USING PEER TEACHERS ON THE AUTISM SPECTRUM

TO TEACH 3D MODELING SKILLS

by

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STATEMENT OF THESIS APPROVAL

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ABSTRACT

Autism spectrum disorder (ASD) is a life-long condition that is characterized by social and communication deficits and restrictive, repetitive behaviors. As of 2014, 1 in 68 8-year-olds in the United States had been diagnosed with ASD. Since most of the literature and interventions are focused on early childhood, one approach to improving some of the challenges associated with ASD, including social and vocational issues, is peer teaching, an educational strategy that typically employs neurotypical, nondisabled students to teach skills to students with a disability. Peer teaching is associated with positive social and academic outcomes. However, most of the peer-teaching literature uses peer teachers who are typically developing or nondisabled and focuses on the deficits of the students with the disabilities. The current study was a program development and evaluation of the iSTAR peer-teaching program that utilizes experienced peer teachers with ASD (9 peer teachers ages 15–26) to instruct students with ASD in iSTAR's summer SketchUp workshop. Six major substantive themes emerged during the qualitative analysis: (a) the meaning of peer teaching, (b) peer teaching motivation, (c) competency, (d) peer teacher challenges, (e) coping, and (f) program review. Themes will be discussed in terms of their consistency with role theory and the concept of scaffolding. The study is consistent with previous findings that peer teaching is a positive teaching strategy that benefits the peer teachers as well as the

learners. This study helps provide the foundation for future studies to explore

individuals with ASD as peer teachers instead of being the recipients being taught by

others.

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INTRODUCTION

Autism spectrum disorder (ASD) is a life-long condition that is characterized by deficits in social interaction and communication. Additionally, individuals with ASD have restrictive, repetitive behaviors and interests (Autism and Developmental Disabilities Monitoring Network [ADDM], 2014). As of 2014, 1 in 68 8-year-olds in the United States had been diagnosed with ASD (ADDM, 2014). ASD occurs more often in boys (1 in 42) than girls (1 in 189) (ADDM, 2014; Hendricks, 2010).

While the main focus of ASD research is on early intervention and social skill development in childhood, ASD is a disorder that can cause long-term challenges that span an individual's life (Hendricks, 2010). With most of the literature and interventions focused on early childhood, research on adolescents and adults with ASD is relatively limited. The studies focused on adolescents and adults are further limited by small sample sizes that make generalizing the research to the broader population difficult (Shattuck et al., 2012).

The transition to adulthood is identified as a crucial period for individuals with ASD (Eaves & Ho, 2008; Levy & Perry, 2011; Schall, Wehman, & McDonough, 2012; Shattuck et al., 2012; Taylor et al., 2012; Wehman et al., 2014). Lack of services, resources, and opportunities during the transition period after high school creates several challenges for young adults with ASD (Eaves & Ho, 2008). According to Taylor et al. (2012), many adults with ASD fail to meet traditional milestones to

achieve independence. Few young adults with ASD have ever lived independently from their parents (Roux, Shattuck, Rast, Rava, & Anderson, 2015). In addition, many individuals with ASD have reported feeling a lack of a high level of personal autonomy (Wehman et al., 2014).

The lack of independence after high school can be attributed to several reasons. Youth with ASD have difficulties securing employment, facing chronic unemployment and low job security (Levy & Perry, 2011; Wehman et al., 2014). Ninety-nine percent of all young adults have held employment at some point between the ages of 21–25 (Roux et al., 2015). However, only 58% of young adults with ASD received payment for employment during same period (Roux et al., 2015).

Once adolescents with ASD leave high school, all of the mandated services they received through special education are no longer available. To continue receiving services, they are forced to enter the realm of adult services, which consist of long waitlists and which are not always capable of meeting individual needs (Taylor et al., 2012).

The services available to assist with the employment issue are inadequate. Very few programs are available to assist adults with ASD obtain a job. Those that exist were developed to assist those who are higher functioning (Levy & Perry, 2007). In vocational rehabilitation programs, adults with ASD are the group that is the most expensive to assist with employment and have some of the poorest outcomes of all disability groups (Schall et al., 2012). Furthermore, the United States vocational rehabilitation system believes adolescents and adults with ASD to be poor candidates for employment (Schall et al., 2012).

Difficulty navigating social situations is one explanation as to why individuals with ASD face challenges in regards to employment. Challenges in understanding and communicating with supervisors can lead to poor job performance and termination (Wehman et al., 2014). One approach to improving some of the challenges associated with ASD, including social and vocational issues, is peer teaching, an educational strategy that typically employs neurotypical students to teach skills to students with a disability.

Peer Teaching

Peer teaching is a technique used in educational settings to increase the level of student engagement with the curriculum. This helps students take a more active role in learning. Based on both Vygotsky's and Piaget's cognitive learning theories, peer teaching involves a more knowledgeable peer assuming the role of a teacher to aid students in the learning process. According to the sociocultural theory of learning, Vygotsky believed that having a more knowledgeable peer assist in the learning process helps increase the rate at which a skill is learned (Velez, Cano, Whittington, & Wolf, 2011). Similarly, in Piaget's theory of cognitive development, peers help children learn by creating a state of disequilibrium that challenges the ideas of the individual until they reach a state of cognitive equilibrium (Velez et al., 2013). In an educational setting, peer teaching is a strategy used to help students learn from and with each other with limited involvement of the teacher (Velez et al., 2013).

Peer teaching has also been used as an intervention to teach individuals with

disabilities. Peer teaching is an evidenced-based practice that is positively associated with development of skills (e.g., social skills, job skills, or classroom assignments) in individuals with disabilities, including individuals with autism spectrum disorder, emotional and behavioral disorders, and serious emotional disturbances (Blake, Wang, Cartledge, & Gardner, 2000; Bobroff & Sax, 2010; Morrison, Garcia, & Parker, 2001; Tournaki & Criscitiello, 2003; Wang et al., 2013). Several studies have shown peer teaching programs can be effective in improving the social skills of students with disabilities. Researchers have found several benefits to the use of peer-teaching programs for students with disabilities, including increased academic achievement, a decrease in negative behaviors, increased quality social interactions, fostering inclusion within a school setting, increased time for individualized instruction, and improved self-esteem and confidence (Banda, Hart, & Lui-Gitz, 2009; Bobroff & Sax, 2010; Cervantes, Lieberman, Magnesio, & Wood, 2013; Chan et al., 2009; Thiemann & Goldstein, 2004; Tournaki & Criscitiello, 2003; Wang et al., 2013). Peer teaching has also been shown to be an effective intervention as students are motivated by the activity itself and students are engaged in a positive activity (Tournaki & Criscitiello, 2003).

Much of the research in the area of peer-teaching interventions focuses on increasing social skills in students with disabilities within a classroom setting. Social skills include initiating conversation (students asking questions or making comments to start a conversation), responding to peers (students responding to questions or comments to peers), and social interaction (student acknowledges peer through reciprocal nonverbal gestures or verbal communication) (Banda et al.,

2009; Carter, Cushing, Clark, & Kennedy, 2005; Hughes et al., 2013; Kamps et al., 2002; Morrison et al., 2001; Thiemann & Goldstein, 2004).

In a study conducted by Banda, Hart, and Lui-Gitz (2009), researchers developed a peer-mediated intervention where typically developing peers were trained to improve the social skills of 2 6-year-old students with autism spectrum disorder (ASD). The peer training included 10-minute sessions two to three times a week, totaling 13 to 17 sessions, after which the peer teacher would practice social skills with the student with ASD. Researchers specifically looked at the frequency of initiations (verbal interactions initiated by the student with ASD) and responses (verbal interactions in response to the typical peer) to determine the success of the program (Banda et al., 2009). Based on observations collected throughout the study, researchers found the peer-mediated intervention to be effective in increasing the frequency of initiations and response in the students with ASD (Banda et al., 2009).

Kamps et al. (2002) found similar results with their peer-mediated social skills training. The study included 5 students with ASD ages 9–10 and 51 of their general education peers ages 8–10. The 12-week intervention was designed to include a 10-minute scripted lesson, where the instructors modeled social skills, followed by 10–15 minutes of social skills practice with their peers during free time (Kamps et al., 2002). Similar to the Banda et al. study, researchers observed and measured the frequency of social initiations and responses (verbal interactions in response to the typical peer). In addition, researchers looked at the mean length and total duration of interactions with peers. Researchers found that the peer training and intervention were effective in increasing the amount and duration of ASD

students' social interactions with their typical peers. Additionally, researchers found that the training helped generalize the social skills during other activities outside of the intervention environment. When compared to a control group, the students who had received peer-mediated social skills training had more social interactions and peer networking during lunch, recess, tutoring programs, and social/play groups (Kamps et al., 2002). Additionally, researchers found that students were able to generalize their skills to expand their interaction to peers they were unfamiliar with (those who were not in the peer-training intervention). However, this occurred less frequently than with the peers that the students with ASD were familiar with (Kamps et al., 2002).

To determine if peer-mediated interventions were effective in increasing the social skills of students with ASD, Morrison et al. (2001) looked at four groups of students ages 10–13, which included 1 student with ASD and 2–3 typical students. Using the typical peers to model appropriate behaviors, each group participated in intervention sessions that included 10-minute peer training and a 10-minute practice session. Researchers observed social skills (requesting, commenting, and sharing) and behaviors (initiations, responses, social interactions, and inappropriate behaviors). Additionally, the peers and the students with ASD were required to monitor how often the student with disabilities completed each of the social skills (Morrison et al., 2001). Based on investigator observation and student- and peer-monitoring, researchers concluded that the peer-mediated intervention was successful in increasing the social initiations of the students with ASD (Morrison et al., 2001). Hughes et al. (2013) had similar findings in their study looking at peer-

directed social interaction interventions for students with ASD ages 16–17. Researchers for this study had similar dependent variables (initiation and social interaction) and found that the social interaction intervention lead by peer teachers was successful in increasing social skills of the students with ASD (Hughes et al., 2013).

Several studies have looked into specific aspects of the peer-teaching interventions to understand what makes a program effective. Carter et al. (2005) looked into the number of peer tutors needed in a classroom setting to be effective in increasing social interactions of students with disabilities in a general education classroom. The study included 3 students with disabilities (ages 11–17) and 6 general education students (ages 11–17). Two conditions for the intervention were used. Condition A had 1 peer tutor working with the student with disabilities and Condition B had 2 peer tutors working with the student with disabilities. The conditions alternated daily throughout the length of the study. Researchers found that the students with disabilities had greater levels of social interactions during Condition B. However, that may be due to the fact that Condition B had more students involved, providing more opportunities for social interaction (Carter et al., 2005).

Thiemann and Goldstein (2004) found that their peer-teaching intervention was effective in increasing the rates of social interactions for 2 students with Pervasive Development Disorder–Not Otherwise Specified (PDD-NOS) (ages 6–9) and was successful in stabilizing the social interaction rates for 2 others. They also found that using a written text treatment, where they used written instructions to

train the peer tutors in addition to verbal instructions, was effective in increasing the rate of social interaction for the participants with PDD-NOS (Thiemann & Goldstein, 2004). Chung et al. (2007) replicated Thiemann and Goldstein's 2001 study that looked at peer-mediated social skills training. Researchers wanted to determine whether a shorter, less intensive version of a social skills program would be effective in increasing the social skills of students with ASD. Students and peer teachers met once a week for 90 minutes throughout the course of the 12-week study. Researchers found that the shorter, less intensive program was effective in increasing the social skills of the students with ASD (Chung et al., 2007).

Although there have been a number of studies that have looked into peer-teaching interventions where a typical peer has tutored a student with a disability, the research based on students with disabilities tutoring other students with disabilities is extremely limited. One exception is a study by Bobroff and Sax (2010). This study examined the effects of using peer tutors with disabilities (severely emotionally disturbed and ASD) who had experience with interviewing for jobs to teach other students with disabilities who wanted to increase their job interviewing skills. Three peer tutors were partnered with 3 students with disabilities and the tutor's ability to be a peer teacher was evaluated. They looked at a tutor's comfort level with being a peer teacher, knowledge of interviewing skills (how to act during an interview, how to evaluate interview questions) and the tutor's personal experience interviewing for jobs (Bobroff & Sax, 2010). For 7 weeks, the peer tutors worked with the students to help teach them interview skills. Practice job interviews were used to evaluate the success of the peer-tutoring program.

Researchers found that the program was successful in increasing the students with disabilities' interview skills. Also reported were benefits for the peer tutors such as enjoyment while teaching, fulfillment in knowing they helped other students, and enjoyment of trying a new activity (Bobroff & Sax, 2010).

While most studies define peer teaching as a student without a disability teaching a student with a disability, Tournaki and Criscitiello (2003) focused on "reverse-role tutoring." In their study, students with disabilities became the tutors for students without disabilities. Participants in the study included 5 students in first grade with emotional and behavioral disorders who were functioning at grade level. Each tutor was paired with a general education student (five total) who was performing below grade level and having difficulties scholastically. The objective of the study was to reduce and eliminate six target behaviors (i.e., pushing, hitting, cursing, screaming, interrupting others, and out-of-seat behaviors) in the tutors (Tournaki & Criscitiello, 2003). For 20 school days during the 20-minute tutoring period where the tutors assisted the students in writing skills, educational assistants recorded the frequency and duration of the target behaviors that the tutors exhibited. Additionally, the tutors received consequences (time-out or loss of free time) consistent with classroom rules for engaging in the behavior. Researchers then compared the frequency and duration of the six target behaviors present during the tutoring session to a nontutoring session where the students participated in regular classroom activities (Tournaki & Criscitiello, 2003). They found that each of the peer tutors showed a decrease of two-thirds over the course of the study in frequency and duration of the target behaviors during the tutoring sessions.

Furthermore, although not a goal of the study, researchers also found that the writing scores of students receiving the tutoring increased (Tournaki & Criscitiello, 2003). They concluded that role-reversal tutoring has many benefits, such as increased academic learning and increased responsibility in students with disabilities, leading to appropriate social behaviors (Tournaki & Criscitiello, 2003).

Blake, Wang, Cartledge, and Gardner (2000) conducted two studies (one descriptive, one experimental) that focused on using a peer-teaching strategy to have elementary and middle school students with severe emotional disturbances (SED) provide social skills instruction to other students with SED. The tutors selected for the studies had the teachers select students who were the most socially skilled in the class to serve as the peer teachers. Both studies focused on using a formal curriculum for the peers to teach social skills, such as those needed for social communication and playing games (Blake et al., 2000). In both studies, researchers found that the peer-mediated instruction facilitated and promoted positive peer interactions among the participants. The results support training students with mild disabilities to teach social skills to their peers with similar disabilities (Blake et al., 2000).

Limitations to Current Research

Based on the available research, the current peer-teaching interventions are limited in a couple of ways. First, the studies generally focus on peer teachers who are typically developing. Very few peer-reviewed empirical studies are available where the individual with a disability acted as the peer teacher. In one article

describing the role of the students with emotional and behavioral disorders as peer teachers, the researchers state that being a peer teacher is more powerful than being the student (Wang et al., 2013).

Researchers cite role theory as one possible explanation. Role theory suggests that "a person's behavior is partially shaped by the social expectations that other people hold as a consequence of his or her role within a community" (Wang et al., 2013, p. 12). Research has shown that those individuals who are given more responsibility act more responsibly (Wang et al., 2013). When students with disabilities are given the role of peer teacher, a role associated with prestige, authority, and competence, it can lead to increased social status that may increase self-esteem and other positive behaviors (Tournaki & Criscitiello, 2003). Previous research has indicated that when students with disabilities are given the opportunity to tutor students in reading, they receive greater gains in reading themselves (Tournaki & Criscitiello, 2003).

Second, most of the studies with peer teachers focused on the deficits of the students with disabilities instead of their strengths. Research has shown that by helping individuals explore their strengths, they show higher levels of positive behaviors, and greater happiness and overall wellbeing (Gander, Proyer, Ruch, & Wyss, 2012).

Third, age is also a limitation in the current research. Most of the students who participate in peer-teaching programs are in elementary school classrooms. While Carter et al. (2005) and Hughes et al. (2013) included high school students in their studies with the ages of the peer teachers and students ranging from 11–17,

only one study (Bobroff & Sax, 2010) included transition-age individuals as peer
teachers and students.

Due to these limitations in the research, new studies need to be conducted to
address the gaps in the research. This study specifically aims to add to the literature
through a focus on transition-age individuals with autism as peer teachers in a
strength-based program.

The Current Study

iSTAR is a technology education program designed to facilitate social,
creative, and employment skills in youth on the autism spectrum. As a strength-
based program, iSTAR focuses on the natural visual-spatial talent of many
individuals with ASD (Grandin, 1995; Mottron & Belleville, 1993; Wright, Diener,
Dunn, & Wright, 2011). iSTAR uses Trimble SketchUp, a 3D modeling program, to
help students develop technology skills, explore careers that utilize 3D technology,
and facilitates social engagement among the students (Wright, Wright, Diener,
Rafferty, & Sampson, 2016).

One way in which iSTAR helps to increase job skills for its students is by
giving them leadership opportunities. iSTAR utilizes students who have previously
attended iSTAR workshops and have shown SketchUp proficiency to act as peer
teachers. In the iSTAR setting, peer teachers assist new students with basic
SketchUp questions, provide positive feedback to students, and help facilitate social
interaction (Wright et al., 2016).

The current study was designed to evaluate a peer-teaching program

developed for iSTAR. The program was developed to enable students who had

previously attended iSTAR workshops and demonstrated proficiency with SketchUp

to act as peer teachers. The current study focused on the development and

evaluation of a peer-teaching program where peer teachers with ASD taught iSTAR

students how to use SketchUp in a workshop setting that focuses on the strengths of

both the peer teachers and the students. Research questions that guided the

methodology included:

- What were the benefits for the peer teachers?

- What were the challenges for the peer teachers?

- How could the peer-teaching program be improved?

METHODS

The peer-teaching program took place at iSTAR summer workshops for youth and young adults on the autism spectrum during the summer of 2015. The summer workshops were located at two sites: Salt Lake City, UT and Boulder, CO. Each of the workshop sites conducted two classes with 8–10 students each. The workshops were staffed by a minimum of 2 facilitators trained to run the classes and manage behaviors. To help teach the students SketchUp and provide technical expertise, each workshop employed a SketchUp expert—a professional who used SketchUp in their daily job.

Participants

To be eligible to be a peer teacher, the individual needed to have a diagnosis of autism, have previous experience in the technology workshops, have demonstrated proficiency in SketchUp, and have the ability to present in front of a group, engage other students in teaching, and follow directions. Nine students (5 in Salt Lake City, 4 in Boulder) met these criteria and were invited to participate both as peer teachers and in the development and evaluation of the peer-teaching program. Parents were sent an email containing information about the technology workshop to be held in the summer and inviting their student to be a peer teacher. The email also informed the parents that their student would be paid for their

participation as a peer teacher. All students selected to be peer teachers agreed to participate.

The 9 peer teachers were all males between the ages of 15 and 26. The average age of the participants in Salt Lake City was 16.8 years and in Boulder the average age was 24.0 years. All participants were Caucasian except 1 who was Hispanic. Further demographic information for each participant can be found in Table 1.

The parent-reported autism diagnosis was confirmed through the use of the Checklist for Autism Spectrum Disorder (CASD) (Mayes et al., 2009). The checklist consists of 30 items on autism symptoms an individual has had in the past or present. Individuals with a score of 15 or more (either in the past or present) are identified as being in the autism range (Mayes et al., 2009). One study compared the use of the CASD and the DSM-IV for diagnostic purposes and found a 100% diagnostic agreement for 157 children with ASD (Mayes et al., 2009).

All but 1 of the students received a CASD score above the benchmark of 15 needed to confirm an autism diagnosis (*N*=8, *M*=22.75, *SD*=3.73). One parent did not complete the checklist; however, this mother reported that her son was diagnosed with autism at the age of 4.

Eight of the 9 participants were previous students in the technology workshops and had demonstrated the necessary qualifications (based on the inclusion criteria above) to be a peer teacher. One student was nominated by the Boulder community to be a peer teacher, as he was proficient in SketchUp and was an undergraduate student in studio and media arts at the local university.

Setting

Salt Lake City, UT

The technology workshop took place at Columbus Community Center, a non-profit organization that serves individuals with disabilities by supporting their independence (Columbus Foundation, 2016). The workshop at the Salt Lake City location was 3 hours a day for 5 days. Students for the workshops were participants in previous summer workshops or were recruited from the local school district. To recruit students from the local school districts, the school district transition specialist asked high school teachers to nominate students for the program (Wright et al., 2015). Twelve students (all males, ages 12–24) with autism were split into two classes. Six students who had previous experience with SketchUp were placed in Class A (an experienced group) and 6 students new to the summer workshop were placed in Class B (new to SketchUp).

Three peer teachers were assigned to Class A and 2 peer teacher were assigned to class B. Due to the differing skill levels of the classes, both groups of peer teachers were given the opportunity to switch classrooms to experience teaching the new students, as well as helping the experienced students.

Boulder, CO

The workshop took place in a local junior high classroom. The Boulder workshop was held 3 hours a day for 10 days. As the workshop in Salt Lake City was only 5 days long, only the first 5 days of the Boulder workshop was included in the analysis. Students were recruited through a local school district and a local private

school for youth with ASD. Fourteen students participated in the summer workshop (12 males and 2 females, ages 12–21). Students who had attended previous summer workshops were placed in Classroom A (5 males, 1 female). Students recruited from the school district were placed in Classroom B (7 males, 1 female).

Two peer teachers were assigned to Class A and 2 peer teachers were assigned to class B. The peer teachers stayed in the same classes throughout the course of the workshop. However, the peer teachers gave SketchUp demonstrations to both of the classes.

Procedure

The peer teaching position was considered a job and participants were paid for their role in helping teach during the technology workshops. Students in Salt Lake City were paid $100 for the week and students in Boulder were paid a $150 stipend for the week. The pay was higher for students in Boulder as the peer teachers were older and had more experience with SketchUp. Students received no extra compensation for their participation in the development and evaluation of the program.

Most of the peer teachers were able to participate in each of the 5 days that were used for analysis. One student from the Salt Lake City location missed the last day due to a family vacation, and 2 students in Boulder missed one day due to illness and a family emergency. The absences did not affect their pay.

Measures

      Once participants accepted their role as a peer teacher, they were invited to attend an orientation to learn more about the peer-teaching role and take part in a preinterview and preassessment of their skills, including teaching, SketchUp, coping, and social skills. During the workshops, the peer teachers participated in pre- and postconferences, recorded their interactions with students using a peer-teaching log, and participated in evaluation interviews (see Table 2).

Preinterviews

      Prior to the workshops, each of the peer teachers took part in a one-on-one semistructured interview at one of the following locations: a parent orientation for new or returning students (all Boulder peer teachers), the office of the main researcher (4 Salt Lake City peer teachers), or the classroom where the technology workshop was held (1 Salt Lake City peer teacher). The preinterview questions addressed the peer teacher's understanding of the peer teacher job description, why they chose to be a peer teacher, and what they hoped to get out of the peer-teaching experience. These questions were asked to help define the role of the peer teacher and to understand the student's motivations. Other questions were designed to gain background information on the participants (previous peer-teaching experience, work and educational experience, and future career goals). Questions were also asked to determine how the peer teachers would respond to stressful, unexpected events or making mistakes. These questions were used to help the researchers learn how to best support the peer teachers during the workshop. The preinterviews

were 10 to 20 minutes in length. Interviews were audio recorded and transcribed (see Appendix A for questions).

Peer-teaching Skills Assessment

During the preinterviews, the peer teachers were asked to complete a peer-teaching skills assessment survey. The survey was designed to determine their perceived level of skills in regards to their abilities to work with students, comfort with teaching tasks, and coping and other skills (e.g., SketchUp, leadership, and presentation). The 53-item survey used a 5-point Likert scale ranging from 1 (*strongly disagree)* to 5 (*strongly agree*). For the skills (technology, leadership, presentations) portion of the survey, the scale ranged from 1, (*no experience*) to 5 (*mastered*) (see Appendix B for the assessment) (see Table 2).

Preconference

Peer teachers were asked to arrive prior to the start of the workshop for the preconference session, a 5- to 10-minute meeting to discuss the daily schedule and the peer-teaching strategy for the day. The preconferences were audio-recorded. The preconference was structured as a training session. The peer teachers were presented with information on how to implement peer-teaching strategies and then they were given the opportunity to ask questions about the schedule, peer-teaching strategies, and any concerns they had.

During the session, the lead researcher explained the daily schedule to the peer teachers, what was expected of them, and welcomed feedback on the program.

For example, peer teachers were expected to arrive on time, remain focused on SketchUp, and be respectful to others. Then, the lead researcher would explain a strategy the peer teachers could implement during the class that would help them feel more comfortable with the peer-teaching task, such as communication techniques and how to approach students for help. During the preconference, peer teachers were encouraged to ask questions about the peer-teaching process or job.

During the preconference on the first day, the peer teachers were given a set of rules and responsibilities. As role models, the peer teachers were expected to follow the rules of the workshop and act appropriately (e.g., stay focused on SketchUp, be respectful, act how they would at a job). Since the peer-teaching role was also functioning as a job for the students, they were expected to act professionally and help students.

Postconference

At the end of each workshop day, the peer teachers participated in a 5- to 15-minute postconference session. The postconference was structured like a focus group, where the peer teachers were asked to give their responses to a series of questions (see Appendix C). The questions focused on what each participant's peer-teaching experience was like that day, what peer-teaching strategies worked, how the peer-teaching program could be improved, and if the peer teachers were able to meet the goal for the number of students they were to help each day (see Appendix D). These questions were asked to determine what the peer teachers' reactions and experience were each day and to determine if any of the peer-teaching strategies

needed to be adjusted for clarity or to meet the needs of the peer teachers. Each participant was asked and given opportunity to respond to each question. The postconference interview was audio-recorded.

Daily Peer Teacher Log

Based on the Tutoring Log from the Bobroff and Sax (2010) study, the peer teachers were asked to track the peer-teaching interactions they had with students during each class. Peer teachers were asked to write the name of the student, how they helped the student, and write a short reflection of the experience. At the beginning of each day, students were either given or chose a goal for the number of students they were to help each day. Typically, students helped at least 1 or 2 students each workshop. These logs helped keep track of how many students the peer teachers were helping and in what areas they helped the students (see Table 2).

Evaluation Interviews

Students were asked to participate in a video evaluation of their experience as a peer teacher. All of the peer teachers agreed to this video interview. The questions were focused on the peer-teaching experience and suggestions for improving the peer-teaching program (Appendix E).

At the end of the evaluation period, the peer teachers took part in one-on-one semistructured interviews that discussed their experience during the previous 5 days. Students were asked questions about their view of peer-teaching since

starting the program, their most memorable moments as a peer teacher, and what peer-teaching strategies were helpful (Appendix E). The postinterviews lasted between 1 and 6 minutes.

Peer-teaching Curriculum

Physical Setting

The classroom was set up in a U shape with the students sitting on the inside of the U. This allowed students to turn around and talk to peer teachers on opposite sides of the room for help. With this set up, the peer teachers could see the students' computer monitors without having to leave their seats. The peer teachers worked on their own models and were placed at computer workstations between new students so they could help the students next to them as they worked. If a student had a question, the peer teachers were able to get up from their workstations to help that student. The peer teachers were also told that they could get up out of their seats and walk around the classroom to see if any students had questions or to check out the work of the students.

During the class time, the peer teachers were able to work on their own SketchUp projects. The peer teachers took a break along with the other students and had the opportunity to present their projects to the other students as well at the end of each day. Almost all the peer teachers presented their projects daily and also used this as an opportunity to teach skills to the other students. Due to time constraints, some peer teachers were unable to present every day as the priority was for the participating students to present.

Peer-teaching Strategies

The peer-teaching strategies suggested to the participants were selected based on feedback from the peer teachers on their preassessment survey or during the postconference debriefing session held daily.

Based on the preassessment feedback, the first strategy (Day 1) dealt with how to approach students and offer help. Peer teachers were given a sheet with key phrases and questions that they could use to help students they noticed needed help with SketchUp. They were also given a list of phrases that they could use if a student turned down their assistance, such as "do you need help with your project" and "if you want help another time, I can help you." Students were reminded these phrases were to give them ideas of how to initiate a conversation or to figure out if the student needed help. They were instructed that the phrases did not need to be used verbatim and could be altered to fit the situation.

During the first evaluation postconference, the peer teachers requested assistance in learning how to better communicate with students. Some peer teachers mentioned that they had difficulty understanding what it was that the students were asking and both parties ended up getting frustrated. The second strategy (Day 2) focused on communication addressing this issue. Peer teachers were given a list of steps to follow to help the communication process. First, the peer teachers were to ask the students if they needed help using the phrases they learned during the first day. If the student needed help and asked the peer teacher a question, the next step would be for the peer teacher to repeat the question to help clarify the need of the student. If the student's request was still unclear, the peer

teacher was to repeat the question one more time before asking another peer teacher for help. If the other peer teacher was unsure of the student's request or how to help, the peer teachers then asked the SketchUp expert to help the student.

The third strategy (Days 3-5) dealt with delivering a SketchUp tool demonstration in front of the class. The peer teachers were asked to pick a SketchUp tool or tip they were comfortable teaching to the class. Once the peer teachers selected their topic for the demonstration, they were given some tips on how to give their demonstration, such as speaking with a loud, clear voice. They were also reminded that while the students may not be watching the screen, they could still be listening or following along on their computer. It was recommended that they ask if the students had questions during and after their demonstration. Once the students completed the demonstrations, they were reminded that some students may have had questions about the demonstration and they needed to be able to be available to assist them with the tool. If students needed help with the tool a peer teacher demonstrated, they either raised their hand to ask for help from the peer teacher or they were directed by workshop facilitators to ask the peer teacher for help.

Analysis

The present study used a qualitative approach for data analysis. To ensure credibility, the researchers used triangulation methods (both data triangulation and investigator triangulation) (Brantlinger et al., 2005). That is, the study used a number of different data sources and several researchers were a part of the data analysis.

All of the interviews and pre- and postconferences were transcribed verbatim. Once the transcripts were completed, a team of coders (a graduate student and two faculty members) separately read and identified themes and key points that appeared in the transcripts. Then, coders met to discuss their individual findings and arranged the data into substantive and theoretical categories. The substantive categories described the beliefs and concepts of the participants. Theoretical categories were derived from prior theory (role theory and scaffolding) and represented those concepts determined by the coders (Maxwell, 2005). Overall, the coders looked for relationships in the data that connected the participant's statements and workshop events within the context of the peer teaching study (Maxwell, 2005).

The peer teacher logs and the preassessment were used as data triangulation to support or refute the themes that the coders identified. Both were used as descriptive data to describe the peer teachers (preassessment) or what the peer teachers did (peer teacher logs). Additionally, the self-reflection piece of the peer teacher logs was coded to provide support for the theoretical categories.

Following the initial round of individual coding, two of the coders (a graduate student and one faculty member) came together to discuss and revise themes and key points. Researchers met during weekly coding meetings to discuss findings, as well as to discuss agreement and resolve disagreement in the coding. Once the preliminary themes and key points were established, an independent research member (a graduate student) who had not participated in data collection evaluated quote placement in categories, suggested subcategories, and looked for

disconfirming evidence, or evidence that was inconsistent with the identified themes (Brantlinger et al., 2005; Maxwell, 2005). Both data that provided support for and against the themes was examined to determine if the themes needed to be modified or remain the same. Coders were aware of disconfirming evidence, so as not to ignore data that did not fit into the identified themes (Maxwell, 2005).

To further credibility, the researchers discussed themes and key points with supporting quotes with the iSTAR research team for feedback. At the completion of the process described above, member checking was completed with a peer teacher and a team member who participated as a behavioral therapist in the workshop. That is, the themes identified were presented to a peer teacher in order for him to provide feedback. By doing so, validity was improved as member checking allows researchers to rule out possibilities of misinterpretation (Maxwell, 2005). The peer teacher who participated in the member checking was selected for his experience with the program and his ability to provide constructive feedback about the peer-teaching program. The themes and key points were provided to the peer teacher and team member for feedback.

Table 1. Peer Teacher Demographics

SLC	John	19	20	ASD	$25-50k
SLC	Paul	18	25	Asperger's	$50-100k
SLC	Aaron	17	17	LD	<$25K
SLC	Sam	15	27	PDD-NOS	$50-100k
SLC	Robert	15	19	Asperger's	$100+k
Boulder	Dean	26	-	Asperger's	$100+k
Boulder	Thomas	24	23	PDD-NOS	$100+k
Boulder	Logan	24	24	PDD-NOS	$100+k
Boulder	Max	22	27	Asperger's	$25-50k

Table 2. Peer Teacher Self-reported Skills Assessment and Students Helped

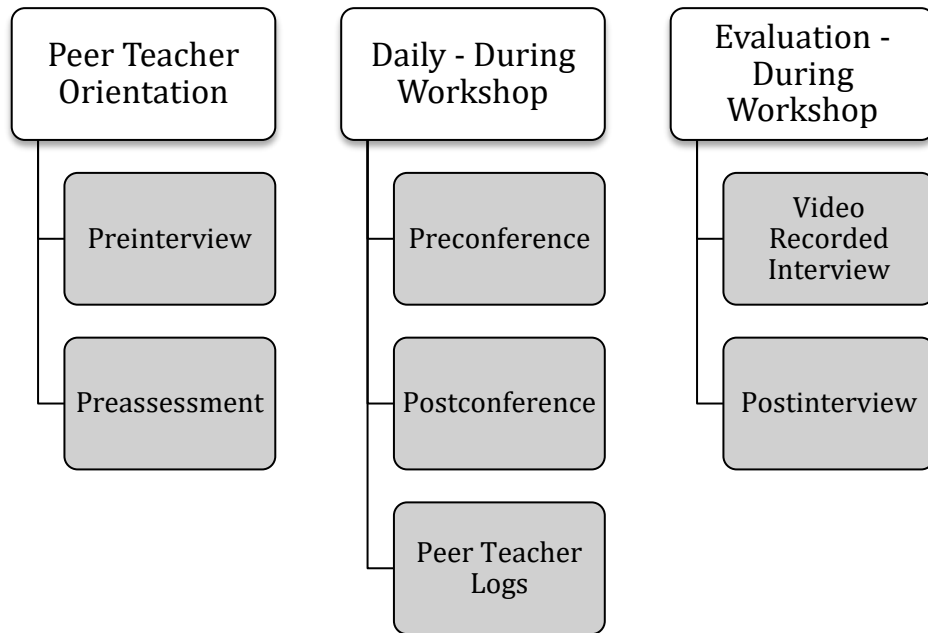| Skill	Salt Lake City (*N*=5)		Boulder (*N*=4)	
	M	SD	M	SD
SketchUp	4.8	0.4	4.0*	0.0*
Teaching	3.8	1.3	3.5	0.6
Leadership Ability	4.2	1.3	4.8	0.5
Social Tasks	4.2	0.8	4.5	0.6
Presenting Projects	4.6	0.5	4.3	0.95
Problem Solving	4.2	1.1	3.5	0.6
Being a Peer Teacher	3.6	1.7	3.5	0.6
Being Confident in Myself	4.8	0.4	5.0	0.0
Building Confidence in Others	3.8	1.6	3.5	1.0
Students Helped				
Students Helped Per Day	2.2	1.1	2.5	1.3

N=3

Figure 1. Measures

RESULTS

Two categories of themes (substantive and theoretical) emerged during the coding of the research data. The themes found in the substantive category, that is the themes that reflect the beliefs of the peer teachers, are described first. The themes are presented in the order in which they address the research questions. The research questions were "what were the benefits and challenges for the peer teachers" and "how can the peer teaching program be improved?"

Those themes that relate to the benefits to the peer teachers will be addressed first, followed by challenges and program improvements. Each theme will be discussed in the results section with supporting peer teacher quotes. Following the presentation of the substantive category, theoretical category themes will be addressed in the same manner. Each of these themes and their sub-themes will be addressed in the results section.

Substantive Categories: Perceived Peer-teaching Experiences

Six major substantive themes arose during analysis: (a) peer teacher reflections, (b) peer teacher motivation, (c) competency, (d) peer teacher challenges, (e) coping, and (f) program review (see Figure 2).

Meaning of Peer Teaching

Peer teachers were provided the opportunity throughout the program to reflect on the meaning and purpose of the peer teacher role. This theme emerged through the peer teachers' discussion of the role of the peer teacher in the workshops. Within this discussion, the sub-themes of reciprocal learning and being a role model emerged.

Reciprocal Learning

While peer teachers were hired to teach SketchUp to the students in the workshops, they learned various skills alongside the students. Skills the peer teachers learned included social and leadership skills as well as further development of their SketchUp skills. Robert stated, "I just want to continue learning because I feel like when I help other people, I learn a bit about myself." Dean commented, "Believe it or not, I actually learned a few things. I was learning along with them too."

One aspect that students were able to learn about themselves was how to be a teacher. Max stated the peer teacher role enabled him to be on "more of an even level when I talk to [the students] there. I am helping them and they are helping me learn how to better help other people." Overall, peer teachers felt as if the role of being a peer teacher helped them learn to teach, which required them to increase their leadership skills. Peer teachers reported these leadership skills included problem solving, communication, and presentation skills that will be addressed in other sections below.

Many peer teachers felt they were able to learn more about the students and got to know them better. Max commented that he "definitely learned about new tools, but probably the thing I have gained the most is just, you know, getting to know [the students]." The peer teachers also helped one another learn how to engage the students. On the first day of the Boulder workshop, Thomas commented about enhancing student interaction. "If you are carrying a book of some kind that one of the popular series or something on your shirt, it can just give you a way to connect with them and gives them a way to open a conversation."

Through teaching others about SketchUp, peer teachers also increased their knowledge of the tools and uses of SketchUp. Many of the peer teachers stated that they learned new tools, such as the offset tool and the smooth function. Dean commented, "Learning SketchUp was a good personal gain" in being a peer teacher.

Role Model

The participants felt the elevated peer teacher role gave them the ability to model appropriate behavior and skills (e.g., listening, staying focused on SketchUp, and modeling presentations). During the preinterview, the peer teachers were asked what they thought the peer teacher role meant. Several stated being a peer teacher allowed them to be a positive role model of appropriate behavior for the students in the workshop.

Paul stated the purpose of peer teachers was "To help [the students] learn how to use the tools at their disposal while still keeping that comfortable atmosphere of... still being among their group." As the peer teachers had once been

students, they felt as if they understood the students' anxieties and frustrations and they believed they would be able to help the students overcome those feelings.

In Boulder, the peer teachers noticed several of the students had difficulty presenting their SketchUp model at the end of the 1st day. For example, students would turn their backs to the audience, speak incoherently, or ramble unnecessarily about their projects. On the 2nd day of the workshops, the peer teachers were able to present their projects first to model for the students how they should act during the presentations. As the week progressed, the peer teachers felt as if the students continually improved their presentation skills by modeling how the peer teachers had presented.

Additionally, during the time given to work on their SketchUp projects, the students looked to the peer teachers for help. It took some encouragement from staff for students to first turn to the peer teachers instead of the facilitators or SketchUp experts for help. However, as the week progressed, the peer teachers felt as if the students became more open to asking them for help. Dean shared that a student, "...went out of his way to ask for my help. I think he knows now that I'm here to help." The peer teachers enjoyed being someone the students looked to as a role model. Logan commented, "I liked it when they actually listened and looked up to me for guidance."

Motivations for Being a Peer Teacher

During the preinterviews, the peer teachers were asked why they wanted and agreed to be a peer teacher in the workshop. Additionally, during the evaluation

interviews, the peer teachers were asked their favorite part of being a peer teacher. Through both of these questions, the motivations the peer teachers had for accepting the role became apparent. Those motivations included (a) helping others, (b) professional development, and (c) paid experience.

Helping Others

One of the most common reasons the peer teachers stated for their motivation to accept the role was the opportunity to help others learn SketchUp. Many of the peer teachers stated they liked to help people and the peer teacher role gave them that opportunity. They also wanted to share with others something that they themselves enjoyed and found engaging and compelling. Several stated since they knew what it was like to have a disability, they could relate to the students and understood the students' perspective. Asked about why he accepted the peer teacher role, Robert commented, "I want to get better working with kids that have difficulties. I just want to help people figure out what to do." John said he wanted to be a peer teacher "...because (a) I like doing SketchUp, and (b) I just think it would be fun to help other people learn the joys of creating their own designs, concepts, whatever they want on SketchUp." Aaron said, "I like helping people and I love SketchUp, so at the same time, I'm helping [the students] with something I like."

Another aspect that arose in this subtheme was the fact that the peer teachers had enjoyed the workshops when they participated as students. Several mentioned they liked using SketchUp and had fun during the workshops. This motivated the peer teachers to want to use the role of the peer teacher to help

students have as enjoyable an experience as they did as students. Max stated, "Just

doing the program was fun. So I would imagine that being able to help other people

and then having them see what the program can do… [gave me] kind of a good

feeling inside knowing that you helped someone else build something."

The peer teachers also liked being able to watch the students' presentations

to see how they were able to take the skills the peer teachers taught and implement

them in their projects. Max said his favorite part of being a peer teacher was "seeing

their projects during presentations because you are always able to pick out what

they did with those little helps that you gave them." The peer teachers enjoyed

seeing the students learn and use the skills they taught them.

Professional Development

Many peer teachers saw the experience as a professional development

opportunity though which they could work toward future career goals, network,

and develop skills.

Many of the peer teachers had participated in the workshops in prior years

and had become skilled in using SketchUp. Additionally, during their time as a

student, the peer teachers had been exposed to various careers that used SketchUp

in daily work tasks, such as video game design, construction, and architecture. This

helped them discover careers and set goals for their future careers. When the

opportunity to be a peer teacher arose, many of the peer teachers saw it as a way to

work toward reaching these goals. Robert said, "I want to be a video game

designer… SketchUp would be really good because I could apply it to what I want to

do in the future." Thomas stated that his motivation for being a peer teacher arose from his desire to teach SketchUp professionally in the future.

Because the SketchUp experts were individuals in the community who used SketchUp, the peer teachers also saw this as an opportunity to network with professionals in the industry. Logan said, "It may be a perfect opportunity… to help me promote my job credentials and qualifications for being a valuable team member." Others stated the peer-teaching experience was a resume builder that would help them get their names out into the community, one they hoped would lead to future employment. Thomas commented, "[Being] a peer teacher is good experience, something to put on the resume. This could lead to something eventually."

The peer teachers also saw the experience as a way to develop their social and professional skills. Sam wanted to be a peer teacher to help him improve his social skills, as he was often nervous and uncomfortable around others. He said, "I want to be better at not being so shy around other people." He felt as if the peer teacher experience would help him develop that skill. Another peer teacher stated that being a peer teacher would help him develop leadership skills that would help him in his future career goal of working in animation.

Paid Experience

Since the peer teachers were paid for helping teach the students in the workshop, money was a motivator for them. Since many of the peer teachers were unemployed or working in low wage positions, receiving a stipend at the end of the

week for their work was an incentive. Many liked the fact they were being paid for having fun using SketchUp, an activity they all enjoyed. When asked his reasons for being a peer teacher, Dean stated that while helping other students was a part of his decision, he had to be honest and admit the money was big influence for him.

Money was also a large part of why Paul decided to participate as a peer teacher. In his preinterview, he stated that being paid was the reason he agreed to participate. In his postinterview, he was asked what he learned as a peer teacher and whether he would return in the future as a peer teacher. He responded:

> I'm told I'm good at it… I do think I'm good at it, but mostly because I have incentive… It's a huge part of me actually being here this week. If I'm getting paid next time too? Yes. Absolutely. If I'm not getting paid, then maybe. Depending on other variables.

For some of the peer teachers, the opportunity to receive meaningful paid experience was a motivator for participating.

Competency

Another benefit the peer teachers received from participating in the program was the perceived self-reported competency they felt in their SketchUp and peer-teaching skills. The two areas of competency that emerged were SketchUp skills and peer-teaching skills.

SketchUp Skills

On the preassessment, the peer teachers rated the statement "I am skilled in SketchUp" on a scale of *strongly disagree* (1) to *strongly agree* (5). The peer teachers reported a high competency level with their SketchUp skills (Salt Lake City *M* = 4.8,

SD = 0.4; Boulder *M* = 4.0, *SD* = 0). This self-reported competency was also evident in the preinterview. Several of the peer teachers noted they had continued to develop their skills outside the workshops. Paul stated, "I've been working and working on [SketchUp], so I've gotten pretty good at it." Others said that their ability to use SketchUp had translated into motivation to develop skills with other design programs, such as the Adobe Creative Suite and Blender Game Engine.

In addition to their perceived competency prior to the workshops, their competency in SketchUp was also evident through the week as the peer teachers worked with the students and discussed in the pre- and postconferences. The peer teachers were asked on the 3rd day of the workshop to demonstrate how to use a SketchUp tool to the students that they selected. Most of the peer teachers felt as if their demonstrations went well and they were successful in teaching the SketchUp tool to the students. For his demonstration, John decided to show the students how to use the Soften Edges function, which helps soften the edges of a shape to make the typically hard lines between surfaces smoother. During the postconference that day, John noted "I seemed to be the only one who knew about the tool I was demonstrating." He expressed pride in his knowledge of SketchUp.

All of the peer teachers felt as if they demonstrated their SketchUp tool well. However, 1 peer teacher did feel as if the SketchUp expert was better at a tool and would rather have him demonstrate it. Thomas had mentioned wanting to demonstrate using the Sandbox tool, which allows users the ability to create terrain in SketchUp. On the day he was set to demonstrate the tool, he discovered the SketchUp Expert was going to demonstrate it. When the SketchUp Expert agreed to

let Thomas do it instead, Thomas still refused to do the demonstration, saying "I would prefer if he did it." When asked if there was another tool he would want to demonstrate, Thomas said no. The following day, Thomas was able to demonstrate the Rotate tool. He said, "I am pretty sure most everybody knows how to use it pretty well, but there are a couple of tricks that make it easier that I could show."

However, while most of the SketchUp skill competency the peer teachers reported was positive, some peer teachers reported they felt as if they did not know the program as well as they assumed and reported negative competency in their SketchUp skills. During the preinterview, Max expressed his concerns that his SketchUp abilities were not as high as some of the other peer teachers'. He said, "I feel like what makes me special in the [workshop] is my presentation. I am a little worried that there are going to be other peer teachers who are definitely [better] at the product than I am." At the end of the week, Dean reported one of the things he learned during the week was that he was not as skilled in SketchUp as he originally thought. While for most the workshop boosted their confidence in the SketchUp skills, some saw others as being more competent and this might have had an undermining effect on their perceived confidence.

Peer-teaching Skills

Most of the peer teachers reported perceived competency prior to their peer-teaching experience. On the preassessment, the peer teachers were asked to rate "I am skilled in being a peer teacher" on a scale of *strongly disagree* (1) to *strongly agree* (5). On average, the peer teachers reported a medium level of competency

with their peer-teaching skills (Salt Lake City M = 3.6, SD = 1.7; Boulder M = 3.5, SD = 0.6). However, those peer teachers who had previously participated in the workshop as a peer teacher reported a higher average (N=5, M=4.2, SD=0.8) than those who had not (N=4, M=2.75, SD=1.3) in teaching skills.

While the initial perceived self-reported competency in peer-teaching skills was average, throughout the week, the peer teachers felt as if they were successful in their role. Robert reported, "I helped as many kids as I could. I felt like I did a good job." Another peer teacher felt, while the SketchUp expert was a better teacher, he was trying his best to help the students. In one of the evaluation interviews, Thomas stated people had previously told him he was a good teacher and was skilled in working with kids. After he was introduced to SketchUp and given the chance to be a peer teacher he noted, "this is something I'm really good at and this is something I could see myself doing as a career."

Overall, the peer teachers felt as if they gained skills (SketchUp and peer-teaching) and were able to be successful in their ability to be a peer teacher. As Thomas said, "It's always nice to have a new skill set to rely on… or just something new and interesting you can do that sets you apart from other people." While the peer teachers felt as if they received many benefits throughout the week, they also reported several challenges they faced as well.

Challenges in Being a Peer Teacher

The challenges most commonly reported by the peer teachers were difficulty with understanding or helping students and frustration with technology in the

workshop. Peer teachers were given the opportunity to report and discuss

challenges they faced during pre- and postconferences. Challenges the peer teachers

faced were also discussed in the evaluation interviews.

Difficulty Understanding or Helping Students

The main challenge for peer teachers was related to communication issues.

The peer teachers reported they felt as if the students would wait until they were

too frustrated with SketchUp to ask for help. Many of the peer teachers stated they

were unsure what to do in those situations. Max reported, "[The] students wouldn't

ask for help and would clearly need it… You don't know what to do."

The peer teachers also felt as if the students had a difficult time explaining

what they needed help with. Paul said, "[A student] wasn't really conveying the

problem to me. I couldn't understand what he needed help with. I couldn't

understand the problem." Peer teachers reported this created a stressful situation

where the student and the peer teacher became confused at what the question was.

The student became frustrated, causing the peer teacher to become stressed

because they did not know how to help the student. In some of these cases, a

facilitator or SketchUp expert would have to step in to help the student.

Other peer teachers reported challenges getting the students to listen to

them when they were helping one-on-one or during a SketchUp demonstration.

Robert said, "I felt like sometimes it's challenging to get people to listen." Peer

teachers reported that the students would not pay attention during the SketchUp

demonstrations or listen during the presentations. Some of the peer teachers who

were stricter with their interpretation of rules, such as listening when someone is presenting, had a more difficult time dealing with these students. They would try to get the student to listen, but some of the students ignored the request. During one demonstration, the students were asked to turn away from their computers. Max tried to get the students to listen and follow the rules of the workshop, such as respecting others during demonstrations, but he was ignored. About this experience he stated, "It's got nothing to do on really whether or not they know it. It's they were told to [pay attention]."

While social interaction between students is encouraged in the workshops during independent work time, peer teachers reported students would get off task and talk loudly with the other students in the classroom. The volume control issue affected some of the peer teachers who were more sensitive to sound. Paul said, "There was a huge problem with voice volume... People were always trying to talk over each other." Although social engagement was encouraged, facilitators (instructors whose main job was behavior management) were needed to step in occasionally to remind students to control the volume level or to redirect focus back onto SketchUp.

The peer teachers were also challenged as the week progressed about the experienced students' questions regarding more advanced tools. In the Salt Lake City workshop, the returning students who had previously attended the workshop were more familiar with SketchUp. The peer teachers in this classroom felt the students did not ask for as much help as beginning students because they were familiar with SketchUp. Robert said, "The thing about this room is that it's people

from the past summer…so they already knew how to work." The peer teachers were

asked to meet and set goals each day for the number of students they were to help.

Some peer teachers reported they were unable to meet those goals because they did

not have the opportunities because the returning students did not ask for as much

help.

The peer teachers in Boulder had a similar experience with the students who

were more experienced and had been to previous workshops. They reported they

had a more difficult time coming up with tools they felt comfortable demonstrating

that the students did not already know. Thus, working in a class with returning

students was a particular challenge for the peer teachers at both sites.

Robert stated, "I felt like people in this class kind of understood what to do

already because they had been working on it… or it was stuff that was already

implemented but they for how to do it."

Frustration With Technology in the Workshop

The peer teachers reported frustration with SketchUp and technology

limitations, such as large file sizes causing the computer to freeze, slow computer

processing speeds, and not being able to use a function in SketchUp the way they

wanted. As Robert said, "[SketchUp] could be something that just pisses you off."

Since the designs the peer teachers and students created were large and

complicated files, some computers had a harder time running SketchUp. When

designs became more complicated and had a large number of polygons in the model,

computers without high-quality graphics cards slowed down and sometimes froze.

Both students and peer teachers expressed frustration at the limitations of the computers (provided by either the site or the student's own laptop) to be able to run the program quickly.

One peer teacher became frustrated after his computer quit and he lost his project. The project had become very complicated in design and was challenging the processing capability of the computer. Thomas experienced this frustration while helping a student who was struggling with these technology limitations. In his peer teacher log, he wrote that he tried to explain to a student the issues of having complicated models, but was unsuccessful in helping the student understand that he needed to use objects that were less complicated. In the reflection he wrote, "His frustration [regarding] loading times is understandable. Using 'slow' computers will enrage us."

Some of the peer teachers also became frustrated with their limited knowledge of how to use all the tools in SketchUp. They were only required to be proficient in SketchUp basic tools and not have a complete mastery of the program. According to the quick reference cards provided by SketchUp, there are over 70 different tools that can be used in SketchUp, many with multiple operations (Quick Reference Card, 2016). Additionally, many tools require the user to take multiple steps in order to complete the desired operation. For example, the Move tool is also used to copy objects if the option (Mac) or control (PC) keys are held down when using the tool.

Mastery of all the tools and operations in SketchUp takes time, something even the SketchUp experts commented they had not accomplished. During Thomas'

demonstration of the Rotate tool, one of the SketchUp experts commented he learned some new things from watching him. Because of the numerous possibilities a student has when using SketchUp (they are often told "if you imagine it, you can do it in SketchUp"), peer teachers had some challenges answering more complicated tool use questions. SketchUp can appear to be a very simple program. However, as a student learns more tools and starts to use the tools as a professional would, the tools and operations of SketchUp quickly become more complex.

Many felt as if there were more complicated tool questions they did not know how to answer. For example, a student in Salt Lake City wanted to make a 20-sided die and requested help from a peer teacher. When Aaron tried to help him, he was unable to answer the student's questions. He said, "I tried to figure out how to do it and help him… but I could find out how to do that exactly… So he just went on to another project."

Another issue the peer teachers faced was in the lack of power they had with the students and to make changes to the way the workshop was run, such as break time and presentation length and style. The peer teachers had an elevated status above the students in the class. However, they still did not feel they had the ability the facilitators or SketchUp experts had to monitor student behaviors or provide feedback to students on how they could improve their modeling. The peer teachers in Boulder wanted to give the students constructive criticism and feedback about how to better present their projects. Yet, they felt as if they could not do so because, if the students did not take the feedback well, they would lose the positive standing they had with the students. The peer teachers wanted help with strategies for

constructive feedback. Max said, "The problem with being peer teachers is that we are still their peers, so we don't have the power that you do… We don't actually have any power to effect any major changes in the way things are." Some peer teachers struggled with the limits of their role, wanting to have the ability to address inappropriate student behavior.

Coping

While the peer teachers faced several challenges in the workshops, they reported in pre- and postconferences and evaluation interviews the strategies they used to manage these challenges. The subcategories of most-often-mentioned coping methods were problem solving and humor.

Problem Solving

During the preassessment, the peer teachers were asked to rate "I am skilled in problem solving" on a scale of *strongly disagree* (1) to *strongly agree* (5). The peer teachers reported a medium to high level of problem solving ability (Salt Lake City M = 4.2, SD = 1.1; Boulder M = 3.5, SD = 0.6).

This level of problem solving ability was also evident in the preinterviews when the peer teachers were asked about their coping skills when making mistakes. In his preinterview, John said, "I try to fix [mistakes] as fast… and efficient as possible, just try[ing] to work it out. Or I slow down. Take a deep breather. Do something else and then go back to it at a later time." Many of the peer teachers mentioned when they made a mistake, they liked to figure out what went wrong and

try to figure out a way to fix it. Max said, "[Making mistakes] throws me for a bit but… usually I am able to regroup and try to figure out whatever is happening could be… not disastrous." In regards to technology issues, Paul said, "If my computer crashed, I'd try to figure out either how to fix it or just see if I could get ahold of another just for that time."

As previously mentioned, one of the challenges the peer teachers faced was communication with the students. Many of the peer teachers were able to find ways to problem solve and figure out the needs of the students. Some of the peer teachers solved problems by working together to help answer a student's question. When he did not know the answer to a questions, Max said, "I can either sit here and make it up as I go and we'll figure it out together, or I can get Thomas."

The peer teachers found asking the students more specific questions about their problem was a good way to get the student to speak more directly about the help they needed. For example, a student asked a peer teacher for help with the Move tool, but was unclear what trouble he was having with it. The peer teacher initially did not understand what the student was asking, so the peer teacher kept asking the student where he wanted the object moved to. After some time of moving objects around, the peer teacher was able to get the student to express his need and was able find a solution to the student's projects. Other peer teachers had similar experiences. When Sam had trouble understanding a student's question, he said, "we just worked on it a bit, [I] asked [the student] a little more questions until I finally understood what he wanted me to do."

The peer teachers were also able to problem solve issues they had when they

did not know the answer to a student's SketchUp question. Many of the peer teachers would ask the SketchUp expert to help, but several of the peer teachers were able to collaborate together to help find solutions to students' problems. If another peer teacher or the SketchUp expert were unavailable to help, the peer teacher would look up the answer on a "Quick Reference Card" that listed and explained all of the SketchUp tools, provided to peer teachers and students to help remind them of all the SketchUp tools and operations. For example, a student asked Aaron to help him scale an object in his project to size. Aaron did not remember how to scale objects. He said, "I didn't know how to do it, but I just looked on the sheet… and so I was able [to help]."

Humor

The peer teachers also used humor as a coping mechanism to deal with the challenges and stressful events that occurred during the workshop. For example, Max was one of the peer teachers who mentioned that humor and joking was a way to cope with making mistakes and stress. On the last day, Max demonstrated the Walk tool. The tool basically allows the user to manipulate the camera angles and viewpoints in SketchUp. Max found that it was a simple demonstration and he was able to use humor to make the situation less stressful for him. He said, "There wasn't a lot for me to make humorous, which of course just disarms me almost immediately when I can't be humorous. Thankfully, [the SketchUp expert's] computer is so slow that I could make humor out of them."

The peer teachers would also joke with one another. During one pre/post

conference, the peer teachers were reminded they needed to stay on task with

SketchUp as they were role models for the other students. John and Paul, who are

friends, joked with each other about needing to stay focused.

> John: That means you, Paul.
> Paul (sarcastically): I am always focused. I don't know what you are talking
> about, Sir.
> John: That's a joke.

The peer teachers also joked with one another when trying to problem solve

issues that arose when the students needed help. In the Salt Lake City workshop, the

students tested out using flags to indicate they needed help from the peer teachers.

When the flags were introduced to the peer teachers, several of them commented

the flags were too small. They began offering suggestions as to what would work

better. Paul suggested, "We should put little bat signals on the computers." To which

Robert replied, "We could do like a batman with bunny ears."

Thomas and Max also joked with each other. On day four in Boulder, the peer

teachers were discussing what demonstrations they were going to do for the day.

Max suggested he show the students how to make stairs, a common request from

students. However, making stairs accurately in SketchUp is complicated, requiring

several steps and a good amount of precision. When asked if he believed stairs were

tricky, the following conversation occurred:

> Max: I hate doing stairs. I despise them.
> Thomas: Stairs are bad. Spiral stairs can go die somewhere.
> Max: I have a tower where I have to make spiral stairs and I am doing
> everything I can to avoid even starting that project.
> Thomas: I am playing my sympathy violin.

The peer teachers also jokingly figured out a way to help students even if

they did not have questions, which really meant creating a problem then offering to

help solve a problem they created. Max said, "And if you can't find a student who needs help there are plenty of ways to make problems." Some of these methods included short circuiting the building and then helping out by fixing the problem they created.

John also jokingly suggested program improvements. He said, "The only thing we needed was a party after the entire program was over. Just a huge big party that goes off the roof and makes all the neighbors annoyed, but we don't care because we're having fun." Overall, for most of the peer teachers, humor was a very common coping strategy documented in the data.

Program Review

The peer teachers were actively engaged in the development of the peer-teaching program, and they were given opportunity to review and evaluate the peer-teaching experience daily. The peer teachers were generally positive about their experiences and about the peer-teaching program in general. While most commented in the evaluation interviews that they thought the program was a good experience overall, many provided constructive criticism for program improvement.

Evaluation

Many of the peer teachers liked how the peer-teaching program was structured. The peer teachers felt having the pre- and postconferences allowed them to better plan for the day and set clear expectations, such as how many students they needed to help, when they would demonstrate SketchUp tools, and if they were

going to present their own projects that day. Max said, "The planning aspect of it is definitely helpful. Figuring out what it is we are doing today, how we can go about it, where we are going to be, that's definitely good to do."

Most of the peer teachers also felt the training sessions that took place during the preconferences were beneficial and helpful in learning how to help the students. Examples given were how to initiate conversations with students, how to better communicate with students, and tips for how to demonstrate SketchUp tools to the students. The peer teachers also mentioned the phrases they were given to learn how to initiate conversations and deal with the students' rejecting their help were useful. Many of them said that the peer-teaching instruction in these areas were self-explanatory but was useful if a peer teacher did not have experience interacting with students or teaching. Robert commented, "I felt there [were] a couple [phrases] that were kind of self-explanatory, but it doesn't hurt to have them there just in case."

Overall, the peer teachers enjoyed their experience and felt as if the program was successful. They felt supported by the staff and knew who to turn to if they had questions. All of them said they would return as peer teachers in future workshops if given the opportunity, but Paul said his return was conditional. Sam said, "I just want to say I hope this thing goes far into the future and there's going to be more people joining in."

<u>Improvements</u>

      While the evaluation of the peer-teaching program was generally positive, the peer teachers were also able to provide some constructive feedback to help improve the program in the future. Many of the suggested improvements were related to the challenges the peer teachers had, such as not knowing more complicated SketchUp tools, getting students to ask for help, and having clear boundaries regarding monitoring student behavior.

      Since some of the peer teachers felt they were not always able to answer the students' questions, Logan's suggestion was to offer the peer teachers a SketchUp review prior to the start of the workshop. This would allow the peer teachers to refresh their knowledge of the program and review more complicated tools they might not be as comfortable with. Thomas said, "The peer teachers tend to pick up things pretty quickly and they do know somewhat what they are talking about. But just a little more prep time for them might be nice."

      As many of the peer teachers felt the students were not asking for help or waiting until they were frustrated until asking for help, communication became a main topic of discussion for improvements. Many felt as if there needed to be a way for the students to signal if they needed help but did not want to speak up that was big enough for everyone to see. One peer teacher suggested the students have an area of the classroom they could go wait in if they had a question, so the peer teachers could see they needed help. Dean and Max suggested the program change how the seating was arranged, so the peer teachers could have more students in their line of sight. Others noted that sitting between two students was helpful

because then the students were able to ask peer teacher sitting next to them a question without having to raise their hand. Sam commented, "Being between people really helped because they could just lean over and ask."

Some of the peer teachers felt as if they needed more finite boundaries for how they were allowed to monitor student behavior and change their behaviors. The peer teachers were instructed at the beginning of the week to watch if students were using other programs besides SketchUp, which was against workshop rules, and monitor how much the students were using the 3D warehouse, as overuse can lead to the computer slowing down. However, the peer teachers then brought up concerns they had about presentations and students not following workshop rules, only to be told that it was the facilitators' job to manage those behaviors. About the confusion, Max said, "I think there just needs to be a more finite boundary for how we are allowed to guide them."

Theoretical Categories

The theoretical categories were based on themes derived from prior theory to help explain or frame the substantive categories. For the purposes of this study, the theoretical categories developed were (a) role theory and (b) scaffolding. The peer teacher logs were coded to be a part of the analysis for the theoretical categories as they tracked the peer teacher interactions with students and the peer teachers wrote a reflection on those interactions.

Role Theory

In role theory, it is believed that an individual's social expectations can influence a person's behaviors. The peer teachers in this study were given an elevated teaching role in the workshops. They were expected to assist students and be appropriate role models for the students. With that elevated role, the researchers wanted to see if their reflections in the peer teacher logs reflected that theory. Based on the coding, the peer teachers reported instances where their elevated role and the expectations of them influenced their behavior. As seen in the *Meaning of Peer Teaching* theme, peer teachers found themselves acting as role models for the students. This can be attributed to the expectation that the peer teachers were expected to model appropriate behaviors for students.

For example, on the first day of the workshop, one of the students Dean had been seated between had been late. The student missed the demonstration the SketchUp expert had given on the basics of how to get started in SketchUp and some of the basic tools. The student was able to start a project but soon had a question, so he asked Dean for help. About the experience, Dean wrote in his log, "He asked me how to delete lots of items at once, so I showed him how to select and press delete. He was using the eraser tool. He missed the first part with the introduction, so I showed him that too." Since Dean was a peer teacher, he took it upon himself to help catch the student up with the information he missed, feeling responsible for the student's learning.

Many of the peer teachers also reported having a positive view of the students due to their interactions with them. When writing the reflections after

helping the students, it was common for some of the peer teachers to write about the student. For example, Robert helped a student learn how to create a box in SketchUp that had specific measurements. After that interaction with the student, he wrote the student was "very easy to work with [and] was very understanding." Sam also wrote in his log something similar after helping a student make arms in his model. He wrote, "I liked helping [the student]. He was very calm and clear." After Thomas helped a student learn how to scale objects, he wrote, "Making properly scaled objects can be a daunting task. So far he has been doing great!"

Scaffolding

According to Horton and Clarke (2006), scaffolding is an instructional technique that allows teachers to put in place supports that help students develop new understanding to reach levels of knowledge they would have been unable to reach by themselves. The peer teachers were able to scaffold the student's learning of SketchUp.

The examples of scaffolding came from the peer teacher logs as they were more pronounced in the logs. The peer teacher logs provided rich, descriptive self-reflection that no other data points were able to capture. The peer teacher logs were an individual reflection versus the group process of many of the other data sources.

For example, a student asked Logan for help using the rectangle tool to make a door for the house he was designing. In working with the student, Logan realized the problem was with the Push/Pull tool, so he showed the student how to use keyboard shortcuts to bypass the problem. In doing so, Logan was able to facilitate

the development of the student's SketchUp skills.

Dean also experienced an instance with a student where scaffolding was evident. A student asked Dean for help as he was having trouble creating windows on the side of the skyscraper he was making. In his reflection, Dean wrote finding a solution for the problem was not easy, as there were many ways to go about making a grid on the side of a building. He wrote, "At first, I suggested a big rectangle with a grid texture, but it didn't work. So then I showed him how to alt + drag but that didn't work either. So I showed him how to copy/paste it." In this instance, not only was Dean helping the student learn how to use SketchUp, but he was also modeling problem-solving skills. Since the first two attempts to answer the question were not successful, Dean had to find other ways to answer the student's question. In doing so, he helped the student learn how to problem solve with different SketchUp tools.

Scaffolding in the workshop also occurred on multiple levels. Since a SketchUp expert was present at the workshop to provide knowledge of working with advanced tools and the peer teachers were involved to help students, there were several layers of expertise present in the workshop. For example, Sam was helping to show a student how to edit textures to make one that resembled dirt. About the experience, he wrote, "[The student] was frustrated at first, but when I showed him how to fix it with [the SketchUp expert's] help, [he] got it fixed." This shows multiple layers of scaffolding. The student reaches out for help from the peer teacher who then requests help from the SketchUp expert. The multiple layers of support show that the peer teachers' skills and knowledge are being developed.

Meaning of Peer-teaching

- Reciprocal Learning
- Role Model

Motivations for being a Peer Teacher

- Helping Others
- Professional Development
- Paid Experience

Competency

- SketchUp/Technical Skills
- Peer Teaching Skills

Challenges in Being a Peer Teacher

- Difficulty Helping Students
- Frustration with Technology

Coping

- Problem Solving
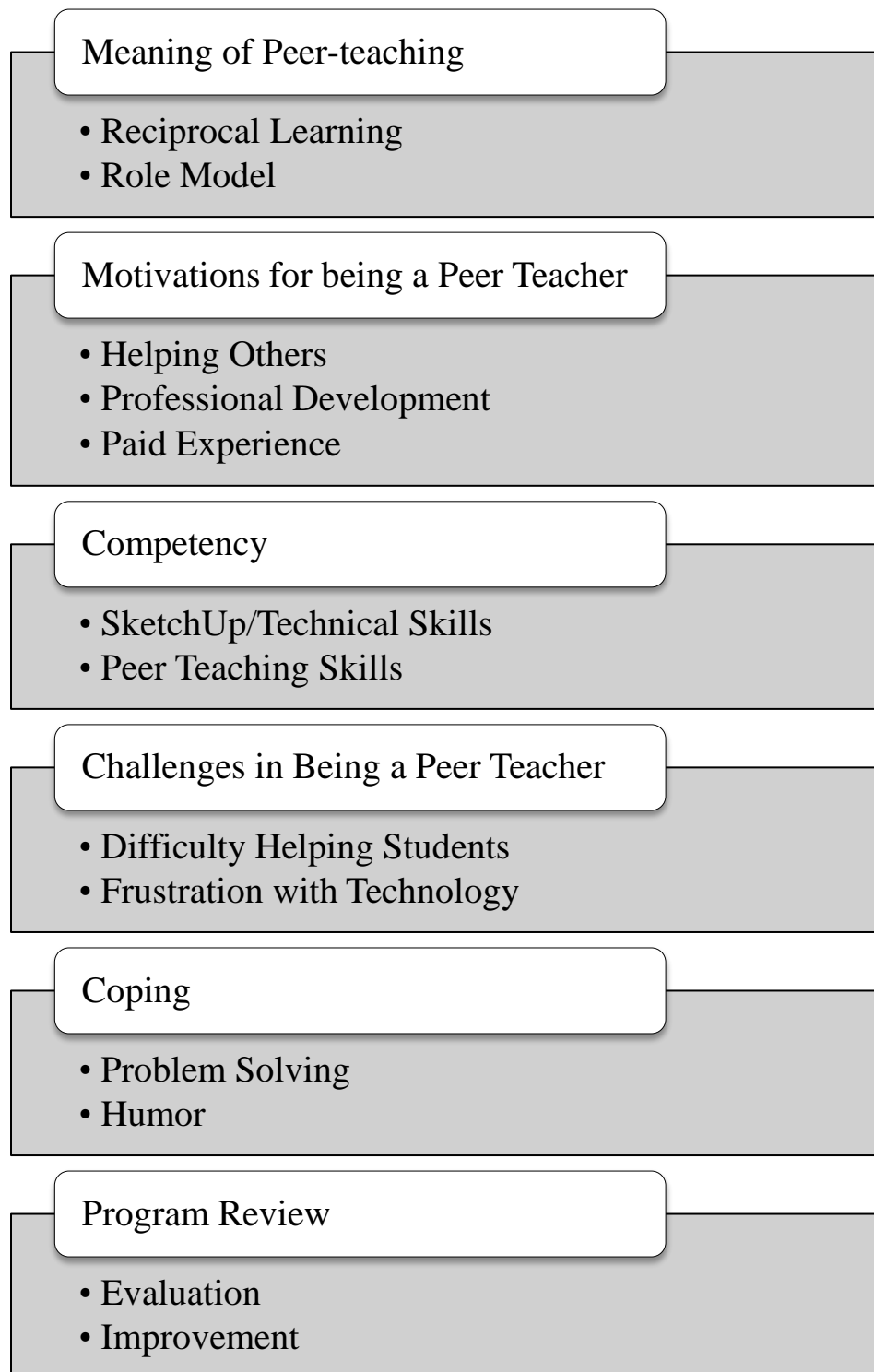- Humor

Program Review

- Evaluation
- Improvement

Figure 2. Perceived Peer-teaching Experiences

DISCUSSION

Based on the results, the peer teachers perceived many benefits and challenges related to the peer-teaching program. There were three major themes that reflected the benefits of peer teaching that emerged from the data: (a) peer teacher reflections (reciprocal learning and being a role model), (b) motivations for being a peer teacher (helping others, professional development, and paid experience), and (c) competency (SketchUp and technical skills and peer-teaching skills). There were two main challenges the peer teachers faced: (a) difficulty helping students and (b) frustration with technology. Peer teachers were able to cope with these challenges through problem solving and humor. The peer teachers also evaluated the program and provided suggestions for improvement.

These results are consistent with the findings in the Bobroff and Sax (2010) study that reported peer teachers with ASD and severe emotional disorder found enjoyment and fulfillment in teaching others. A majority of the peer teachers in this study reported their motivation for being a peer teacher was due to the fact they enjoyed teaching others and wanted the students to enjoy learning SketchUp. This study is also consistent with findings that peer teaching is a positive teaching strategy that benefits the peer teachers as well as the learner. Results were similar to the study by Tournaki and Criscitiello (2003), which used students with disabilities as peer tutors to their nondisabled peers and found an increased level of

responsibility in the peer tutors. This study found that there was an increased level of responsibility felt by the peer teachers. This finding helps confirm role theory, which states that if the role someone holds is perceived in a certain way, a person's behavior will match those expectations (Wang et al., 2013). The peer teachers in this study took on more responsibilities due to the elevated role of being a peer teacher, including teaching students who had missed SketchUp demonstrations and having a positive view of students.

Results of this study also confirm the theory of scaffolding, an instructional technique used by teachers to provide supports for students to reach levels of knowledge they would not have reached alone (Horton & Clarke, 2006). Scaffolding was evident in the study through both one-on-one teaching and during demonstrations.

Recommendations

Based on the results, recommendations for program development include improvements in (a) supportive environment, (b) communication, (c) role clarity, and (d) program development.

Supportive Environment

One of the main differences between the peer teachers in Salt Lake City and Boulder was the competitive versus supportive environment. A competitive environment emerged when the peer teachers were encouraged to help as many students as they felt able. Several of the peer teachers in Salt Lake City competed

against each other to see who could help the most students. John remarked he was unable to help a student one day because Paul got there first. Others became discouraged when they saw some peer teachers had filled their entire peer-teaching log, and they had only helped 1 or 2 students. Furthermore, the peer teacher who completely filled out the peer teacher log on Tuesday and Wednesday did not complete a peer teacher log on Thursday or Friday. The competitive environment may have led the peer teacher to over extend and interact more than he was comfortable doing, leading to what the facilitators perceived to be burnout. Peer teacher supervisors can help monitor and manage peer teacher expectations in order to prevent a competitive environment and peer teacher burnout.

In Boulder, the peer teachers were supportive of each other and encouraged the others when they expressed feelings of self-doubt by noting each other's talents and abilities. The peer teachers asked one another for help if needed. When 1 peer teacher said most of his peer-teaching experience was asking for help from another peer teacher, he was reassured that was an appropriate response. Collaboration among peer teachers should be clearly identified as a positive interaction and a goal for peer teachers to meet.

The difference in setting could have been related to the age and maturity level of the peer teachers (average age of peer teachers in Boulder was 7 years older than those in Salt Lake City). Those running programs with peer teachers need to be aware that competition might undermine self-confidence and supervisors should encourage a supportive environment where peer teachers help one another rather than compete. They can accomplish this by letting the peer teachers know that

everyone will work at a different pace and that the number of students helped does not affect their successful performance.

Communication

The communication challenges the peer teachers faced were as expected since it is one of the hallmarks of ASD. As communication problems were one of the main challenges for the peer teachers, it is recommended that staff provide strategies for fostering effective communication. This can be accomplished in many ways. First, many of the peer teachers liked being placed between students so they could lean over and help when the student asked. Peer teachers can be seated between students, instructing them to intermittently ask the students next to them if they need assistance. This would help the students know that the peer teacher is available and willing to help them.

Additionally, teaching the peer teachers how to read student cues of frustration would be helpful. By learning how to read frustration in the student, peer teachers will learn how to recognize when to step in with help. For example, peer teachers can learn how to recognize expressions of frustration, such as sighs, agitated movements, and verbal pronouncements of frustration. In this study, the peer teachers were told they could walk around the room to ask students if they needed help. By learning how to read the cues of the students, the peer teachers would be able to identify which students needed help as they walked around.

Facilitators and SketchUp experts could also direct students to ask peer teachers for SketchUp help instead of answering the questions themselves. As the

facilitators and SketchUp experts in prior workshops were the ones to answer student questions previously, they need to be reminded to allow the peer teachers the opportunity to assist students first. By doing so, the facilitators can focus more on assisting students with more challenging behaviors and the SketchUp expert can help with the more advanced SketchUp operations.

Role Clarity

Based on the feedback from the peer teachers, one area of improvement that needs to be addressed is role clarity. Many of the peer teachers felt the guidelines for managing student behavior were unclear and ambiguous. Prior to the beginning of a SketchUp workshop, the roles of staff and peer teachers need to be clearly identified. Questions such as who the students should first turn to for SketchUp help and who will handle inappropriate student behavior need to be established. It is recommended the peer teachers be the first people the students ask for help when dealing with basic SketchUp questions. Since it is unlikely that peer teachers have the behavior management skills necessary for dealing with students who have more difficult behaviors, facilitators need to be ones who manage inappropriate and challenging behaviors. Peer teachers can model appropriate behaviors for students, but they should not be the ones directly responsible for managing a student's behavior.

The peer teacher role is centered on instruction of SketchUp and this needs to be clarified. Based on the peer teachers' feedback, it was more difficult to be placed in a classroom with more advanced students who did not need as much help.

From the peer teacher feedback, the classroom composition will change for future workshops. In the future, the participating students will be placed into mixed ability classrooms (both new and returning students). This arrangement would allow peer teachers to have experience working with both new and more advanced students.

Program Improvements

Workshop staff need to be aware of technological issues with SketchUp that may cause the peer teachers and students to become frustrated. One of the main issues is the size of the projects, as more complicated projects are more difficult for computers to process. Facilitators can help students to understand why more complicated projects cause the computer to slow down. They can also set the expectation and parameters for project size. For example, if an object in the project slows down their computer to the point where they become frustrated, the students will have to find a less detailed substitute object or remove the complex object from their project.

Workshop staff can also remind students more frequently, about every 15 to 20 minutes, to save their projects. By doing so, if SketchUp crashes when a student is working, they will have a recent version saved to start working from again rather than having to completely start over.

Some of the peer teachers also suggested having a SketchUp review session prior to the beginning of the workshop. This would allow the peer teachers to refresh their skills and review any tools they might have forgotten how to use. During this time, the SketchUp expert could review more advanced tools with the

peer teachers to help familiarize them with more complex SketchUp operations. By doing so, the peer teachers may be more comfortable with SketchUp and be more confident in their abilities.

Limitations

The study has a number of limitations worth noting. First, all of the data were collected from the perspective of the peer teachers, so only their thoughts and opinions were included in the evaluation of the program. The study would have benefited from including additional perspectives from the students and workshop staff (facilitators and SketchUp experts). Having the participating students evaluate their experience with the peer teachers would provide more information about how effective the peer teachers were at teaching. This might provide insight into the benefits and challenges of the peer-teaching program from the students' perspective. For example, it would have been interesting to see if the students also perceived communication problems between the peer teachers and themselves. The students might have additional suggestions for how they could help convey that they needed help or how to identify the problem they were asking about. Including the perspective of the workshop staff would have also been beneficial. SketchUp experts could have evaluated the peer teachers' SketchUp demonstrations and the facilitators could have evaluated the interactions between the students and the peer teachers.

Second, the time frame for the workshops was short. Due to scheduling limitations, the Salt Lake City workshop only ran for 5 days and the Boulder

workshop only ran for 10 days. The results are based only on the first 5 days of each workshop, so the benefits and challenges are only what was perceived in the short term. Having a longer timeframe for the workshops might provide further information on the benefits received and challenges faced in both the short term and long term from multiple perspectives.

The time at which the final evaluation interviews take place also needs to be adjusted. Instead of having an evaluation interview occur on the last day of the workshop, a postinterview should be conducted after the workshop has ended. Since the evaluation interviews took place during the last day, many of them were short and not very detailed. On the last day of the workshop, both students and peer teachers were eager to complete their projects, as the final presentation time is specifically designated to showcase their work to families, friends, and community members. Many of the peer teachers were focused on completing their projects, so they wanted to quickly end the interview to return to work. Having the postinterviews at a later date would give the peer teachers the time to process their experience and discuss it away from the excitement of the last day of the workshop.

Strengths

While the study had some limitations, there are many strengths. First, the study included peer teachers with ASD in the development and evaluation of a program that was designed for them. Including them in the research process allows them to have a voice in programs that meet their needs more appropriately. During the peer teacher orientation, Max mentioned he felt nervous about being a peer

teacher and being involved in the research. To ease his concerns, one of the researchers told him, "We will learn as much from you as you learn from us." Having individuals with ASD involved in this research and program development helped to create program modifications that better meet the needs of students with ASD.

This study also adds to the body of literature about peer teaching. Since very few studies include students with ASD acting as peer teachers, it is an important addition. This study can help open the door for future studies to explore individuals with ASD as peer teachers instead of being the recipients being taught by others. In this study, the talents and skills of these peer teachers became evident and they masterfully filled the role of teaching others.

Additionally, the study occurs in a natural setting instead of laboratory settings. This provides the peer teachers the opportunity to provide authentic assessment of the program as the workshops took place in the community. The reactions of the students and peer teachers were natural and authentic. The peer teachers were able to talk about their experiences and did not require behavior management prompts and reinforcers typically seen in autism research.

The study also provided skill development, leadership opportunities, and meaningful employment for the peer teachers. Many of the peer teachers noted they were either unemployed or in a position that was menial and lacked mental stimulation. The peer-teaching program provided them with the opportunity to be leaders in the workshop, help build and develop the skills of students as well as their own, and gain experience that can help lead to future employment.

Future Program Development

Future plans for program development include the development of an intermediate level SketchUp workshop and development of internships for peer teachers. Unlike the current SketchUp workshops that focus on creativity and exploration of the program, an intermediate level workshop would focus on developing advanced skills that could be used to gain employment or internships in the community. The intermediate workshop would be similar to the workshop described in Wright et al. (2016), in which students were able to convert 2D construction building plans into 3D models in SketchUp. Students would work on developing skills. Unlike the case study, they would be more job focused, so the students would not have as much room for creativity. The intermediate level workshops would help develop the skills necessary to accomplish similar tasks, which would help students get internships with companies in various fields, such as architecture and construction. The internships would be positions within a field that uses SketchUp in daily activities.

Longer range goals include continuing to develop programs that would help peer teachers on the autism spectrum find jobs in the technology industry. The program is currently developing curriculum that helps students explore how various professionals, such as architects, engineers, and video game designers, use SketchUp in their careers. Some of the peer teachers were given the opportunity to be involved in curriculum development. They are testing curriculum activities by designing models based on activities at the same time. This curriculum is intended

to give peer teachers the opportunities to explore and develop skills that could help

them find employment in a technology field that uses SketchUp.

APPENDIX A

PEER TEACHER PREINTERVIEW QUESTIONS

Introduction: These are a list of questions that will help me get to know you better and get your ideas on what it means to be a peer teacher. Your answers will help us address how to best support you to become a better peer teacher. We are developing our training to fit your needs. Your honesty is appreciated.

1. What do you think it means to be a peer teacher?

2. Why do you want to be a peer teacher?

3. What do you hope to get out of being a peer teacher?

4. Have you had peer-teaching experience? If so, what was it like?

5. What has been your experience with SketchUp?

6. What is your educational or work background?

7. What are your future career goals?

8. Do you have any concerns about being a peer teacher?

9. Do you have any conflicts during the summer camp that might interfere with be a peer teacher? (tests, work, etc.)

10. What do you do if you feel overwhelmed with a task?

11. How do you cope with making mistakes?

12. How do you handle it when something unexpected happens?

13. Anything else that you would like to tell me about yourself or your role as a peer teacher?

APPENDIX B

PREASSESSMENT

Peer Teaching Preassessment

Introduction: This preassessment is used to understand your current teaching and SketchUp skills, comfort with tasks, and coping abilities. Your answers on this questionnaire will help us address how to best support you in becoming a better peer teacher. Your honesty is appreciated. It's okay if you don't know how to do something. We are developing our training to fit your needs.

Instructions: Please read the following and circle each item using the rating scale below.

Rating Scale:

1 = Strongly Disagree
2 = Somewhat Disagree
3 = Neutral
4 = Somewhat Agree
5 = Strongly Agree

	Knowledge of Working with Students	**Rating**				
1.	I know how to react if a student does not follow the rules.	1	2	3	4	5
2.	I know how to react if a student does not listen to me.	1	2	3	4	5
3.	I know how to react if a student does not want my help.	1	2	3	4	5
4.	I know how to monitor behaviors in students.	1	2	3	4	5
5.	I know how to model appropriate behaviors for others.	1	2	3	4	5
6.	I am responsive to the needs of students.	1	2	3	4	5
7.	I am aware of the needs of students.	1	2	3	4	5
8.	I am able to provide supportive feedback to students.	1	2	3	4	5
9.	I give encouragement to students.	1	2	3	4	5
10.	I am able to help students problem solve.	1	2	3	4	5
11.	I am able to give students clear directions.	1	2	3	4	5
12.	I can show interest in students' projects and models.	1	2	3	4	5
13.	I can show students how to accomplish a task without doing it for them.	1	2	3	4	5
14.	I can help students accomplish their goals.	1	2	3	4	5
15.	I know how to ask students questions to help them problem solve.	1	2	3	4	5

	Comfort with Tasks	Rating				
16.	I feel comfortable teaching others.	1	2	3	4	5
17.	I feel comfortable teaching others one-on-one.	1	2	3	4	5
18.	I feel comfortable teaching others during the presentations at the end of the day.	1	2	3	4	5
19.	I feel comfortable teaching in a large group.	1	2	3	4	5
20.	I feel comfortable teaching in a small group.	1	2	3	4	5
21.	I feel comfortable following directions.	1	2	3	4	5
22.	I feel comfortable receiving feedback about my performance.	1	2	3	4	5
23.	I feel comfortable asking students questions about their projects.	1	2	3	4	5
24.	I feel comfortable in social situations.	1	2	3	4	5
25.	I feel comfortable talking to others about their interests.	1	2	3	4	5
26.	I feel comfortable talking to others about my own interests.	1	2	3	4	5
27.	I am comfortable being a role model.	1	2	3	4	5
28.	I feel comfortable offering help to students without being asked to do so.	1	2	3	4	5
29.	I feel comfortable offering help to students when an instructor asks me to.	1	2	3	4	5
30.	I feel comfortable offering help to students when the student asks for help.	1	2	3	4	5
31.	I feel comfortable providing positive feedback to students.	1	2	3	4	5
32.	I feel comfortable interacting with students during break time.	1	2	3	4	5
33.	I feel comfortable making mistakes.	1	2	3	4	5
34.	I feel comfortable accepting suggestions on how to be a better peer teacher.	1	2	3	4	5

	Coping	**Rating**				
35.	I am able to cope with my frustration with technology.	1	2	3	4	5
36.	I am able to cope with my frustration with students.	1	2	3	4	5
37.	I am able to cope with my frustration when things do not go my way.	1	2	3	4	5
38.	I am able to be flexible.	1	2	3	4	5
39.	I am able to regulate my emotions.	1	2	3	4	5
40.	I am able to cope with my mistakes.	1	2	3	4	5
41.	I am able to take turns.	1	2	3	4	5
42.	I am able to accept it if someone does not want my help.	1	2	3	4	5
43.	I am able to accept it if someone does not like my project.	1	2	3	4	5
44.	I am able to accept it if someone says something negative about my project.	1	2	3	4	5

	Skill Assessment	**Rating**				
45.	I am skilled in SketchUp.	1	2	3	4	5
46.	I am skilled in teaching.	1	2	3	4	5
47.	I am skilled in leadership ability.	1	2	3	4	5
48.	I am skilled in social tasks.	1	2	3	4	5
49.	I am skilled in presenting projects.	1	2	3	4	5
50.	I am skilled in problem solving.	1	2	3	4	5
51.	I am skilled in being a peer teacher.	1	2	3	4	5
52.	I am skilled in being confident in myself.	1	2	3	4	5
53.	I am skilled in building confidence in others.	1	2	3	4	5

- **Please circle the peer teaching strategies that you would like more information about:**

Monitoring Behaviors	Providing Positive Feedback	Teaching One-on-One	Teaching to a Group
Asking Questions	Teaching SketchUp	Peer Teaching Role	Corrective Feedback
Being a role model	Problem Solving	Working with Difficult Students	

Other teaching issues you would like to know more about (please describe)

- **Do you have any questions or concerns about being a peer teacher?**

APPENDIX C

POSTCONFERENCE QUESTIONS

1. How did today go?

2. What was your peer-teaching experience like today?

3. What parts of the peer-teaching program worked?

4. What parts of the peer-teaching program could be better?

5. Were you able to meet today's goals?

APPENDIX D

PEER-TEACHING LOG

Peer Teaching Log

Name: _____   Date: _____

Name of Student Helped	How you help student? (What you did? What tool? What part of project? Feedback?)	Reflection (What did you think of experience? Would you do something different next time?)
Josh	*I helped him with the move tool. He wanted two boxes to be on top of each other.*	*I liked helping Josh. He was frustrated at first, but I helped him figure out how to fix the problem.*

APPENDIX E

EVALUATION INTERVIEW QUESTIONS

1. How has your view of being a peer teacher changed since you started doing the peer-teaching program?

2. What was one of the most memorable moment for you as a peer teacher?

3. Do you feel like the peer-teacher training was helpful in learning how to be a peer teacher?

4. Did you find you had adequate support from the staff?

5. Do you have any suggestions for how to improve the peer-teaching program?

6. What has been your experience been like?

7. What parts of being a peer teacher could be improved?

8. Did you like helping students? What did you like about it?

9. Did you like demonstrating how to use SketchUp to the group?

10. What have you learned about yourself during your time as a peer teacher?

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