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Types, Subjects, and Purposes of K-12 Online Learning Interaction

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Types, Subjects, and Purposes of K-12 Online Learning Interactions

Jered Borup

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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ABSTRACT

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Doctor of Philosophy

Although K-12 online learning has experienced exceptional growth, research in the area has lagged behind. This dissertation addressed this gap in the literature using a multiple article dissertation format. The first article used survey data from two online English courses at the Open High School of Utah (OHSU) to examine students' reported interactions with content, peers, and instructors. The large majority of students viewed all investigated types of interaction as educational and motivational. Students perceived learner–instructor and learner–content interactions to have significantly higher educational value than learner–learner interactions, and viewed learner–instructor interaction to be significantly more motivational than learner–content interaction. Furthermore, nine significant correlations were found between the time students spent on human interaction and course outcomes.

The second article examined learner–parent and parent–instructor interactions within the same context. Similar to the first article, survey data was used to measure parents' and students' perceived quantity and quality of parental interactions with students and teachers. It was found that generally students and parents viewed parent–instructor and learner–parent interactions as motivational. Students viewed learner–parent interaction as significantly more motivational than did their parents. The quantity of reported parental interactions tended to negatively correlate with course outcomes. These negative correlations may be the result of parents' tendency to increase interaction levels following poor student performance and may not reflect the actual impact of parental interactions on individual student learning.

When discussing the results in the second article, the claim was made that future research should look beyond the quantity of interactions and develop a theoretical framework that identifies and categorizes the roles of individuals in improving student outcomes. The third article of this dissertation presents such a framework that can help guide K-12 online research and design. The Adolescent Community of Engagement (ACE) framework consists of four main constructs that make up a K-12 online learning community. The first three (*student engagement*, *teacher engagement*, and *peer engagement*) build on previously established online frameworks that originally emerged from higher education contexts. In addition, the ACE framework recognizes the role of parents in their child's learning and introduces a fourth construct, *parent engagement*, which builds on two previously established face-to-face frameworks.

Keywords: K-12 online learning, online teaching, interaction, parenting, peers, teachers

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To my parents who taught me the value of education.

To my chair who guided and mentored me along the way.

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To my daughter who inspired me to do difficult things.

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DESCRIPTION OF CONTENT AND STRUCTURE

The articles that make up this dissertation focus on types, subjects, and purposes of interactions found in a K-12 online learning environment. The first article focused on Moore's (1989) three types of interactions: learner-content, learner-instructor, and learner-learner. Moore's original framing was meant to describe interactions within higher education contexts and ignored two additional types of interactions that are especially important within K-12 settings: learner-parent and parent-instructor. The second article focused on these two parental interactions. Burnham and Walden (1997) also stressed the importance of moving beyond the types of interaction and classifying interaction according to subject: "[I]nteractions have objects (things learners interact with that influence the learner) and subjects (things that the interactions are about). These two elements can and should play an important part of any classification of interactions" (p. 52). Our review of the literature identified three subjects of human interactions: content, procedural, and social.

The first two articles focused on different types of interactions, however they were both conducted at the Open High School of Utah and employed similar methods for data collection and analysis. Both articles relied on parent and student survey data to measure perceived quantity and quality of interaction as well as several course outcomes. The data were analyzed using a series of descriptive and inferential statistics. Each article ends with references and a discussion of the limitations and implications of the results. It is important to note that both articles have been published in separate journals. The first article (Borup, Graham, & Davies, 2013a) was published in the *Journal of Computer Assisted Learning* and the second (Borup, Graham, & Davies, 2013b) in the *American Journal of Distance Education's* special issue on Issues and

Frameworks for K-12 Online Distance Education. Each article was written to comply with the journals' varying recommended article length and structure.

The third article (Borup, West, Graham, & Davies, in progress) of this dissertation contains a theoretical framework termed the Adolescent Community of Engagement (ACE) framework. Although several online learning frameworks have emerged from higher education contexts, none were created to explicitly address the unique student and environmental characteristics of the K-12 online learning environment. The ACE framework was created to help guide future K-12 online learning research. Following Whetten's (1989) guidance for constructing theoretical frameworks, the ACE framework identifies and defines relevant constructs, hypothesizes how the constructs are related, and sets boundaries for which the framework is intended to be applied.

Lastly, this dissertation ends with a list of references for the article citations that were used anywhere other than the three dissertation articles.

ARTICLE 1: The Nature of Adolescent Learner Interaction in a Virtual High School

Setting

Borup, J., Graham, C. R., & Davies, R. S. (2013). The nature of adolescent learner interaction in a virtual high school setting. *Journal of Computer Assisted Learning*, 29(2), 153–167.
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Abstract

This study used survey data to measure the effect of learners' reported interactions with content, peers, and instructors on several course outcomes in two virtual high school courses that emphasized interactive learning. Surveys found that the large majority of students viewed all investigated types of interaction as educational and motivational. Students perceived learner-instructor and learner-content interactions to have significantly higher educational value than learner-learner interactions and viewed learner-instructor interaction to be significantly more motivational than learner-content interaction. Furthermore nine significant correlations were found involving the time students reported spending on human interaction and course outcomes. Seven of the significant correlations were related to the time students reported spending in human interaction and the more affective outcomes such as course satisfaction and disposition towards the subject area. Outcomes also indicate that learner-learner interaction had higher correlations with course outcomes than learners' interactions with the content or their instructor. Students' perceived learning was not significantly correlated with any type of interaction, and only students' total reported time spent on learner-learner interaction and students' social learner-learner interaction were significantly correlated with their grade.

Introduction

Historically, distance education has been the province of adult and university study programs. However, the context is quickly expanding to include adolescent learners. In 2009 Picciano and Seaman estimated that over a million K-12 students in the United States engaged in online learning (Picciano & Seaman, 2009), and some states have already begun to make online learning part of their high school graduation requirements (Alabama State Department of Education, 2009; DiPietro, Ferdig, Black, & Preston, 2008). K-12 online learning has not expanded without growing pains. The problem garnering the most attention has been its high attrition rate (Bernard et al., 2009; Cavanaugh, Gillan, Kromrey, & Hess, 2004; Cavanaugh, 2001; Ungerleider & Burns, 2003). Because there is no common metric for measuring the attrition rate in online learning it is not possible to compare the attrition in online courses to that of face-to-face courses. However, many administrators believe it to be 10-20% higher (Carr, 2000). As a result, expanding online learning programs can potentially aggravate the United States public school system's already high attrition rate wherein only about one out of every four students graduates on time with a regular diploma (Chapman, Laird, Ifill, & KewalRamani, 2011; Aud et al., 2010). It is imperative that the growth in online learning is matched with increased efforts to improve course outcomes.

Students' failure to persist in an online environment is multifaceted, including frustration over the lack of prompt feedback (Hara & Kling, 1999; Petrides, 2002), unclear instructions (Hara & Kling, 1999; Song, Singleton, Hill, & Koh, 2004), a sense of isolation and lack of community (Song et al., 2004; Vonderwell, 2003), and the absence of personal contact (Dziuban, Hartman, & Moskal, 2004). Since these problems involve the quality and levels of human interaction found in online learning, the American National Colligate Athletic Association

(NCAA) has claimed that online courses with low levels of human interaction are not “academically sound” for high school student athletes (Brown, 2010, para. 5). Furthermore, younger students tend to have less internal locus of control, fewer meta-cognitive skills, and lower self-regulation abilities, making quality interactions in virtual schools more crucial than they are with adult learners (Cavanaugh, 2007; Moore, 1993, 2007; Rice, 2006). As a result Cavanaugh et al. (2009) asserted the need for more research regarding interactions in a K-12 virtual school setting.

This research attempts to answer Cavanaugh et al.’s (2009) call for more data regarding interactions in a virtual school setting. Using survey data and student grades, we quantitatively measured effects of interactions among members of virtual high school (VHS) courses on course outcomes. More specifically, we addressed the following questions:

1. What do VHS students report about the quality and quantity of time spent on course-related interactions?
2. Does the quantity of time VHS students reported spending on interactions positively correlate with course outcomes of (a) grades, (b) perceived learning, (c) course satisfaction, and (d) improved disposition towards the subject area?

Literature Review

This section of the paper will first introduce how researchers have classified learning interaction. Following we will review the limited amount of research examining interactions in a VHS environment.

Classification of Learning Interactions

Our review of literature identified two primary types of learning interaction classifications: types and subjects.

By type. Of the three forms of interaction identified in 1989 by Moore (learner-content, learner-instructor, and learner-learner), learner-content interaction was noted as essential to any education. For such interaction to occur, the learner must be intellectually engaged with the course content in ways that improve content understanding. Moore saw that the main purposes of learner-instructor interaction as motivating and helping the learner maintain interest in the content—also presenting information, helping the learner apply course content, providing feedback, and adjusting the course structure to better fit learner needs. Moore commented that learner-peer interaction can take place with or without the instructor in a one-on-one or group setting. Although the need for learner-learner interaction is not the same for all, Moore felt that it might be more important for younger learners, who tend to find peer interaction more motivational and stimulating than adult learners.

By subject. Burnham and Walden (1997) stressed the importance of moving beyond the types of interaction and classifying interaction according to intended subject: "[I]nteractions have objects (things learners interact with that influence the learner) and subjects (things that the interactions are about). These two elements can and should play an important part of any classification of interactions" (p. 52).

Several researchers have attempted to classify interactions according to their intended subject (Berge, 1995; Gilbert & Moore, 1998; Hawkins, Barbour, & Graham, 2011; Mason, 1991; Offir, Barth, Lev, & Shteinbok, 2003), all of whom identified interactions as having a social purpose, which includes creating a friendly environment where learning can occur. Although Gilbert and Moore (1998) classified interactions regarding course management and procedures as social, the majority of the researchers viewed those interactions as a distinct category they termed *organizational* (Mason, 1991), *procedural* (Hawkins et al., 2011; Offir et

al., 2003), or *managerial* (Berge, 1995). These interactions are not directly related to the content, but set expectations, timetables, and procedural rules.

All of the researchers also identified interactions as having an instructional purpose of improving participants' content understanding. The majority of researchers grouped these interactions into a single category they termed *instructional* (Gilbert & Moore, 1998; Hawkins et al., 2011), *intellectual* (Mason, 1991), or *pedagogical* (Berge, 1995).

One area of disagreement was the categorization of feedback interactions. Hawkins et al. (2011) grouped feedback interactions with instructional interactions and Gilbert and Moore (1998) and Mason (1991) viewed them as social. Feedback interactions could also be considered procedural, as student performance is evaluated in terms of meeting the procedural expectations of the course. Such differences are to be expected since not all interaction subjects "fit neatly into one of the categories—there is overlap" (Berge, 1995, p. 24). However, Offir et al. (2003) stated that researchers must work toward clearly defining these categories: "[to] tease apart the essential elements of the interaction, and to investigate which interactions correlate with positive learning and attitudinal outcomes" (p. 71).

Benefits of Interaction in a Virtual High School Environment

Weiner's (2003) qualitative research found that VHS students perceived that learner-learner and learner-instructor interaction positively impacted their motivation, academic success, and personal growth. Weiner's research also emphasized the essential role of instructor interaction in learners' experiences, stating,

CyberSchool teachers who connected with their students, who offered structured, well-designed lessons, and who responded immediately to students' e-mails, created a positive learning environment, in which students felt comfortable and successful. The opposite

held true for students who had limited contact with their teachers, these students were often frustrated and disillusioned with distance education. (p. 49)

Similarly an extensive evaluation of an online course with a low attrition rate (4.2%) found frequent learner-instructor interaction to be a major contributor to course success (Varsidas, Zembylas, & Chamberlain, 2003). Murphy and Rodriguez-Manzanares' (2009) interviews with 42 online instructors also supported the view that learner-instructor interaction can have a motivational effect on adolescent learners. However, Beldarrain's (2008) examination of 30 VHS Spanish I students found significant relationships between learners' achievement and their interactions with content, peers, and course interface but not with their interactions with the instructor. This finding of non-significance should not be viewed simplistically. Bedlarrain noted that the instructor would typically initiate interaction following poor academic performance. A predominance of interaction of this sort could result in no correlation or even a negative correlation between learner-instructor interaction and course performance.

Hawkins, Graham, Sudweeks, and Barbour's (2013) large quantitative study (n=2,269) at a state-run VHS examined the relationship between students' perceived quality and frequency of social, instructional, and procedural interactions with the instructor. It was found that the quality and frequency of interaction impacted course completion rates but not on grades. The researchers hypothesized that one possible reason for the non-significant relationship between interaction and awarded grades was students' varying success goals including several students who were motivated by completion of the course and not on the final course grade.

Zucker's (2005) examination of 230 VHS students' and 16 teachers' survey responses found that all teachers indicated that they valued learner-learner interaction, and about two-thirds of the students either agreed or strongly agreed that learner-learner interactions were an

important part of their learning. However, 69% of the instructors and only 32% of the students felt that learner-learner interaction helped motivate students to learn (a 37% gap), and 75% of the instructors and 46% of the students (a 29% gap) felt that learner-learner interaction helped students to actually learn the course material. While the minority of students felt that learner-learner interaction improved their motivation and content understanding, the large majority of students (77%) indicated that learner-learner interaction was valuable because it “gave them the ability to know other students and their points of view” (p. 51). These findings may indicate that learner-learner interaction had a larger impact on outcomes not measured in this study.

In summary, research supports that learner-content (Beldarrain, 2008), learner-instructor (Hawkins et al., 2011; Weiner, 2003; Varsidas et al., 2003) and learner-learner interactions (Weiner, 2003; Beldarrain, 2008; Zucker, 2005) have positively impacted students’ academic success. However, Beldarrain (2008) did not find a significant relationship between students’ academic achievement and their interaction with instructors, possibly due to the prevalence of instructor-initiated interactions following poor academic performance. And while Zucker’s (2005) findings suggest learner-learner interaction to be an important part of student learning, less than half of the study participants considered interactions with their peers to be motivational or beneficial in actually learning the course content. Zucker’s findings indicate that learner-learner interaction alone may not have a direct impact on student learning and motivation and that instructors should design collaborative learning activities that better utilize peer interaction to achieve learning outcomes. Only Hawkins et al. (2013) examined the subject of students’ interactions with their instructor, finding social, instructional, and procedural interactions with the instructor to be positively correlated with student grades.

Methods

This research was conducted at the Open High School of Utah (OHSU), a virtual charter school which opened in the fall of 2009. Although OHSU has a relatively small student body it has been recognized locally and nationally for its innovative learning model. For instance, at the 2011 State Educational Technology Directors Association Education Forum, the current U.S. Secretary of Education recognized OHSU as an example of how online learning can transform student learning (Duncan, 2010).

According to its charter, OHSU was established to provide students with an innovative online experience that provides a rich and responsive curriculum and a high level of learner-instructor and learner-learner interaction (Wiley, 2009). OHSU exclusively uses and creates its curriculum from open educational resources so that it can be adapted in response to student needs. OHSU also works to create visually engaging content. Courses utilize asynchronous communications, providing students with an any-time-any-place learning model. According to OHSU's 2010 annual report, instructors have four office hours per day during which students can synchronously contact them (OHSU, 2010) and four hours a day during which they identify and contact struggling students to attempt to engage them in the course (OHSU, 2010). The school also provides several non-mandatory opportunities to have face-to-face interactions with peers and instructors, including social and academic events (OHSU, 2010).

Participants

According to the school charter, 127 freshman students enrolled in OHSU during the 2009-2010 academic year and were taught by four instructors (Wiley, 2009). The following academic year OHSU added a sophomore class to bring their total enrollment to 250 students and eight full-time instructors. To be accepted, students must be Utah residents and enroll in the

four core courses offered by OHSU; the majority of students take all six of their courses from OHSU. The school's annual report for the 2009-2010 school year stated that Caucasians made up over 95% of the school's population, with only six minority students enrolled. Nearly 19% of the students were "economically disadvantaged," and nearly 8% were designated as needing "special education" (OHSU, 2010). Demographic information for the 2010-2011 academic year is not currently available.

To ensure inclusion of a large majority of students, researchers and OHSU administrators selected two core freshman English courses for analysis. One was selected from the second semester of the 2009-2010 year, and other from the first semester of the 2010-2011 year.

Data Collection

Researchers created and administered to students of the two selected courses a survey measuring the frequency of Moore's (1989) three types of interaction (student-instructor, student-student, student-content), asking students what percentage of their interactions with others were focused on social, content, and administrative topics (see Table 1). The survey also attempted to measure three course outcomes: students' perceived learning, their course satisfaction, and their perceptions of changes in their disposition toward course material (see Table 2). In addition OHSU provided researchers with students' final course grades to determine student performance.

Researchers conducted think-aloud phone interviews concerning the surveys with two students who had previous VHS experience. Following Dillman's (2000) recommendation the researchers asked students to read out loud the survey items and verbalize everything they were thinking. The students were asked to pay particular attention to anything that was confusing or frustrating. It was also common for the researchers to ask the students specific questions

regarding the meaning of terms. The think-aloud interviews resulted in minor changes to the wording of some items.

Table 1

Operational Definitions of Interaction Inputs

Types of Interaction	Definition
Learner-content	Students' time spent working on course materials doing assignments, readings, etc.
Learner-instructor	Students' time spent interacting with their teacher talking (face-to-face or on the phone), text-chatting, writing/reading emails, etc.
Learner-learner	Students' time interacting with other students in the course talking (face-to-face or on the phone), text-chatting, writing/reading emails, etc.
Subject of Human Interaction	Definition
Content	Students' interaction with others focused on improving content understanding by clarifying, explaining, expanding the course material, etc.
Procedural	Students' interactions with others focused on course requirements, assignment due dates, grades, technical issues, course expectations, etc.
Social	Students' interactions with others focused on motivation, encouragement, personal interest, clubs, humor, service projects, etc.

Table 2

Survey Items Used to Measure Course Outcomes

Course Outcome	Survey Item
Perceived learning	On a scale of 0 to 5, how much did you learn in the first semester of this course? (0= <i>you learned nothing</i> and 5= <i>you learned a great amount</i>)
Course satisfaction	On a scale of 0 to 5, how satisfied were you with the first semester of this course? (0= <i>not at all satisfied</i> and 5= <i>extremely satisfied</i>)
Change in disposition	After taking the first semester of this course I enjoy learning about the content area much more than I did before I took the course. (1= <i>strongly disagree</i> and 6= <i>strongly agree</i>)

Researchers administered the surveys via email in September 2010 to analyze the final semester of the 2009-2010 academic year and February 2011 to analyze the first semester of the 2010-2011 academic year. Researchers used similar procedures to obtain parental consent.

Data Analysis

Researchers combined survey results from the two semesters for analysis. To answer the first research question, they used descriptive statistics and one-way ANOVAs to measure and compare students' perceived quantity and quality of course-related interactions. They addressed the second research question using a Spearman rho correlation analysis—the nonparametric equivalent of the Pearson correlation coefficient. Researchers chose nonparametric tests over their parametric counterparts because several frequency distributions were markedly skewed, which violated the assumptions of normality that these parametric tests require. An alpha level of .05 was used to test all statistical significance.

Results

Ninety-seven of the 250 surveyed students (38.8%) completed the survey and parental consent to participate in the study was obtained for 83 of those 97 respondents. Prior to analysis, researchers examined the data for errors and one fall 2010 survey was removed resulting in a usable survey response rate of 32.8%. Of the remaining 82 respondents, 42 were female. Researchers combined the survey responses from the winter 2010 semester ($n=37$) and the fall 2010 semester ($n=46$).

Research Question 1: Reported Quantity and Quality of Interactions

The first research question was addressed by asking students to respond to items regarding the quantity of time they spent on course interactions and the quality of those interactions. Initial analysis of students' reported quantity of interactions found one invalid response to an item and four extreme outliers (students reporting improbably high amounts of interaction), which adversely affected the statistical means. To more accurately represent the quantity of interaction that occurred in the course, the invalid response and four outliers were removed when calculating students' reported frequency of interactions. The removal of outliers corrected the skewed distributions to a more acceptable range; however, the remaining distributions remained somewhat positively skewed, and student responses regarding the amount of time that they spent on course interactions varied greatly (see Table 3).

On average students reported spending about 8 hours per week on course interactions. Learner-content interaction made up 72.3% of that time. In addition, students reported spending an average of about 1.5 hours on learner-learner interactions and 42 minutes on learner-instructor interactions. Learner-learner interaction had a somewhat bi-modal distribution, with 17 students reporting no learner-learner interaction and 14 students reporting 3.5 or more hours per week.

Students also reported that they initiated interactions with their instructor slightly more often than vice versa (54.4%).

Table 3

Reported minutes per week students engaged in different types of interaction

Subject of interaction	<i>n</i>	Median	Mean	SD	Skewness factor	Percent of total interaction
Learner-content	77	300	347.86	220.76	1.50	72.28
Learner-instructor	77	30	42.07	44.99	1.66	8.74
Learner-learner	77	30	91.32	125.28	1.86	18.98

Students perceived that 45.3% of their human interaction was social, with content and procedural interactions combined comprising less than 55% of their interactions with instructors and peers (see Table 4). Almost 90% of students' social interactions were learner-learner (see Table 5). Students reported that 59.3% of learner-learner interactions were social. In contrast, social interactions made up only 14.2% of learner-instructor interaction, with 40.4% focused on content and 45.3% on procedural aspects of the course. While there was not a wide disparity between the source of students' content and procedural interactions, students reported that the majority of their content interaction (54.8%) came from peers and the majority of their procedural interactions (56.2%) came from the instructor (see Table 6).

Table 4

Reported minutes per week students interacted with instructors and peers regarding content, procedural, and social topics

Type of interaction	Subject of interaction	<i>n</i>	Median	Mean	SD	Skewness factor	Percent of total
Learner-instructor	Content	77	8.00	17.82	25.86	2.69	40.44
	Procedural	77	10.80	19.97	20.28	1.79	45.32
	Social	77	2.70	6.27	10.68	3.01	14.23
Learner-learner	Content	77	7.5	21.60	31.52	1.79	23.65
	Procedural	77	4.5	15.57	25.40	2.29	12.05
	Social	77	12	54.15	96.40	2.74	59.30
Total	Content	77	24	39.42	42.84	1.36	29.55
	Procedural	77	21	33.55	37.99	2.03	25.15
	Social	77	16.4	60.42	100.73	2.81	45.30

Table 5

Reported minutes per week students interacted with instructors and peers categorized according to their intended subject

Subject of interactions	Type of interactions	<i>n</i>	Median	Mean	SD	Percent of total
Content	Learner-instructor	77	8.00	17.82	25.86	45.21
	Learner-learner	77	7.5	21.60	31.52	54.79
Procedural	Learner-instructor	77	10.80	19.97	20.28	56.19
	Learner-learner	77	4.5	15.57	25.40	43.81
Social	Learner-instructor	77	2.70	6.27	10.68	10.38
	Learner-learner	77	12	54.15	96.40	89.62

A six-point Likert scale (1=*strongly disagree*/ 6=*strongly agree*) measured students' perception of the educational value of the different types and subjects of interactions they experienced in the course, with no response indicating they did not experience a specific kind of interaction. In general, students reported all investigated types and subjects of interaction as valuable to their learning (see Table 6). A one-way ANOVA showed that the educational value of the three types of interaction (with the content materials, peers, and instructor) differed significantly, $F(2, 215) = 16.358, p < .001$. A post hoc test showed students perceived learner-instructor and learner-content interactions to have significantly higher educational value than learner-learner interactions. Still nearly 95% of students felt learner-learner interactions to be valuable to their learning. No significant difference was found between the educational value of learner-instructor and learner-content interactions reported by students.

Descriptive statistics showed that students tended to view interactions with their peers and instructor regarding content to be more valuable to their learning than interactions on course procedures and social matters. A one-way ANOVA confirmed that the subjects of learner-instructor interaction differed significantly in perceived value to student learning $F(2, 201) = 4.696, p=.010$. As expected, a post hoc test showed that learner-instructor interaction focused on the content was significantly more valuable to their learning than their learner-instructor interaction for social purposes ($p=.010$) Likewise, students perceived their learner-instructor interaction regarding course procedures as considerably more valuable to their learning than learner-instructor interactions for social reasons. However, this difference was not quite statistically significant ($p=.053$). A one-way ANOVA showed no significant difference in the educational value of students' interactions with their peers regarding the content, social matters, or course procedures $F(2, 167) = 2.098, p=.126$.

Table 6

Descriptive Statistics Regarding Students' Perceived of Educational Value of Interaction

Interaction type	Interaction subject	<i>n</i>	Agreed	Percent agreed	Median	Mean	SD
Learner-Content		81	79	97.53%	5	5.01	0.814
Learner-Instructor		74	68	91.89%	5	5.09	0.995
	Content	71	67	94.37%	5	5.06	0.924
	Procedural	75	67	89.33%	5	4.95	0.928
	Social	58	51	87.93%	5	4.55	1.062
Learner-Learner		63	52	82.54%	4	4.22	1.128
	Content	62	59	95.16%	5	4.58	0.821
	Procedural	53	46	86.79%	4	4.32	1.015
	Social	55	42	76.36%	4	4.22	1.134

Note. Students responded using a six-point Likert scale (1=*strongly disagree* and 6=*strongly agree*). The number of respondents varied because students who did not experience a kind of interaction did not respond.

Researchers used the same Likert scale to measure the motivational value of the different types and subjects of interactions students experienced in the course. On average students reported all investigated types and subjects of interaction to be motivational (see Table 7). A one-way ANOVA and post hoc analysis showed that students felt the motivational value of learner-instructor interaction to be significantly greater than learner-content interaction, $F(2, 214) = 5.409, p = .005$.

Students tended to view their learner-instructor and learner-learner interactions regarding the course content to be more motivational than those concerning course procedures and social matters (see Table 8). However, one-way ANOVAs showed no significant difference between students' reported motivational value of the various subjects of their interactions with their instructor ($F(2, 198) = .198, p=.820$) and their peers ($F(2, 163) = .373, p=.690$).

Table 7

Descriptive Statistics Regarding Students' Perceived Motivational Value of Interaction

Interaction type	Interaction subject	<i>n</i>	Agreed	Percent agreed	Median	Mean	SD
Learner-content		81	67	82.72%	4	4.20	1.077
Learner-instructor		74	65	87.84%	5	5.09	1.101
	Content	70	64	91.43%	5	4.79	1.006
	Procedural	74	65	87.84%	5	4.68	1.048
	Social	74	66	89.19%	5	4.78	1.101
Learner-learner		62	50	80.65%	4.5	4.39	1.206
	Content	59	50	84.75%	5	4.53	1.040
	Procedural	52	43	82.69%	5	4.37	1.189
	Social	55	44	80.00%	4	4.36	1.223

Note. Students responded using a six-point Likert scale (1=*strongly disagree*/ 6=*strongly agree*).

The number of respondents varied because students who did not experience a kind of interaction did not respond.

Research Question 2: Interaction and Course Outcome Correlations

The second research question asked if students' reported quantity of time spent on course interactions correlated with four course outcomes: (1) students' end-of-semester percentage grade, (2) students' perceived learning, (3) students' perceived course satisfaction, and (4) students' change in disposition toward the course content. Researchers conducted several Spearman rho correlations to determine such relationships (see Table 8). The majority of the correlations suggested no relationship between course outcomes and the amount of time students reported on interactions. No significant correlations existed between the time students spent on course interactions and their perceived learning or between students' reported time spent on learner-content interactions and any of the four course outcomes. However, results showed nine significant correlations.

Four of the nine significant correlations were related to students' disposition toward the course content and their human interactions. More specifically, students' disposition toward the content was significantly correlated with their overall time spent on learner-learner interactions ($r=.307, p=.005$), their content interactions with their peers ($r=.299, p=.006$) and instructor ($r=.288, p=.009$), and their social interactions with their instructor ($r=.232, p=.036$). In addition, students' disposition toward the content had a low-to-medium correlation with their overall reported time spent on learner-instructor interactions ($r=.211, p=.057$) and their time spent on social learner-learner interactions ($r=.205, p=.065$), but these were not significant.

While results showed no significant correlations between students' course satisfaction and the time they spent on learner-instructor interactions, student satisfaction was significantly correlated with their total time spent on learner-learner interactions ($r=.291, p=.008$) and their time spent on learner-learner interactions regarding the course content ($r=.240, p=.030$) and

procedures ($r=.226, p=.042$). Similarly researchers found no significant correlations between students' grade and the time they spent on learner-instructor interactions, but they found significant correlations between students' grade and their overall time spent on learner-learner interactions ($r=.257, p=.020$) and social learner-learner interactions ($r=.290, p=.008$).

Table 8

Correlations Between Students' Quantity of Interaction and Course Outcomes

Interaction type	Interaction subject	Grade	Perceived learning	Course satisfaction	Improved disposition
Learner-content		.057	.188	-.058	.103
Learner-instructor		.099	.119	.091	.211
	Content	.078	.144	.120	.288**
	Procedural	.070	.162	.144	.147
	Social	.006	.106	.076	.232*
Learner-learner		.257*	.197	.291**	.307**
	Content	.170	.190	.240*	.299**
	Procedural	.159	.172	.226*	.176
	Social	.290**	.123	.167	.205

Note. * $\alpha < .05$ ** $\alpha < .01$

Discussion

This section of the paper we discuss the findings of this research within the context of the existing literature. Following we will highlight the limitations of this research and how future research could possible addresses these limitations to build a better understanding regarding the impact of learning interactions' impact student outcomes.

Quantity and Quality of Interaction

Students' reported quantity of time spent on course interactions varied greatly. Although the cause of this variation is unknown, it may be a reflection of student characteristics and a highly flexible online learning environment. Unlike traditional face-to-face instruction which regulates seat time for each student, online learning affords students the ability to progress at a pace appropriate to their ability to master the content. Swanson (1990) found students' metacognitive abilities, not aptitude, to be correlated with time students took to solve problems. Sternberg (2002) defined metacognition as "children's knowledge and control of their cognitive processing" (p. 604). Metacognition is closely related to students' self-regulation. Winne (1995) stated that self-regulated learners have the ability to set learning goals and sustain their motivation as they work to achieve them. Thus in a flexible online learning environment, it is likely that students with higher metacognition and self-regulation skills will spend less time on learner-content interaction than their less able peers.

Variability was greater in students' reported time interacting with their instructor. Instructors may spend an equivalent amount of time on a course whether teaching online or face-to-face, but *how* they spend their time can differ drastically. Face-to-face instructors teaching the same content to multiple classes spend much time duplicating instructional activities, whereas many online instructors who teach asynchronously can use technology to create instructional activities once and make them available to students to access at their own convenience. Additionally, face-to-face instructors have custodial and supervision responsibilities which in a virtual school are shifted to parents, freeing instructors for more individual interactions with students (Russell, 2004). Thus the online instructors in this study may have been able to spend more of their time on individualized learner-instructor interactions where needed, resulting in a

high variance in learner-instructor interactions. Time flexibility, access to peers' contact information, and varying desire for peer interaction may have contributed to high variance in students' reported quantity of learner-learner interaction.

A large majority of students viewed all investigated types of interaction as motivational and valuable to their education. This finding supports previous K-12 online learning research that found learner-learner (Weiner, 2003) and learner-instructor interactions (Murphy & Rodriguez-Manzanares, 2009; Weiner, 2003; Varsidas et al., 2003) to be motivational and educationally valuable. This also contradicts Zucker's (2005) finding that a minority of students viewed their learner-learner interactions as motivational and helpful in learning the course material. Students in this study reported that learner-instructor interactions were significantly more motivational than learner-content interactions and that their learner-learner interactions had motivational effects similar to their learner-instructor interactions. These findings support Moore's (1989) claim that motivating students to learn content is a purpose of learner-instructor and learner-learner interactions. However, students perceived the educational value of their interactions with peers to be significantly lower than that of their interactions with instructor and content, perhaps because their learner-learner interactions were mostly classified as social.

Social interactions are an important part of online learning because they allow learners and instructors to establish a presence in the course and convey themselves as real people (Garrison et al., 2000). In addition, social interactions help to establish environments that "draw reluctant participants into the discussion" and facilitate shared thinking activities (Garrison & Anderson, 2003, p. 54). Previous researchers analyzed students' posts to a course discussion board and concluded that social presence is required for deep learning to occur (Rourke, Anderson, Garrison, & Archer, 2001). This supports researchers' recommendation to dedicate

time for social interactions at the start of the semester (Murphy & Rodriguez-Manzanares, 2009; Tu & Corry, 2002; Tu & McIsaac, 2002). However, Rourke et al. (2001) warned that too much social presence may harm student learning. Garrison and Anderson (2003) explained, “Too little social presence may not sustain the community. On the other hand, too much social presence may inhibit disagreement and encourage surface comments and social banter” (p. 53). Following the establishment of social presence instructors should work to focus learner-learner interactions more on content. If this is done students will likely perceive learner-learner interactions to be more educational.

Relationship of Outcomes to Interaction Levels

Although many educators are “convinced that if student time on task is increased, an increase in student achievement will follow” (Stallings, 1980, p. 11), we found no significant correlation between the time students reported interacting with course materials and their course outcomes. Though this finding may seem to contradict time-on-task theories, it may simply reflect students’ varying ability to interact with the course content as stated above. Stallings (1980) argued that researchers should not only examine how much time a student spends on task but “how the available time is used” (p. 11). It is possible that some students simply used their learner-content interactions less efficiently and required more time on task to achieve similar learning outcomes. Bernard et al. (2009) concluded that, “Increasing the quantity of interaction may lead to enhanced learning and satisfaction, but increasing the quality of such interactions ... may be of greater importance” (p. 1266).

Although no significant correlations were found related to learner-content interactions, nine significant correlations were identified between students’ reported time spent on human interaction and course outcomes, reflecting four major trends. First, seven of the nine significant

correlations were between the time students spent on human interaction and the affective outcomes of course satisfaction or improvement in content disposition. Second, seven of the nine significant correlations were between the time spent on learner-learner interactions and course outcomes. This finding supports Beldarrain's (2008) finding that within a K-12 online setting learner-learner interaction tended to be more highly correlated with achievement than was learner-instructor interaction. However, Arbaugh and Benbunan-Fich's (2007) and Swan's (2002) large correlational studies conducted in higher education found online students' learner-instructor interactions to have a larger effect on affective course outcomes than did learner-learner interactions. This apparent contradiction between K-12 and higher education supports Moore's (1989) claim that learner-learner interaction plays a more crucial role in young students' learning as compared to adult learners. Third, researchers found only one significant correlation related to students' procedural interactions with their peers and instructor. Finally, students' perceived learning was not significantly correlated with any of the types or subjects of human interaction, and only students' total time spent on learner-learner interaction and students' social learner-learner interaction were significantly correlated with their grade. Picciano (2002) similarly found that higher education students' quantity of interaction on course discussion boards was not significantly correlated with their exam performance. It is possible that human interaction has a stronger effect on affective course outcomes than on students' demonstrative performance.

Like Beldarrain (2008) we warn against simplistic interpretation of non-significant correlations; alternative reasons may explain them. OHSU's charter stated that instructors spend half of their work day contacting low performing and possibly less satisfied students to attempt to more fully engage them in the learning process (Wiley, 2009). A high volume of such

interaction would diminish the correlation between learner-instructor interaction and course outcomes, possibly resulting in no correlation or even a negative correlation for some.

It is also likely that absence of stronger correlations between students' reported time spent on learner-learner interaction and their learning outcomes was due to their peer interaction being largely social, with less than 25% focused on course content. If instructors guide learner-learner interaction to focus more on collaborative learning and shared learning activities, stronger relationships between learner-learner interaction and learning outcomes will likely emerge. In addition, the low correlation between learning outcomes and procedural interaction with instructor and peers may reflect the need of students with lower self-regulation and meta-cognitive abilities for more procedural reminders than more able students.

Limitations and Future Research

Several limitations of this study should be addressed by future research. This study was limited to student interactions in a single virtual high school, grade, and content area, making our findings difficult to generalize to other contexts. Future research should be conducted across multiple contexts: settings, grade levels, and content areas. In addition, data from this research were not normally distributed because several students reported abnormally high levels of interaction. Information gained from research on larger populations will likely show distributions that are less skewed, allowing for more parametric testing to be used and increasing the statistical validity of the results.

Cook, Heath, and Thompson's (2000) meta-analysis of online surveys used in 49 studies reported a mean response rate of 39.6% and Sheehan's (2001) review of online surveys used in 31 studies reported a mean response rate of 36.8%. Similarly, the initial response rate of this study was 38.8%. However, parental consent was only obtained for 85.6% of responding

students and one survey was removed due to errors resulting in a final usable response rate of 32.8%. Due to the small and largely homogenous student population, little was done in the current research to ensure that respondents were representative of the OHSU student population. Future research should work to improve student and parent participation and more importantly obtain quality response representativeness of diverse student populations (Cook et al, 2000).

Additionally, the research relied exclusively on data from one self-report quantitative survey. Greene, Caracelli, and Graham (1989) warned “that all methods have inherent biases and limitations, so use of only one method to assess a given phenomenon will inevitably yield biased and limited results” (p. 256); these researchers recommended triangulating with a mixed methods approach, which can enrich and deepen understanding. Future research should use a variety of quantitative and qualitative data sources: e.g., instructor and student interviews, open- and closed-ended survey items, email and discussion board communication, course management software analytic data, additional holistic measures of student performance such as GPA, and instructor and school records. Obtaining information regarding minors can be difficult, and qualitative data analysis can be laborious. However, potential for understanding effects of interaction on student learning make this work critical.

Conclusion

This research used students’ self-report survey data to describe learners’ interactions in a VHS course. Although students’ perceived quantity of interaction varied greatly, they tended to view all investigated types of interaction as motivationally and educationally valuable. They perceived learner-instructor and learner-content interactions to have significantly higher educational value than learner-learner interactions. In contrast to students’ reported value of the different types of interaction, correlations with course outcomes indicated a stronger relationship

with learner-learner interaction than the other types of interaction. Seven of the nine identified significant positive correlations between students' reported quantity of time spent on the different types and subjects of interactions involved learner-learner interactions. Only two exceptions were found. Students' improvement in disposition toward the content was significantly correlated with their reported quantity of learner-instructor interactions regarding the content ($r=.288, p=.009$) and social matters ($r=.232, p=.036$). In addition seven of the nine identified significant correlations were with the more affective course outcomes, i.e. course satisfaction and improved disposition toward the content.

It remains unclear why learner-learner interactions would be more highly correlated with course outcomes while students perceived learner-learner interactions to be significantly less educationally valuable than their interaction with the content and instructor. A closer examination of the correlation patterns may shed light on this apparent contradiction. Only students' total reported time spent in learner-learner interactions and in social learner-learner interactions were correlated with students' end of semester grade. It is possible that learner-instructor interactions are more beneficial to students' end of course grade but are not shown in correlations across a large number of students with varying performance levels because of instructors' tendency to increase their quantity of interactions with individual students following their low academic performance. This type of interaction pattern could significantly weaken the correlation between the quantity of learner-instructor interactions and student performance indicators. In contrast, learner-learner interactions are likely less prone to increase in reaction to low student performance and may simply be an indicator of students' willingness to engage in the course. It is also possible that more able and self-regulated students required less content and procedural interactions freeing more time for social interactions. These interaction patterns

would result in a low or even negative correlation between students' quantity of learner-instructor interaction and student performance indicators and a significant positive correlation between students' quantity of learner-learner interaction and student performance indicators. In addition the lack of significant correlations between course outcomes and students' reported quantity of learner-content interactions may simply reflect students' varying ability to interact with the course content.

This study offers implications for designing and teaching VHS courses. Student motivation is one element that contributes to student success (Murphy & Rodriguez-Manzanares, 2009; Weiner, 2003). The current study results support Weiner's (2003) qualitative findings that learner-instructor interaction can affect student motivation and learning; data further demonstrate similar effects for learner-learner interaction—and thus the need to design interaction-rich learning environments for virtual high school students (Garrison, Anderson, Archer, 2000). Because instructor interaction time is limited and can be costly, online instructors with high student enrollment need to balance large group interaction with individualized one-on-one consultations. Cavanaugh et al.'s (2009a) national virtual schooling survey found that nearly 90% (n=72) of the 81 responding schools either had learner-instructor interaction policies or were in the process of creating them. Most of these policies required instructors to make additional contacts with lower performing or inactive students. Our findings support such policies.

A more industrial model of instruction that implements division of labor principles may enable a VHS to provide all students with higher levels of quality learner-instructor interaction (Peters, 1971) enabling instructors to utilize their rich content and pedagogical knowledge to effectively teach students (Shulman, 1986). Peters (1971) explained that through careful

planning a teacher's responsibilities and functions can be divided and assigned to other workers or technology. For instance, procedural interactions simply require an individual who is knowledgeable about course procedures, an aide could handle them, allowing instructors to focus primarily on content interactions with students. Adria and Woudstra (2001) reported that this form of division of labor principles was effective in a large higher education distance education setting. A call center was created and manned by individuals who were familiar with course procedures. When students called or emailed the call center the person receiving the request responded to procedural inquiries and relayed content related inquiries to the instructor. The researchers found that most of student inquiries were adequately addressed by the call center and did not require the attention of the instructor. It is possible that similar methods could be used in the VHS setting and may allow instructors to better focus their interactions with students on the content.

Results from this study also support the need for instructors and course designers to create collaborative and rigorous shared thinking activities to make better use of learner-learner interaction, which tends to be largely social if left unchecked. Although some level of social interaction may be essential it is not sufficient for quality learning to occur. Garrison and Cleveland-Innes (2005) explained that "the leadership role of the instructor [is] powerful in triggering discussion and facilitating high levels of thinking and knowledge construction" (p. 137) and that "quality interaction (i.e. critical discourse) must be a specific design goal" (p. 141). The instructor must design and trigger quality learner-learner interaction focused on the content and then monitor these discussions to ensure that the learner-learner interactions are focused on the learning objective. Garrison and Anderson (2003) explained that "this requires more than a

‘guide on the side’ but less than a ‘sage on the stage’” (p. 69). Future research can aid instructors in their design of shared thinking activities. Woo and Reeves (2007) stated:

The bottom line is that to increase the learning effects of online interaction, we should, first of all, understand clearly the nature of interaction within the framework of social constructivist learning theory. Once we gain such an in-depth understanding, we should be able to engage in productive research and development to identify the necessary design principles for implementing more effective interaction activities within Web-based learning environments. (p. 23)

A close relationship between researchers, course designers, and instructors can prove to be beneficial to our understanding of K-12 online interactions and improving course outcomes for the growing number of VHS students.

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ARTICLE 2: The Nature of Parental Interactions in an Online Charter School

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Abstract

A belief commonly held in the K-12 education community is that parents can have a positive impact on their child's learning. However, little research has examined parental involvement in an online learning environment. With online enrollments increasing rapidly, it is important to examine parents' significant role in K-12 online learning and their impact on course outcomes. Using survey data, researchers found that generally students and parents viewed parent-instructor and learner-parent interactions as motivational. Students viewed learner-parent interaction as significantly more motivational than did their parents. The quantity of reported parental interactions was generally negatively correlated with course outcomes. These negative correlations may be the result of parents' tendency to increase interaction levels following poor student performance and may not reflect the actual impact of parental interactions on individual student learning.

Introduction

The U.S. Department of Education (2010) stated that parents need to be more fully integrated into children's learning activities, which includes increasing and improving interactions with their children and their children's teachers. Such interactions have an important role in their child's learning for a variety of reasons. K-12 students tend to have an external locus of control, with fewer meta-cognitive skills and self-regulation abilities than adult learners (Cavanaugh, Barbour, & Clark, 2009a; Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004; Moore 1989). Thus most K-12 students require adult supervision to encourage and monitor their learning (Cavanaugh et al., 2004). In traditional brick-and-mortar schools, these custodial and supervisory responsibilities are performed by school teachers and administrators. However, K-12 online enrollments are increasing rapidly, and more and more students are taking courses from home (Picciano & Seaman, 2009), requiring parents to assume more of the traditional teacher responsibilities. This condition may make parental involvement more important in K-12 online learning than in traditional education settings (Liu, Black, Algina, Cavanaugh, & Dawson, 2010; Russell, 2004). Unfortunately, the current parental involvement literature focuses mainly on the traditional face-to-face setting (Black, 2009; Liu et al., 2010). Although researchers may glean insights from this research, Liu et al. (2010) warned that the effects of parental involvement may be different in an online environment than on traditional face-to-face student learning.

In this paper we attempted to address the gap in the literature and quantitatively examine parental interactions during online learning. This research addressed the following questions for an online charter school called the Open High School of Utah (OHSU):

1. What are students' and parents' perceived quantity of course-related parental interactions?
2. What motivational value do students and parents place on course-related parental interactions?
3. Does the quantity of parental interactions reported by students and parents correlate with course outcomes?

In this paper we will first describe the previously identified types and subjects of interactions that occur in educational settings. Next we will review the previous research regarding parental interactions in K-12 face-to-face and online environments. Following, we will share the findings from our research conducted at OHSU and discuss the implications. Finally, we will identify the limitations of this research and suggest ways future researchers may work to improve our understanding of the impact of parental interactions on online student learning.

Literature Review

Moore (1989) argued that without distinctions between the different types of interactions the term *interaction* would become meaningless. To this end Moore wrote an editorial identifying three types of interactions: learner-content, learner-instructor, and learner-learner (Moore, 1989). He explained that learner-content interaction is the “defining characteristic of education” (p. 2); it occurs when learners spend time with content materials resulting in an increase in understanding. Moore (1989) believed learners' interactions with their instructor and peers can also have several learning benefits. For instance, learner-instructor interactions can maintain student motivation, present new information, model skills and attitudes, help students apply their learning, assess student learning, and provide feedback. In addition, learner-learner

interactions can help learners develop group interaction skills as they stimulate and motivate learners to engage in learning activities (Moore, 1989).

Burnham and Walden (1997) did not consider grouping interactions by type to be sufficient, asserting that interactions should also be categorized by their subject. Table 9 summarizes the articles that have attempted to classify interactions according to their subject and to the roles that instructors fulfill when interacting with students (Berge, 1995; Gilbert & Moore, 1998; Hawkins et al., 2011; Heinemann, 2005; Offir et al., 2002). All authors identified course content as an important subject of interactions. All authors also viewed interactions as having a social element when topics are not directly related to the course content. Similar to social interactions, procedural interactions are not directly related to the course content, but set assignment requirements and course timetables. Gilbert and Moore (1998) recognized this similarity and grouped procedural interactions in the category of social interactions; however, all other authors viewed procedural interactions as a separate subject. Online learning requires students to be skilled at using the course interface and learning tools (Hillman, Willis, & Gunawardena, 1994), and students tend to seek help from the instructor when technological problems arise (Weiner, 2003). Berge (1995) grouped these interactions regarding technological issues as its own category, while Hawkins et al. (2011) and Offir, Lev, Lev, and Barth (2002) grouped them with procedural and administrative interactions. These discrepancies are not surprising, and some interactions likely have overlapping subjects and purposes (Berge, 1995). It is important to note that only Hawkins et al. (2011) examined and categorized interactions in the K-12 online environment.

Table 9

Identified Subjects of Interactions

Article	Identified Interaction Subjects			
Berge (1995)	Pedagogical	Social	Managerial	Technical
Gilbert & Moore (1998)	Instructional	Social		
Hawkins, Barbour, & Graham (2011)	Instructional/ Intellectual	Social/ Supportive	Procedural/ Organizational	
Heinemann (2005)	Intellectual	Social	Organizational	
Offir, Lev, Lev, & Barth (2002)	Content-related	Social	Administrative	

While Hawkins et al.'s (2011) teacher interviews showed that the above forms and subjects of interaction exist in K-12 online learning, two additional types of interaction should be examined: learner-parent and parent-instructor. Research on these two types of interaction in an online setting has been limited. However, K-12 face-to-face research may provide insights into how learner-parent and parent-instructor interactions may impact online course outcomes. In this section we will first review literature examining the impact of parental involvement in a face-to-face context. Following, we will review the limited research regarding parental impact in an online environment.

Parental Involvement in Traditional Learning

In an attempt to summarize the vast research on parental involvement in a face-to-face setting, this section will describe three meta-analyses that included 116 studies (Fan & Chen, 2001; Hill & Tyson, 2009; Jeynes, 2005). Fan and Chen's (2001) meta-analysis, the largest of the three, found a correlation coefficient of 0.25 between overall parental involvement and

academic achievement. While this shows a low-to-moderate correlation, Fan and Chen (2001) stated that in the social sciences it “should not be regarded as trivial” (p. 11).

The meta-analyses identified some dimensions of parental involvement to be more strongly correlated with academic achievement than others. For instance, Fan and Chen (2001) found that parental home supervision practices such as limiting students’ off-task behavior and distractions had the weakest relationship with student performance and that parents communicating high expectations had the strongest relationship. Similarly, Jeynes (2005) reported that parental style and expectations were more strongly related with educational outcomes than setting rules or attending school activities. Additionally, Hill and Tyson (2009) found parental help with homework to have the lowest correlation with students’ academic achievement.

These low correlations “should not be interpreted simplistically” (Fan & Chen, 2001, p. 13). Some parental interactions such as help with or supervision of homework are likely in reaction to poor student achievement and/or behavior. Thus a high volume of these parental interventions may actually improve student performance for individual students but would show a low or negative correlation across many students with varying performance levels (Fan & Chen, 2001; Hill & Tyson, 2009).

Parental Involvement in Online Learning

A national survey found that 43 of the 81 responding virtual schools had policies in place regarding the frequency of parent-instructor interaction, and 13 were in the process of creating similar policies (Cavanaugh et al., 2009b). The majority of these policies explicitly required teachers to contact parents regarding student progress, but the frequency of contact ranged from weekly to quarterly. All of the existing policies required more frequent contact with parents of

low performing and absentee students. While these policies emphasized the frequency and topic of contact, the mode of communication was typically not specified, with only 26% of policies addressing the need for the interaction to be synchronous (Cavanaugh et al., 2009b). Although these types of parental interactions appear commonplace, Black, Ferdig, and DiPietro (2008) found that few virtual schools actually track parental involvement activities, and Liu et al. (2010) noted researchers have neglected to give proper attention to parental involvement in virtual schooling. The balance of this section will be spent reviewing the existing parental involvement research.

Some research has indicated that parents fail to understand their role in children's online learning (Boulton, 2008; Like, 1998; Murphy & Rodriguez-Manzanares, 2009). Following interviews with online students, parents, and teachers, Litke (1998) found that many parents either were uninvolved or tended to increase their involvement following academic problems. Like (1998) concluded that parents need to more fully understand their essential role in their child's online learning. Similarly, Boulton (2008) interviewed all 22 students enrolled in a supplemental online high school course and found that students expected their parents to assume the motivation and supervision roles of a traditional face-to-face teacher. However, most parental support did not last long, and only three students successfully completed the course. Boulton recommended that online programs "consider planned parental involvement for students working from home" (p. 17). Murphy and Rodriguez-Manzanares (2009) interviewed 42 online instructors and recommended that online teachers encourage parental involvement through regular school-to-home communication because K-12 students require someone at home to encourage them. More specifically, following interviews and school and home observations in a blended high school setting, Waters and Leong (2011) recommended that parents be trained in

four specific roles: (1) organizing their child's time, (2) incentivizing and motivating their child, (3) providing learning support when needed, and (4) acting as managers to ensure that their child adequately progresses in learning course content.

The research cited above relied primarily on qualitative methodology. In contrast, Black (2009) used survey data to quantitatively measure parental involvement in a virtual schooling context. He found that parents perceived a higher level of parental involvement than did students. Black also found no significant relationships between student- and parent-reported level of parental involvement and student course grade. However, Black performed the same analysis using only the responses for which both the parent and student completed the survey and found a significant positive relationship between parental praise and student performance. In addition, a significant negative relationship was found between parents' reported level of engagement in instructional activities and students' grades. Although the cause of the negative relationship is unknown, Black hypothesized that parents lacked the knowledge and skills to adequately aid their student's learning and/or that an increase in involvement might have followed (not necessarily preceded) poor academic performance.

In summary, little research has been conducted on the effects of parental involvement on K-12 students' online learning. Existing research, which has relied primarily on interview data, showed that while students (Boulton, 2008) and parents (Murphy & Rodriguez-Manzanares, 2009) value parental involvement, some parents have failed to understand and fulfill their educational roles (Boulton, 2008; Litke, 1998). When Black (2009) attempted to quantitatively test the impact of parental involvement on student performance, the results were mixed.

Methods

This research was conducted at the Open High School of Utah (OHSU), an online charter school that completed its inaugural academic year in spring of 2010. OHSU was particularly appropriate for this research because a high level of parental interaction is promoted. At the start of each academic year, OHSU holds a face-to-face parent orientation to introduce parents to OHSU faculty and familiarize them with the learning management system. OHSU also orients parents to their rights and responsibilities via a parent organization in which all parents are automatically enrolled.

Participants

According to the school charter, during the 2009-2010 academic year, 127 freshman students were enrolled in OHSU and were taught by seven instructors (Wiley, 2009). The following year, OHSU added a sophomore class to bring their total enrollment to 250 students and the number of instructors to fourteen. The majority of students take all six of their courses from OHSU. The school's 2009-2010 annual report stated that during this school year about 95% of students were Caucasian, 19% were economically disadvantaged, 8% were identified for special education, and 46% were formerly home schooled (OHSU, 2010). The 2010-2011 annual report reported that about 97% of students were Caucasian, 14% were economically disadvantaged, 5% were identified for special education, and 21% were formerly home schooled (OHSU, 2011).

To ensure the inclusion of a large majority of students, two core freshman English courses were chosen for analysis: one from the second semester of the 2009-2010 academic year and the other from the first semester of the 2010-2011 academic year.

Data Collection

Two surveys created by the researchers and administered to students enrolled in the two selected courses and their parents. Surveys were used for data collection for two primary reasons: (1) surveys allow a broad response and (2) OHSU had not previously tracked or recorded the amount of parental interactions. To access the most accurate data required directly asking those participating in the interactions.

The surveys were designed to measure the time that parents and students spent on course interactions and determine the percentage of their interactions was focused on social, content, and procedural topics (see Table 10). In addition, the surveys asked students and parents to report the motivational value of course interactions. Student surveys measured three course outcomes: course satisfaction, student perceived learning, and change in disposition toward the course content. Parent surveys measured parents' satisfaction with the course and their perceptions of student learning (see Table 11). In addition, researchers used end-of-semester course grades as an indicator of student performance. While the study focused primarily on parental interactions, the surveys also measured learner-instructor, learner-learner, and learner-content interactions; these interactions, however, are only reported as reference points by which to view parental interactions. The full analysis of learner-instructor, learner-learner, and learner-content interaction can be found in Borup, Graham, and Davies (2013).

Table 10

Operational Definitions of Interactions

Interaction Type	Definition
Learner-parent	Parents' and students' time spent interacting with one another regarding the course.
Parent-instructor	Parents' time spent interacting with their student's instructor talking (face-to-face or on the phone), text-chatting, writing/reading emails etc.
Interaction Subject	Definition
Content	Interactions focused on improving content understanding by clarifying, explaining, expanding the course material, etc.
Procedural	Interactions focused on course requirements, assignment due dates, grades, technical issues, course expectations, etc.
Social	Interactions focused on motivation, encouragement, personal interest, clubs, humor, service projects, etc.

Table 11

Survey Items Used to Measure Course Outcomes

Course Outcome	Survey Item
Student course satisfaction	On a scale of 0 to 5, how satisfied were you with this course? (0= <i>not at all satisfied</i> and 5= <i>extremely satisfied</i>)
Student perceived learning	On a scale of 0 to 5, how much did you learn in the first semester of this course? (0= <i>you learned nothing</i> and 5= <i>you learned a great amount</i>)
Student change in disposition	After taking the first semester of this course I enjoy learning about the content area much more than I did before I took the course. (1= <i>strongly disagree</i> and 6= <i>strongly agree</i>)
Parent course satisfaction	On a scale of 0 to 5, how satisfied were you with the first semester of this course? (0= <i>not at all satisfied</i> and 5= <i>extremely satisfied</i>)
Parent perceived student learning	On a scale of 0 to 5, how much do you feel that your student learned in the first semester of this course? (0= <i>your student learned nothing</i> and 5= <i>your student learned a great deal</i>)

A content expert on the research team examined these surveys to verify evidence of content validity (i.e., whether the construct was adequately addressed by the questions being asked). An external measurement expert also examined the items' rating scales. Parent and student surveys were then pilot tested using think-aloud sessions with two students and parents who had previous online learning experience (i.e., students and parents voiced their thoughts and actions while they took the survey). This was done to improve the readability of the items and to ensure that participants understood what they were asked. Minor changes to the wording of some items were made as a result of this analysis.

Procedures

Soon after the selected semesters had ended, researchers obtained email lists from OHSU and sent an email to parents and students, including a link to additional information about the study. In accordance with the institutional review board's protocols established for this study, parents and students were given the option to read and sign the informed consent page digitally. The study design required paired student-parent surveys; thus prior to analysis researchers removed any survey that was not part of a student-parent match. The pairing required that the surveys contain identifying information; when the pairing was complete, all identifying information was removed.

Data Analysis

To answer the first study question, researchers used descriptive statistics to present the amount of time participants reported spending in various types of course interactions. The Wilcoxon signed-ranks test—a nonparametric equivalent to the paired-samples t-test—was used when making statistical comparisons between parent and student reports. The Wilcoxon signed-ranks test was used rather than the standard t-test because the assumptions for using the t-test

analysis were not met (i.e., the response data were not normally distributed, and equal variance between comparison groups could not be assumed). To address the second study question, researchers used descriptive statistics to report the motivational value of reported parent interactions. Students and parents indicated the motivational value of interactions using a six-point scale. Results were somewhat normally distributed, allowing researchers to use a one-way ANOVA and paired-samples t-test analysis to make mean comparisons between parent and student responses. Researchers analyzed data for the third study question by correlating the time students and parents reported for parent interactions with course outcomes. The Spearman rho correlation was used rather than the typical Pearson correlation coefficient because response distributions were markedly skewed, which violated the assumption of normality required for using the Pearson correlation. An alpha level of .05 was used to test all statistical significance.

Results

Parent-student paired survey responses from the winter 2010 semester ($n=37$) were combined with those from the fall 2010 semester ($n=46$). Prior to analysis researchers examined the data for errors, and one fall 2010 paired survey was removed; thus 82 usable parent-student paired survey responses were generated from the student population of 250. Of the 82 surveys, 42 student respondents were female (51%) and 77 parent respondents were students' mothers (94%).

Research Question 1: Quantity of Interactions

Parents and students were asked to report the average number of minutes they spent in course interactions per week. Initial analysis found that seven students and three parents reported unrealistically high amounts of some types of interactions--positive outliers that adversely affected distribution means. To better represent the average number of minutes

students and parents spent in course interactions, the 10 surveys containing extreme outliers were removed when calculating descriptive statistics. Although 10 participants reported unrealistically high numbers, it can still be assumed that they spent a relatively high number of minutes in course interactions as compared to other participants. Based on this assumption, researchers included survey results from these participants when making comparisons using the Wilcoxon signed-ranks test, which is not affected by outliers.

On average, parents reported spending about an hour and 35 minutes per week on learner-parent and parent-instructor interactions--about 90% of it in learner-parent interactions (see Table 12). About 65% of parents (51 individuals) reported having an average of 5 minutes or less of parent-instructor interaction per week, and 40% (33 individuals) reported having no interaction with the instructor over the course of the semester. In contrast, only 5 parents reported having no learner-parent interactions.

Table 12

Amount of Interaction Reported by Parents (minutes per week)

Type of Interaction	<i>n</i>	Median	Mean	SD	Skewness Factor	Percent of Total Interaction
Learner-Parent	79	60	86.0	74.3	1.1	90.4
Parent-Instructor	79	5	9.1	14.2	2.2	9.6

On average, students reported spending about 10 hours and 14 minutes per week in learner-parent, learner-content, learner-instructor, and learner-learner interactions (see Table 13). The majority of this time, 5 hours and 51 minutes (57%), was spent in learner-content interactions. However, students also reported that a large portion of their course interactions were learner-parent interactions (21%), surpassing their learner-learner (15%) and learner-

instructor (7%) interactions. A Wilcoxon signed-ranks test found that students perceived a significantly higher level of learner-parent interactions than did their parents ($z=-2.1, p=.039$).

Table 13

Amount of Interaction Reported by Students (minutes per week)

Type of Interaction	<i>n</i>	Median	Mean	SD	Skewness Factor	Percent of Total Interaction
Learner-Parent	75	90	128.0	141.4	2.1	20.9
Learner-Instructor	75	30	42.3	45.3	1.7	6.9
Learner-Learner	75	30	92.2	126.5	1.8	15.0
Learner-Content	75	300	351.1	222.7	1.5	57.2

Students and parents were also asked to estimate the portion of their interactions that focused on the content, course procedures, and social matters (see Tables 14 and 15). Parents and students were similar in the percentage of time that they reported spending on learner-parent interaction focused on the content, course procedures, or social matters. For instance, students and parents agreed that about 40% of their total learner-parent interactions was focused on the content. Parents are typically not content experts, and it was originally hypothesized that a smaller percentage of learner-parent interaction would be spent discussing the content and a larger percentage would be social. Surprisingly students reported their interactions with their parents as similar in subject to their learner-instructor interactions. Students reported that topics focused on course content and procedures made up the majority of their learner-parent (82%) and learner-instructor (85%) interactions. In contrast, students' learner-learner interactions were largely social (59%).

Table 14

Amount of Interaction Reported by Parents Disaggregated by Their Subject (minutes per week)

Type of Interaction	Subject of Interaction	<i>n</i>	Median	Mean	SD	Skewness Factor	Percent of Total Interaction
Learner-Parent	Content	79	20.1	34.3	39.3	1.9	39.9
	Procedural	79	18.6	32.6	37.7	1.7	37.9
	Social	79	9	19.0	27.6	2.1	22.1
Parent-Instructor	Content	79	0	2.4	4.4	2.1	26.4
	Procedural	79	.1	5.2	8.9	2.2	57.9
	Social	79	0	1.4	3.9	4.1	15.7
Total	Content	79	22.8	36.7	41.1	1.8	38.6
	Procedural	79	24.3	37.9	41.9	1.5	39.8
	Social	79	9	20.5	29.0	2.1	21.5

Table 15

Amount of Interaction Reported by Students Disaggregated by Their Intended Subject (minutes per week)

Type of Interaction	Subject of Interaction	<i>n</i>	Median	Mean	SD	Skewness Factor	Percent of Total Interaction
Learner-Parent	Content	75	25.8	50.6	66.7	2.1	39.5
	Procedural	75	32.4	54.3	63.8	2.0	42.4
	Social	75	9	23.1	37.5	2.8	18.1
Learner-Instructor	Content	75	8	17.7	26.0	2.7	41.9
	Procedural	75	10.8	18.2	20.5	1.8	43.1
	Social	75	2.7	6.4	10.8	3.0	15.0
Learner-Learner	Content	75	7.8	22.1	31.8	1.8	24.0
	Procedural	75	4.5	15.9	25.7	2.3	17.3
	Social	75	12	54.2	97.3	2.7	58.8
Total	Content	75	68.8	90.4	90.2	1.5	34.4
	Procedural	75	76.5	88.5	78.7	1.5	33.7
	Social	75	36	83.6	114.4	2.4	31.9

Research Question 2: Motivational Value of Interactions

In order to address the second research question, parents and students reported on a six-point Likert scale (1=*strongly disagree* to 6=*strongly agree*) whether the different types of interaction they experienced “helped motivate [them] to learn the course content.” The number of respondents varied because students and parents were asked to respond only if they had experienced that type of interaction. In addition, all parents used the same Likert scale to report the motivational value they perceived in some interactions that did not directly involve them (i.e. learner-content, learner-instructor, and learner-learner interactions). Overall the majority of parents and students viewed all types of interaction as motivational (see Tables 16 and 17). The following sections will address specific student and parent perceptions.

Data analysis showed no difference in the motivational value reported by parents for learner-parent, parent-instructor, and learner-content interactions (4.5). However, parents reported that learner-instructor interaction motivated their students the most (5.0) and learner-learner interactions motivated students the least (4.1). A one-way ANOVA found that parents believed learner-instructor interactions motivated their students significantly more than learner-learner interactions, $F(4, 362) = 28.3, p < .001$ (see Table 16).

Table 16

Motivational Value of Interactions Reported by Parents

Interaction Type	<i>n</i>	Agreed	Percent Agreed	Median	Mean	SD
Learner-Parent	76	67	88.2	4.5	4.5	1.1
Parent-Instructor	45	40	88.9	5	4.5	1.1
Learner-Instructor	82	73	89.0	5	5.0	1.1
Learner-Learner	82	59	72.0	4	4.1	1.4
Learner-Content	82	68	82.9	5	4.5	1.3

Students reported that their learner-instructor interactions had the highest motivational value (5.1) and learner-content interaction had the lowest (4.2). A one-way ANOVA found that students' reported motivational value for the different types of interaction differed significantly, $F(4, 346) = 37.928, p < .001$, and a post hoc test found several significant differences. The motivational value of learner-parent interactions reported by students was significantly higher than learner-content ($p < .000$), learner-learner ($p = .008$), and parent-instructor ($p = .001$) interactions. In addition students reported that learner-instructor interaction motivated them significantly more than learner-content interaction ($p = .010$) (see Table 17).

Table 17

Motivational Value of Interactions Reported by Students

Interaction Type	<i>n</i>	Agreed	Percent Agreed	Median	Mean	SD
Learner-Parent	75	73	97.3	5	5.0	0.8
Parent-Instructor	59	47	79.7	4	4.3	1.4
Learner-Instructor	74	65	87.8	5	5.1	1.1
Learner-Learner	62	50	80.7	4.5	4.4	1.2
Learner-Content	81	67	82.7	4	4.2	1.1

Several paired samples t-tests were conducted to determine if students and parents differed significantly in the motivational value they reported for the different types of interaction. Students reported learner-parent interaction as significantly more motivational ($p=.002$) than did their parents. Students ranked their learner-content interaction as significantly less motivational than did their parents ($p=.011$).

Research Question 3: Correlations Between Interactions and Course Achievement

The third research question asked whether the quantity of parental interactions reported by students and parents correlated with the six measured course outcomes: (1) students' end-of semester percentage grade, (2) students' perceived learning, (3) students' course satisfaction, (4) students' change in disposition toward the course content, (5) parents' perception of the level of their student's learning, and (6) parents' course satisfaction. Due to the skewness of interaction frequency distributions, researchers used a Spearman rho correlation analysis. The results are presented in Tables 10 and 11.

Students' reported time spent in learner-parent interactions was negatively correlated with almost all course outcomes, though the negative correlation was significant only with the time they reported spending in learner-parent interaction regarding the content and their reported change in disposition toward the content ($r = -.25, p = .021$). These negative correlations contrasted with the largely positive correlations found between course outcomes and students' reported quantity of time spent in learner-content, learner-instructor, and learner-learner interactions.

Parents' perceptions of their students' learning level and parents' course satisfaction had significant positive correlations with students' overall reported time spent on learner-learner interactions, as well as with all three of the intended subjects of learner-learner interactions (i.e., course content, procedures, and social topics). Finally, a significant negative correlation was found between students reported time spent on course interactions and parents' reported satisfaction with the course ($r = -.23, p = .043$) (see Table 18).

Table 18

Correlations Between Students' Reported Quantity of Interaction and Course Outcomes

Type	Subject	Student Grade	Student Perceived Learning	Student Course Satisfaction	Student Improved Disposition	Parent Perceived Learning	Parent Course Satisfaction
Learner- Parent		-.08	-.01	-.21	-.18	-.18	-.15
	Content	-.00	-.07	-.18	-.25*	-.18	-.14
	Procedural	-.12	-.07	-.13	-.07	-.14	-.13
	Social	-.05	-.03	-.15	.06	-.14	-.08
Learner- Instructor		.10	.12	.09	.21	.01	-.01
	Content	.08	.14	.12	.29*	.01	-.06
	Procedural	.07	.16	.14	.15	.12	.13
	Social	.01	.11	.08	.23*	-.02	-.07
Learner- Learner		.26*	.20	.29*	.31*	.29*	.29*
	Content	.17	.19	.24*	.30*	.29*	.30*
	Procedural	.16	.17	.23*	.18	.31*	.33*
	Social	.29*	.12	.17	.21	.23*	.22*
Learner- Content		.06	.19	-.06	.10	-.07	-.23*

Note: * significant at the $\alpha = .05$ level

Parents' reported time spent on learner-parent and parent-instructor interactions showed mostly negatively correlations with the measured course outcomes, three of which were significant. Parents' reported time spent on learner-parent interaction regarding the content had a significant negative correlation with students' reported course satisfaction ($r = -.24, p = .027$) and with students' reported change in disposition toward the content ($r = -.25, p = .023$). In addition, the time that students reported they spent on learner-parent interaction regarding course procedures had a significant negative correlation with student grade ($r = -.28, p = .012$) (see Table 19).

Table 19

Correlations Between Parents' Reported Quantity of Interaction and Course Outcomes

Type	Subject	Student Grade	Student Perceived Learning	Student Course Satisfaction	Student Improved Disposition	Parent Perceived Learning	Parent Course Satisfaction
Learner-		-.09	-.16	-.20	-.14	-.11	-.18
Parent							
	Content	-.03	-.14	-.24*	-.25*	-.15	-.18
	Procedural	-.28*	-.09	-.09	-.09	-.12	-.15
	Social	.04	.02	-.01	.10	.05	.08
Parent-		-.02	-.12	-.10	-.12	-.01	-.03
Instructor							
	Content	.03	-.02	-.01	-.03	.00	-.05
	Procedural	-.04	-.21	-.19	-.14	-.01	-.05
	Social	.06	-.05	-.01	-.09	-.02	.04

Note. * significant at the $\alpha = .05$ level

Discussion

This section of the paper will first discuss the implications of the results presented in this article. Following, we will discuss the limitations of this research and suggest ways that future researchers may work to improve understanding of the impact of parental interactions on students' online learning.

Quantity and Quality of Interaction

Research for this study attempted to measure the quantity of the different parental interaction types and subjects that occur in an online learning environment. Students reported spending nearly 40% more time interacting with parents regarding the course than they reported interacting with peers and over 300% more than they reported interacting with their instructor. This supports researchers' claims that parents' role in student online learning is crucial (Boulton, 2008; Liu et al., 2010; Murphy & Rodriguez-Manzanares, 2009; Waters & Leong, 2011). However, a large variance was found in the reported levels of learner-parent and parent-instructor interaction. This variance in part confirms Litke's (1998) grouping of parental involvement levels as absentee, supportive, and participatory.

The researchers also found a large variance in parents' reported quantity of parent-instructor interaction, with over 40% of parents reporting no interaction with their student's instructor. This could be a reflection of OHSU's policy that requires teachers to focus attention on lower performing students (OHSU, 2010). The large majority of students viewed parent-instructor interactions as motivational (97%), which supports previous suggestions that student performance might increase if teachers worked more collaboratively with parents (Boulton, 2008; Murphy & Rodriguez-Manzanares, 2009).

This research found that students viewed learner-parent interaction to be significantly more motivational than perceived by their parents. This finding indicates that parents may not fully understand the motivational value of their interactions with their student. It was also found that a large portion of the reported learner-parent interactions focused on the content. Shulman (1987) claimed that effective teaching requires a “special amalgam of content and pedagogy that is uniquely the province of teachers” (p. 8). As a result, parents’ content interactions with students may prove more effective when aided by teachers. For instance, teachers can make the content and other educational resources available to parents along with teaching suggestions and tips.

Relationship of Outcomes to Parental Interaction Levels

The large majority of parental interactions were not significantly correlated with course outcomes, and most were negatively correlated. This finding replicates Black’s (2009) research that found a negative correlation between the level of parental involvement and online student performance. Similar to Black (2009), we hypothesize that the correlations likely reflect the OHSU parental interaction policy that encourages instructors to contact parents of low performing students, as well as some parents’ tendency to engage in interaction with the instructor and their student following academic problems. If a large proportion of parental interaction occurred in reaction to poor student performance, the correlation that results from examining a large group of students could mask the true benefit of parental involvement on individual student learning. The benefit of parental involvement can be seen in the fact that a large majority of students and parents reported that learner-parent and parent-instructor interactions were motivational. These and Black’s (2009) correlations may be lower than similar

correlations in a face-to-face context (Fan & Chen, 2001) because parents are more available and responsive to struggling students' needs in an online learning environment.

Also it is simplistic to assume that a high level of parental involvement is required for high student achievement. Litke (1998) hypothesized an inverse relationship between the amount of responsibility students accept for their own learning and the amount of parental involvement that is required for student success. Thus when examining self-regulated students with an internal locus of control, researchers might expect to find low correlations between student achievement and parental interactions.

In contrast to the negative correlations reported above, the amount of time students reported interacting with their peers was significantly correlated with their parents' satisfaction with the course. This positive relationship may be a reflection of parents' concerns regarding their children's social development (Cavanaugh et al., 2004) and their desire for their children to interact socially with their peers (Shoaf, 2007).

Limitations and Future Research

Although the current study had an acceptable response rate of 32.8% (Cook, Heath, & Thompson, 2000), the survey was administered to parents and students of a new online charter school with a small student population, resulting in a relatively low number of respondents (n= 82). Future research should be conducted in larger, more diverse settings. This type of research may result in different findings because "budgets, availability of personnel, size of the school, state models, and models of instruction are all likely to change the roles that are expected of an online educator" (Ferdig, Cavanaugh, DiPietro, Black, & Dawson, 2009, p. 496) and in turn the level of parent involvement.

Future research should also seek to understand how some parent characteristics, such as education level and socioeconomic status, influence parents' ability to effectively engage in educational interactions with students. In addition, the research relied primarily on parent and student perceptions obtained through surveys. Although these perceptions are insightful, they can be biased. For instance, in this research students reported a significantly greater total amount of learner-parent interaction than did their parents. In contrast, Black's (2009) survey research found that parents perceived a higher level of parental involvement than did students. Researchers should be aware of these differences and consider the subjective nature of self-report data. Interviews, email communications, analytic data obtained from learning management systems, and observations could be used to triangulate self-reported levels of parental interaction. Obtaining and analyzing this type of information from vulnerable K-12 populations can be difficult and laborious; however, its value outweighs the cost.

Future research should also look beyond quantity and examine the quality of learner-parent and parent-instructor interactions. Researchers should work to create a theoretical framework that identifies and categorizes the different types of parental involvement activities and set forth hypotheses on how they might influence student learning. Rice (2006) stated that some of the blame for the lack of K-12 research can be attributed to "the lack of a theoretical rationale" (p. 440). A theoretical framework may help to increase the quality of online research. Mishra and Koehler (2006) explained that a framework not only helps to guide researchers' focus to what is important but helps them to ignore the insignificant. A framework could aid researchers to highlight best practices and identify the types of involvement that have the most impact on course outcomes. This type of information can have practical implications for K-12

online learning course designers and teachers; thus it has the potential to improve course outcomes for all students.

Conclusion

This research used parents' and students' self-reported data to describe parental interactions at OHSU, an online charter school. Researchers found a large variance in the reported quantity of learner-parent and parent-instructor interactions reported by students and parents. About 40% of parents reported having no interaction with the instructor. Although students and parents reported that learner-parent and parent-instructor interactions positively affected students' learning motivation, students' and parents' reported quantity of parental interactions largely correlated negatively with course outcomes. These negative correlations may reflect parents' tendency to increase interaction levels following academic problems and instructors' tendency to spend a high percentage of their time interacting with low performing students in attempting to more fully engage them in the course. Thus a large percentage of these interactions would result in the low or negative correlations without reflecting the actual impact on student learning at the individual level.

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**ARTICLE 3: The Adolescent Community of Engagement Framework: A Lens for
Research on K-12 Online Learning**

Abstract

This paper describes the Adolescent Community of Engagement (ACE) framework as a lens to guide research and design in adolescent online learning environments. Several online learning frameworks have emerged from higher education contexts, but these frameworks do not explicitly address the unique student and environmental characteristics of the adolescent online learning environment. The ACE framework consists of four main constructs that make up an adolescent online learning community. The first three (*student engagement*, *teacher engagement*, and *peer engagement*) build on previously established online frameworks that originally emerged from higher education contexts. In addition, the ACE framework recognizes the role of parents in their children's learning and introduces a fourth construct, *parent engagement*, which builds on two previously established face-to-face frameworks.

Introduction

Adolescent online enrollments have grown dramatically the past decade (iNACOL, 2012; Queen & Lewis, 2011; Wicks, 2010) despite relatively low levels of student engagement that have contributed to higher attrition rates than what is found in face-to-face environments (Hawkins & Barbour, 2010; Patterson & McFadden, 2009; Rice, 2006). The concerns over low performing online schools have caused Molnar (2013) to recommend that policymakers “slow or stop growth of virtual schools until the reasons for their relatively poor performance have been identified and addressed” (p. ii). While it appears unlikely that such a slowdown will occur, Rice (2006) suggested that the growth of online learning should be matched with rigorous research examining the critical components to student success.

An essential step in establishing a strong research foundation is the formation of a theoretical framework (Rice, 2006). Unlike higher education, which has several online learning frameworks (see Garrison, 2000), no framework explicitly addresses the unique student and environmental characteristics of the adolescent online learning environment. This paper first summarizes major theoretical frameworks that provide insights about adolescent online learning communities and then presents a framework that identifies and defines different types of interaction and engagement in an online adolescent learning environment. It also sets forth researchable hypotheses on how those communities may improve students’ success.

Review of Literature

This section of the paper will review three theoretical frameworks that are widely cited and explicitly focus on how learning interactions can positively impact online students’ educational experiences. These three foundational theories are (1) Moore’s (1989) three types of interaction, (2) Moore’s (1980) theory of Transactional Distance, and (3) Garrison, Anderson,

and Archer's (2000) Community of Inquiry framework (CoI). Following, current frameworks on parental involvement in students' learning will be discussed and applied to the online environment.

Types of Learning Interaction

Moore (1989) defined three types of interaction: learner-content, learner-instructor, and learner-learner interaction. He claimed learner-content interaction is the foundation of any educational experience and occurs when students interact with learning materials. Learner-instructor interactions are meant to provide additional content information, improve student motivation, and provide students with opportunities to apply their understanding with instructor feedback. The third type of interaction is between learners and may have a more motivational effect on adolescent learners than on adults.

Burnham and Walden (1997) added a lesser-known type of interaction that may play a significant role in adolescents' online learning—learner-environment interaction. Anderson (2004) noted that learner-environment interaction can include learners' interactions with their families, workplaces, and communities. Although including all elements of a learner's environment would violate Whetten's (1989) guidance to keep frameworks parsimonious, the absence of some environmental elements would make a K-12 online framework incomplete. For instance, Borup, Graham, and Davies (2013b) found that parents and students largely viewed learner-parent and parent-instructor interactions as having a motivating effect on student learning.

Transactional Distance and Community of Inquiry

Moore's (1980) theory of Transactional Distance emerged from an independent study setting and emphasized three interrelated elements that impact students' perceived transactional

distance: dialogue, structure, and autonomy. Moore (1980) explained that independent study programs have a high level of structure and require little dialogue resulting in a high level of transaction distance. Inversely, a course with low transactional distance contains ongoing dialogue around learning materials that can be modified to meet student needs (Moore, 2007). Moore (2007) also explained that “the greater the transactional distance the more the learners have to exercise autonomy” (p. 95).

Garrison et al.’s (2000) CoI framework emerged from a more interactive learning environment and emphasized the construction of knowledge through sustained communication between all members of the learning group—including learner-learner interaction. The CoI framework describes three interrelated core elements:

- Teaching presence: “the design, facilitation, and direction of cognitive and social processes” (Anderson, Rourke, Garrison, & Archer, 2001, p. 5).
- Social presence: “the ability of participants in the Community of Inquiry to project their personal characteristics into the community” (Garrison et al., 2000, p. 89).
- Cognitive presence: participants’ ability to “construct meaning through sustained communication” (Garrison et al., 2000, p. 89).

Garrison et al. (2000) called teaching presence the *binding element* because the establishment of cognitive and social presence is unlikely to occur without the active involvement of the teacher. More specifically, Anderson et al.’s (2001) content analysis of online discussion boards within a higher education online environment identified three indicators of teaching presence: facilitating discourse, providing direct instruction, and designing and organizing the course. However, Garrison and his colleagues also encouraged others to examine teaching presence within other

aspects of online learning (Anderson et al., 2001) and within K-12 populations (Garrison, Anderson, & Archer, 2010).

Parental Involvement Frameworks

The U.S. Department of Education (2010) stated that “engaging families and communities in education is critical to improving outcomes for all students” (p. 1). Staker (2011) summarized this need for parent engagement when he said “Schools depend on families and the community to support students . . . providing them a place to sleep, dental visits, love and nurture, and homework help” (p. 28). Some have argued that parental engagement is even more critical in online learning environments because students are increasingly spending more time studying at home (Liu et al., 2010). However, it is difficult to identify parental roles in online learning environment due to the current lack of research on the topic. In part, this lack of understanding stems from the absence of parents in the major online theoretical frameworks discussed above. As a result this section of the paper considers parental engagement frameworks by Epstein (1987) and Hoover-Dempsey and Sandler’s (1995, 2005). Although both frameworks were designed within a face-to-face learning environment, they may shed light on parental behavior in online learning environments.

Epstein (1987) grouped parental responsibilities into related but separate categories. First, parents are responsible for meeting their children’s basic physiological needs (e.g. food, safety, sleep, etc.) and academic needs (e.g. school supplies and a place to learn at home) (Epstein & Dauber, 1991). Second, parents should attend to communications from teachers and act on the provided information. Third, Epstein (1987) believed that parents should be involved at school, such as participating in fundraising activities and attending other school activities. Epstein (1987, 1995) contended that when parents volunteer at school, teachers increase their parental

interactions and students view their parents as committed to their success. Originally, this responsibility also included participation in parent-teacher associations (PTA) but later this responsibility was cited as its own category labeled “involvement in decision making” (Epstein & Dauber, 1991, p. 291). Lastly, parents can aid students in their home learning activities (Epstein, 1987).

While Epstein’s framework categorized the different parental responsibilities, Hoover-Dempsey and Sandler (1995, 2005) sought to understand why parents become involved and how their involvement impacts student learning. Hoover-Dempsey and Sandler (1995) contended that three things impact the types and levels of parental involvement: (1) their perceived roles and responsibilities, (2) their self-efficacy, and (3) requests from their child or school to become involved. In addition, Hoover-Dempsey and Sandler (1995, 2005) explained that parent behavior can impact student learning because it provides students with affective support, reinforces student behavior, models correct academic behavior, and provides students with direct instruction and shared thinking activities.

The Adolescent Community of Engagement Framework

Due to the lack of a theoretical framework that explicitly addresses the adolescent online environment and learner, we propose the Adolescent Community of Engagement (ACE) framework. The ACE framework uses online learning research to build on the frameworks discussed above and is made up of four main constructs: *student engagement*, *teacher engagement*, *peer engagement*, and *parent engagement* (see figure 1). We will begin our description of the ACE framework by describing its four constructs and the elements within each construct.

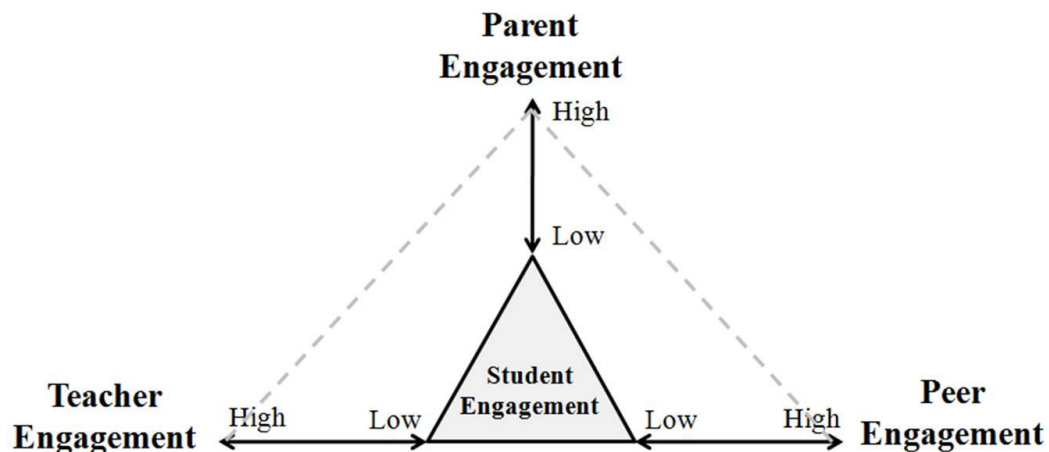


Figure 1: The level of student engagement is represented by the area of the triangle—a larger triangle representing greater student engagement. The primary hypothesis of the framework is that as parent, teacher, and peer engagement increase so will student engagement until it fills the area indicated by the dotted line.

Student Engagement

The term *engagement* is commonly used by K-12 learning communities, and is thought to play a critical role in student achievement (Fredricks, Blumenfeld, & Paris, 2004; Reschly & Christenson, 2012). Unfortunately, there still does not exist a universally accepted definition of engagement despite nearly 50 years of research on the topic (Hughes, Luo, Kwok, Loyd, 2008). While a conclusive definition is elusive, there are some similarities and differences between some of the previous definitions that help to operationalize the term *student engagement* (see Table 20).

Table 20

Identified Types of Engagement

Article	Identified Types of Engagement			
Fredricks et al., 2004	Emotional	Cognitive	Behavioral	
Appleton et al., 2006	Psychological	Cognitive	Behavioral	Academic
Finn & Zimmer, 2012	Affective	Cognitive	Social	Academic
Reeve, 2012	Emotional	Cognitive	Behavioral	Agentic
Chapman, 2003	Affective	Cognitive	Behavioral	
Perry, 2012	Emotional	Intellectual	Physical	Social

Perry (2012) explained that emotions are present in any educational experience. As a result, all of the identified articles described student engagement as having an emotional characteristic. Chapman (2003) explained that students' emotional reaction to learning tasks is a type of affective engagement. Fredricks et al. (2004) and Appleton, Christenson, Kim, and Reschly's (2006) added that students' reactions to interactions with teachers and peers was also a type of psychological or affective engagement. Similarly, Reeve's (2012) concept of emotional engagement included the "presence of task-facilitating emotions such as interest and the absence of task-withdrawing emotions such as distress" (p. 150).

All of the articles also identified student engagement as having a cognitive characteristic. Appleton et al. (2006) explained that affective and cognitive engagement are similar because both are less observable and represent internal processes. Perry (2012) broadly defined intellectual engagement as all cognitive and intellectual processes, whereas Finn and Zimmer (2012) more narrowly defined it as "the expenditure of thoughtful energy needed to comprehend

complex ideas in order to go beyond the minimal requirements” (p. 102). Others added that cognitive engagement included meta-cognitive (Chapman, 2003) and self-regulation abilities (Appleton et al., 2006; Fredricks et al., 2004; Reeve, 1012).

Researchers also identified student engagement as having more demonstrative characteristics. Chapman (2003) and Reeve (2012) explained that behavioral engagement requires students to actively respond to learning activities that are presented to them. Appleton et al. (2006) and Fredricks et al. (2004) included participation in social and extracurricular activities, believing that participation in these activities positively impacts course outcomes and lowers attrition rates. Similarly, Finn and Zimmer (2012) viewed academic and social engagement as types of behavioral engagement. Academic engagement was referred to as students’ behavior directly related to the learning process and social engagement as students’ efforts to follow the mores and folkways of the class/school. Perry (2012) included behaviors such as watching others engage and “standing still and being contemplative” as types of physical engagement, blurring the line between physical and intellectual engagement.

In conclusion, when examining the existing student engagement definitions, three types of engagement emerged: affective, behavioral, and cognitive engagement. In order for learners to be fully engaged in learning activities, all three types of engagement must be present. We have termed these criteria the ABCs of student engagement. We also agree with Fredricks et al. (2004) who stated “in reality these factors are dynamically interrelated within the individual; they are not isolated processes” (p. 61). Bandura (1986) explained that if students obtained knowledge solely through individual efforts, their knowledge acquisition would be extremely hindered. Similarly, we claim that students are more likely to be fully engaged in an interaction-rich environment. As a result we view quality student interactions with the content and members

of the learning community as the point where the ABCs of student engagement converge. Similar to Reeve (2012) we also recognize that students are active agents and may accept or reject the support offered by others in their learning community. The other constructs in the ACE framework are viewed as supports to student engagement, and their effectiveness is judged by how well they directly or indirectly improve the ABCs of student engagement.

Teacher Engagement

This section of the paper will discuss teacher engagement. Teacher engagement is the ability of teachers to positively impact student engagement by facilitating interaction, organizing and designing, and instruction (see Figure 2). We also recognize that these three elements of teacher engagement can be performed by one or multiple individuals depending on the context and the instructional model used (Davis & Rose, 2007). For instance, Harms et al. (2006) described one online instructional model where the traditional roles of the face-to-face teacher are performed by three individuals: on-site facilitators who provide students with face-to-face support, instructional designers who create course content and learning activities, and teachers who monitor and assess learners' interactions with the content. Harms also acknowledged that in some environments these roles could be fulfilled by a single individual. As a result, researchers who use the ACE framework should adapt the ACE framework to meet the specific environment that they are researching.

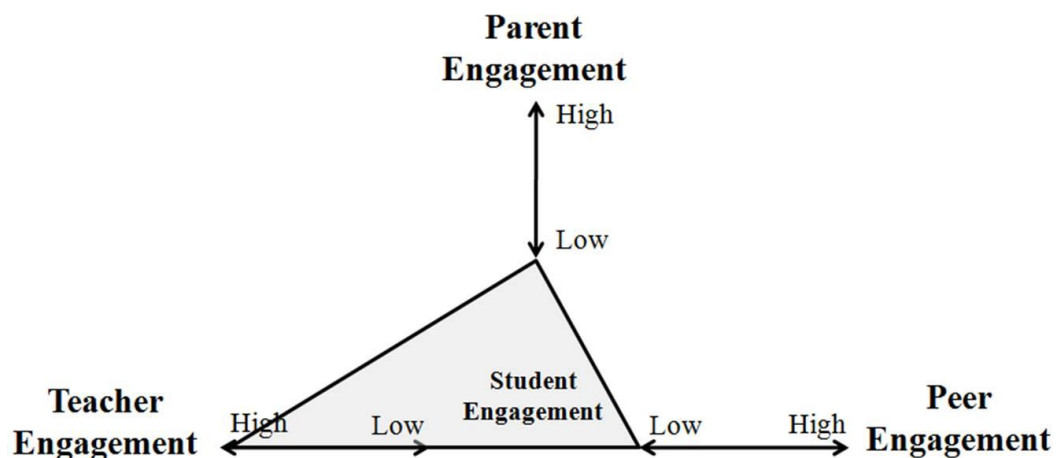


Figure 2: The ACE framework with high teacher engagement. As teacher engagement increases so will student engagement as represented by the area of the triangle.

Facilitating interaction. The first element of teacher engagement is facilitating interaction. This includes the need to facilitate human interaction as well as learners' interactions with the content. Our review of the literature identified three indicators of teachers' effective facilitation activities: nurturing, monitoring and motivating, and facilitating discourse.

Nurturing. Picciano, Seaman, and Allen (2010) stated that public schools have the responsibility to “nurture and provide social and emotional support” to their students (p. 29). Although all communities require care, Repetto, Cavanaugh, Wayer, and Liu (2010) explained that it is especially important for K-12 teachers who are asked to serve as pseudo parents to their students. Unfortunately, research has found that nurturing these types of relationships can be difficult at a distance (Hawkins, Barbour, & Graham, 2011; 2012; Murphy & Rodriguez-Manzanares, 2008; Picciano, Seaman, Allen, 2010). However, interviews with K-12 online teachers and students have indicated that caring relationships can be nurtured in interaction-rich environments (Velasquez, Graham, & Osguthorpe, 2013; Borup, Graham, & Velasquez, 2013)

and Nippard and Murphy (2007) suggested that online teachers find ways to discuss topics unrelated to the course content.

Kanuka (2008) explained that teachers not only provide students with information but are required to nurture a safe and secure environment where learning can take place. This is especially important since conflict avoidance is a motivating factor influencing some students' decisions to take online courses (Rice, 2006). Teachers should express specific behavior requirements to students and parents, including anti-cyber-bullying policies, to help ensure a safe online learning environment that fosters free and safe communication (Mosier, 2010; Rice, 2006). Although bullying is likely less common in an online environment (Sorensen, 2012), cyber-bullying tends to be text based allowing students to reread the comments making it especially harmful to students (Rice, 2006). Rice (2006) explained that the same permanence that can make cyber-bullying more harmful can also make it easier to combat. Unfortunately, Dawley, Rice, and Hinck's (2010) review of online teacher professional development found a "high need" (p. 30) for more training on cyber-bullying and other psychological aspects of online learning indicating that teachers may not be prepared to adequately respond when bullying is identified.

At times the support that schools provide students moves beyond the psychological to the physical. Schools can help provide students access to academic materials beyond the family's fiscal reach (Epstein, 1987)—for example, a virtual school can provide laptops and stipends for Internet access (Kerr, 2011). This is especially important in light of Roblyer, Davis, Mills, Marshall, and Pape's (2008) finding that having a computer at home helps to predict student success in online learning.

Monitoring and motivating. Teachers are responsible for monitoring students' engagement in assigned learning activities. iNACOL's standards for quality online teaching (2011b) explain that online teachers should monitor student cognitive engagement using formative and summative assessments. Online teachers can easily monitor students' behavioral engagement (e.g., taking exams, submitting assignments, and posting comments to discussion boards). However, students' affective and cognitive engagement are less demonstrative and can be difficult for online teachers to recognize. For instance, some students have a tendency to read others' comments on discussion boards without regularly posting comments themselves. This type of *lurking* behavior may be a reflection of high cognitive engagement but can be invisible to teachers (Beaudoin, 2002). This may lead teachers to believe that the student has a low level of engagement in the course. However, Beaudoin (2002) explained that while more reflective students may be less visible online, they may actually also be more fully engaged than their more active and perhaps less reflective peers. Many learning management systems (LMS) contain sophisticated student data systems that can aid teachers in monitoring activities by recording the materials and pages that students view and the time spent doing so (Cavanaugh, 2009). This type of analytic data can give teachers a better understanding of each student's level of engagement (Zhang & Almeroth, 2010). Cavanaugh (2009) added that student data systems have the potential to move beyond description to prescription by identifying threshold amounts of "time in a class, clicks on a class website, or teacher contacts with parents" and alert teachers when the thresholds are not met (p. 16). Cavanaugh also saw value in providing parents with access to their student's data to aid them in their monitoring activities. However, some schools have been slow to utilize the analytic data inherent in their LMS (Dickson, 2005). Dickson (2005) hypothesized that analytic data would be more fully utilized if it was better organized and

presented within the LMS. Teachers should also monitor group learning activities such as discussion board posts. However, Garrison and Anderson (2003) warned that too much monitoring could actually be detrimental. Instructors will know that this balance has been found when “students take responsibility for collaboratively constructing and confirming understanding” (Garrison & Anderson, 2003, p. 69).

There appears to be a close relationship between monitoring and motivating activities. For instance, while coding teacher interviews, Borup, Graham, and Drysdale (accepted) found it difficult to distinguish between monitoring and motivating behaviors because monitoring was almost always an antecedent to motivating. It appears that motivating students is critical to student engagement. Following a qualitative study of a virtual high school, Weiner (2003) stated, “the key ingredient to online learning lies solely within motivational issues” (p. 46). Bandura (1977) explained that student motivation is closely related to past experiences and student self-efficacy is more fully impacted when student mastery comes through their experiences overcoming obstacles. As a result it is important that teachers structure activities in ways that challenge students yet still allow for success. Similar to parents, instructors can use positive reinforcement and verbal persuasion to increase student motivation (Cavanaugh et al., 2004; Murphy & Rodriguez-Manzanares, 2009). DiPietro et al. (2008) examined successful online instructors and found a connection between instructors’ immediate feedback and student motivation, suggesting that feedback and praise are most effective when closely associated to student behavior. Cavanaugh et al. (2004) added that younger students require “a more extensive reinforcement system than older students” (p. 7). If teachers and parents’ individual motivating efforts are inadequate, their efforts may be combined to provide students a more extensive reinforcement system. Borup et al.’s (accepted) examination of teacher practices at an online

charter school found that when praise and encouragement were insufficient teachers also collaborated with parents to create formal learning contracts for students that could include formal rewards and reprimands for student behavior.

Encouraging discourse. Another key indicator of facilitating interaction is encouraging discourse among members of the learning community. Speaking of a higher education context, Garrison et al. (2000) explained that online teachers have the responsibility to facilitate learner-instructor and learner-learner discourse. This is also true in a K-12 environment, but K-12 online teachers have the additional responsibility of facilitating parent-instructor and learner-parent discourse (Borup et al., accepted; Black, 2009; Epstein et al., 1997; iNACOL, 2011b). Borup et al. (accepted) found that teachers commonly facilitated discourse with students by *checking in* with them via email and chat to see how they were doing and if they could do anything to help. Similarly, Archambault et al. (2010) found checking in on students to be especially important for students who are at risk of failing. It is also important that teachers foster quality learner-learner interactions that focus on the construction of new knowledge (Garrison & Anderson, 2003). By facilitating learner-learner interactions teachers may also address parents' concerns that their students have less opportunities to socialize with peer (Sorensen, 2012). In addition, Blau and Hameiri (2012) found a positive relationship between the online activity level of the teacher and that of mothers indicating that teachers can positively impact parent engagement online.

Organizing and designing. The second element of teacher engagement is *organizing and designing*. Instructors can have a positive effect on student engagement as they effectively organize and design the course. Researchers have suggested that without adequate structure, students will procrastinate their work online (Tunison & Noonan, 2001; Weiner, 2003). This is especially true for students with special needs (Keeler & Horney, 2007). As a result Cavanaugh

et al. (2004) recommended that teachers organize lessons into short segments with simple instructions that allow students to learn in stages. Weiner (2003) added that above all, teachers should set concrete deadlines that are well communicated to students and parents. This type of communication can aid parents as they work to organize their student's time as discussed later.

Designing is closely related to *organizing*. Garrison et al. (2000) stated that course design can have a direct impact on student learning because it determines the amount of content to cover and how that content should be presented. Mishra and Koehler (2006) stated that teachers use three types of knowledge when designing lessons: content knowledge, technological knowledge, and pedagogical knowledge. Included in pedagogical knowledge is an understanding of teaching strategies and methods, as well as an awareness of students and how they develop. As a result, teachers should work to understand the cognitive, social, and developmental stages of their learners which can be more diverse with adolescent learners than adults (Cavanaugh et al., 2004). Borup et al. (accepted) found that teachers in an online high school used this knowledge to modify the course content to better fit student interests and needs. These modifications tended to be minor and were often referred to as tweaks and appeared to be important to teacher satisfaction. This was supported by Hawkins, Barbour, and Graham's (2012) findings that teachers felt a level of dissatisfaction when they were not provided the opportunity or time to modify their course curriculum.

As the online student population becomes more diverse, teachers will increasingly need to work with parents to create individualized education plans (IEP) and 504 plans to ensure that the course content and activities meet the needs of students with learning disabilities (iNACOL, 2011b; Muller, 2009, 2010; Repetto et al., 2010). One Chief Executive Officer (CEO) of an online charter school that was particularly successful with students on IEPs highlighted the need

for parent-teacher collaboration to “differentiate instruction and tailor goals for each student” (Spitler, Repetto, & Cavanaugh, 2013; p. 11). Keeler and Horney (2007) added that designing instruction to meet students’ individual needs is especially difficult because there can exist conflicting needs across students. For instance, Barbour (2007) suggested that courses contain visual and interactive elements. However, these types of elements can actually restrict access to some students who need visual, hearing, or other accommodations (Keeler & Horney, 2007). Unfortunately, Rice, Dawley, Gasell, and Florez (2008) found that online teachers generally do not receive the necessary training to meet the needs of these students and require additional training to help them “modify, customize, and/or personalize activities to address diverse learning styles” (p. 30).

Instructing. *Instructing* is the third element of teacher engagement. Anderson et al. (2001) explained that regardless of the context, teachers are required to provide “intellectual and scholarly leadership” (p. 8). Intellectual leadership can be provided by asking questions, drawing attention to certain concepts, summarizing student discussions, and directing students to additional resources. Preservice teachers in Kennedy, Cavanaugh, and Dawson (2013) study observed that teachers’ instructing responsibilities focused on individualized tutoring sessions and providing constructive feedback. Johnston and Barbour’s (2013) examination of advanced placement courses found that students viewed instructor feedback as one of the most valuable aspects of their educational experience. Instructors can also instruct students on skills not directly related to the content such as study skills and self-assessment (iNACOL, 2011b). Furthermore, Weiner (2003) observed that online students are likely to ask teachers to instruct them when they encounter technological problems. Unfortunately, K-12 online teachers (n=596) reported on a national survey that they lacked the confidence and skill to help students

troubleshoot technological problems (Archambault, 2011; Archambault & Crippen, 2009). As a result, school administrators should provide inservice opportunities to improve teachers' technological knowledge and/or a skilled technical support staff to help students when technological problems arise (Cavanaugh, 2009).

Teacher's ability to respond to students' instructional needs does appear to depend of the context. For instance, Borup et al. (accepted) examination of an online charter school found that teachers' four hours of daily office hours helped teachers to respond to student needs and some teachers found that they were better able to tutor students individually than they previously could do in a face-to-face context. In contrast, Hawkins et al. (2011, 2012) examination of a large virtual school in the same state found that teachers' high student loads made it difficult to provide individualized instruction and viewed themselves as graders. Similarly, Waters (2012) found that parents and students at an online charter school had difficulties receiving timely instruction from their teachers. More research should seek to identify how teachers effectively provide students with personalized instruction and how these instructional strategies can scale.

Parent Engagement

This section of the paper will discuss how parent engagement can positively impact student engagement by facilitating interaction, organizing, and instructing (see Figure 3). Although parents and instructors have unique roles and responsibilities in students' education, Epstein and Dauber (1991) observed that parents and instructors have *overlapping influences* on student engagement. As a result, parent engagement contains similar elements to that of teacher engagement. Although their overlapping responsibilities can be done without the aid of the other, greater educational outcomes may be achieved when instructors and parents work in concert (Borup, Graham, & Davies, 2013b; Epstein et al., 1997).

It is also important that we define the term *parent*. In the No Child Left Behind Act (2002) the U.S. Congress stated that “the term ‘parent’ includes a legal guardian or other person standing in loco parentis” (p. 2087). Such a definition acknowledges that the role of a parent can be fulfilled by multiple individuals who may or may not be the students’ legal guardian, such as a grandparent or older sibling. In the context of this framework, the term *parent* is also operationalized as an adult with a close emotional and loving connection with the student. While teachers can also form close emotional and loving connections with the students, parents have a shared history with the students and their relationship extends well beyond the course.

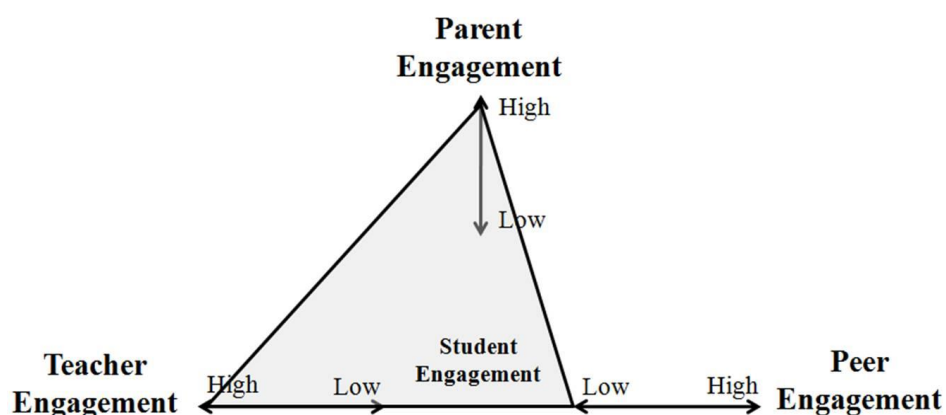


Figure 3: The ACE framework with high parent engagement and teacher engagement. It is hypothesized that as parent and teacher engagement increase so will student engagement as represented by the area of the triangle.

Facilitating interaction. The first element of parent engagement is facilitating discourse which we hypothesize has three indicators: nurturing, monitoring and motivating, and volunteering.

Nurturing. *Nurturing* is defined as parents’ actions to ensure students’ basic needs are met, allowing them to more effectively engage in learning activities. Staker (2011) explained that schools depend on parents to “love and nurture” their students while also providing for their

basic physiological needs such as a “place to sleep” and “dental visits” (p. 28). Epstein (1987) added that parents need to provide their children with access to basic learning materials (e.g. access to a computer with internet connection, books, writing materials, etc.) and help them to develop the social and behavioral skills needed to be successful in an academic setting (Epstein, 1987).

Monitoring and Motivating. Although parents’ *nurturing* activities afford students the opportunity to engage in learning activities, many young students lack the autonomy and self-regulation to do so efficiently and effectively (Barbour & Reeves, 2009). Harms et al. (2006) explained that the same technology that can provide students with a rich online learning experience also provides students with more opportunities to cheat and plagiarize. In addition, students’ easy access to entertainment and social networking sites can also prove distracting (Harms et al., 2006). Early K-12 distance education programs recognized the need for student monitoring and sent learning materials directly to a student’s brick-and-mortar school, which then supervised the student’s learning (Russell, 2004). However, an increasing number of students are taking online courses from home (Clark, 2007), shifting more monitoring responsibilities to parents to ensure students’ academic honesty and help student to engaged in learning activities (Russell, 2004; Sorensen, 2012). Eyal (2012) explained that schools can aid parents in their monitoring activities by providing them with their student’s scores and analytic data. Eyal hypothesized that when this type of information is provided, parents would be more cognizant of where their involvement is needed and become more involved “on a personal level” (p. 38). Litke (1998) qualitative research found that parental involvement can vary greatly. Similarly, Boulton’s (2008) student interviews indicated that parental monitoring tended to be short-lived. As a result Litke (1998) suggested that teachers help parents to more fully

understand the role that they play in their student's learning. This type of communication has the potential to improve the quality and longevity of parental monitoring.

In general, adolescent learners lack motivation and have an external locus of control (Boulton, 2008; Cavanaugh et al., 2004; Moore, 1989, 2007). As a result, over the course of their monitoring activities parents will likely find that they need to motivate their student to engage in course activities. In an online learning environment students can miss the motivating physical presence of instructors (Tunison & Noonan, 2001), but parents can fill this void in part by using positive reinforcement following students' positive engagement activities (Hoover-Dempsey & Sandler, 1995, 2005; Liu et al., 2010). Murphy and Rodriguez-Manzanares (2009) conducted 42 interviews with online instructors and concluded that parents should be "actively encouraging or pushing" their students (p. 11). For instance, Water's (2012) phenomenological research examining parental roles at an online charter school showed that parents found that incentives and rewards were effective at improving student engagement in learning activities. However, Waters also found that it was difficult for some parents to reinforce student behavior because they were unaware of student activity or knowledge. As a result teachers may be able to help parents in their motivational efforts by highlighting to them their student's accomplishments.

Volunteering. Lastly, parents can volunteer to help the school. Similar to traditional school settings, virtual schools can organize parent organizations that help to coordinate volunteering opportunities. A report by the U.S. Department of Education (Planty et al., 2009) found that while a majority of parents of high school students (83%) reported attending at least one general school or parental organization meeting, only 34% actually volunteered or served on a school committee—significantly less than parents of younger students (52%). Parents' SES

status was also correlated to parents' level of participation. While these activities may not have a direct connection to student cognitive engagement, they show students that parents are committed to their success and may have a large impact on student affective engagement (Epstein, 1995; Hoover-Dempsey & Sandler, 1995). Volunteering in many ways is an example of modeling discussed later in this document.

Organizing. The second element of parent engagement is *organizing*. Just as teachers help students organize their virtual environment, parents should help to organize students' physical environment and time. Maslow (1943) stated children need some form of routine, giving the perception that the world is reliable and predictable. In part this can be done as parents help students organize their physical learning space in a way that facilitates student engagement (i.e. a comfortable learning area free from major distraction). Although instructors set the timetable of the course through regular due dates, parents should help their students to organize and regulate their daily schedule since the virtues of autonomy and independence can also prove to be vices for students who lack self-regulation skills (Tunison & Noonan, 2001). Sorensen (2012) analyzed 92 parent surveys and found that parents struggled to help their student stay on schedule in an autonomous learning environment. For instance, Waters' (2012) qualitative research found that two parents of seventh-grade students would both adjust their students' learning schedules according to the student's mood or interest level. One parent encouraged her student to work on subjects she enjoys the most when she lacks motivation. The other parent stated that he would have his student take the day off when the student was moody or tired "rather than force him to do it" (p. 162). It would appear that the correct balance between strictness and flexibility in scheduling students' time is idiosyncratic and largely based on

student characteristics and needs. Additional research in the area could prove helpful in providing parents with heuristics that could aid them in organizing their student's time.

Instructing. The third element of parent engagement is *instructing*. Although parents are typically not content experts, Borup, Graham, and Davies' (2013) found that a large portion of parents' interactions with students was focused on the content. Hoover-Dempsey and Sandler (2005) explained that parents can engage students in closed-ended instructional activities that are focused on memorization of information as well as open-ended instructional activities that result in semantic understanding of the content (Hoover-Dempsey & Sandler, 2005). Waters (2012) found that when parents lacked knowledge they would search for the information online or contact the course instructor. Borup et al. (2013) suggested that teachers could improve the effectiveness of parents' instructional activities if they made "the content and other educational resources available to parents along with teaching suggestions and tips" (p. 52).

Parents' instruction can also extend beyond the content to more peripheral information and skills such as learning strategies, technology skills, and academic integrity (Lee & Figueroa, 2012; Liu et al., 2010). For instance, Lee and Figueroa (2012) recommended that parents, together with their student, read assignment directions and rubrics as well as school policies on academic integrity and misconduct. Waters (2012) also found that parents instructed their students on identifying and using quality of online resources.

Peer Engagement

This section of the paper will discuss *peer engagement* (see Figure 4). Although peers can perform several of the parent and teacher engagement behaviors listed above, peers do not typically share the same responsibilities as parents and teachers when it comes to helping other

students' improve their engagement. Still, they often do have an impact on student engagement through instructing and collaborating, and motivating behaviors.

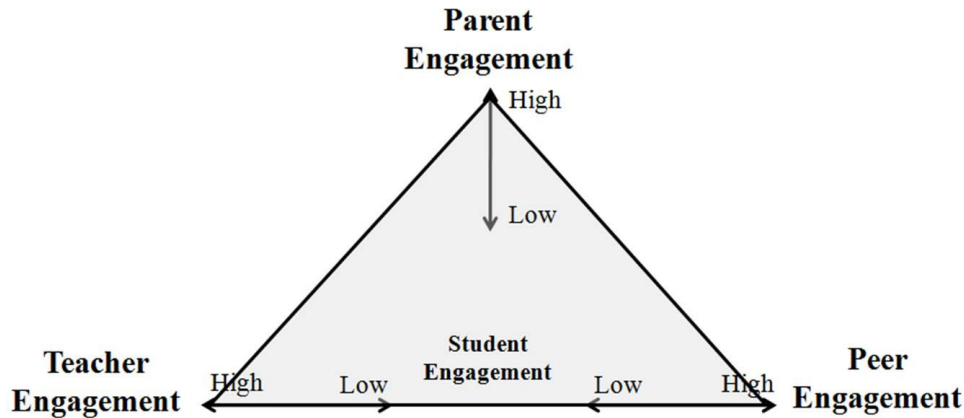


Figure 4: The ACE framework with high parent, teacher, and peer engagement—maximizing student engagement as represented by the triangle.

Instructing and collaborating. Similar to descriptions in parent and teacher engagement, *instructing* involves peers sharing and comparing previously obtained knowledge of the content and meta-cognitive understanding to others—in essence becoming an additional teacher (Gunawardena, Lowe, & Anderson, 1998). *Collaborating* moves beyond simply sharing and comparing information and occurs when students co-construct new knowledge. iNACOL's standards for quality online courses stated that students be provided with collaborative learning opportunities with their peers (iNACOL, 2011a), and online communication tools may provide students with more collaborative learning experiences than are possible face-to-face (Cavanaugh et al., 2004). Although peers can engage in informal collaborating activities, K-12 learners have fewer life experiences than adults and may find it difficult to co-construct meaning without adequate teacher scaffolding (Cavanaugh et al., 2004). Regardless of the setting, collaborating

requires a high level of student commitment and is best done once students have formed a sense of community with their peers (Garrison et al., 2000).

Motivating. Peer *motivating* can also influence student engagement. Moore (1989) explained that learner-learner interactions have a stimulating and motivating effect on young learners. Although students may intentionally motivate other students using explicit praise and encouragement, often high standing students are not cognizant of the motivational effects that their interactions have on their peers (Bandura, 1986).

Modeling and Social Presence: The Enabling Variables

Although parents, teachers, and peers have differing roles in improving student engagement, we hypothesize that all of their attempts to improve student engagement can be enhanced with modeling and social presence. Hoover-Dempsey and Sandler (1995) viewed modeling as an *enabling variable* because it improves the possibility of student success. Bandura (1986) found that behavior is more likely to be emulated when modeled by someone with high status. As a result Hoover-Dempsey and Sandler (1995) believed that parental modeling is especially important because children tend to hold parents in high regard. In addition, Liu et al. (2010) hypothesized that parental modeling could play an especially important role in online learning because of parents' physical proximity to students. Similarly, Moore (1989) stated that learners' interactions with instructors are important because the instructor models proper academic behavior to students.

Due to their physical separation from online students, teacher and peer modeling is enhanced by social presence—a person's ability to convey themselves as *real* in computer mediated communication (Garrison et al., 2000; Gunawardena, 1995). Students' social presence can have a positive effect on their perceived learning and course satisfaction (Caspi & Blau,

2008; Richardson & Swan, 2003; Swan & Shih, 2005). Garrison et al. (2000) explained that social presence reaches beyond the social climate and can positively impact student learning because students more freely exchange academic ideas once social presence has been established. Similarly, we argue that parents and instructors are more likely to effectively and efficiently collaborate once a sense of closeness has been formed and parents and instructors have established a degree of social presence. Becker and Epstein (1982) stated that interactions can lessen “the sense of distance felt by teachers and parents” (p. 88).

Discussion

Whetten (1989) described four “necessary ingredients of a theoretical contribution” (p. 490): (1) the *What*, (2) the *Why*, (3) the *How*, and (4) the *Who, Where, When*. The *What* and the *Why* identify and define the variables that make up the object of inquiry and explain why these variables were selected. Mishra and Koelher (2006) added that the value of a framework is not only helpful in directing researchers’ focus but also in assisting them to identify what to ignore. In this paper we have used existing K-12 online literature to build on previously established frameworks to identify and describe indicators of student, parent, teacher, and peer engagement. We recognize that the ACE framework is not a comprehensive list of groups of people and their influencing factors on student engagement. Similar to Ferdig et al. (2009) we believe that such a comprehensive list would actually distract researchers’ focus from best practices. However, we have tried to find the balance between completeness and parsimony in hopes of providing researchers and course designers with a useful framework that identifies major constructs and indicators that influence adolescent student engagement in online learning contexts.

Whetten (1989) stated that the *How* of theoretical frameworks explains the relationship between different components and provides a testable structure. The primary hypothesis of the

ACE framework is that there exists a positive correlation between student engagement and parent, teacher, and peer engagement. However, their shared responsibility to improve a student's engagement is not equally distributed and, as a result, are likely not equally correlated. Parents have a greater and more permanent responsibility to ensure the child's holistic development and care. Although parents may delegate some of this responsibility to teachers, the ultimate responsibility for the wellbeing of a child remains with the parent. Although some teachers and students form caring relationships that extend far beyond the confines of the course, teachers' primary responsibilities begin and end with the course. In contrast to parents and teachers, students have no natural or contractual responsibility to aid their peers. Instructors and parents can encourage and incentivize students to aid in their peers' learning but students ultimately accept or reject this responsibility.

Lastly, Whetten (1989) explained that the *Who, Where, and When* set the boundaries and the settings within which the framework operates (Whitten, 1989). The ACE framework has been designed to describe types of engagement in an interaction-rich adolescent online learning environment. Although this framework may prove useful in younger grades, it was not specifically designed for that context. It is also important to note that there are several types of learning models, each requiring different levels of teacher, parent, and peer engagement (Ferdig et al., 2009). In some supplemental online learning programs, the elements of teacher engagement can be performed by three individuals: a designer, a teacher, and an on-site facilitator (Harms et al., 2006). Differing learner models will also place varying emphasis on parent engagement. For instance, within full-time online programs students work from home placing a greater need for parental monitoring, organizing, and instructing.

It is hoped that the *What*, the *Why*, the *How*, and the *Who*, *Where*, *When* of the ACE framework may provide some clarity to the “conceptual confusion” (Saba, 2005, p. 260) that currently exists with K-12 online learning and provide researchers with a foundation on which to build a better understanding of both current practice and the possibilities of K-12 online learning. Researchers should first work to describe how students engage in online learning activities and the efforts of parents, teachers, and peers to improve a student’s engagement. To do so researchers might use a variety of data collection methods such as surveys, interviews, participant reflections, and observations. Researchers could also gain a better understanding of the different types of engagement by examining course management system analytic data, course design, discussion boards, and email communication. Such research could refine and/or expand the ACE framework, and most importantly identify the critical components to student success as called for by Rice (2006). Researchers should also seek to create and validate instruments to quantitatively measure the different types of engagement identified in the ACE framework. Doing so would allow researchers to conduct correlation and regression analyses providing insights into the relationship between student engagement and parent, teacher, and peer engagement. This understanding has the potential to improve practitioners’ decision making when creating and implementing collaborative course designs, interaction policies, and parental involvement programs. Such a coordinated effort between researchers and practitioners has the potential to improve course outcomes for the expanding population of K-12 online learners.

Conclusion

Although K-12 online learning has experienced considerable growth (Queen & Lewis, 2011; Wicks, 2010), research has lagged (Cavanaugh, Barbour, & Clark, 2009). This paper provides a framework on which to examine adolescent online learning settings. We have used

existing K-12 online learning literature to build on existing frameworks that have emerged from the higher education and face-to-face settings. The resulting ACE framework identifies four types engagement (student engagement, teacher engagement, parent engagement, and peer engagement) and explains how teachers, parents, and peers might influence students' affective, behavioral, and cognitive engagement.

We identified three primary indicators of teacher engagement: facilitating interaction, designing and organizing, and instructing. Although parents and teachers have unique roles in students' education, Epstein and Dauber (1991) observed that parents and teachers have overlapping influences on student engagement. As a result, teacher engagement and parent engagement both represent some responsibility in facilitating interaction, organizing, and instructing. Their overlapping responsibilities can be done without the aid of the other but it is believed that greater educational outcomes will be achieved when instructors and parents work in concert (Epstein et al., 1997). Although peers can help with most of the engagement indicators listed above, peers' responsibilities to improve other students' engagement are not the same as that of parents and teachers. We contend that peer-engagement is primarily made up of two elements: *instructing and collaborating*, and *motivating*. The framework as a whole suggests that the degree to which students engage in learning activities will be influenced by parent, instructor, and peer interactions.

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Overall Conclusions and Discussion

Although K-12 online learning has grown dramatically, the growth has not occurred without some trepidation. The concern that has garnered the most attention is online learning's attrition rate that tends to be higher than that of face-to-face courses. The cause of the high attrition is complex and idiosyncratic but many researchers point to the quality of interactions as a contributing factor (Dziuban, Hartman, & Moskal, 2004; Hara & Kling, 1999; Petrides, 2002; Song, Singleton, Hill, & Koh, 2004; Vonderwell, 2003). Unfortunately little research has been conducted examining interactions in the K-12 online learning environment. Guided by Moore's (1989) three types of interactions, we examined the quantity and quality of interactions at the Open High School of Utah. Learner-parent and parent-instructor interactions were additionally examined in recognition that parents have an important role in the child's education—especially in K-12 levels. Following Burnham and Walden's (1997) guidance we also examined the subjects of those interactions (i.e. social, procedural, and content topics). Lastly, we correlated the quantity of interactions with several course outcomes.

Surveys found that the large majority of students viewed all investigated types of interaction as motivational. Although students tended to view their interactions with their peers to be less motivational and educational than their interactions with their instructor and parents, the majority of the significant correlations were between students' quantity of time spent interacting with their peers and course outcomes. This somewhat contradictory finding may indicate a spurious correlation. Course outcomes and students' time interacting with their peers are possibly less correlated with each other and more correlated with student engagement. Unfortunately, student engagement was not measured in this research so this hypothesis could not be tested. In fact, there does not exist a universally accepted definition for student

engagement or a validated instrument for measuring student engagement in an online learning environment (Fredricks, Blumenfeld, & Paris, 2004; Hughes, Luo, Kwok, Loyd, 2008). Work in this area could be especially important to understanding how learner interactions impact course outcomes.

The large majority of students felt that their interactions with their parents (97%) and instructor (88%) were motivational in their learning. However, students' reported quantity of learner-instructor and learner-parent interactions tended not to be significantly correlated with course outcomes. In fact, the quantity of students' interactions with their parents tended to negatively correlate with course outcomes. Qualitative research conducted in online environments—including OHSU—has indicated that the nature of online learning affords teachers the flexibility to provide students with a high level of personalized interactions which in some cases can be higher than in a face-to-face environment (Borup, Graham, & Drysdale, in review; Borup, Graham, & Velasquez, 2013; Sorensen, 2012). Similar to Black (2009) we also hypothesize that the teachers in this research used their flexibility to spend more of their time interacting with low and underperforming students. It is also possible that when students study at home parents' proximity allow them to be more responsive to students' needs following low performance. These types of interaction patterns would help to explain the low or negative correlations between course outcomes and the time students reported interacting with their teacher and parents.

McNeal (2012) tested this reactive hypothesis by conducting a regression analysis on data obtained from the National Longitudinal Educational Study and found little empirical evidence in support. McNeal also claimed that some types of parental engagement that are beneficial for young children are less effective or even damaging to adolescent learning. McNeal ended by

saying that there are likely some forms of parent involvement that positively impact student achievement and that “future researchers should focus on better understanding parent involvement itself” (p. 88).

One barrier to the type of research that McNeal (2012) suggested is the lack of a theoretical framework. For instance, this dissertation research used types and subjects of interactions to frame the data collection and analysis. Although the framework proved helpful in planning and interpreting the results, the findings were ultimately limited. A framework that simply identifies the types and subjects of interactions does little to help researchers explain the quality of those interactions and how they might impact course outcomes. It may be more useful if a framework helped to identify the intended or perceived purposes of those interactions and explain how they could impact course outcomes. For instance, Garrison, Anderson, and Archer’s (2000) Community of Inquiry framework and Moore’s (1980) theory of transactional distance focus on the purpose of interactions such as reducing psychological distance or establishing social presence that supports discourse. Current frameworks also describe the different roles that teachers and parents fulfill as they participate in interactions (Anderson, Rourke, Garrison, & Archer, 2001; Epstein, 1987; Epstein & Dauber, 1991). However, these frameworks were created within higher education or face-to-face environments and do not specifically address the unique characteristics of the K-12 online environment or learner characteristics.

The third paper in this dissertation presents a framework that may help in examining how others (i.e. teachers, parents, and peers) can work to impact student engagement. The Adolescent Community of Engagement (ACE) framework used existing K-12 online literature to build on previously established frameworks. Guided by Whetten’s (1989) “necessary

ingredients of a theoretical contribution” the ACE framework identifies and defines student, teacher, parent, and peer engagement as critical elements of student success, explains the relationships between these elements, and sets the boundaries for which the framework is intended to be used. It is hoped that the ACE framework may provide some clarity to the “conceptual confusion” (Saba, 2005, p. 260) that currently exists with K-12 online learning and provide researchers with a foundation on which to build a better understanding of how teachers, parents, and peers can impact course outcomes.

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