

The Need for Peer Tutoring in Our Schools

Tad Watson

Students learn at different rates, and many require extra practice or support beyond what is offered in the classroom to achieve mastery. Providing additional support can be particularly challenging due to limited time, staff, and budgetary resources available to school systems. However, peer tutoring offers a means of providing assistance to students effectively in multiple content areas at a reasonable cost. Peer tutoring enables non-professionals to provide instruction in an individualized, low stress, tutee led environment, facilitating education through a unique personalized manner professional educators cannot duplicate. Moreover, meta-analyses have found peer tutoring to consistently to be an effective means of providing support (Cohen, Kulik, & Kulik, 1982; Hattie, 2009; Leung, 2014), although the optimal strategies for improving student achievement are debated. The merits of peer tutoring tend to extend beyond tutee achievement, as research has shown tutors, teachers, and parents also benefit (Baker, Rieg, & Clendaniel, 2006; Worley & Naresh, 2014). Since peer tutoring programs vary widely in implementation, significant investigation is required to understand what elements are necessary to create an effective program. Specifically, the impact of peer tutoring programs upon tutees and tutors, the structure of peer tutoring programs, the cost-effectiveness of peer tutoring, and limitations of existing literature warrant inquiry to understand how effective peer tutoring programs can be and what elements are necessary to develop effective peer tutoring programs.

Defining Peer Tutoring

Peer tutoring is credited to have begun formal implementation in 1753 under the supervision of superintendent Andrew Bell, who by pairing older students with younger for remediation noticed both tutees' and tutors' academic achievement and self-confidence increased

(Topping, 1988). Peer tutoring has since expanded to the provision of academic instruction from any non-professional instructor to support students. Peer tutoring can involve students of similar ages, such as eighth grade students assisting seventh graders in math (Grubbs, 2009) or adult community volunteers assisting middle school students in a variety of topics (Allen & Chavkin, 2004). Peer tutoring differs slightly from mentoring because peer tutoring's objectives tend to be primarily academic, although like mentoring increased confidence and social acceptance are cited as tutee benefits (Austin, 2008; Baker, Rieg, & Clendaniel, 2006; Davis, Fantuzzo, & Ginsberg, 1995; Fogarty & Wang, 1982).

Three Bodies of Research

Peer tutoring research tends to be implemented in one of three forms. The first major area of research is the use of peer tutoring as an instructional strategy during class by pairing students with one another to practice. The second is as a supplementary educational service pairing tutors and tutees to meet for support outside of class. The third is for students in special education, as tutees and tutors. Preliminary research suggests peer tutoring as a classroom instructional strategy (Duran & Flores, 2013; Hertz-Lararomitz, Khalil, Lararomitz, & Ron, 2013; Lueg & Lueg, 2014), supplemental educational service (Austin, 2008; Grubbs, 2009; Rothman & Henderson, 2011), and strategy for assisting students with disabilities (Azicoitia, 1989; Balboni & Spencer, 2003; Fuchs & Mathes, 1991) have all been shown to be effective means of providing academic support. However, the scope of this review will only explore the second body of research, peer tutoring as a K-12 supplementary educational service outside of class.

Research Methodology. A specific criteria was used when choosing books, dissertations, master's theses, journal articles, and reports for

analysis. First, all resources had to conduct investigations outside of regular class time, such as during an activity period or after school. Second, dissertations and theses had to have received signed approval from their respective chair present on any document used for research. Third, all studies or journal articles must have been peer reviewed, and any studies located within books were traced back to the original study. If the respective study was not peer reviewed, then the study was not included in the analysis. Fourth, any studies in which tutors received monetary compensation were not included in analysis, for reimbursement implies tutors were no longer volunteers, although supervisors may have been paid. Fifth, supplementary educational service programs and meta-analyses including a composition of students with disabilities and students without disabilities were included, but studies designed explicitly for students with disabilities were not. The primary sources of literature were ERIC, JSTOR, the online William and Mary Swem Library and the third-floor stacks of the William and Mary Swem Library. One limitation of this analysis was potentially relevant privatized peer tutoring research articles were not included due to their cost.

Two Interesting Patterns in Research.

One interesting pattern noticed when reviewing literature was how the focus of peer tutoring research has changed over the decades. Earlier research, such as investigation conducted by Furst and Rosenshine (1969), Allen (1976), Topping (1988), and Merrett (1994) focused heavily how to develop effective program structures and different types of supervision with minimal attention to measuring how effective a program was. By contrast, recent research tended to place more emphasis upon the effectiveness of peer tutoring upon student achievement than program structure (Allen & Chavkin, 2004; Baker, Rieg, & Clendaniel, 2006; Rothman & Henderson, 2011). The pattern of analyzing structure versus achievement may simply be because earlier resources were from books rather than online journals, although even earlier journal authors such as Fogarty and Wong (1982) have a substantively

developed description of the structure of peer tutoring. Since the focus of peer tutoring seems to have shifted to a pragmatic paradigm, subsequent analysis will also focus heavily upon the impact of effective peer tutoring. However, several studies from before 1990 are still included because of their relevance and detailed analysis of program structure less common in more recent research.

A second pattern evident in peer tutoring literature was the frequency of peer tutoring as a tool to improve students' ability in mathematics. Of the 10 case studies analyzed focusing upon the impact of peer tutoring relative to tutee achievement, five focused exclusively upon tutee achievement in mathematics (Austin, 2008; Baker, Rieg, & Clendaniel, 2006; Davis, Fantuzzo, & Ginsburg; Fogarty & Wang, 1982; Worley & Naresh, 2014), and four on a combination of mathematics and other courses (Allen & Chavkin, 2004; Goodlad & Hirst, 1989; Grubbs, 2009; Rothman & Henderson, 2011). Only one study involving four tutors assisting four tutees in reading did not focus upon mathematics (Yawn, 2012). Therefore, as the impacts of various studies are analyzed, results are most immediately relevant to student achievement in mathematics.

Impact of Peer Tutoring

Research suggests both tutors and tutees tend to benefit from participation in peer tutoring programs. Academically, tutees benefit from increased practice and tutors from reciprocal teaching. The magnitude of tutees' benefit varies between researchers, but overall programs are reported positive almost unanimously, leading some researchers to call the fidelity of peer tutoring research into question (Furst & Rosenshine, 1969; Topping, 1988; Leung, 2014). Qualitatively, both tutors and tutees tend to benefit from the experience, and other stakeholders such as parents and teachers have provided positive reactions (Baker, Rieg, & Clendaniel, 2006; Fogarty & Wang, 1982; Grubbs, 2009).

Academic Impact Upon Tutees

The effectiveness of peer tutoring research is typically measured by comparing student achievement using post-positivist comparison, and when measuring student achievement researchers have consistently found peer tutoring has had a positive impact (Allen & Chavkin, 2004; Austin, 2008; Davis, Fantuzzo, & Ginsburg, 1995; Grubbs, 2009; Rothman & Henderson, 2011). The effect sizes of peer tutoring as analyzed by two recent meta-analyses have been rated as 0.55 by Hattie (2009) and 0.47 by Leung (2014), both results implying peer tutoring has a significant positive impact. A third earlier meta-analysis conducted by Cohen, Cohen, and Kulik (1982) gave three different effect sizes dependent upon the length of time; students who participated for 0 – 4 weeks showed an average effect size of 0.95, for 5 – 18 weeks 0.42, and for 18 – 36 weeks 0.19. All three meta-analyses note a wide variance of effect sizes among studies (Cohen, Kulik, & Kulik, 1982; Hattie, 2009; Leung, 2014). Effect sizes may vary by subject area as well, as Leung (2014) noted students benefitted most from remediation in physical education with an effect size of 0.90, then science, 0.45, reading and math, 0.34, and finally language with an average effect size of 0.15.

A Few Examples of the Academic Impact of Tutoring. Meta-analyses are useful for establishing whether an instructional strategy is effective, although evidence from a few studies may be beneficial to elucidate peer tutoring's impact. For example, in one program 12 middle school tutors provided eight hours of remediation in math and reading to 18 third, fourth, and fifth grade students, and tutees gained an average of 4.17 points on a computerized test, whereas a control group gained 1.5 (Fogarty & Wang, 1982). In a second program 10 sixth grade students provided eight 30-minute tutoring sessions to 10 fifth graders on a set of word problems in mathematics, and tutees' scores on a post-test increased 5.5 points, whereas a control group's increase was 1.25 points (Austin, 2008). In a third program, seventh and eighth grade Beta Club members assisted sixth, seventh, and eighth grade peers in multiple subjects,

although 67% of participants requested remediation in math (Grubbs, 2009). The exact number of participants is not given, although 100 tutees are stated to have participated, most for less than two hours. The tutees' average grade increase was .1 points, a gain considered significant by the researcher due to the increasing complexity of the content during the year (Grubbs, 2009).

Alternatively, the impact of peer tutoring may be considered with respect to the percentage of students who benefit. For example, in a study during the ninth year of a peer tutoring program's implementation, university volunteers assisted 85 third through sixth grade students in math (Baker, Rieg, & Clandaniel, 2006). 86% of all tutees improved academically, 5% stayed the same, and 11% decreased in ability (Baker, Rieg, & Clandaniel, 2006). In another example, 31 Americorps volunteers tutored a group of 230 at-risk middle school students in math and reading (Allen & Chavkin, 2004). The results of tutoring were broken into two groups based upon time; 74 at risk students received 0 – 13.25 hours of tutoring and 156 received 14 – 61 hours. Allen and Chavkin (2004) found 60.8% or 45 of the 74 students receiving less tutoring passed, and 80.1% or 125 of the 156 students receiving more tutoring passed. The examples provided do not encompass the full range of results from various peer tutoring programs, but should give some insight into peer tutoring's effectiveness implied by the meta-analyses.

Impact Relative to Time. Somewhat counterintuitively, the effect size of peer tutoring analyzed by Cohen, Kulik, and Kulik (1982) decreased with increased time, and investigation into Cohen, Kulik, and Kulik's meta-analysis reveals their conclusions should be taken with reservation since not all studies included were peer reviewed or published (Goodlad & Hirst, 1989). For example, one study involving peer tutoring for 12 students in lowest 10% for 11 months was not peer reviewed (Mohan, 1972), yet was registered as having a statistically suspicious positive effect size of 2.3 (Cohen, Kulik, & Kulik, 1982). Additionally, Cohen, Cohen, and Kulik noted unpublished studies

tended to average significantly larger mean effect sizes, 0.85. While frequently referenced by peer tutoring researchers, others have challenged the legitimacy of Cohen, Cohen, and Kulik's results, "Notably, this study was conducted prior to the development of many methods in meta-analysis and, therefore, did not correct for the effects of small samples, weigh the effect sizes by sample sizes, or consider the sample outliers" (Leung, 2014, p. 559).

One comparison between the duration of peer tutoring program achievement and positive impact can be found by comparing the effectiveness of Austin (2008) and Fogarty and Wong's (1982) studies to Grubbs' (2009). In the two former studies, students received remediation for four and eight hours respectively, and each gained a few points relative to the control, whereas in Grubbs' analysis most students received less than two hours of remediation and showed very minor overall gains. In another comparison, students' participation durations were divided into categories of 14 to 61 hours and zero to 13.25 hours, the former achieving a pass rate of 60.8% and the latter 80.1% (Allen & Chavkin, 2004). Unfortunately, research comparing the duration of intervention is uncommon, as noted by Allen (1976).

Most investigators hold the implicit view that the longer the tutoring program, the more positive effects will be. However, this assumption lacks empirical support. It is quite conceivable that after a certain amount of time with the same partner, both the tutor and tutee will become bored..., and tutoring will have negative effects. (Allen, 1976, p. 242)

A correlation between time and tutee achievement may exist, and is intuitively appealing, but has not yet been established. One potential method for analyzing peer tutoring with respect to time would be for researchers to group student achievement based upon participation duration as Allen and Chavkin (2004) did, assuming students participated for different lengths, although such comparisons are rare.

Academic Impact Upon Tutors

While the academic impact of peer tutoring upon tutees is the focus of most research, tutors also benefit from reciprocal teaching resulting from instruction. A few studies suggest peer tutoring has a positive academic impact upon tutors (Hattie, 2009; Worley & Naresh, 2014), such as in one example when Algebra I tutors reported feeling having gained more during a session from review than their tutees (Worley & Naresh, 2014). However, effects of peer tutoring upon tutors have rarely been measured. One potential reason for not measuring the impact of peer tutoring upon tutors is because peer tutoring is often conducted using cross-age tutors of more than one or two years. If, for example, community volunteers may tutor middle school students (Allen & Chavkin, 2004), then academic impacts upon tutors are largely irrelevant. Alternatively, even if tutors and tutees are of similar age, the supervisor may focus on tutee gains, choosing not to analyze the impact of peer tutoring upon tutors (Grubbs, 2009).

Qualitative Impact of Peer Tutoring

Beyond improving academic scores, peer tutoring can also be instrumental in developing a collaborative school culture. Overall, peer tutoring has been received favorably by both tutors and tutees (Austin, 2008; Baker, Rieg, & Clendaniel, 2006; Fogarty & Wang, 1982; Goodlad & Hirst, 1989) as well as by parents and teachers (Baker, Rieg, & Clendaniel, 2006; Fogarty & Wang, 1982; Grubbs, 2009). Unlike academic achievement, researchers have recognized there is usually a little negative feedback accompanying challenges in peer tutoring, although overall feedback is very positive (Baker, Rieg, & Clendaniel, 2006; Goodlad & Hirst, 1989; Grubbs, 2009).

Positive Feedback from Tutees. The opportunity to practice in an individualized or small education setting with a non-professional educator tends to be perceived positively by tutees. In a three-year study known as the Pimlico Connection, 750 university tutors provided over 17,000 hours of remediation to over 8,600 secondary pupils Wednesdays after school for fifteen weeks in

science, mathematics, and craft and design technologies (Goodlad & Hirst, 1989). Tutees noted their favorite parts about peer tutoring were the rapid responsiveness, helpfulness, and individual attention provided by tutors (Goodlad & Hirst, 1989). Furthermore, on exit surveys “Most pupils report *no dislikes at all*” (Goodlad & Hirst, 1989, p. 100, emphasis in original). Goodlad and Hirst’s (1989) positive responses to peer tutoring have also been common in smaller programs. For example, in a study with 72 at-risk fourth and fifth grade students, the 26 students in the experimental group who received peer tutoring from university volunteers in math felt a stronger sense of self-concept and social acceptance than the control (Davis, Fantuzzo, & Ginsberg, 1995). In another program in which 10 fifth grade tutees kept journals, nine students reported they felt “great” about participating in peer tutoring, and the tenth’s reaction was neutral (Austin, 2008).

Positive Feedback from Tutors. Overall, tutors’ feedback from participation has also been positive. University tutors enjoyed assisting elementary school students, and noted the experience was particularly beneficial since the volunteers were education majors (Baker, Rieg, & Clendaniel, 2006). In the Pimlico Connection, 96 percent of tutors reported receiving “useful practice in communicating scientific ideas” (Goodlad & Hirst, 1989, p. 89). For cross-age tutors, a group of seven Algebra student tutors reported appreciating the remediation gained from tutoring seven pre-Algebra tutees (Worley & Naresh, 2014). Last, a group of middle school tutors assisting elementary and middle school tutees in math and reading indicated after participating they are more likely to request aid from teachers, although curiously the same tutors also expressed complete disinterest in becoming math teachers (Fogarty & Wang, 1982).

Feedback from Parents and Teachers. Extending beyond tutor and tutee, peer tutoring also tends to receive positive feedback from teachers and parents. Teachers tend to appreciate the one-on-one academic support for struggling students (Fogarty & Wang, 1982; Grubbs, 2009), and see benefits such as increased participation during class, increased

amounts of homework completion, and a more positive attitude (Baker, Rieg, & Clendaniel, 2006). Parents appreciate peer tutoring because participation relieves parents with the task of assisting with homework, a task parents may not be entirely comfortable with (Baker, Rieg, & Clendaniel, 2006). The majority of feedback connected with peer tutoring is positive, although not all.

Negative Feedback. Despite peer tutoring’s overall perceptions from stakeholders, researchers note there is usually a small percentage of negative feedback as well. For example, in one study absences either from university volunteers of elementary tutees caused frustration when some students had to be temporarily re-assigned to different groups (Baker, Rieg, & Clendaniel, 2006). In the Pimlico Connection, some tutees responded unfavorably to the constant attention tutors maintained, and other tutees thought tutors provided too much help (Goodlad & Hirst, 1989). In a third example, in an action research study in which Beta Club middle school students tutored other students, a 25 survey responses were collected from tutees and 13% of tutees stated peer tutoring had not been helpful (Grubbs, 2009).

Qualitative results tend to be unchallenged by researchers. One reason for general acceptance may be because perception is difficult to quantify and may indeed be consistently positive. Alternatively, most researchers tend to make a point of including negative interviews within results, providing balance to strongly encouraging reports. However, some studies’ results prompt skepticism, such as Grubbs’ (2009) analysis of responses, indicating 13% of students responded negatively, a percentage mathematically impossible to form from a group of 25. Grubbs’ error is likely a small miscalculation rather than intentional misrepresentation, the latter a transgression sometimes suspected by peer tutoring researchers.

Concerns in Research

Quantitatively, the analysis of peer tutoring programs warrants some skepticism because peer tutoring has had an unusually optimistic record of

either positive or neutral results. One hypothesis for peer tutoring's unusually high level of effectiveness is because programs with negative results are either rare or unpublished, as was noted by Furst and Rosenshine (1969), who stated "We had some real difficulties in locating studies which we knew had been issued and which included negative findings. For some reason or another, these were 'unavailable' from funding agencies" (p. 34 – 35). A deeper look into peer tutoring meta-analyses supported Furst and Rosenshine's suspicion, as another meta-analysis explicitly reported being unable to locate a single study with negative effects (Topping, 1988). Additionally, Cohen, Cohen, and Kulik's (1982) meta-analysis illustrated some studies had negative effect size on a graph, but the names of studies used to generate the graph were not included, complicating peer review. A more recent meta-analysis lists 16 of 72 studies, 22%, having had minor negative effects (Leung, 2014), a percentage that does not undermine the overall credibility of peer tutoring as an effective means of academic support, but is significant enough to call former research into serious question. Leung (2014) had the advantage of conducting research using online data bases, but 36 of Leung's 95 sources were published before 1989, implying the likelihood of having no peer tutoring programs with negative effects before Topping's (1988) analysis was very low.

Alternatively, research may have consistently reported positive results, but only because positive impacts inherently result from structured research. Success may not follow within an academic environment that is *laissez-faire*, as noted by Allen (1976), "It is assumed that bringing two persons together and designating one as a tutor will automatically lead to a healthy, profitable tutoring relationship. This assumption is simply not supported by the available evidence" (p. 175). While peer tutoring has a strong research background of effectiveness, successful peer tutoring may have resulted from effective program structure and implementation implicit in research design, not casual tutor-tutee pairings, and therefore inquiry into what structural components are

necessary to produce positive student achievement is prudent.

Program Structure and Implementation

The variety of factors involved structuring a peer tutoring program makes designing an outline complicated, a challenge further compounded by conflicting opinions among researchers and broad program descriptions in literature (Allen & Chavkin, 2004; Cohen, Cohen, & Kulik, 1982; Goodlad & Hirst, 1989; Grubbs, 2009; Merrett, 1994; Topping, 1988; Yawn, 2008). Although not specifically studied, the role of program supervisors and strategies for implementation are consistent themes between studies, and therefore reviewing existing program structures with respect to supervisors' possible roles, implementation of peer tutor training, and a frequent challenge, maintaining attendance, is beneficial to develop effective peer tutoring programs.

Understanding the Scope of Supervisor's External Role

Findings of the most appropriate role for a peer tutoring supervisor varies with research. For example, one successful peer tutoring program in its ninth year of operation stressed that program organization is vital (Baker, Rieg, & Clendaniel, 2006). Students can be independent facilitators of planning meeting times and self-monitoring, but such efforts are usually met with low participation and sustainability (Topping, 1988). Therefore, at the very least supervisors are recommended to plan meetings and provide some level of participation during tutoring sessions (Merrett, 1994; Topping, 1988) and should be a member of the school staff, not an external assistant (Allen, 1976). Once a supervisor is chosen, a plethora of operational tasks, such as tutor training, coordinating efforts with teachers, and choosing a location remain before conducting the first peer tutoring session. As noted by Allen (1976),

Many tutoring systems require considerable time and commitment from school personnel. Some systems require substantial tutor training (e.g. 10 or 12 sessions over a

6-week period). Others require the involvement of many persons and a substantial reorganization of the school (e.g., systems where all or most of the children in school are engaged in some sort of cross-age tutoring on a daily basis). Some attention must be given to preparing the school staff to accept, install, and operate such programs effectively. (Allen, 1976, p. 187)

Some researchers suggest implementation will be easy, for tutors are plentiful and eager to help (Austin, 2008; Merrett, 1994), although such views ignore the stresses incurred by supervisors in coordinating a program. Peer tutoring is a challenge; "It requires an extra effort to reduce a complex curriculum to activities in which non-professional tutors can take part" (Goodlad & Hirst, 1989, p. 67). Because establishing an effective peer tutoring program requires a substantial effort on the part of its supervisor, experienced program designers recommend starting small to ensure a program is successful and manageable (Goodlad & Hirst, 1989).

Peer Tutor Training

The duration or even necessity of peer tutor training is a point of significant conflict among educational researchers. Peer tutor training is frequently recommended as an essential element to program success (Allen & Chavkin, 2004; Goodlad & Hirst, 1989; Grubbs, 2009; Merrett, 1994; Topping, 1988; Yawn, 2008). The length of peer tutor training has varied widely, and researchers have implemented training sessions ranging from less than 30 minutes (Merrett, 1994) to two 45-minute sessions, (Davis, Fantuzzo, & Ginsburg, 1995) to five days with continual development throughout the year (Allen & Chavkin, 2004). However, not all researchers consider training necessary. Previous conclusions of the importance of peer tutor training were conducted in single case scenarios, while in a meta-analysis Cohen, Kulik, & Kulik (1982) discovered a negligible difference in effect size for both tutee and tutor achievement when comparing trained and untrained tutors, .41 versus .36 for tutees and .34 versus .32 for tutors. A

second meta-analysis considered tutor training beneficial, but recommends the duration of training be fewer than two and a half sessions (Leung, 2014).

One reason the effectiveness of peer tutor training is disputed is because the effectiveness of training is difficult to gauge. Authors of peer tutoring books tend to include either examples or concise outlines of successful peer tutoring structures (Allen, 1976; Goodlad & Hirst, 1989; Topping, 1988), but lack several cases of experimental data to support configurations. By comparison, descriptions of training programs in single case analyses have detailed results, but are often vague (Allen & Chavkin, 2004; Davis, Fantuzzo, & Ginsberg, 1995; Glass, Levin, Meister, 1987). For example, a description of five days of preservice training devoted one day to math, one day to reading, and three days to educational practices (Allen & Chavkin, 2004). Another study states students are trained by the program manager using a locally produced manual, yet a description of such manual is absent (Glass, Levin, & Meister, 1987). The lack of description of peer tutor training methods makes analysis difficult, a concern shared by Furst and Rosenshine (1969).

More information about the objectives of their programs, details of the tutor training, descriptions of the materials used in tutoring situation. All of these should be given with as many specific examples and actual materials as possible. Without this knowledge it is difficult to synthesize the results in any meaningful way, and it is almost impossible to replicate programs. (Furst & Rosenshine, 1969, p. 35, emphasis in original)

Whether by refreshing content knowledge, recommending educational practices, or familiarizing tutors with the program's expectations, research tends to support implementing some form of peer tutor training, yet evidence of which elements optimize peer tutoring training remain unresolved.

Organizing Peer Tutoring Sessions

During tutoring sessions, supervisors' roles may be described as non-participant, monitor, or planner. A non-participant supervisor leaves students to coordinate meetings and exhibits no oversight during tutoring sessions, and such structure tends to cause tutors and tutees to stray off task frequently (Topping, 1988). A monitor supervisor ensures students remain on task and provides guidance when appropriate, but lets tutors and tutees decide what material will be remediated and how. Monitoring helps prevent socializing (Topping, 1988), and is recommended for programs with large age gaps between tutors and tutees, such when university students tutor elementary school students, since tutors are mature enough to plan lessons quickly and adapt to gaps in their knowledge" (Goodlad & Hirst, 1989). Last, a planner supervisor provides resources such as lesson plans, teachers' notes, exercises for students, and a recommended strategy of study. Structured programs require the most planning time, but are recommended for students of similar ages or when teachers who wish to maintain a stronger locus of control (Goodlad & Hirst, 1989).

Attendance. Attendance will likely present a challenge, and researchers have recorded attendance levels percentages ranging from 50% (Yawn, 2012) to 55% (Grubbs, 2009) to 90% (Rothman & Henderson, 2011). Two of the distinct disadvantages of implementing a peer tutoring program outside of regular class hours are first ensuring that students have the means to attend, as procuring transportation can be an impediment (Topping, 1988), and second motivating tutees to attend, as tutees may choose not to receive additional instruction (Grubbs, 2009). One recommended method of increasing attendance is to provide students and teachers with reminders about peer tutoring (Grubbs, 2009). Another recommended strategy is to ensure remediation is in the same place every week and there is some form of enjoyment involved in each session (Merrett, 1994).

Attendance challenges are sometimes overlooked in research because students who fail to participate a minimum number of sessions may be removed from the statistical analysis (Davis, Fantuzzo, & Ginsburg, 1995; Furst & Rosenshine, 1969; Grubbs, 2009; Yawn, 2008). For example, one study beginning with eight tutor-tutee pairs noted many candidates had attendance issues, and therefore the final evaluation only included four pairs (Yawn, 2008). A second study began with 78 tutees, but only 72 were tested on the post-test, due to challenges in attendance (Davis, Fantuzzo, & Ginsburg, 1995). In a third study, tutoring occurred before school but many tutees chose to spend time with friends rather than attend (Grubbs, 2009). The supervisor then attempted to increase participation by distributing reminders in teachers' mailboxes (Grubbs, 2009). Analysis of students with a constant attendance record may be necessary to test the effectiveness of strategies implemented within a peer tutoring program, but the omission of participants creates an unrealistic set of results. Rates of attendance and differences in effect size based upon attendance can be accounted for in research by matching effect size with duration, as Allen and Chavkin's (2004) analysis did by grouping students into participants who completed either 0 – 13.25 or 14 or more hours, yet such division is currently rare. Furthermore, analysis of partial attendance can still be used to gauge other elements of peer tutoring, such as barriers to participation, perceptions of the program, and cost.

Economics of a Peer Tutoring Program

The cost of developing a sustainable peer tutoring program is difficult to calculate because peer tutoring programs for educational research tend to be free, either investigated for one year by the supervisor or funded by a grant (Allen & Chavkin, 2004; Austin, 2008; Davis, Fantuzzo, & Ginsberg, 1995; Fogarty & Wang, 1982; Grubbs, 2009; Rothman & Henderson, 2011; Yawn, 2012). Therefore, the cost estimates for a sustainable program tend to be theoretical (Allen, 1976; Glass, Levin, & Meister, 1987), and would greatly benefit from more substantive research.

Existing Data. The limited information about the cost-effectiveness of peer tutoring suggests peer tutoring is significantly more cost effective than programs with comparable effect sizes (Allen, 1976; Glass, Levin, & Meister, 1987). A theoretical example of the cost effectiveness of providing peer tutoring was calculated at \$212 per student per year, compared to \$827 per student year for comparable adult tutoring and \$804 per student year for a comparable reduction in class size (Glass, Levin, & Meister, 1987). Another example estimates a manager can supervise 50 student tutors per day in a classroom or independently, estimating the cost at the manager's salary plus \$1.00 per student per year (Allen, 1976). The estimation of 50 students per day may be possible within a classroom, but in an external setting seems unrealistic for a single supervisor. Funding may come from an upper level administrator (Baker, Rieg, & Clendaniel, 2006) or think tank (Goodlad & Hirst, 1989), and a sustainable peer tutoring program will likely require funding for at least one supervisor.

Limited Data. Some researchers investigate peer tutoring programs with prior experience (Baker, Rieg, & Clendaniel, 2006; Goodlad & Hirst, 2989; Naresh & Worley, 2014). For example, a math peer tutoring program in its ninth year of implementation has consistently found very positive results coordinating peer tutoring between local university students studying education and elementary school students, and employs a program coordinator and two teachers (Baker, Rieg, & Clendaniel, 2006). Another program conducted a pilot peer tutoring program for one year before researching, and then collected data during the second (Worley & Naresh, 2014). Since the program only utilized 14 students total and was conducted during an advisory period during the school day, cost was not a factor (Worley & Naresh, 2014). The Pimlico Connection was intended to be a three-year trial (Goodlad & Hirst, 1989), but is still maintained, and proudly boasts students may participate for free (The Pimlico Connection Annual Report, 2017). However, the cost of zero on the Pimlico Connection's reports is not helpful to

researchers and prospective developers of peer tutoring programs. Students and parents may not have to pay for participation, but someone, in this case a think tank (The Pimlico Connection Annual Report, 2017), funds coordinating staff and facilities, and knowledge of the overhead costs could serve as a reference point. Whether funding is needed for larger programs or if a program should be kept free and small requires greater attention, for currently inclusion of the cost of peer tutoring programs is not well defined.

Conclusion

Research surrounding the impact and best practices within peer tutoring vary, there are notable disagreements among researchers, and analysis of the academic, qualitative, economic, and structural components will not provide an explicit formula for improving student achievement. Overall, researchers find peer tutoring tends to be effective (Cohen, Kulik, & Kulik, 1982; Hattie, 2009; Leung, 2014), though traces of negative feedback suggest peer tutoring can also be ineffective, "There is no doubt that peer tutoring *can* work. That is unequivocally demonstrated by the research evidence. However, the evidence also shows that peer tutoring *can fail* to work, and failure you cannot afford" (Topping, 1988, p.xx). Hopefully, understanding the background surrounding anticipated benefits of peer tutoring and conditions needed to ensure success will help supervisors develop and implement a beneficial instructional strategy to meet the enduring challenge of delivering quality education.

References

- Allen, A. Chavkin, N. F (2004). New evidence that tutoring with community volunteers can help middle school students improve their academic achievement. *School Community Journal*, 14(2), 7-18.
- Allen, V. (1976). *Children as teachers: Theory and research on tutoring*. New York, Academic Press.

- Austin, J. (2008). *The effects of peer tutoring on fifth-grade students' motivation and learning in math* (Master's Thesis). Retrieved from http://digitalcommons.brockport.edu/ehd_theses/239.
- Azicoitia, C. (1989). *Structured peer tutoring in Chicago's vocational education program* (doctoral dissertation). Retrieved from ERIC, (ED 320020).
- Baker, J., Rieg, S., Clendaniel, T. (2006). An investigation of an after school math tutoring program: University tutors + elementary students = a successful partnership. *Education, 127*(2), 287-293.
- Cohen, P., Kulik, C, & Kulik, J. (1982). Educational outcomes of tutoring: A meta-analysis of findings. *American Educational Research Journal, 19*, 237-248.
- Davis, G. Fantuzo, J. Ginsburg, M. (2015). Effects of parent involvement in isolation or in combination with peer tutoring or self-concept in mathematics achievement. *Journal of Educational Psychology, 87*(2), 272-281.
- Flores, M. Duran, D. (2013). Effects of peer tutoring on reading self-concept. *International Journal of Educational Psychology, 2*(3), 297-324.
- Furst, N. Rosenshine, B. (1969). *The effects of tutoring upon pupil achievement: A research review*. Retrieved from <http://files.eric.ed.gov/fulltext/ED064462.pdf>
- Goodlad, S., Hirst, B. (1989). *Peer tutoring: A guide to learning by teaching*. London: Kogan Page.
- Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge.
- Hertz-Lararowitz, R. Khalil, M., Lararowitz, R., Ron, S. (2013). *Designing cooperative learning in the science classroom: Integrating the peer tutoring small investigation group (PTSIG) within the model of the six mirrors of the classroom model*. Retrieved from <http://files.eric.ed.gov/fulltext/ED567161.pdf>
- Lueg, K. Lueg., R. (2014). From teacher-centered instruction to peer tutoring in the heterogeneous international classroom: A Danish case of instructional change. *Journal of Social Science Education, 13*(2), 39-62.
- Grubbs, N. (2009). The effects of the peer tutoring program. *GSCA Journal 16*(1), 21-31.
- Mathes, L., Fuchs, P. (1991). *The efficacy of peer tutoring in reading for students with disabilities: a best-evidence synthesis* (doctoral dissertation). Retrieved from ERIC, (ED 344352).
- Merrett, F. (1994). *Improving reading: A teacher's guide to peer tutoring*. London: D. Fulton Publishers.
- Mohan, M. (1972). *Peer tutoring as a technique for motivating the unmotivated*. Fredonia, NY: Teacher Education Center, State University College.
- Rothman, T., Henderson, M. (2011). Do school-based tutoring programs significantly improve students' performance on standardized tests? *RMLE Online 34*(6). 1-10.
- Spencer, V., Balboni, G. (2003). Can students with mental retardation teach their peers? *Education and Training in Developmental Disabilities, 38*(1), 32-61.
- The Pimlico Connection. (2017). *The Pimlico Connection annual report*. Retrieved from https://www.imperial.ac.uk/media/imperial-college/be-inspired/student-recruitment-and-outreach/public/Pimlico-Annual-Report-2016-17_v4_final.pdf
- Topping, K. (1988). *The peer tutoring handbook: Promoting cooperative learning*. Cambridge, MA: Brookline Books.

Worley, J, Naresh, N. (2014). Heterogenous peer tutoring: An intervention that fosters collaboration and empowers learners. *Middle School Journal*, 46(2), 26-32.

Yawn, C. (2012). Effects of gifted peers tutoring struggling reading peers. *Journal of Special Education Apprenticeship*, 1(1), 1-11.