachers "avoid the assumption that online learners are those who prefer less personal contact with instructors, are independent learners, have high motivation to learn, are self-disciplined and have high personal self-efficacy" (p. 1592). This advice was directed to online teachers teaching adult learners and may be even more applicable to adolescent learners.

Murphy and Rodriguez-Manzanares (2009) suggested that motivation is not self-generated or intrinsic; but rather, teachers play a pivotal role in motivating young adults who are even less likely to be autonomous. This was supported by the research that indicated that while adult learners may be autonomous, self-regulated learners, younger adults often lack the ability to regulate their own learning through self-discipline and intrinsic motivation (Barbour & Reeves, 2009; Cavanaugh et al., 2004; Cavanaugh, Barbour, & Clark, 2009; Rice, 2006). Thus these students may need more support. Finally, it should be noted that the line between designing, facilitating and directing instruction (i.e., teacher presence), and sustaining reflection and discourse on that instruction/content (i.e., cognitive presence) is a fine distinction.

Social Presence in Virtual Schools

There is also a significant amount of literature on social presence in mediated environments. Ferdig et al. (2009) identified multiple studies on best practices and standards

promoting social presence via teachers providing multiple channels and opportunities for communication and providing prompt feedback - two activities supported by DiPietro et al.'s (2008) research on best practices of successful online teachers.

However, some virtual teachers struggle to create meaningful interactions with students in a mediated environment. Harms, Niederhouser, Davis, Roblyer, and Gilbert (2006) argued that teachers received “little or no foundation for effectively communicating with students at a distance ” (p. 2). Yet communicating and teaching in an online environment was distinctly different than that of a physical classroom environment (Murphy & Rodriguez-Manzanares, 2009a). Off the cuff interactions that were casual and informal in nature and spontaneously happened inside and outside of the physical classroom had to be “pre-mediated” and “consciously promoted” in an online environment (Murphy & Manzanares, 2008 p. 1068). Murphy and Rodriguez-Manzanares (2009a), based on 42 teacher interviews, identified that the absence of visual presence and cues required that virtual teachers find new ways of interacting and building rapport. However, teachers struggled to find meaningful ways to do this. Analyzing the same interview data, Murphy and Rodriguez-Manzanares (2009b) found that virtual teachers did not yet view the online classroom as a community with “familiar faces, spontaneous interactions, and automatic social presence” (p. 13). While this study was limited to the experiences of Canadian teachers and their perceptions may not be universal, they do illustrate the importance of helping teachers develop communication strategies to establish both social and teacher presence in order to build a sense of community online.

Since teacher, social, and cognitive presences are important to the learning ecosystem, teachers need more formal opportunities to develop these skills. Too often, teachers first learn critical online teaching behaviors on the job. Rice and Dawley (2007) found that 62% of virtual

school teachers reported receiving no training in advance of their first online teaching experience. However, 90% indicated that they engaged in ongoing professional development provided by their online institution. When exploring the type of training teachers received, the focus was on foundational knowledge, tools, and instructional design. Despite this training, based on the 536 open-ended responses, Rice and Dawley found that a sense of isolation from both students and teachers was one of the top three themes cited. Unfortunately, due to the study's quantitative design, the authors did not explore the "why" behind teachers' sense of isolation in the virtual environment.

Method

The purpose of this study was to explore how teachers viewed their position, purpose, and place in a supplemental, asynchronous, self-paced, virtual high school. This led to the following research question: How do teachers' perceive their role as online teachers? To answer this research question we used case study methodology. According to Stake (1995) the use of case study is appropriate when the goal is to understand and concentrate on a singular, unique phenomenon. Utah's Electronic High School (EHS) was the case for this particular study.

We conducted eight semi-structured, telephone interviews with EHS teachers over a three-month period in 2009. Semi-structured interviews allowed researchers to explore perceptions, feelings, and attitudes of participants and explore a broader range of topics than more structured interviews (Fontana & Frey, 2000). All interviews were digitally recorded and transcribed verbatim. We used Ruona's (2005) method to organize and code the data. Specifically, we used a constant comparative method of coding to identify themes (Ezzy, 2002), which highlighted similarities and differences among participants.

Case

There are nine virtual schools operating in Utah (Watson et al., 2010). EHS, the only state-led program, is the largest in Utah and one of the largest in the United States with almost 50,000 course enrollments (i.e., a single student could be enrolled in multiple courses and counted each time in this enrollment figure). EHS serves a diverse student body. Fifty percent of students enrolled for credit acceleration, 30% for credit recovery, and 20% for both purposes. Students can enroll in any of 66 unique courses across eleven different disciplines. Course offerings range from the usual (i.e., algebra II, chemistry, English 9) to the advanced (i.e., Calculus, A.P History) to the more unique (i.e., astronomy, Navajo language). EHS teachers developed the curriculum using Utah's *State Core Curriculum Standards*.

At the time of the study, EHS employed four administrative staff, one part-time counselor, and 76 licensed teachers. A large majority of the teachers worked part-time and were contracted between 1 to 5 hours a day (Webb, 2008). Data from February 1, 2008-January 31, 2009 indicated a student-to-teacher ratio of 233:1, and a student load ranging from 2 to 1726 students over 198 sections. Seventy two percent of teachers taught a single class consisting of two to four quarter-credit units.

There are several policies that make EHS a unique program. The program model is open entry/exit, allowing students to enroll at any time. Consequently, students proceed through the course at their own pace with little, if any, student-to-student interaction. Enrollment and courses are free to Utah high-school aged students. Beginning October 2007, students had to complete the course within a 6-month timeframe and remain active (i.e., submit an assignment within a thirty-day period), or be dropped from the course. Lastly, EHS grants credits to the student rather

than deferring to the student's residential high school. However, they do not award failing grades (i.e., a student who fails a course, withdraws, or is removed due to inactivity suffers no consequences).

Participant and Class Characteristics

Eight teachers were selected for the study. The teachers were selected using intensity sampling (Patton, 2002). Pseudonyms, date ranges, and, in some instances, generic course titles were used to protect participants' anonymity. Table 2 describes the study's teachers and courses.

Table 2

Study Participants and Class Characteristics

Teacher / Class Characteristics	Discipline							
	English		Mathematics		Science		Social Science	
High/Low Completion	H	L	H	L	H	L	H	L
Quarter 1 course/grade	Eng. 12	Eng. 9	Lower-Division	Upper-Division	Elective	Elective	U.S. Hist.	U.S. His
Teacher	Molly	Sandra	Holly	Kristine	Brian	Tamara	Carl	Mark
Quarter 1 completion rate	20.8%	5.1%	15.2%	0.0%	30.2%	18.5%	21.0 %	20.6 %
Course completion rate*	39.2%	7.5%	22.6%	0.0%	45.1%	47.4%	37.4 %	33.8 %
Quarter 1 course size	106	985	197	108	116	135	62	155
Course size (quarter units combined)	183	1821	388	138	161	197	126	417
Face-to-face teaching (n= years)	14	14	15	14	32	18	22	18
EHS teaching (n= years range)	3-5	10-15	3-5	10-15	3-5	10-15	10-15	3-5

Note: H = high completion class; L = low completion class; Classes constitute two to four quarter units.

Examining class completion data from February 1, 2008 to January 31, 2009, four teacher/class case pairs were identified in the top and bottom 30% of class completion rates. To protect the anonymity of the participants, pseudonyms, date ranges, and generic course names were used.

Results and Discussion

The major theme that emerged from the interview data was teachers' sense of disconnection. Exploring this theme further, we uncovered three types of disconnections teachers felt: disconnection from their students, from their traditional notions of what it meant to be a teacher, and from their fellow teachers. While teachers wanted to have a sense of connection with their students, profession, and peers, structural barriers made it difficult. In the following section, we describe these three disconnections and discuss the implications the detachment had on teacher attitudes, behaviors, and community.

Disconnection from the Students

Teachers felt disconnected from their students for a variety of reasons. One reason was the absence of the physical cues students gave in a traditional classroom setting. In this online environment, teachers were never certain if students understood the subject matter, and they missed the instantaneous feedback in the form of visual cues. As Mark stated:

One of the reasons I love education is I like the interchange. You know, the instant feedback, the look in the face, the look around the room to see if somebody got it. And that's kind of difficult with an online class. And sometimes students will send me an email afterwards saying, "Thanks for this help" or "Thanks for explaining of what you [the student] wanted." You know, something like that. But it's not like it's immediate feedback that you get in the classroom. So I do miss the interchange with the students.

This absence and need for the cues of students' grasping the material ties back to a sense of teacher presence. Similarly, teachers in Lai and Pratt's (2009) and Murphy and Rodriguez-Manzanares' (2008) struggled to navigate with the absence of students' physical cues helping them interpret silence and student understanding.

Tamara felt the lack of responsiveness was a challenge since she never felt she knew why students were disengaged.

There are a lot of those voiceless students. Sometimes they think to enroll into it and they never, you know, you send them an email, "Are you interested?" You may or may not hear back from them. You don't know if the email is even right. I don't get a response back. Sometimes I get an undeliverable. Sometimes I don't. You know, I'm not very good at saying, "Stick with it. You'll do fine." Because if I don't hear back from them and they don't respond back, I don't even know if they are there anymore.

Not knowing why students were struggling contributed to her feeling disconnected from them. Traditional methods teachers could employ to investigate why students are struggling such as walking down the classroom row, catching the student in the hallway, or talking with another teacher at the teacher's lounge are not accessible to teachers in an online environment (Murphy & Manzanares, 2008; Murphy & Rodriguez-Manzanares, 2009b). Moreover, beyond emailing the student, teachers expressed that they did not know what else to do to reach out and engage.

One teacher viewed social interactions as something the students did not want in an online environment, "My feeling is that the reason they are taking this is because they want to get through it and not chit chat with the teacher, and so I try to keep it more of a professional and business approach to their online education." Another teacher did not want to get "too absorbed" and another felt that the "return on investment" for social interactions would not "justify the time

spent.” Teachers considered these forms of interaction as inconsequential with minimal benefit to the student. In a similar vein, Nippard and Murphy’s (2007) qualitative analysis of twelve synchronous courses found that social interactions often drew attention away from the content delivery. Though not expressed overtly, compounded with the time factor, the distraction cause by social interactions may be one reason why EHS teachers tended to limit them.

Paradoxically, the absence of these very exchanges made it difficult for teachers to feel like they knew their students. As Molly stated:

There are times when I feel like I don’t know the students. So unless they are good writers or they email me a lot, or you know, it is hard for me to, they’re just kind of a name, and I don’t like that. But the kids who are consistent in turning in the assignments, you get to know pretty well.

Students and teachers were able to establish a “co-presence” as Harms et al. (2006) described it through frequent interaction over the subject matter.

However, not all teachers felt like they could establish a connection with their students, “see their personalities,” and have a “personal relationship” with them. Teachers struggled to find meaningful ways to build rapport with their students frequently contrasting the process of doing this online with how it generally occurred in the physical classroom. Brian articulated it well contrasting how physical and virtual relationships were established saying:

Well the difference with them again is: I see them; I interact with them; I shake their hands; I know their name; I know their face. A lot of them I know their sad story behind some this. At EHS you just can’t do any of that. It’s nameless. It’s faceless. Even though you can feel some of that in the interactions and the other end of that are the kids that are just really very, very bright moving forward in positive ways. And you kind of feel like

I'm glad that there's this opportunity for you to get these credits and you can move on and do some of those things.

I know very well there is a percentage of my EHS kids that are that type of kid just at a high-school level. But I don't have any way of creating that rapport or interaction with them at that level. I try to be sympathetic to the fact that some of these kids. I can tell by the way they write and the way that they express themselves that they probably academically struggled. I'm trying to save that.

Murphy and Rodriguez-Manzanares (2008) argued that online teachers need new strategies for building rapport and social presence in an online environment in the absence of the physical and visual cues. Furthermore, these interactions need to be intentionally planned and integrated into the learning. They went on to say that the contradictions teachers face in the online and physical classrooms can be a driving force, as Engstrom (2001) described it, for "change and innovation in practice" (as cited in Murphy & Rodriguez-Manzanares, 2008, p. 1070). For EHS teachers, they felt the contradictions, but continued to grapple with identifying and applying these new strategies to connect with their students.

There were several possible consequences resulting from the absence of a relationship between the student and teacher. For example, it may be easier for the student to disengage from the course when they do not feel connected to their teacher. Kristine expressed this consequence saying:

I think it's way easier for a kid to fail out of a class if the teacher, if they haven't got a relationship with the teacher. They're like, "I don't know this person. It doesn't matter. I don't care if I fail." There's not this personal, like, "I don't want to hurt their feelings. I don't want to look bad." If they don't know the teacher, then they don't care about those

things. So sometimes when you have that personal relationship with them it helps push them forward because they just have those internal motivations that they don't want to let them look bad or let someone down.

Similar to DiPietro et al.'s (2008) findings, a relationship that includes deadlines, encouragement, and continual teacher communication may be enough to keep students motivated.

The disconnection between students and teachers not only effects students' commitment to the course but may also put strain on the teachers' commitment to the course and students as well. Brian hinted at this struggle saying:

I don't know exactly how to word this. I care if they are passing. I care if they are understanding. But I don't know *them* to care. So it's not a personal caring. It's a generalized, "I hope you do well." And once in a while a student will, by the way they word things, you can just tell they struggle in general in school. And I kind of feel hopeful that they make it through and survive and accomplish those goals, but I don't actually put a face to anybody. They don't know me, and I don't know them. We're just connecting through a cyber space here.

Essentially, Brian's words indicated that EHS teachers cared for their students at an aggregate level but not at an individual level as they struggled to form these personal relationships.

Similarly, teachers in Lai and Pratt's (2009) study also struggled to connect at an individual level with their students and at times felt they were "talking to a blank wall" (p. 14). This was the case even though these courses were taught synchronously using video-conferencing technologies.

Disconnection from the Traditional Notion of Teaching

In addition to feeling disconnected from the students, teachers felt disconnected from their role as a teacher. They felt “very removed” from the teaching experience as they traditionally viewed it. Some teachers viewed themselves primarily as graders since the “curriculum is already set up.” As one teacher stated, “I evaluate their work more than teach them. You know they are kind of on their own for learning and I just evaluate their learning, I guess.” In contrast to the traditional classroom where teachers play all of the roles Ferdig et al. (2009) and Davis (2007, November) articulated, teachers felt fragmented and at a loss playing just teacher or course facilitator role as opposed to the additional roles they played in the brick-and-mortar classroom. Consequently, they did not feel like a teacher in the sense that they were familiar with in their face-to-face classrooms. Carl articulated this difference in roles well saying:

It is probably different than face-to-face because you are displaying the information right there with the student. And with EHS, it’s already done on the computer system, and so a lot of the times the role you just get to grade the papers. And then just answer questions. But as far as like being, I almost want to say a mentor because you can see that student you can talk to them right then, it is definitely different that way. Almost like, here’s professor’s assistant. Here is a bunch of papers, and you just kind of grade it.

Brian felt that his teaching role was even more narrowly confined to that of a grader. In contrast to the more holistic role of teacher, course facilitator, instructional designer, local key contact, mentor, technology coordinator, and guidance counselor he played in his walled classroom (Ferdig et al., 2009). Again, looking to Ferdig et al.’s (2009) work on role definition, in a face-to-face classroom the teacher would play all eight roles whereas in an online classroom the

teacher may only play one. This created a sense of role fragmentation for the teachers causing them to feel disconnected from their own profession as they knew it.

Another role teachers expressed was that of a navigational mentor helping “herding them along towards the finish line.” Again teachers indicated that this role made them feel less like a teacher in the traditional sense. As Molly stated:

It is hard because your first instinct is that I want to say I’m a teacher. But a lot of times I don’t think I teach because of the curriculum is set up. And you know in face-to-face teaching you are on stage all the time and you are doing everything you can to get them to pay attention and you can see their faces and know what is happening. And you just don’t get that online. It is hard to get a sense of the person behind the assignment unless they are good writers. There are a lot of kids, you know. If they are good writers you get a sense of their personality, and it is easier. But if they are not great writers, you don’t get that voice in their writing and so it is hard to [pause]. You know, I don’t feel like I am teaching them. I feel like I put it out there, and they have to be willing to put the time and effort into it and learn the material. And you know, I’m kind of removed from it. And I do think I try to mentor them, and I try to guide them through it, and if they have questions I can answer their questions.

Feeling removed from the act of stand-up teaching, the design of the instruction, and the physical presence of the students resulted in this teacher feeling less like a teacher and more like someone standing on the sidelines ready to offer support when asked. These indicators speak to the imbalance in the teacher presence and social presence.

The constructs of teacher presence, social presence, and cognitive presence, must be present and balanced for a community to develop and thrive (Garrison & Arbaugh, 2007).

However, at EHS teachers felt like teaching “it’s just not the same” or “different” because community was lacking. Not only did teachers miss playing the more holistic role that they did in the traditional classroom, they recognized that the role of a teacher was much greater than the singular role they were experiencing as online teachers. As one teacher expressed:

But I love teaching in the classroom. I love that one on one with students and there’s something about seeing their face and their facial expression and being able to tell if they’re having a bad day as well. Teaching isn’t just teaching a subject, but it’s teaching the students and helping them through their stress of daily life and teaching them compassion and I don’t get to do that on EHS and that’s something I miss a lot.

This teacher expressed that teaching was more than just connecting over content, but also included connecting with the student on issues outside of the classroom. Simply put, EHS teachers were frustrated by their inability to fulfill the role of teacher as they had traditionally identified it in their brick-and-mortar environment.

Disconnection from Fellow Virtual Teachers

In addition to feeling disconnected from the students and the traditional role of teaching, teachers also felt disconnected from each other. At times, not only did the teachers feel the students were “on their own”, but they felt that they were too. As Brian expressed, “At EHS, it’s pretty much everybody is their own island.” Despite monthly synchronous professional development training, and an annual faculty meeting drawing in faculty from across the state, many teachers felt isolated and disconnected from their peers and practices. While some teachers felt that they could email their peers for help and assistance, others expressed feeling “alone” and colleagues less “accessible.” The traditional forms of gathering best practices at a traditional school were more challenging in the online setting. Teacher experienced isolation as they

struggled to learn from one another and understand how their performance compared in relation to others. As Molly said:

Well the problem is we don't know how we are doing sometimes. I mean, you get a little thing from students or parents every once in a while. But I don't really know compared to other teachers what they are doing better than I am, or what they are not doing. And so you're kind of isolated in that you're not knowing sometimes how it is going.

Again, the absence of feedback from students, parents, and peers contributed to a sense of isolation and uncertainty in their performance as a professional. Teachers lacked a sense of community established by a balance social presence, teacher presence, and cognitive presence.

Beyond not knowing how one was doing in relation to one's peers, some teachers felt like they did not have a way to gather best practices for online teaching. As Mark put it:

One thing that I like is about teaching in the classroom is I get to know faculty, and you get to bounce off a lot of ideas and things on them. And I don't notice that with EHS. I don't feel like I am necessarily a part. I just feel like this little individual who is doing their little thing. And we do have faculty meeting once a year, but it is never really a time when you really get to know the faculty.

Again, the traditional means for sharing best practices as a profession did not work in the online setting. Consequently some teachers at EHS struggled to find thought partners to contribute to their professional development in meaningful ways. Similarly, in their report on professional development for virtual schools, Davis and Rose (2007) articulated that teachers cannot work in isolation but need ongoing support structures in the area of professional development and educational support.

Just as students were expected to initiate contact to receive attention and responsiveness (Hawkins, Barbour, & Graham, 2010), teachers were also supposed to initiate interactions with one another. The onus of engagement for teacher-to-teacher interaction was on the inquirer just as it was for the students. When asked what her expectations were for interaction with other virtual teachers, Kristine stated the following:

I don't expect that we can be this face-to-face, touchy-feely-huggy group. [chuckle] It's not like we have lunch together like you would in a high school. You can't have that kind of an interaction. So given the constraints, I feel that we're very connected in terms that I don't have a problem emailing some of the other teachers and asking them how they're doing certain things. I don't feel like I can't do that. I just feel like, yeah, we're definitely on our own just as our students are. But anybody is only an email or phone call away.

What Kristine articulated was that the degree of interactions and its sufficiency was relative to the expectations one had for the community or group. Thus, if you joined a group with expectations that you would function as an independent body with interaction only when you initiated it, then teaching and studying at EHS worked well. However, if you expected your interactions to be initiated from both directions than EHS would feel like an "island."

Conclusions and Implications

The teachers' reported experiences in this study led to the following issues. The absence or limited interaction, particularly social, contributed to their sense of disconnection from their students. Teachers did not have the same sense of being professionals because of the limited role they played in the online classroom compared to the roles they assumed as a classroom teacher. Just as teachers felt isolated from their students, the majority felt isolated from each other due to their perceived inability to establish a collaborative relationship with their colleagues. From the

COI lens, teachers' limited interaction with their students and colleagues resulted in an imbalance of social and teacher presence. This limited interaction, coupled with teachers' limited sense of cognitive presence due their limited role in the content creation, resulted in feelings of disconnection and a limited sense of community.

There are three main implications that EHS and its teachers should consider to address these issues. It is possible that the formal and perceived academic nature of EHS' LMS prevented or hindered social interactions between students and teacher and amongst students themselves. Barbour and Plough (2009) described one online program that used a closed social network to create a non-academic space where students could socialize with each other and with their teachers. EHS ought to establish space for these forms of interaction either as an extension of the LMS or outside of it completely. Second, while the virtual school environment created a fragmentation of roles for the teacher, the EHS instructional model further limits the ability of their teachers to perform even the duties normally undertaken by virtual school teachers and course facilitators (Ferdig et al., 2009). EHS teachers can make a conscious effort to increase the quality and frequency of content-based interactions with their students by reducing class sizes. This would allow teachers to have a greater instructional role (or both teacher and cognitive presence) as well as free up time for them to engage in other types of interaction. Finally, EHS should create a space for a virtual staff room in the LMS where teachers could interact, share best practices, and discuss student issues.

There are three primary areas that researchers should consider for future investigation into the sense of disconnection in a virtual school environment. First, given the teachers' beliefs that the lack of interaction with their students had a detrimental effect on student performance and engagement, researchers should determine if the students themselves shared this sentiment.

This is an important avenue for future research because if students do not share these same concerns efforts towards instructional changes should be focused elsewhere. Second, as teacher roles in the online environment have become fragmented and because of this fragmentation, teachers do not feel the same sense of professional identity as they do in the classroom. A potential line of inquiry would be to examine the student role in the online environment. This examination should focus upon both the potential and perceived changes students sense with being an online student, and whether those perceived changes have similar negative effects on their role in the instructional environment. Finally, while the majority of teachers interviewed indicated they felt disconnected from their online teaching colleagues, there was one teacher (e.g., Kristine) who felt otherwise. It would be interesting to determine which of these was the prevalent attitude with a larger sample of EHS teachers. This would allow EHS to undertake corrective measures if the majority opinion stayed consistent or focus their efforts elsewhere.

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ARTICLE 3

Course completion rates and student perceptions of the quality and frequency of interaction in a virtual high school

Article Abstract

This study examined the relationship between students' perceptions of teacher-student interaction and academic performance at an asynchronous, self paced, statewide virtual high school. Academic performance was measured by grade awarded and course completion. There were 2,269 students who responded to an 18-item survey designed to measure student perceptions on the quality and frequency of teacher-student interaction. Confirmatory factor analysis indicated that the model was a good fit. Hierarchical logistical regression indicated that an increase in the quality and frequency of interaction resulted in an increase in completion. The estimated effect for quality and frequency composite items on completion was .839 and .566 respectively. The practical significance of teacher-student interaction on grade awarded was minimal. The results of this study are discussed, as well as implications for practitioners and researchers.

Introduction

Within the last sixteen years virtual schooling has spread across 48 states and the District of Columbia (Watson, Murin, Vashaw, Gemin, & Rapp, 2010). In 2000, there were an estimated 40,000 to 50,000 K-12 students enrolled in online programs (Clark, 2000). More recent estimates put the figure at 1,030,000 K-12 students (Picciano & Seaman, 2009), a 20-fold increase in less than a decade. The student population among virtual schools is becoming increasingly diverse. Historically, virtual school students were described as highly motivated, honors/advanced, independent learners who were more likely to attend four-year college than their face-to-face counterparts (Barbour, 2009). Today, a broader range of students is choosing virtual schooling for the purpose of credit recovery or to fulfill a graduation requirement (Watson, Gemin, & Ryan, 2008; Watson et al., 2010). The virtual school phenomenon is even extending down into the elementary grades with more than 26 states offering at least some full- or supplemental-online learning opportunities for grades K-5 (Watson et al., 2010).

Attrition from online courses, particularly at the K-12 level, has been a significant challenge (Simpson, 2004; Smith, Clark, & Blomeyer, 2005; Zucker & Kozma, 2003). Though reasons for student persistence in an online environment are complex and multifaceted (Willing & Johnson, 2004), interaction may be a key factor to student success. In contrast to a sizable amount of interaction research in post-secondary, there has been a paucity of empirical research into online learning at the K-12 level (Barbour & Reeves, 2009). In a review of literature, Rice (2006) found “very little research examining relationships between K-12 interaction that directly related to student performance, satisfaction, and retention in distance education contexts” (p. 439). Clearly, more research is needed to examine the relationship between student success and

interaction in virtual schooling contexts to identify teacher best practices to improve student retention and academic performance.

The purpose of this study was to examine the relationship between students' perceptions of teacher-student interaction and academic performance in a supplemental, asynchronous, self-paced, statewide virtual high school. This article begins with an exploration of the factors related to academic success in K-12 and post-secondary online learning environments. The researchers then describe the analysis of student perceptions of teacher-student interaction and academic performance using Pearson's Product Moment Correlation Coefficient and Hierarchical Linear Modeling. Finally, the researchers conclude by discussing two changes institutions can make to improve teacher-student interaction, along with two avenues of potential research.

Literature Review

Historically, distance education has faced higher dropout and failure rates compared to traditional classrooms (Roblyer, Davis, Mills, Marshall, & Pape, 2008). Furthermore, it is believed that attrition rates are higher for virtual school settings compared to post-secondary online learning programs (Smith et al., 2005). While no official attrition rate exists across virtual schools by state or school type, they range broadly from 10% up to 70% (Roblyer & Davis, 2008). For example in its first year of operation, Illinois Virtual High School had only a 53% completion rate (Clark, Lewis, Oyer, & Schreiber, 2002), while the Alberta Distance Learning Center asynchronous courses had only a 47% completion rate (Elluminate Inc., 2006). These problems may be further masked by variations in how virtual schools calculate a successful completion and the length of trial periods when students are not considered to be "officially" enrolled (Hawkins & Barbour, 2010)

Factors Influencing Student Performance in K-12 Online Learning

Several studies have examined the relationship between learner characteristics and student performance. Roblyer and Marshall (2003) identified learner characteristics predictive of high school student online course completion using the Educational Success Prediction Instrument (ESPRI), which predicted passing students with 100% confidence and failing with 95% confidence with 135 students across 13 virtual high schools. Additionally, she found no differences on personal characteristics (e.g., age, grade level, or gender). Successful students scored higher in self-efficacy, individual initiative, organizational skills, access to technology, and spent less time working outside of school. Roblyer's (2008) replication study, using a larger sample (n=4,100), also found successful students scored higher on technology access, self-efficacy, and organization. Additionally, past performance (i.e., GPA) was a strong predictor of success. However, samples in both studies were selective (e.g., the majority were Caucasian, drawn from rural/suburban populations, had a historically high pass rate, and had time built into their schedule for their online coursework).

Teacher support in the online learning environment has also been tied to academic success. However, the role of the teacher in the virtual school environment has expanded from what we typically understand the traditional classroom teacher's role to be. Three critical roles have emerged: virtual school designer, teacher, and site facilitator (Davis, 2007, November). The role of virtual school site facilitator (i.e., the onsite local mentor and advocate), though not as thoroughly researched as the other two roles, has been tied to program and student success (Davis & Roblyer, 2005). In their evaluation of a statewide online program, evaluators found "facilitators that are directly working with students day-by-day are key to the success of the program" (Roblyer, Freeman, Stabler, & Schneidmiller, 2007, p. 11). Though rarely

documented, Mulcahy (2002) reported school-based teachers and principals often voluntarily provided technical and supervisory support, along with significant academic tutoring.

Factors Influencing Student Performance in Post-Secondary Online Learning

In contrast to the limited research at the K-12 level, there is a more substantial body of literature focused on online learning in adult populations. Student success online has been tied to several factors. While demographic characteristics (i.e., gender [Bernard, Brauer, Abrami, & Surkes, 2004; Levy, 2007; Willging & Johnson, 2004], ethnicity [Dupin-Bryant, 2004], occupation [Willging & Johnson, 2004], and age [Levy, 2007; Willging & Johnson, 2004]) were not predictive of completion rates; prior academic success (Bernard et al., 2004; Dupin-Bryant, 2004; Wang & Newlin, 2000; Wojeiechowski & Palmer, 2005) and success in past online courses (Dupin-Bryant, 2004) were predictive. Additionally, affective traits (e.g., student's locus of control [Willging & Johnson, 2004], motivation level [Jamison, 2003], and independent learning styles [Diaz, 2000]) were predictive of success online. Factors external to the learner such as pre-course orientation sessions (Wojeiechowski & Palmer, 2005), study skills (Osborn, 2001), and strong computer skills (Dupin-Bryant, 2004) have also been tied to student success. Additionally, studies have identified interaction as a key factor for online student success (Thurmond & Wambach, 2004, January; Wallace, 2003).

Interaction and Student Performance in Post-Secondary Online Learning

Scholars have identified five types of interaction in online distance education: learner-instructor, learner-learner, learner-content, learner-interface, and vicarious interaction (Hillman, Willis, & Gunawardena, 1994; Moore, 1989; Sutton, 2001). Post-secondary interaction research has primarily focused the quality and/or frequency of interaction in relation to three outcome variables: satisfaction, perceived learning and academic achievement (Swan, 2001). High quality

and levels of interaction have been associated with increased learner satisfaction (Jung, Choi, Lim, & Leem, 2002; Picciano, 2002; Russo & Benson, 2005; Shea, Fredericksen, Pickett, Pelz, & Swan, 2001; Swan, 2001), perceived learning (Picciano, 2002; Rovai & Barnum, 2003; Stein, Wanstreet, Calvin, Overtoom, & Wheaton, 2005), and academic achievement (Jung et al., 2002; Picciano, 2002). Isolation and disconnection had the largest influence on students' decision to drop out and disengage (Bocchi, Eastman, & Swift, 2004; Willging & Johnson, 2004).

Different taxonomies have emerged to examine teacher-student interaction. Based on distance education theories, Heinemann (2005) identified three major types of teacher interactions: intellectual, organizational, and social. While there is substantial research into interaction in post-secondary online learning, researchers caution against generalizing these findings to adolescents who often lack the ability to regulate their own learning (Barbour & Reeves, 2009; Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004; Rice, 2006). Typical of research in K-12 online learning, only a handful of studies have examined these three types of interaction.

Interaction and Student Performance in K-12 Online Learning

Research on teacher-student intellectual/instructional interactions has emphasized the importance of feedback on student satisfaction and persistence. Weiner's (2003) qualitative study of a cyber charter school found limited teacher-student interaction a major concern. Students reported the lack of timely feedback was frustrating, impeded learning, and led to feeling "ignored, lonely, or lost" (p. 49). Furthermore, researchers who identified virtual schooling best practices also emphasized the importance of prompt feedback on student learning, progress, and connectedness (DiPietro, Ferdig, Black, & Preston, 2008; Ferdig, Cavanaugh, Dipietro, Black, &

Dawson, 2009). However these studies were based on student/teacher perceptions or standards analysis and did not tie the impact of interaction on actual student performance.

In relation to procedural interactions, Roblyer (2006), who identified best practices from three successful virtual schools, found policies and practices that required teachers to track student progress and proactively reach out to inactive students via email, telephone calls, and monthly student and parental consultations. While promising, these practices were not based on systematic research showing improved academic performance.

Social interactions in the form of self-disclosure, humor, and encouragement were also important to virtual high school student motivation and progress (DiPietro et al., 2008; Mulcahy, Dibbon, & Norberg, 2008; Nippard, 2005; Roblyer, 2006; Weiner, 2003). Mulcahy et al. (2008) found struggling students missed social interactions and felt distant from their online teachers, preferring to seek help from their face-to-face teachers. Additionally, Nippard and Murphy (2007) found a disconnect between the mediums that teachers and students used to create social exchanges, likely making the positive effects difficult to achieve. However, both studies were conducted with largely rural samples, which typically display a stronger sense of community (Kannapel & DeYoung, 1999). While these studies provide insight into the nature of interactions in K-12 virtual schooling, few connected these forms of interactions to student persistence or academic performance.

Method

The purpose of this study was to examine the relationship between teacher-student interaction and academic performance. This led to the following research question:

What is the relationship between students' perceptions of the quality and frequency of teacher-student interaction and academic performance?

The authors used correlation and hierarchical linear modeling research methods from survey data to address this research question.

Context

Utah's Electronic High School (EHS), a primarily supplemental, statewide, self-paced asynchronous virtual school, was the research setting. With 46,089 student enrollments from February 1, 2008 to January 31, 2009, the school operated on an open-entry/exit enrollment model where students proceeded at their own pace with little, if any, student-to-student interaction. Students had to submit a graded assignment every 30 days, remain active in the course, and complete the course within a six-month time period. If they violated either of these policies, they were automatically dropped from the course but could immediately re-enroll at any time at no cost to the student or penalty on their academic record.

EHS teachers developed the primarily text-based curriculum using Utah's *State Core Curriculum Standards*. At the time of the study, there were 66 unique classes taught by 1 full- and 76 part-time teachers. According to the 2008 audit, approximately 64% of teachers were also employed as teachers somewhere other than EHS (Center for Educational Leadership and Technology, 2008). Of these teachers, 90% were also employed full time elsewhere. All respondents were certified to teach in their content area. Nearly sixty percent of teachers taught only one class at EHS, while 28% taught two classes, and 13% taught three or more classes. The average student-to-teacher ratio was 233:1, but ranged from 2 students to 1,726 students per section.

Overall, 34% of students enrolled from February 1, 2008 to January 31, 2009 completed their courses. Completion rates by individual disciplines ranged widely from 10.27% to 62%,

with a large degree of variance. Table 1 indicates the mean completion rates by discipline for students enrolled from February 1, 2008 to January 31, 2009.

Table 1

Mean and Percent Completion Rates by Discipline (n=46089)

Discipline	N	Percent Completion	SD
Computer science education	448	10.27	30.39
Fine arts	1393	14.86	35.58
World languages	1756	18.05	38.47
Language arts	7149	18.73	39.02
Science	3031	19.80	39.85
Electives/Career/Technology	5337	26.72	44.25
Social studies	7082	26.77	44.28
Mathematics	2034	26.84	44.33
Driver's education	2429	42.57	49.46
Health & physical education	8776	47.76	49.95
Financial literacy	6654	62.41	48.44
Total / Average	46089	34.18	47.43

The high completion rates for the courses in financial literacy, health and physical education, driver's education may be due to the fact that they were required for graduation.

Participants

Participants were invited from a pool of 67,759 students who were enrolled from February 1, 2008 through September 29, 2009 and met the following criteria:

- Submitted a request to sit for their proctored final exam,

- Earned a grade,
- Did not earn a grade, but had enrolled in the class for more than six months as of May 1st, 2009, and
- Did not earn a grade, yet enrolled in class for three months but less than six months or completed at least 50% of the class work.

A total of 2,269 surveys with full or partial data were received. This represented a 3.34% response rate. Over two-thirds of respondents were females, and 84.4% were white. Ninety-five percent of respondents identified English as their native language. Overall, it was a fairly homogenous group of respondents with a significant number of Caucasian and female respondents. Other virtual schooling studies have also found an overrepresentation of dominant cultures within the sample (Black, Thompson, Askenazi, Ferdig, & Kisker, 2010). Since EHS does not collect demographic data on incoming students, it was not possible to compare the respondent sample to the larger population.

Based on the survey data, 75.1% of respondents (n=1705) reported having successfully completed the course (i.e., a grade was awarded), while 24.9% of respondents (n=564) indicated they did not complete the course. The sample was skewed towards successful students, as evidenced by the fact that overall completion rates for 2008-2009 were only 34%. However the grade distribution from A through D- for participants was reflective of the larger population. Possible reasons for the response bias include motivational factors (i.e., if students didn't complete the course, one would not expect them to take time to complete the survey), how the survey was administered (i.e., an email sent out to all students as well as an integrated step in the course completion process just prior to signing up for a proctored exam), and respondents' original motive for enrolling at EHS (i.e., original credit or accelerated graduation). In addition,

the nature of volunteer subjects may also account for the higher completion rates, as volunteers generally show higher levels of achievement, motivation and intellect than those who do not participant in non-mandatory assessments (Rosenthal & Rosnow, 1975).

Instrument

Perceptions of the quality and frequency of interactions were measured using an 18-item survey instrument (see Appendix A). The researchers developed their instrument after reviewing 15 quantitative surveys where at least one scale measured teacher involvement, interaction, or support and found that none were a perfect fit for the study context (i.e., self-paced, asynchronous online secondary courses with little or no interaction with peers). The researchers adopted or adapted items from several of these existing instruments when appropriate.

The survey asked students to supply basic demographic information. Additionally, 13 items measured students' perceptions of the quality of student-teacher interactions and five items measured students' perceptions of the frequency of interactions. Quality items were designed to measure the three interaction types Heinemann (2005) identified:

1. Intellectual/Instructional interactions (n=4): exchanges related to feedback for this study.
2. Organizational/Procedural interactions (n=4): exchanges related to class logistics, procedures, and processes.
3. Social interactions (n=5): exchanges related to support, encouragement, and connectedness.

The instrument was piloted on 10 youth, with feedback used to improve the survey prior to its broader administration.

Data Collection

The study items were incorporated into an existing EHS class evaluation survey and administered in two ways. In February 2010, the principal emailed an invitation and survey link to 46,089 participants enrolled in courses from February 1, 2008 to January 31, 2009, with a reminders sent to non-respondents four weeks later, and the survey was closed following another four-week period. The second method of administration was its integration into the course completion process as a part of the class evaluation that students completed after finishing their coursework, but prior to taking the proctored exam. A total of 21,670 students had access to this route of completing the survey via its integration into the course.

Student responses were mapped back to EHS' student performance database, linking responses to actual course grade, date of enrollment, date of completion (if applicable), course name, and instructor. Data were then de-identified.

Data Analysis

To estimate the construct validity, the researchers used confirmatory factor analysis (CFA). The purpose of CFA is to determine whether items purported to measure a particular construct shared a significant portion of common variance and load to the intended construct (Hair, Black, Babin, Anderson, & Tatham, 2006). CFA can be used to assess the degree of convergent and discriminant validity. Convergent validity refers to the extent to which the items purported to assess a certain construct (i.e., frequency, social, feedback, etc.) share common variance and load to the same construct. In contrast, discriminant validity refers to the extent to which constructs are discrete factors with little overlap. Constructs that have weak correlations between each other indicate a high level of divergent validity.

CFA was performed using Mplus version 5.21. Preliminary CFA analyses were done on four proposed single factor interaction scales (a) frequency, (b) feedback, (c) procedural, and (d) social factor scales. Secondary analysis was conducted on the 13 quality items, where CFA was used to determine whether a first-order factor structure (i.e., interaction quality composite score) or a three-separate factor structure (i.e., instructional, procedural, social interaction composite scores) best fit the data. Reliability was estimated using Cronbach's alpha coefficient.

Three procedures were used to examine the relationship between quality and frequency interaction variables with academic performance, as measured by grade awarded and course completion status: Pearson's product-moment correlation coefficient, hierarchical linear modeling (HLM), and hierarchical logistical regression. Using SPSS, HLM was used as a secondary analysis used to examine the dependent variable grade awarded. Since the second dependent variable, completion, was dichotomous, the researchers conducted hierarchical logistical regression using Mplus. Both regression statistics were conducted to estimate the degree of dependence among students with the same teacher and the consequences of violating the assumption of independence.

Limitations

There were several methodological limitations to this study. First, the survey was administered via email in March 2010 to 46,089 participants who were enrolled from February 1, 2008 to January 31, 2009 (the remaining 21,670 students were given the opportunity to complete the survey as a part of the end of course procedures). Researchers indicate that recall bias increases when there is a delay between the time of the experience and recall of said experience (Stynes & White, 2006). The gap in time from when students experienced the course and when they recalled their interaction experiences was problematic. Second, the low response rate (i.e.

3.34%) indicated a likelihood of non-response bias or the likelihood that respondents and non-respondents differ significantly. According to Rosenthal and Rosnow's (1975) review of literature on studies relying on volunteers as subjects, the authors found that volunteers were "likely to show higher levels of achievement than their less achievement-motivated colleagues" (p. 40). While they found 15 studies showing no relationship between volunteering and intelligence, they found 20 studies that indicated volunteers were significantly more intelligent than non-respondents. Essentially, those who volunteered to complete a non-mandatory survey may not be representative of the larger population. There is evidence of non-response bias in the fact that 75% of those who responded to the survey for this study had completed their online course compared to only 31% of the general population at EHS during the time of the study. Due to the fact that participants were minors, dispersed geographically, and the difficulty of obtaining IRB approval through the State and Brigham Young University, beyond a follow-up survey, I did not build in other means to reach out to the non-respondents.

Results

We begin this section with a discussion of the confirmatory factor analysis to determine whether items measured intended constructs and shared a significant portion of common variance. This is followed by a presentation of the descriptive statistics to provide the reader with an understanding of the participants and response counts. This is concluded by a discussion of the results of the Pearson's product-moment correlation coefficient and hierarchical linear modeling, which was designed to tell us the strength of the relationship between students' perceptions of the quality and frequency of interaction and academic performance.

Confirmatory Factor Analysis

Model fit was determined using Chi-Square Test for Difference Testing, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). To determine reasonably good fit, the researchers were guided by CFI and TLI scores close to .95 or greater and RMSEA scores close to .08 or below (Brown, 2006). Table 2 indicates the fit statistics on the preliminary analysis of the four proposed first-order factor scales.

Table 2

Fit Statistics on Preliminary Analysis of First-Order Factor Scales

Model	Model Fit Indices			
	# of Items	CFI	TLI	RMSEA
Frequency First-Order Factor Structure	5	0.997	0.997	0.065
Feedback First-Order Factor Structure	4	0.992	0.988	0.187
Procedural First-Order Factor Structure	4	0.998	0.998	0.112
Social First-Order Factor Structure	5	0.986	0.982	0.271

In all cases, preliminary analysis found the model fit indices were within the acceptable range, indicating the items loaded to the intended factors. Secondary analysis using CFA on the quality items was used to determine whether quality items loaded to a single quality construct or loaded best to three separate constructs: feedback, procedural, and social. Table 3 depicts the fit statistics for quality items loading to a single-order factor structure, second-order factor structure, and three separate factor structure (i.e., feedback, procedural, and social).

Table 3

Fit Statistics on Secondary Analysis of Models for Quality Items (n=13)

Quality Factor Models	Model Fit Indices		
	CFI	TLI	RMSEA
First-Order Factor Structure	0.953	0.984	0.203
Second-Order Factor Structure	0.961	0.988	0.177
Three-Separate Factor Structure (i.e., feedback, procedural, social)	0.961	0.988	0.177

Again, the fit statistics were within the acceptable range as outlined by Brown (2006). It should be noted that the fit statistics were the same for the second-order and three-separate order factor structures. Thus, to determine definitively which model for quality factor structures was the best fit, the researchers used the chi-square test (CHI) for difference testing comparing the first-order and three-separate factor structure models. This resulted in CHI values of 471.202, $df = 2$, and $p < .00001$, indicating that the three-separate factor model fit the data significantly better than the first-order factor. Figure 1 depicts the path diagram for the proposed three-separate factor structure model along with the correlations between constructs and items.

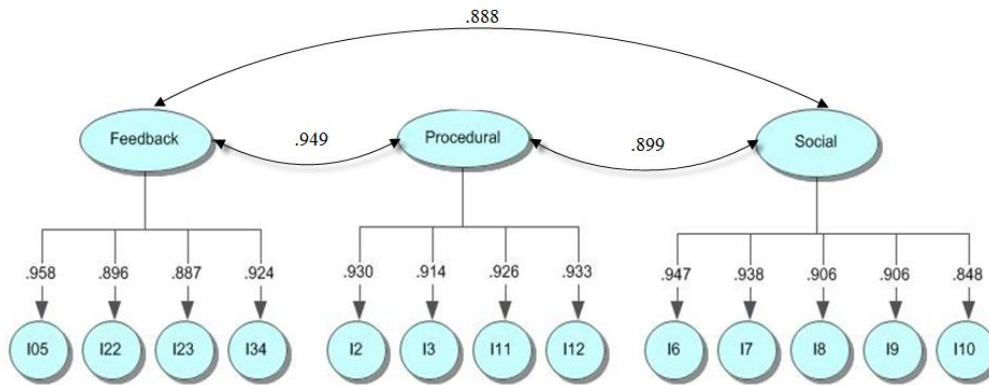


Figure 1. Three-Separate Factor Structure Model for Quality Items. This figure illustrates the path diagram for the three separate factor structures and construct correlations.

The high factor loadings indicated that items loaded to the intended constructs and had high convergent validity. However, the high correlations between feedback, procedural, and social constructs indicated low discriminant validity. Practically speaking, participants responded similarly on all three constructs implying the constructs these items measured were distinguishable only theoretically and not statistically.

The high correlations between each construct and the fact that they pointed to a common theoretical construct (i.e., quality), led researchers to test a second-order factor structure with feedback, procedural, and social factors linked to an overarching theoretical construct we refer to as interaction quality (see Figure 2).

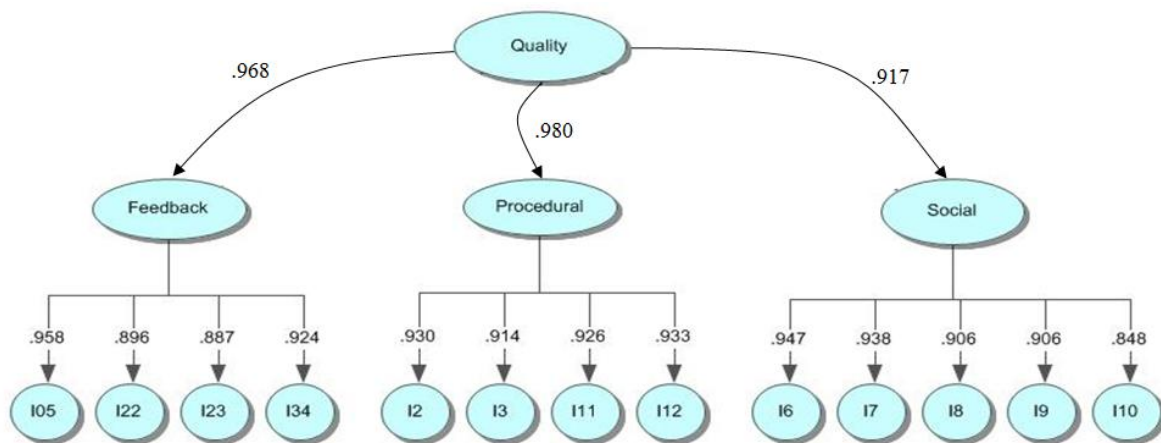


Figure 2. Second-Order Factor Structure Model for Quality Items. This figure illustrates the path diagram for a second-order factor structure and construct correlations.

Once more, this model demonstrated high correlations between the first order factor (i.e., quality) and second order factors (i.e., feedback, procedural, social). These correlations indicated that the second order factors were part of a larger, theoretical construct we refer to as interaction quality.

Reliability

Cronbach's alpha for the interaction quality and quantity composites were .94 and .85 respectively. The reliability estimates for the three quality factors were .86 for feedback, .91 for procedural, and .92 for social. These were strong reliability levels as they fell well above the acceptable minimum value of alpha at .70 (Hair et al., 2006).

Descriptive Statistics

The mean composite scores for interaction quality and frequency items were 3.2 (on a 4-point scale) and 2.43 (on a 5-point scale) respectively. Table 4 provides the mean scores for the factors analyzed in the survey.

Table 4

Factor Composite Means, Standard Deviations, and Variances

Factors	N	Mean	SD	Variance
Quality Composite	2202	3.20	0.59	0.35
Feedback	2123	3.38	0.66	0.43
Procedural	2117	3.34	0.61	0.37
Social	2122	2.96	0.66	0.43
Frequency Composite	2182	2.43	0.91	0.83

Note: The number of students (N) varies as not all of the respondents answered all of the questions.

Scores for quality of interaction were higher than frequency of interaction, which may have been a reflection of EHS' independent study model.

There was a fairly normal distribution of scores for the quality composite factor, as indicated by Figure 3. Quality items were on four-point scale where 1 = strongly disagree, 2 =

disagree, 3 = agree, 4 = strongly agree. Though the distribution of scores was slightly skewed towards the positive, this was expected since no one indicated that they strongly disagreed with any items on the survey. Figure 4 shows the distribution of scores for the frequency composite of items collapsed into a five-point scale where 1 = hardly ever, 2 = once a month, 3 = twice a month, 4 = once a week, and 5 = twice a week.

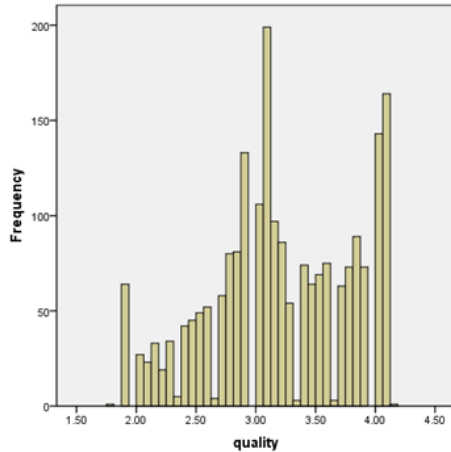


Figure 3. Distribution of Scores for Quality Factor on a Scale of One to Four. This figure illustrates the frequency of respondent scores on the quality composite.

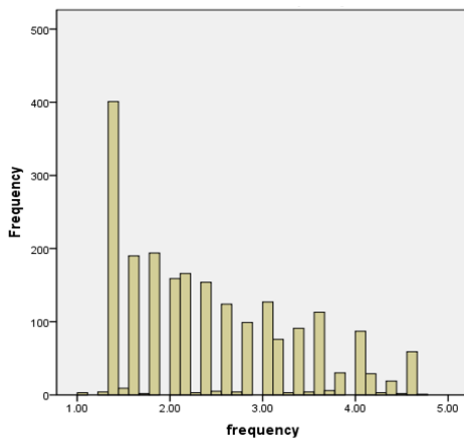


Figure 4. Distribution of Scores for Frequency Factor on a Scale of One to Five. This figure illustrates the frequency of respondent scores on the frequency composite.

Unlike that of the quality variable, the scores were negatively skewed. This was expected given EHS' independent study model.

Frequencies of interaction varied based on the type of interaction. Table 5 indicates student reported frequencies of interaction for feedback, procedural, and social interactions.

Table 5

Reported Frequency of Student-Teacher Interaction by Type

Interaction Type	Frequency of Interaction					Total Respondents
	Hardly Ever	Once a month	Twice a month	Once a week	Twice a week	
Feedback/Instructional	43.4%	17.3%	14.4%	18.1%	6.7%	2,136
Procedural	37.3%	19.4%	15.5%	20.2%	7.7%	2,147
Social	61.7%	11.6%	8.3%	12.8%	5.6%	2,133

Note: The number of students (n) varies as not all of the respondents answered all of the questions.

While students reported low frequencies of interaction in all three areas, students indicated that they interacted more frequently over procedural issues than social or instructional matters.

Initial Data Analysis: Pearson's Product-Moment Correlation Coefficient

Mean quality and frequency composite scores were correlated by academic performance as measured by grade awarded and course completion. Letter grades were re-coded on a scale of 1 to 13 with a 1 as an A+, 2 as an A, 3 as an A-, etc. Table 6 indicates the correlation coefficients, N, statistical significance, and the measure of the strength of the association (r^2).

Table 6

Pearson's Product-Moment Correlation Coefficient for Study Variables

Construct Composite	Pearson's Coefficient (r)	N	p	r ²
Quality x Grade Awarded	.147	1,683	<.0001*	.021
Feedback x Grade Awarded	.135	2,123	<.0001*	.018
Procedural x Grade Awarded	.174	2,117	<.0001*	.030
Table 6 (Continued)				
Social x Grade Awarded	.101	2,122	<.0001*	.010
Quality x Completion	.269	2,186	<.0001*	.072
Feedback x Completion	.234	2,123	<.0001*	.054
Procedural x Completion	.297	2,117	<.0001*	.088
Social x Completion	.209	2,122	<.0001*	.043
Frequency x Grade Awarded	-.036	1,676	.142	.001
Frequency x Completion	.095	2,167	<.0001*	.009

Note: *correlations significant at the .05 level. The number of students (N) varies as not all of the respondents answered all of the questions and the number of completer/non completer versus those who received a grade were not equivalent in size.

Correlations between perceived quality and frequency factors by grade awarded and course completion were very weak to negligible at both the composite and factor levels. Quality as a predictive measure had the highest correlations by grade and completion. However, it only explained 2.1% and 7.2% of the variance respectively. Again, this was a very weak correlation.

Further analysis of correlations at the item level showed items correlated to completion had higher coefficient values than items correlated to grade awarded, though all items were .3 or lower. The researchers hypothesized that that there would be differences in how lower-

performing students (i.e., credit recovery) versus higher performing students (i.e., original credit) would perceive teacher-student interactions. However, correlations comparing these student types again found very weak to negligible relationships between academic performance and quality/frequency variables. In summary, correlations between the variables were almost non-existent. These findings were unexpected and led the researchers to either (1) question their hypothesis that quality and quantity of interactions would correlate with student performance in this context or (2) consider that perhaps respondents were not independent of one another, a primary assumption for the Pearson's product-moment correlation coefficient.

Secondary Data Analysis: Hierarchical Linear Modeling and Hierarchical Logistical Regression

The unexpected results from the correlational analysis led the researchers to conduct hierarchical linear modeling to identify the relationship between variables, believing that there may be dependencies within groups of students who had the same teacher. The primary question in conducting HLM and hierarchical logistical regression was to determine if students with the same teacher were responding similarly in terms of the nature and frequency of interaction. Table 7 displays the mean, standard deviation, and intraclass correlation for the dependent variables: grade awarded and completion.

Table 7

Dependent Variable Mean, Standard Deviation, and Intraclass Correlations

Dependent Variables	Mean	SD	Intraclass Correlation*
Grade Awarded	10.04	1.617	.210783
Completion	.74	0.438	.266096

Note: *Computed from the random intercept null model.

The mean for grade awarded was 10.04 which translated to letter grade was an A-. Completion mean is reported as a proportion with 74% of respondents successfully completing the course. Intraclass correlations were used to measure the degree of interdependence among observations (i.e. student respondents) with the same teacher. The high intraclass correlation values were evidence that there were dependencies in student responses grouped around the teacher (Raudenbush & Bryk, 2001). These dependencies would explain the weak to negligible correlation values from the initial analysis using Pearson's product-moment correlation coefficient, which masked the actual relationship between interaction type and academic performance.

To examine interaction and grade awarded, the researchers used HLM. Table 8 displays the estimates of fixed effects. In this analysis grade awarded is the dependent variable and quality and frequency of interaction are independent variables.

Table 8

Grade Awarded Estimates of Fixed Effects

Construct	Estimate	S,E.	Est./S.E.	<i>p</i>
Quality Composite	.2720	.0709	3.836	<.0001*
Feedback	.2264	.0661	3.425	<.0001*
Procedural	.3590	.0708	5.075	<.0001*
Social	.1355	.0613	2.211	.027*
Frequency Composite	-.0942	.0415	-2.271	.023*

Note: *correlations significant at the .05 level

In all instances the perceived quality and frequency of interaction associated with the grade awarded were significant at $p=.05$ level. The estimate effect column in the table indicates that for every 1 unit increase in the perception of the four point quality of interaction scale, there

was a .272 unit increase in the 12-point grade (e.g., B- to B is one unit difference. Note EHS does not award failing grades, thus a 12-point grade scale). In other words, a four unit difference in perception of interaction quality (i.e., the full scale) only accounted for a one unit grade difference. The practical significance of this finding is minimal.

To examine interaction and completion, the researchers used hierarchical logistical regression, as the dependent variable was dichotomous in nature. Table 9 displays the estimates of fixed effects. In this analysis completion is the dependent variable and quality and frequency of interaction are independent variables.

Table 9

Completion Estimates of Fixed Effects

Construct	Estimate	S,E.	Est./S.E.	<i>p</i>
Quality Composite	.839	.082	10.246	<.0001*
Feedback	.583	.051	11.481	<.0001*
Procedural	.624	.052	12.021	<.0001*
Social	.632	.058	10.978	<.0001*
Frequency Composite	.566	.061	9.312	<.0001*

The perceived quality and frequency of interaction associated with the completion were significant at $p=.05$ level. For completers and non-completers there were significant differences in scores on the quality composite construct. The scores on quality composite by completion had an estimate effect at 0.839. Thus for every one unit increase on the four-point interaction scale for quality items the log odds of completing the course increased by .839. Additionally, for every one unit increase on the five-point frequency scale, the log odds of completing the course increased .566. Thus a one unit difference in perception of quality of interaction is nearly the

difference between a non-completer and completer. Additionally a two unit difference on the frequency scale differentiates non-completers from completers.

Discussion

There were three main findings resulting from this study: (1) methodological insights, (2) key differences between completers and non-completers on quality and frequency of interaction, and (3) little practical significance on differences between high and low performing students' perceptions on quality and frequency of interaction. There were methodological understandings that arose from this study that may be just as important as the findings related to virtual schooling. Like many other studies measuring the relationship between interaction and academic performance or perceived satisfaction (e.g., Fredericksen, Pickett, Shea, Pelz, & Swan, 2000; Restauri, 2006; Swan, 2001), the researchers used a correlation statistic to measure this relationship. Using this analysis, correlations were weak at best. Since respondents who shared a common teacher may have answered similarly, the assumption of independence was violated—a major premise of correlation coefficients. Consequently, the researchers conducted HLM and hierarchical logistical regression, resulting in more meaningful insights on student perceptions of interaction in relation to academic performance. Future research that draws participants from across multiple courses and instructors should account for the violation of response independence and nest students by teacher using hierarchical linear modeling. Another methodological insight resulting from the CFA was that there were significantly high correlations between feedback, procedural, and social factors. This meant that students generally responded similarly to the procedure, feedback, and social interaction questions. Students split by grade responded differently on the three constructs. However since there were relatively few

C and D students in the population one could still get the interaction effect at the end without significantly changing the correlations when examining the entire population.

Second, there were unique findings between completer and non-completer responses. First, the results of this study indicate that the quality and quantity of interaction mattered to student completion rates. Higher quality interaction and more frequent interaction scores increased the log odds of completion significantly. In other words, students who completed the course perceived greater interaction and quality of interaction than non completers. This finding supports the higher education research on the importance of interaction to remain engaged (i.e., Bocchi, Eastman, & Swift, 2004; Willging & Johnson, 2004) and gives statistical backing to the handful of qualitative studies pointing to the importance of interaction in virtual schooling environments (i.e., DiPietro et al., 2008; Ferdig et al, 2009; Mulcahy, Dibbon, & Norberg, 2008; Nippard, 2005; Roblyer, 2006; Weiner, 2003).

Finally, in contrast to interaction impacting completion, there was no practically significant effect of interaction on the grade awarded. There were several possible reasons for this outcome. First the results may be due to the fact that there was little variation in grades awarded among respondents. The mean grade was an A-, with 76% of respondents receiving an A compared to only .6% receiving a D and 4.1% receiving a C. Thus, it would be difficult to detect differences in perceptions on such a small number of respondents. Another possible reason for the absence of an effect was that students who completed the course were satisfied solely with completion irrespective of the grade awarded, because, in many cases completion with any non-failing grade was all that was required for graduation. For the bulk of students completion may have been more of an important issue than the grade awarded. Teacher interaction impacted completion but not necessarily grade awarded at a significant level. Finally, it was common

practice for teachers at EHS to allow students to resubmit work for an improved grade. One could speculate that this increased interaction moved some students from non-completion to passing the course and they perceived high interaction as a result of multiple resubmissions.

Conclusions and Implications

The quality and frequency of interaction had a significant impact on student completion but not on grade awarded. Increased levels of the quality and frequency of interaction resulted in increased student completion. However, there was no difference on grade awarded, a result likely due to the limited variation in grades awarded, attitude towards completion, and resubmission practices at EHS.

Based on the results of this study, along with the limitations of EHS' instructional model, there are two implications for practitioners in this and similar environments. First, interaction matters in terms of both the quality and frequency of interaction. Students who completed the course perceived their interactions with teachers more positively than their non-completer. Teachers should continue to maintain a high quality and frequency of interaction with students, particularly those at risk of dropping out. One way to achieve this is to place a greater emphasis on interaction at the beginning of a course—a time when all students are most likely to be engaged in the course. Teachers should interact with students on multiple occasions in the first day or so of enrollment because this may be when they are most primed to engage in the course. These interactions would include: (a) an introduction to the learning management system navigation, along with how to participate in the course and interact with the content (i.e., procedural); (b) general information about the course content and learning goals (i.e., instructional); and (c) an introduction to the teacher as a person and warm welcome to the class (i.e., social). Second, teachers should take proactive measures to reach out to students regardless

of their progress in the course. The increased interaction may be enough to move students from the non-completion status to completion status.

In addition to these implications for practice, there are also two areas of future inquiry. First, perceptions of behaviors are often very different from actual behaviors (Fishman, Marx, Best, & Tal, 2003). Mining data from learning management systems, which contain all teacher-student interactions (i.e., teacher-student emails, student question postings, assignment submission and feedback, etc.), would be a simple way to determine the relationship between frequency of interaction and academic performance (Schneider, Krajcik, & Blumenfeld, 2005). Furthermore, content analysis of such interactions with a clear coding system could also reveal the quality of the interaction in a less subjective manner. Second, the fact that the overall student perceptions of the quality and frequency of interaction were minimal may be due to the nature of the case itself (i.e., a self-paced, asynchronous, open-entry virtual school with large class sizes, failing grades are not awarded). Due to the wide variation in virtual school types, similar studies with other virtual schools may yield different, and potentially more positive, results for both grade awarded and completion.

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EHS MISSION

Our mission is to educate, remediate, accelerate, and graduate Utah's diverse learners with caring, qualified teachers using current technology to provide rigorous curricula, timely access to quality online instruction, and prompt, professional feedback to student work.

Instructions: How are we doing in meeting our mission? Your feedback does not impact your credit/grade for this class.

You were added to [Course Name / Section] with [Teacher] on [Date].

[Student Name & ID Number]

Please describe the kind of credit you wanted when you signed up for this class ([Course Name / Section]):

- credit recovery - make up a failed class
- original credit - first time to earn this credit

LEARNER SATISFACTION

[Course Name / Section]	Strongly Agree	Agree	Disagree	Strongly Disagree
Overall, I would rate the quality of this class as outstanding				

TIMELY ACCESS

[Course Name / Section]	Strongly Agree	Agree	Disagree	Strongly Disagree
When I had difficulty understanding the class policies and procedures (e.g., turning in assignment, knowing what my current grade was, which assignments I needed to re-do, etc.), I could get help from my teacher. <i>[Procedural]</i>				
My teacher helped me resolve technical issues quickly.				

¹ Items used to measure procedure, instructional or social interaction, along with the frequency of interaction, are noted after each item. These notations that appear in italics within the [] brackets did not appear in the version of the instrument completed by students.

<i>[Procedural]</i>				
Navigating the class materials was easy.				

CARING TEACHERS

[Course Name / Section]	Strongly Agree	Agree	Disagree	Strongly Disagree
When I had difficulty understanding the class material, I could get help from my teacher. <i>[Instructional]</i>				
My teacher encouraged me to keep going with the class. <i>[Social]</i>				
I felt like my teacher wanted me to succeed in this class. <i>[Social]</i>				
By the time I left the class, I felt like my teacher knew me. <i>[Social]</i>				
By the time I left the class, I felt like I knew my teacher. <i>[Social]</i>				
I felt comfortable interacting with my teacher. <i>[Social]</i>				

QUALIFIED TEACHERS

[Course Name / Section]	Strongly Agree	Agree	Disagree	Strongly Disagree
My teacher clearly communicated what I needed to do to successfully complete the class. <i>[Procedural]</i>				
My teacher clearly communicated what I was expected to do on class assignments. <i>[Procedural]</i>				
My teacher demonstrated the skills I was expected to learn in this class.				
Overall I would rate the quality of the teaching as outstanding.				

RIGOROUS CURRICULA

[Course Name / Section]	Strongly Agree	Agree	Disagree	Strongly Disagree
Compared to what I knew before I took this class, I learned a lot.				
The class challenged me to think in new ways.				
I had opportunities in this class to explore how I could use this information in my everyday life.				
I put a great deal of time into this class.				

[Course Name / Section]	10 or more hours	8-9 hours	6-7 hours	4-5 hours	2-3 hours	0-1 hours

How many hours a week did you typically spend working on this class?						
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CURRENT TECHNOLOGY

[Course Name / Section]	Strongly Agree	Agree	Disagree	Strongly Disagree
The curriculum included a good mix of written, audio, visual, and interactive content.				

EDUCATE, REMEDIATE, ACCELERATE

[Course Name / Section]	Strongly Agree	Agree	Disagree	Strongly Disagree
I would recommend this class from EHS to a friend.				

PROMPT, PROFESSIONAL FEEDBACK

[Course Name / Section]	Strongly Agree	Agree	Disagree	Strongly Disagree
My teacher gave me useful feedback on my assignments. <i>[Instructional]</i>				
My teacher gave me prompt feedback on my assignments. <i>[Instructional]</i>				
My teacher frequently initiated contact with me about the class. <i>[Frequency]</i>				
I frequently initiated contact with my teacher about the class. <i>[Frequency]</i>				

[Course Name / Section]	1 day	2-3 days	4-6 days	1 week-2 weeks	More than 2 weeks
My teacher would typically respond to my questions in ... <i>[Frequency]</i>					

[Course Name / Section]	Usually twice a week	Usually once a month	Usually twice a month	Usually once a month	Hardly ever or never
How often during the class did you and your instructor interact on issues related to class logistics (e.g., grades, class requirements, etc.)? <i>[Frequency]</i>					
How often during the class did you and your instructor interact on issues related to the subject matter (e.g., clarifying, explaining, expanding the class material, etc.)? <i>[Frequency]</i>					

How often during the class did you and your instructor interact on issues related to social matters (e.g., encouragement, motivation, personal interest, etc.)? <i>[Frequency]</i>					
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Reason for taking this EHS class:

What was the main reason why you decided to take this class at EHS?	
	I wanted to make space in my schedule for other classes.
	I thought this class would be faster to complete than a face-to-face (live) class.
	I needed to make up for a class I failed or did not finish.
	I wanted to graduate early (and I am not behind on my credits).
	I wanted to earn my adult high school diploma.
	I wanted to work through the class at my own pace.
	I thought online classes are easier than face-to-face (live) classes.
	Special needs (travel for competitions, family reasons, filming, health etc.) so I can't be in school regularly.
	The class was not offered at my school.
	It sounded interesting. I just wanted to.
	Other reason (please list):

ADDITIONAL FEEDBACK

What did your instructor do that helped you to keep going with this class?	
What did your instructor do that made it hard for you to keep going with this class?	

[Course Name / Section]	Strongly Agree	Agree	Disagree	Strongly Disagree
The transition to the new EHS system in July 2009 was smooth for me for this class.				
The new EHS system (launched in July 2009) improved the overall quality of my experience at EHS.				

	Yes	No
Would you be willing to have a follow-up conversation with someone to better understand your experience at EHS with this class?		
If Yes, please supply your phone number:		

To help us better serve students in this class in the future, please give your main reason for not completing this class within 6 months.

(Submit Feedback to EHS)

CONCLUSIONS

This study had three primary foci: teachers' perceptions of interactions, teachers' view of their role as online teachers, and the relationship between students' perceptions of teacher-student interaction and academic performance.

The article entitled, *Strictly Business: Teacher Perceptions of Interaction in Virtual Schooling*, addressed teacher perceptions of interactions. Interviews from EHS teachers revealed that the majority of interactions were in the form of feedback on assignments or were in response to a student initiated inquiry or action. Institutional factors such as high student-to-teacher ratios and automated performance tracking mechanisms made it difficult for teachers to proactively interact with their students.

The article entitled, *“Everybody is Their Own Island”: Teacher Disconnection in a Virtual School*, examined teacher role identification in the online environment. EHS teachers primarily gave feedback on assignments, along with having limited social and proactive instructional interactions. This led to a feeling of disconnection from their students and the profession, as they had traditionally defined it. Teachers also felt isolated from their peers, which required them to demonstrate similar initiative to their students in order to reach out to colleagues for help in navigating the online teaching environment.

Finally, the article entitled, *Course Completion Rates and Student Perceptions of the Quality and Frequency of Interaction in a Virtual High School*, explored the relationship between teacher-student interaction and academic performance. The quality and frequency of interaction had an impact on student completion. Students who perceived higher levels of the quality and frequency of teacher-student interaction showed higher completion rates. However,

interaction made no difference to the final grade students received, a result likely due to several factors unique to the case.

Limitations of the Study

The findings of this study were limited to virtual schools with similar contexts to those of EHS. EHS was a unique virtual school. It operated on an open-entry/open-exit model where students can start and stop at any time. Courses were designed primarily to be completed independently and delivered asynchronously with little or no student-to-student interaction. Large class sizes limited the amount of teacher-to-student interaction. EHS primarily offered supplemental courses to students who are taking their coursework residentially or through home-school. All teachers, with the exception of one, worked part-time for EHS and the majority held other full-time jobs outside of EHS. While the majority teachers in virtual schools teach part time elsewhere (Watson, Murin, Vashaw, Gemin, & Rapp, 2010), other aspects EHS' model are not atypical of most virtual schools.

Themes of the Study

There were three themes that spanned the manuscripts contained in this dissertation. First, interaction matters to teacher satisfaction and student completion. From a qualitative perspective, teachers expressed that a lack of interaction resulted in a sense of disconnection and distance between themselves and their students. While they were satisfied helping students succeed in this mediated learning environment, they missed the frequency and types of interactions they had in their physical classrooms compared to their online classes. From a quantitative perspective, higher levels of interaction resulted in increased student completion. For every one unit increase on the four- and five-point scale for quality and frequency items the log odds of completing the

course increased at a practically significant level. These findings imply that more should be done to foster and promote interaction in this type of environment.

Second, with this model, interaction was minimal from both the student and teacher perspectives. Teachers viewed the primary interaction as instructional in nature, taking the form of feedback on assignments. In contrast, students felt that they communicated most with their teachers over procedural matters. However, these interactions were limited with over 55% of respondents indicating they communicated with their teachers at most once a month. Social interactions were the least common form of interaction in the eyes of both students and teachers. Teachers indicated that they missed the social interactions with their virtual students that they had with their classroom ones.

The second theme to emerge was that there were multiple barriers that made the quality and frequency of interaction difficult. First, the nature of the model at EHS limited the number of interactions students. Since there was no definitive start and end date the only type of interactions students could have is with their instructor. Large class sizes made it difficult for teachers to reach out to students since everyone was in a different place at a different time. Second, the large class sizes often forced teachers into a reactive instead of proactive position when engaging with students. As such, teachers rarely interacted with students beyond giving feedback on graded assignments and responding to questions. Third, the large class sizes – coupled with a rudimentary student tracking system – made it challenging for teachers to monitor student progress and get to know their students on a personal level. Thus, social interactions in the form of encouragement and self-disclosure were minimal. Finally, teacher attitudes also limited the nature of the interactions at EHS, as some felt that social interactions were either unwanted by the students or pedagogically inconsequential.

Implications for Practice

There were three implications for practitioners that could help to improve interactions in this virtual school. First, interaction matters to both teacher satisfaction and student completion. As such, teacher interaction should be emphasized and integrated into every aspect of the infrastructure to facilitate teacher and student success. This begins with the job description emphasizing interaction to providing teacher training on how to interact with students in an online environment. Teachers should be required to become certified in online teaching and part of such training would include the role of different types of interaction (i.e., teacher-to-student, student-to-student, student-to-content, etc.), the nature of these interactions (i.e., instructional, procedural, and social), and how to interact effectively with adolescent, online students synchronously and asynchronously. Specific to EHS, teachers need to make more proactive measures to reach out to students on a weekly basis through email. Given the large class sizes and lack of definitive start dates, this suggestion may be more realistic and meaningful if the messages were automated and tailored to student's actual progress (or lack thereof) in the course. These emails could also be motivational in nature, with a certain level of self-disclosure on the part of the teacher thus increasing their social presence. Second, the class sizes could be reduced to give teachers the necessary time to engage with students on matters beyond assignment feedback. Teachers could also have more time freed in order to proactively reach out to students struggling to make progress. Finally, EHS should consider creating spaces within the learning management system for more teacher-student, student-student, and teacher-teacher interactions that extend beyond conversations over content. If teachers engaged in these three practices stated above, students may have a more favorable impression of the interactions (i.e., both the frequency and quality) they have with their teachers. This may help both students and teachers

feel a sense of social presence and community often difficult to achieve in a mediated environment.

Suggestions for Future Research

Finally, there are four avenues for future research following this line of inquiry. First, all three studies dealt with perceptions of interaction as opposed to actual behavior, which in educational contexts are often not the same (Fishman, Marx, Best, & Tal, 2003). With all interactions captured digitally, mining the learning management system (LMS) data would be a simple way to quantitatively and qualitatively examine actual interactions online and its relationship to student performance. Dickson (2005) explored this type of data mining in one virtual school's LMS and found that student participation, as measured by student clicks and time logged in the LMS, correlated with higher academic performance. Though insightful, Dickson's exploration was limited to student-content interactions and did not include teacher-student interactions. More could be done in K-12 contexts to understand a broader range of interaction behaviors online and their relationship with student persistence and performance.

Second, the students' voice in the virtual schooling learning experience, particularly those who disengage or struggle to succeed online, needs to be a focus of future research. Barbour and Reeves (2009) advocate such a line of inquiry. Too many studies have given voice to the teachers, as was the case with this one, but few studies have examined students within the online learning environment in any real depth. It would be valuable to understand the differences in experiences and interactions students have who disengaged prior to beginning their online course (i.e., non-starters or those who disengage early on in their online course experience, often falling within the virtual school's trial period) and those who struggle yet persisted to completion.

Third, researchers need to investigate courses that have been specifically designed for struggling students (e.g., credit recovery courses), along with the nature of interactions in those courses compared to other types of online courses or those completing their online course on their first attempt. The self-paced nature of the online course and the potential for individualized instruction on the part of the teacher are affordances the virtual school medium provides, more so than a traditional classroom (Barbour & Reeves, 2009). However, future research could investigate whether there are differences in how teachers interact with students to obtain success in the virtual school environment, along with whether differences in teacher behavior exist among virtual school teachers (i.e., those teaching credit recovery versus non-credit recovery), and between virtual school teachers and classroom teachers. Examining credit recovery courses could also reveal different teacher behaviors and course design factors that support a broader range of student abilities.

Finally, all or portions of this study should be replicated at virtual schools that follow a specific schedule or have definitive start and end dates. The low levels of interaction at EHS, due to its independent-study model, likely influenced the results of this study. Researchers could examine how perceived or actual interactions differ at virtual schools where teacher-student interaction plays a more prominent role in the learning experience. Additionally, the examination of interaction at virtual schools could be expanded to include different types of interaction, such as student-student, student-content, learner-interface, and vicarious interactions.

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