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The Effect of Symmetrical and Asymmetrical Peer-Assisted Structures on Music Achievement and Learner Engagement in the Secondary Large Ensemble

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THE EFFECT OF SYMMETRICAL AND ASYMMETRICAL PEER-ASSISTED STRUCTURES ON MUSIC ACHIEVEMENT AND LEARNER ENGAGEMENT IN THE SECONDARY LARGE ENSEMBLE

by

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The Effect of Symmetrical and Asymmetrical Peer-Assisted Learning Structures on Music Achievement and Learner Engagement in the Secondary Large Ensemble has been approved for the Department of Music Education.

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The final copy of this dissertation has been examined by the signatories, and we Find that both the content and the form meet acceptable presentation standards Of scholarly work in the above mentioned discipline.

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The Effect of Symmetrical and Asymmetrical Peer-Assisted Learning Structures on Music Achievement and Learner Engagement in the Secondary Large Ensemble
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The purpose of this study was to examine the effect of two different reciprocal peer-assisted learning (PAL) arrangements on music achievement and learner engagement in the secondary instrumental music classroom. Using a quasi-experimental design, six middle schools in one large urban/suburban school district were purposively chosen based upon the following criteria: grades 6-8, non-selective enrollment, one full-time band director, only one section of 7th-grade band, students begin instrumental music in 6th grade. Student participants (N=261) representing six separate 7th-grade bands were randomly assigned at the school-level to one of two treatment conditions: symmetrical PAL where students of like-ability were paired together and asymmetrical PAL where students of divergent ability were paired together. Over the course of four weeks during twelve, twenty-minute sessions, students worked in pairs taking turns being the 'learner' and the 'teacher' to improve sight-reading ability and music theory knowledge. Students were provided with a variety of structured activities including rhythm-counting worksheets, composition exercises, sight reading etudes, and key signature worksheets. Students were allowed to determine their own rules for interaction, turn taking, and the amount of material to be covered in each session. Additionally, the concepts of interdependence and intersubjectivity (Piaget, 1938; Vygotsky, 1978) were embedded in the activities for each session. Three pre/posttest outcome variables were assessed: sight-reading performance, music theory knowledge, and learner engagement. Sight-reading ability was assessed using SmartMusic © where students individually performed a researcher-constructed etude in line with state music standards for second-year instrumental music. Music theory knowledge consisted of a researcher-constructed, ten-item written measure asking students to identify various major key signatures. Learner engagement was measured using the learner engagement and disaffection self-report measure developed by Wellborn (1991). Additionally, two individual difference variables were measured: individual socioeconomic status and achievement goal motivation orientation (Elliot & McGregor, 2001). Data were analyzed using a hierarchical linear regression to account for data nested at multiple levels and to avoid violations of non-independence. Results indicate that each of the three outcome domains showed significant gains. Moreover, a significant interaction effect was found between socioeconomic status and learner engagement. Implications for teaching and future research are discussed.
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CHAPTER I

The role of American concert band directors has changed dramatically over the last 150 years. Just as glaciers leave behind distinct topographical features, the current landscape of the American concert band in secondary schools is an amalgam of the varied traditions and practices developed during this period. Beginning with the professional bands of the late nineteenth century, American concert bands and their directors “met a different social need than that of the orchestra... the bands, especially those of Gilmore and Sousa, entertained their audiences with superb showmanship... whereas the orchestras maintained the traditions of the old world” (Mark & Gary, 2007, p. 297). After the golden days of the professional band subsided, due in part to the end of World War I, bands moved from military and professional units to primarily being available in communities and public schools. School bands expanded prolifically during this period (1918-1941), fueled by an influx of post World War I bandsmen looking for work and an instrument manufacturing industry looking to expand sales and promote competition (Fennell, 1954; Fonder, 1989).

As a product of military training, band directors of this period brought with them an approach based largely upon autocratic discipline and rigor. A document published in a 1930 edition of the School Musician titled “Ten Commandments for Band” captures the raison d’etre of this era:

“A good band is built on discipline. Members must be shown the way to attainment of organizational ideas... Band members should be made conscious at all times of the right way of doing things in the interest of order, both physical and mental” (Wainwright, 1930).
In the period after World War II, the focus of bands and their directors began to shift from an approach based upon discipline toward the creation of a standard instrumentation and core repertoire of original music for band. The 1958 president’s address to the American Bandmasters Association heralded this new mantra: “The music which we play should be carefully screened and weighed for its innate worth, for it must become the overwhelming reason for the existence of bands” (Hindsley, 1958). This new philosophy underscored the aesthetic potential of school bands beyond that of a disciplined moral training ground. The new music being composed not only required the band director become an artist conductor (Battisti, 2002; Reynolds, 1998), but also heralded a shift in the role of the band director. For instance, in the preface of the 1961 edition of The Modern Conductor, Elizabeth Green states, “It is in rehearsal that the conductor acts as a guide, building in the musicians minds a concept of the work parallel to his own, for the eventual public performance requires an enlightened and sensitive conductor” (Green, 1961, p. xiv).

During the 1960’s and 1970’s, and concurrent with the rise of artist band conductors, an effort was made to broaden the experience of music students by integrating subjects such as composition, history, and performance in what became known as the comprehensive musicianship movement. In response to major events such as the 1965 Seminar on Comprehensive Musicianship, and the publication of extensive curricular materials including Robert Garafalo’s Blueprint for Band and Joseph Labuta’s Teaching Musicianship in the High School Band, a consilience of artist conductor and teacher roles promoted a new ideal of superior performance
undergirded by a broad musical understanding (Choate, 1968; Jones, 1980; Mark & Gary, 2007). Succeeding decades have been marked by frequent debate among those who hold traditionalist views of the band director as a disciplinary figure, those who wish to advance conductor-as-artist ideals, and those who favor a merger of artistic and educational goals.

**Redefining the Role of the Teacher-Conductor**

Recently, a new conception of the conductor as servant-leader has emerged. Wis (2002) calls for school ensemble directors to conceive of themselves as servant-leaders who “cultivate a forward-looking atmosphere because they always expect growth... they do not view rehearsal as a process where the ensemble has something done to it; rather they look at rehearsal as drawing out the ensembles potential” by focusing upon “empowering ensemble members through positive influence, goals, and a vision for success” (p. 17).

Within the servant-leader framework, the teacher-conductor serves students by drawing out their connection with music before considering personal desires. In this arrangement, an autocratic approach of “do so because I say so,” is transformed into “you will want to do this when you understand why.” In order to foster this disposition, teachers need to cultivate trust between themselves and their students as well as between the students. Trust is also a key tenet of fostering interdependent learning since students who teach each other often care about how much their peers are learning (Thousand, Villa, & Nevin, 2002). Indeed, the degree of trust a teacher is able to cultivate between students in the large ensemble classroom has been shown
to increase a sense of collective efficacy and group cohesion not to mention intrinsically rewarding musical collaboration (Matthews & Kitsantas, 2007).

All of the roles that band directors have played in the distant and more recent past (i.e., professional showman, competitive disciplinarian, artist conductor, teacher-conductor, and servant-leader) are visible in today’s school band landscape (Battisti, 2002; Williamson, 1998). There are those who suggest, however, that a shift in perspective is needed from a teacher-driven performance orientation where the goal is getting ready for the next concert toward a more student-centered environment where the process of learning is emphasized. Kirchoff (1999) notes the limitations of a completely teacher-driven rehearsal environment:

“I believe in shifting responsibility to the students. If you tend to be completely goal oriented, your conductor’s list gets longer because it may be easier and quicker to do these things yourself. The problem is that the next time around you have to start all over again. However, when students are aware of the big picture, and their list is as long as yours, you can build on an ever-increasing base of knowledge and experience” (p. 50).

Beyond concerns about band director role and instructional goals are issues surrounding access and participation. Both philosophers and researchers have noted the high quality of American instrumental music programs (Reimer, 2010) while at the same time questioning their effectiveness in promoting comprehensive musicianship and life-long musical engagement. Numerous status studies have shown that fewer than one out of four high school students participate in elective school ensemble classes (Elpus & Abril, 2011). Nevertheless, many band directors defend the status quo because of the perceived risk that change might negatively impact performance quality or decrease ensemble enrollment (e.g., Fallin &
Garrison, 2005; Rideout, 2005). Others argue that the breadth and depth of learning is compromised by performing repertoire in ensembles that is not mirrored in popular culture, and that few students are willing to sustain participation given the commitment of time and effort (e.g., Williams, 2007; Kratus, 2007).

While a teacher driven model may have helped American concert bands achieve their current status, Kirchoff’s call for increased student engagement invokes the notion that there are still deeper levels of musical learning that can be achieved through the use of varied student participation structures in large ensembles. Reimer (1994, 2010) makes the case that while the 21st century has brought many changes to music education, as a creative process, music making is still fundamentally “a series of explorations, discoveries, and the attendant critical and reflective making of decisions” (p. 9). In light of these points, it would seem that a metamorphosis of the school band director’s role is needed that at once preserves the richness of tradition while also allowing room for different modes of participation that are less teacher-directed.

**Collaborative Learning and Democratic Education**

Collaborative learning, which is defined as the construction of shared meanings through continual conversation, conceptual learning, and integrative experiences (Cohen, Brody, Sapon-Shevin, 2004), is an instructional approach that is less teacher-directed and allows for frequent peer interaction. Different from cooperative learning, which mirrors workplace environments typified by pooled contributions in a division of labor where each individual is responsible for a subordinate goal (Foot & Howe, 1998), collaborative learners work in pairs or small
groups to practice and hone face-to-face interaction, positive interdependence, knowledge co-construction, interpersonal skills, and assessment of group and individual learning effectiveness (Thousand & Villa, 1994). Collaborative learning may be the oldest form of learning known to humankind (Piaget, 1936; Rogoff, 1990; Topping, 2005; Vygotsky, 1978), however, it did not become a common feature of American school classrooms until the mid 1970s. While some collaborative techniques emphasize task engagement, exploration, reconstruction, and reorganization of information (e.g., Reid, Forrestal, & Cook, 1989; Topping & Ehly, 2001), others emphasize personal responsibility for learning, accountability, and positive-role interdependence (e.g., Johnson & Johnson, 1991). Within collaborative frameworks, individuals may receive tailored guidance that facilitates understanding, concept acquisition, problem-solving and successful completion of rule-based educational tasks (e.g., Rogoff, 1990). Given the realization of collaborative learning in a wide variety of contexts, it has become a topic of interest for many educational scholars, whose research efforts have shown the academic, social, and emotional benefits of such arrangements (Beane & Apple, 1995; Johnson & Johnson, 1989; Slavin, 1991).

Collaborative learning incorporates many of the principles of democratic education (Cohen, Brody, Sapon-Shevin, 2004; Keeson, Koliba, & Paxton, 2002). A democratic educational process, as conceived of by the progressive early twentieth-century educational philosopher John Dewey (1859-1952), stands in contrast to teacher directed, autocratic approaches evidenced in some historical band director models. Dewey believed that a democratic education allows for continual
reorganization, reconstruction, and transformation of one’s knowledge.

Furthermore, he believed that this type of education is only possible “when education mirrors a society that makes provisions for all citizens to be on equal terms to participate in the public good,” and “when education secures the flexible readjustment of its institutions so as to mirror the needs of the lives of its citizens” (Dewey, 1916, p. 115). The principles of a democratic education should promote the “open flow of ideas,” the “faith in the individual and the collective,” the use of “critical reflection to evaluate problems,” and nurture an empathy for the “welfare, dignity, and rights of others” (Beane & Apple, 1995, p. 6). Dewey claimed, “the educational environment must enable individuals to liberate and organize their capacities” [emphasis original] (Dewey, 1916, p. 127). Moreover, the equality at the heart of a democratic society entails individuals “sharing experiences until they become a common possession” (Dewey, 1916, p. 10).

Socially, collaborative classroom practices mirror a democratic society by supporting group collaboration to enact shared goals, individual choice, reflective thought, and the development of individual responsibilities that contribute to the public good (Scruggs, 2009). Peer-assisted learning (PAL), an instructional arrangement where peers actively help each other to gain knowledge and skill through active help and support (Topping & Ehly, 2001), is one vehicle for the realization of these collaborative ideals. An environment where students have the opportunity to collaborate with their peers – acting as both the conduit and receiver of knowledge – provides a degree of autonomy in which they can be the architects of their own education (Anderson, Levis-Fitzgerald, & Rhoads, 2003). Furthermore,
education based on democratic principles utilizes social structures that contribute to individual growth through student choice and constructive dialogue in order for citizens to successfully participate in a democratic society (Dewey, 1916).

Traditionally, learning to play a musical instrument has existed along a continuum of experiences that range from private lessons to large mixed-instrument classes (Mark & Gary, 2007). Opportunities for beginning and intermediate students to learn collaboratively are often dependent on the contextual setting in which instrumental music instruction takes place. In ensemble contexts where there are often a large number of students enrolled, music teachers may be tempted to adopt a more efficient approach of delivering instruction to everyone at once and limiting peer interaction. Doing so, however, may result in homogenized pedagogy that does not address learning challenges associated with specific instruments and parts or the educational needs of certain musicians, thereby diminishing the quality of teacher feedback, student engagement and individual achievement (Johnson, in-press; Jorgensen, 1997; Topping & Ehly, 1998).

While collaborative learning can conceivably be applied to any music-learning situation involving two students or more, barriers to these types of instructional arrangements arise in large ensembles when a) the teacher maintains didactic control over instruction, and b) the goals of group performance trump the goals of individual student learning.

**Problem Statement**

If the ultimate goal of music education is to foster an artistic disposition, or at the very least aficionados who attend to music with mental, emotional, and physical
energy (Reimer, 2003), then music educators must expand the roles that students play in music classrooms. To enact this vision, students must experience a variety of musical roles that foster the active exploration of various musical concepts and, as a result, the teacher may frequently assume a more peripheral and supporting role.

Music educators have recently highlighted the narrowness of student experiences in large-ensemble music classrooms, many of which are contrary to the principles of democratic education (e.g., Allsup, 2003; DeLorenzo, 2003; Hanslik, 2010; Reimer, 2010; Woodford, 2005). In order to foster democratic principles in the music classroom, Woodford (2005) recommends providing students with the opportunity to create, elucidate, articulate, and validate their own opinions and musical understandings with others. While Wis’ (2005) and Kirchoff’s (1999) approaches are a step toward establishing a classroom more aligned with democratic education ideals, the implementation of varied instructional configurations like PAL may be necessary to translate democratic ideals into tangible and meaningful learning outcomes.

Teaching and learning that happens in the large ensemble context is often centered on teacher-determined performance goals rather than upon a flexible learning model that allows students to meet their individual needs as independent musicians (Jones, Palinscar, Ogle, & Carr, 1987; Shively, 2004). Unfortunately, while researchers have found collaborative endeavors such as peer-assisted learning (PAL) to be productive and increase student achievement in music and non-music contexts (e.g., Alexander & Dorrow, 1983; Goodrich, 2007; Johnson, in press; Roscoe & Chi, 2007; Topping & Ehly, 2001), the use of PAL is rare and contrary to the
traditional teacher-centered learning environment most prevalent in large ensembles (Allsup, 2003; Green, 2008; Johnson, 2011; Wis, 2005). Many scholars have suggested that the barriers to realizing the ideals of collaborate learning are inherent in the structure and history of the large ensemble (e.g., Bartel, 2004; Kratus, 2007; Williams, 2007).

While the goal of bringing collaborative learning into the large ensemble is not to eliminate the rich tradition of ensemble performance in the American public schools, the learning potential of those involved can be inhibited when an ensemble leader assumes primarily an autocratic role. The danger of the teacher-conductor possessing the majority of control in the classroom is that “students are not being given the opportunity to develop the individuality and responsibility required to be an artist... while producing results quickly, this [didactic instruction] leaves students dependent on the teacher, when what is desired is the development of musical independence” (Reimer, 2000). Furthermore, when the conductor makes the majority of decisions related to the organization of the learning environment, the student is most often reduced to that of a mere technician who lacks engagement (Williams, 2007).

The focus of PAL is to allow students to organize their own learning experience and to a degree, learn about or explore unknown or less developed concepts with a peer. However, with more autonomy to organize their learning environment, a higher degree of responsibility for productive learning is placed upon the individual student. While PAL looks and feels different from traditional teacher-led instruction, if students are to develop mental, emotional, and physical
understandings of music, then the responsibility for developing these traits must be shared by both student and teacher. Ultimately, PAL is a way for teachers to share the responsibility for learning with the student and to foster student autonomy and agency, which over time, can lead to musical independence.

It is often difficult or unattractive for teachers to embrace PAL and other collaborative learning practices because of the louder and more raucous nature of student interaction as well as the 'bumpy,' or messy interactions between students when governing their own processes (Cazden, 2001). To successfully integrate PAL as part of curricular instruction, the teacher must embrace a role that is more 'guide-on-the-side' and less 'sage-on-the-stage,' leaving room for students to make autonomous decisions (Green, 2004). Moreover, teachers must tolerate environments different than those where students dutifully sit silently, awaiting the next set of instructions.

To provide evidence that PAL is a valid instructional configuration to use in conjunction with full ensemble rehearsals and to help teachers take the risk of reorganizing valuable instruction time, research on how collaborative learning environments can improve student achievement and engagement in the secondary large ensemble is needed. By using an approach that balances collaborative learning models such as these with teacher led instruction, it may be possible to give students the opportunity to develop a deep level of musical understanding, improve the level of individual and ensemble performance, and increase learner engagement, thereby leading to an increase in secondary ensemble participation as well as lifelong arts appreciation.
Collaborative Learning Models

There are several models of collaborative learning that utilize peer-to-peer interaction. Some forms focus on small groups working together with the objective of task engagement and concept exploration, reorganization, and reconstruction (Reid, Forrestal, & Cook, 1989). Some emphasize personal responsibility for learning, and positive role interdependence (Johnson & Johnson, 1991). Others stress individualized guidance offered by a peer to facilitate concept acquisition, problem-solving strategies, and understanding of culturally-specific rule-based tasks (Rogoff, 1990).

The cognitive, social, and experiential distance between those involved largely determines the roles that individuals play in collaborative learning. The continuum of participation encompasses both asymmetrical and symmetrical pairings. On one hand, individuals of relatively similar ability, social status, and experience working together characterize a symmetrical grouping. Conversely, an asymmetrical grouping is characterized by relatively larger gaps in achievement, social status, and experience between individuals. Additionally, participation between individuals in collaborative learning endeavors can involve a reciprocal-role (i.e., each person plays both the role of the helper and helped) or fixed-role (i.e., one individual is assigned as the helper who leads the other individuals). Indeed, the various combinations of these factors can create myriad collaborative learning arrangements. Taken together, the success of various collaborative learning models is in their capacity to combine several associated elements (e.g., motivation,
attention, contribution, questioning, and feedback) that are critical to the learning process (Tolmie, Howe, Mackenzie, & Greer, 1993).

Phillips (1972) compares several possible ways in which variations of student interaction in classroom learning situations are typically realized in what she labels “participant structures,” or “culturally learned patterns of conversational rights and obligations” as described by Florio-Ruane (1987, p. 190). Herrenkol and Guerra (1998) claim that one of the most prevalent participant structures in formal schooling is typified by didactic teacher control, and that structures where teachers give students space to foster a sense of individual autonomy are the least frequent. It is in this space between teacher and student that student creativity can flourish as “students are triggered by the ideas of others and that different perspectives often cause group members to consider a larger number of perspectives” (Murray, 2002: 40). Additionally, when individual autonomy is fostered in classroom environments, students tend to promote each other’s success, form realistic impressions of each other’s competencies, and give feedback that promotes the basic acceptance of oneself as a competent person (Murray, 2002; Topping & Ehly, 2001).

Peer-assisted learning is one type of collaborative learning that music teachers might use to foster more individual and student-to-student autonomy in the large ensemble. Peer-assisted learning (PAL) is defined as “the acquisition of knowledge and skill through active-helping and supporting among status equals or matched companions” (Topping, 2005, p. 631), and has been identified as one of the most prevalent forms of collaborative learning in modern education (Topping, 2005). PAL enables individuals to organize their own learning environment and
allows students the flexibility to focus upon their own individual needs to overcome ignorance (Topping & Ehly, 2001). PAL also fosters student autonomy by reducing the degree of teacher-determined processes (Roscoe and Chi, 2007). Indeed, some large ensemble teachers may be employing student leadership techniques that could easily be transformed into a vehicle for peer-assisted learning (Goodrich, 2007; Johnson, 2011; Sheldon, 2001).

Educational scholars who have investigated PAL indicate that it is an effective means for improving student achievement in a wide variety of subject areas (Cohen, Kulik, Chen-Lin, & Kulik, 1982; Ginsburg-Block, Rohrbeck, & Fantuzzo, 2006; McMaster, Fuchs, & Fuchs, 2006; Robinson, Schonfield, & Steers-Wentzell, 2005; Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003; Roscoe & Chi, 2007). Demographically, the success of PAL has been noted in a variety of suburban, urban, rural settings (e.g., Rohrbeck et al., 2003; Ginsburg-Block et al., 2006). Specifically, PAL has been most successful in urban schools, with students who were economically disadvantaged and of minority status. While the reasons for this remain largely speculative, one intriguing theory is that low SES students often do not have the readiness to learn in a formal school setting that may be designed to primarily serve students of higher SES. Hence, PAL provides a space for less developed students to practice and refine their knowledge of basic concepts beyond what is received at home (Rohrbeck et al., 2003).

The constellation of collaborative learning models in the large ensemble classroom can range from stand partners sharing ideas, students working in a pairs to acquire or extend their musical knowledge, and chamber music groups that are
A handful of scholars in music education have investigated the effect of PAL on music achievement (Alexander & Dorrow, 1983; Darrow, Gibbs, & Wedel, 2005, Johnson, in-press). This modest amount of research does indicate that students engaging in PAL earn higher music achievement scores than do students who receive traditional large-group, teacher-led instruction. These findings are supported by a handful of qualitative music education studies in which researchers have learned that PAL supports not only gains in student achievement, but also fosters a high degree of learner engagement (Goodrich, 2007; Leber, 2007). A more detailed review of PAL literature will be given in Chapter Two.

**The Psycho-Social Dimensions of Peer-Assisted Learning**

Two unique psycho-social theories originating from cognitive and developmental psychology have been associated with peer-assisted learning and collaborative learning more broadly (Foot & Howe, 1998). Research into collaborative learning has traditionally built upon the theories of Piaget and the concept of *equilibration*. Equilibration describes development as a process of assimilation and accommodation as an individual attempts to reconcile cognitive conflict (i.e., previously unknown information) within existing mental schema (i.e., previously known information). According to Piaget, intellectual growth and adaptation is a result of either assimilating new information and reinforcing previously held understandings, or accommodation where new information is reconciled in a way that incites mental growth (Piaget, 1932; Doise & Mugny, 1984).

Peer-assisted learning – a form of learning situated within the constellation of collaborative learning practices – has been traditionally founded on Vygotskian
theory and the concept of the *zone of proximal development* (ZPD) (Foot & Howe, 1998). The ZPD is defined as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 86). The use of both theoretical frameworks by PAL scholars stems from the historical association of PAL with both collaborative and peer-tutoring practices (Topping & Ehly, 1998). Whereas Piagetian concepts are often more associated with neo-PAL practices such as symmetrical arrangements where peers of equal ability work together and frequently trade roles, Vygotskian concepts are most often associated with traditional forms of PAL such as asymmetrical arrangements where peers of divergent ability work together and are most often led by the more experienced individual (Topping & Ehly, 1998).

Traditionally, Vygotskian and Piagetian theories of development have been considered by many to be in opposition. For Piaget it is said that individual children construct knowledge through their actions on the world; for Vygotsky development is said to be embedded in social processes (Cole & Wertsch, 1996). However, such a dichotomous conceptualization is refuted by Cole and Wertsch, who suggest that Piaget and Vygotsky differ most notably with their views concerning the role of culture – specifically, the mediation of action through culturally specific knowledge. Both would have agreed that an individual constructs a mental model to solve problems but can be aided in this process through the intervention of outside individuals who possess culturally specific knowledge (Pass, 2004). The influence of
social interaction varies by degree and orientation.

There are important distinctions, however, that must be made between the two theories. Both Piaget and Vygotsky considered human development to involve internal and external processes. However, Piaget considered the seeds for individual development to be oriented internally and to be governed primarily through biological and cognitive development. Conversely, Vygotsky considered the seeds for development to originate in the social realm where individual understanding is mediated by knowledge possessed and transmitted by other more experienced individuals. In other words, while Piaget and Vygotsky both viewed interaction as the key to learning, the catalyst for individual development fundamentally differs.

Another difference between the theories of Piaget and Vygotsky is the influence of context on development. Piaget was interested in discovering the process of independent problem solving while treating social life as only a peripheral concern (Saxe, 1991). Conversely, Vygotsky was interested in the adaptation of behavior to fit specific contexts and how contexts were socially structured to support behavior (Davis, 1990). Whereas Piaget considered a child’s ability to answer a question correctly to be a generalized structure of thought that permeates much, if not all, of the child’s intelligence, Vygotsky considered that a child’s ability to know the correct answer to imply an understanding of the goals of specific knowledge and therefore the interpersonal and cultural context in which the knowledge is embedded (Rogoff, 1991).

A third difference between the two theories is how activity is conceptualized. Piaget considered individuals to actively construct their own development
internally by acquiring and accommodating knowledge through interactions with their environment (Davis, 1990). According to Piaget, development is a series of structured cognitive transformations that fuel the development of patterns of logical reasoning throughout one's lifetime (Piaget, 1969). Vygotsky also considered activity to play a central role in development. However, instead of being operationalized as internal cognition, Vygotsky considered activity to be mediated by the external sociocultural context in which an individual is embedded (Rogoff, 1991). Specifically, Vygotsky considered the cultural practices embodied by the community that an individual operates within to influence the ways that an individual approaches the goals they set out to achieve.

While differences are present, the two theories also share important similarities that scholars have used to describe the process of co-constructing knowledge with a peer. Drawing upon both Piagetian and Vygotskian strands, scholars agree that the benefits of peer-assisted learning are made possible by two interwoven processes: intersubjectivity and positive interdependence (Ginsburg-Block, Rohrbeck, & Fantuzzo, 2006; Johnson & Johnson, 1994; Johnson, Maruyama, Johnson, Nelson, & Skon, 1981; Johnson, Johnson, & Stanne, 2000; Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003; Stauffer & Kaplan, 1994; Thousand, Villa, & Nevin, 2002; Topping, 2010). Simply put, intersubjectivity is the process of creating shared meanings and positive interdependence is the feeling that students “sink or swim” together.

The process of peers creating intersubjectivity often begins with either incorrect or incomplete understanding of a concept or skill. Through sharing
misconceptions, peers have the opportunity to discuss conflicting ideas and to make
decisions about their own understanding and the understanding of a peer.
Intersubjectivity is created between peers as joint decisions are made, especially
those that result in an agreed approach to solving a specific problem. When students
feel a sense of commitment to each other’s success in relation to a specified task, the
result is positive interdependence. While intersubjectivity refers to how knowledge
is mutually constructed between peers, positive interdependence refers to why
individuals are motivated to work together.

Together, intersubjectivity and positive interdependence help to create
situations in which students: (a) see that their work benefits their peers and their
peer’s work benefits them, and (b) draw on mutual support and encouragement to
maximize learning and celebrate joint success (Johnson & Johnson, 1994). On the
contrary, participant structures such as those germane to the didactic, traditional,
conductor-led large ensemble may make intersubjectivity and positive
interdependence difficult to achieve because of the focus on teacher-student
interaction rather than student-to-student interaction.

**Need for the Study**

In an effort to improve student achievement and engagement in the
secondary large ensemble music classroom, it may be necessary to expand the ways
in which secondary ensemble teachers conceive of and deliver music instruction.
Indeed, music students who participate in collaborative learning communities tend
to be self-directed, efficient, and enjoy longer periods of concentration (Claire,
1993). Still, collaborative learning environments may be particularly effective when
implemented in contexts where the ensemble conductor’s vision supports the development of individual musicianship and long-term participation in music.

Despite the fact that previous research in general education has revealed that collaborative learning arrangements such as PAL can result in higher levels of student achievement (e.g., Cohen et al., 1982; McMaster et al., 2006; Roscoe et al., 2007; Schonfield et al., 2005) there is a lack of research on the impact of collaborative learning structures on student learning in the music classroom. Those studies conducted in music classrooms have primarily focused on elementary general music students (e.g., Darrow, Gibbs, & Wedel, 2005), elementary age beginning band students (e.g., Alexander & Dorrow, 1983), elementary students with special needs (e.g., Madsen, Smith, & Feeman, 1988), or at-risk high school band and choir students (e.g., Johnson, in-press). Scholars that have been focused on the implementation of collaborative learning in the secondary ensemble setting have limited their comparisons to the effect of collaborative learning versus teacher-led instruction and have not compared the effects of various types of symmetrical and asymmetrical PAL participant structures on both students’ psychological and achievement outcomes. More research is needed to determine what types of peer-assisted learning arrangements enhance student learning in the secondary instrumental music classroom.

While student achievement has been shown to increase as a result of PAL, it remains unclear how collaborative learning might positively affect learner engagement. Theoretically, engagement in the music classroom is greatly enhanced when individuals have the opportunity to share their own opinions and create
meaning with other music learners. The opportunity and ability to make decisions, use strategies, and create frames of reference that enable individual understanding are all key aspects of engagement in a learning environment (Bruner, 1996).

Education scholars (e.g., Connell & Wellborn, 1991; Skinner, 1991) have hypothesized that when the social structure in a learning environment serves to fulfill a student’s individual needs, individual engagement will flourish. Engagement is comprised of both behavioral and emotional components. Students who are engaged show

“sustained behavioral involvement in learning activities accompanied by a positive emotional tone. They select tasks at the border of their competencies, initiate action when given the opportunity, and exert intense effort and concentration in the implementation of learning tasks; they show generally positive emotions during ongoing action, including enthusiasm, optimism, curiosity, and interest” (Skinner & Belmont, 1993, p. 572).

Another potentially important impact on collaborative learning is a student’s motivation to learn as reflected by their achievement orientation. Achievement goals describe how an individual is motivated to pursue competence in a given domain (e.g., task mastery, performance relative to others). Educational psychologists (e.g., Ames, 1992; Dweck, 1986; Elliot, 1999) conceive motivation of this sort to consist of two realms: mastery goal orientation (e.g., competence is pursued for intrinsic reasons), and performance goal orientation (e.g., competence is pursued in order to demonstrate competence relative to others). Research regarding individual goal orientations in music education has been limited to either secondary teacher-led large ensemble settings (e.g., Schmidt, 2005; Matthews & Kitsantas, 2007; Miksza, 2009), undergraduate preservice music education majors
(e.g., Schmidt, Zdzinski, & Ballard, 2006), the practicing habits and retention of college musicians (e.g., Smith, 2005), and the performance of professional musicians (Bonneville-Roussy, Lavigne, & Vallerand, 2011). However, it remains unclear how student goal orientations might influence achievement and engagement in collaborative learning arrangements. Specifically, more research is needed in the secondary music classroom to determine if individual goal orientations influence achievement and engagement outcomes that result from collaborative learning.

Scholars in general education investigating the effects of collaborative learning have discovered significant relationships between demographic variables and academic achievement. Specifically, students in urban schools on average make higher achievement gains than their suburban or rural counterparts. Moreover, similar trends were found for students who were economically disadvantaged and who were of minority status (e.g., Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003; Ginsburg-Block, Rohrbeck, & Fantuzzo, 2006). Research in collaborative learning in music education has been limited to demographically homogeneous samples. Therefore, more research is needed to understand how individual student demographic differences (i.e., socioeconomic status) influence collaborative learning in the secondary, large ensemble classroom.

**Purpose of the Study**

The purpose of this study was to examine the effect of peer-assisted learning on student achievement and engagement in the secondary middle school instrumental music classroom. Two different instructional arrangements were compared: reciprocal PAL where students are paired in symmetrical dyads and
reciprocal PAL where students are paired in asymmetrical dyads. Specific research questions were as follows:

1. What is the effect of method of instruction (symmetrical PAL vs. asymmetrical PAL) on sight-reading achievement?
2. What is the effect of method of instruction (symmetrical PAL vs. asymmetrical PAL) on basic music theory knowledge?
3. What is the effect of method of instruction (symmetrical PAL vs. asymmetrical PAL) on learner engagement?
4. Do relationships exist between sight-reading achievement, music theory knowledge, learner engagement, SES, and achievement goal orientation?
5. Is the effect of method of instruction on outcome variables (sight-reading achievement, music theory knowledge, learner engagement) moderated by individual difference variables (SES and achievement goal orientation)?

Definitions

Achievement Goal-Orientation: Achievement goals describe how an individual is motivated to pursue competence in a given domain (e.g., task mastery or performance relative to others) (Elliot, 1999).

Collaborative Learning: An instructional arrangement that involves a group of learners engaging in a common task where each individual relies upon and is accountable to other group members (Thousand, Villa, & Nevin, 2002)
Large Ensemble Teacher-Led Instruction: An instructional arrangement where the teacher/conductor embodies a didactic role by being the primary source of information and learning therefore possessing the majority of control in the learning environment (Johnson, 2011).

Learner Engagement: Refers to active, goal-directed, flexible, constructive, persistent, focused interactions with the social, cognitive, physical, and emotional learning environments (Furrer & Skinner, 2003).

Peer-Assisted Learning (PAL): Refers to the acquisition of knowledge and skill through active helping and supporting among status equals or matched companions who are not professional teachers (Topping & Ehly, 2001).

Reciprocal PAL: A PAL instructional arrangement where pairs of students working together frequently switch back and forth between the roles of being the helper and the helped (Topping & Ehly, 2001).

Symmetrical PAL: Refers to PAL arrangements where students are grouped to minimize cognitive distance (Foot & Howe, 1998).

Asymmetrical PAL: Refers to PAL arrangements where students are grouped to maximize cognitive distance between individuals (Foot & Howe, 1998).

Delimitations

Data collection was limited to the measurement of sight-reading achievement, knowledge of basic music theory, learner engagement, and achievement goal-orientation for 7th grade band students in two instructional settings: symmetrical PAL with traditional teacher-led large ensemble instruction and asymmetrical PAL with traditional teacher-led large ensemble instruction. Both
symmetrical and asymmetrical PAL groups used class-wide, same-age, reciprocal arrangements with students working in assigned pairs based upon their sight-reading achievement and music theory knowledge pretest scores. The use of PAL in other large ensemble classes such as orchestra or choir was not investigated.

Participants in this study were drawn from one large urban/suburban school district in a large metropolitan area in the Rocky Mountain region. Participating schools were limited to those that group band students by age rather than ability, have separate band classes for each grade, have only one 7th grade band, and where the teacher had a minimum of one year residency prior to the start of the study.
CHAPTER II

Review of Literature

Peer-assisted learning (PAL), oriented within the realm of collaborative learning, is supported by a vast scholarly literature. While PAL has been established as a successful means for raising student achievement in a wide variety of subject areas (Topping, 2005), the investigation of PAL by music education researchers remains limited in the secondary instrumental ensemble context. This may be due in part to the lack of secondary music educators’ knowledge of the rich potential for learning that can arise when PAL activities are integrated into the large-ensemble learning environment.

In Chapter One, PAL was framed as a vehicle for fostering democratic principles in the secondary instrumental music classroom. However, before effective and sustained use of PAL can occur in this context, it is important to establish an understanding of theoretical frameworks that undergird PAL as well as the results of research on PAL conducted in general education and music education settings. This chapter is divided into two major sections. The first section, divided into two parts, includes an introduction to salient concepts from four theoretical frameworks for PAL: (1) psycho-social developmental theories of Jean Piaget and Lev Vygotsky, and (2) achievement goal-orientation and learner engagement motivation theories. The second major section of this chapter is contains a review of PAL research in general education and music education.
Psycho-Social Foundations of Peer-Assisted Learning

Concepts from two psycho-social theories of human development have traditionally been associated with PAL (Topping & Ehly, 1998). First, Piaget’s theory of genetic epistemology posits that learning and development occur through a process of assimilation and accommodation as a result of cognitive disequilibration and equilibration. Next, Vygotsky’s socio-cultural theory of development frames learning as product of interactions between novice and expert individuals, where the ability of the novice is stretched by the more developed skill of the expert when engaging in a shared task or activity.

The cognitive and social hierarchy between those who are engaged in collaborative learning endeavors can be thought to exist along a symmetrical and asymmetrical continuum. Hypothetically, cognitive conflict as a result of disequilibration proposed by Piaget might occur more readily in symmetrical arrangements between individuals of equal ability, whereas, asymmetrical arrangements between individuals of unequal ability are more readily associated with Vygostky’s zone of proximal development. In the following section Piagetian and Vygotskian frameworks will be presented followed by a discussion of their respective symmetrical and asymmetrical participant structure associations. Lastly, the processes of mediation, intersubjectivity, interdependence, and observational learning will be discussed as a way to illustrate how learning occurs in PAL arrangements.

Piaget and Genetic Epistemology. Jean Piaget (1886-1980) emphasized the nature of a child’s development through a process of cognitive conflict and
resolution. Known as the theory of *genetic epistemology*, Piaget considered human development to be a biological process, where as an individual matures they adapt to the world through assimilation (using existing mental schema to understand and operate in a new situation) and accommodation (the reorganization of existing mental schema to adapt and take in new information) (Piaget 1936/1952). It is by encountering new ideas that cognitive conflict takes place as the individual essentially holds both ideas in their minds. Propelled by cognitive conflict, development is conceived as a process of accommodating new information, whereby the individual attempts to assimilate this new information to restore balance (equilibrium) by rearranging existing mental schemas to master the new challenge (McLeod, 2009).

Recently Neo-Piagetian scholars have refuted the commonly held belief that there is a clear distinction between internal and social knowledge, and instead claim that development is dependent upon cognitive conflict rooted in the social construction of knowledge (Doise, Mugny, & Pérez, 1998). Thus, development is a process of spiral causality comprised of two interwoven concepts: social interaction and cognitive development. Specifically, at each moment of development, the individual possesses specific competencies that allow them to participate in social interactions whereby they can develop new competencies that can continue to enrich their participation in other social interactions (Doise & Palmonari, 1984).

Importantly, when considering aspects of social status and cognitive conflict, Piaget (1965/1995) distinguished between two types of socio-cognitive conflict: *intellectual cooperation* and relational autonomy (the relationship between peers of
equal status) and *intellectual restraint* and heteronomy (the relations between individuals who possess differing degrees of authority as with student and adult teacher). While Piaget believed that egalitarian interactions between individuals of a lateral or ‘horizontal’ nature would be more successful in promoting cognitive conflict resulting in growth and development, recent developmental psychologists bring to light a more nuanced interpretation. The intellectual capacities of an adult allow them a greater chance to introduce cognitive conflict simply by being aware of more perspectives (Doise & Mugny, 1984), whereas interactions between peers of more equal intellectual means might make cognitive conflict unlikely (Mugny, De Paolis, & Carugati, 1984). Thus it is clear that for any cognitive growth to occur between peers of equal status working together in PAL, there needs to be a full unfolding of cognitive conflict.

Howe and Foot (1998) have elaborated on the concept of cognitive conflict by focusing on the conditions for successful collaboration through the use of *operational transacts*. An individual that uses operational transacts takes reasoning that is expressed by another in dialogue and transform it in some way (Berkowitz & Gibbs, 1983). Nested within the Piagetian concept of cognitive conflict through dialogue, operational transacts involve transformation through justification, clarification, or elaboration of a disagreement.

Social dynamics have also been shown to influence how individuals engage in producing cognitive conflict. In Piaget’s own words “criticism and conflict are born of discussion and true discussion is only possible amongst status equals” (Piaget, 1932, p. 409). In a series of controlled experiments, Butera, Mugny, Legrenzi, and
Perez (1996) tested the degree that an individual’s perception of group consensus impacted individual reasoning and ability to learn from cognitive conflict. Results showed that the source of the information mattered in that when a problem had a single answer, in which the source of consensus was from a perceived majority of peers, subjects overwhelmingly adopted the perceived majority’s opinion. Conversely, when the problem had several possible answers and the source of an answer was from a perceived minority, most subjects gave alternate hypotheses and cognitive conflict was present.

An important characteristic of development through cognitive conflict is that a learner does not simply imitate the behavior of another, as would be the case when individuals learn from a perceived social majority, more powerful adult, or more capable peer. Therefore, problem solving with a person of equal status may induce a high degree cognitive conflict promoting a process of assimilation and accommodation whereby intellectual growth and development can occur (Doise, Mugny, & Pérez, 1998).

**Vygotsky and Sociocultural Development.** Lev Vygotsky (1896-1934), a prominent Russian cognitive psychologist, conceived of the development of higher mental functioning as being fundamentally social rather than an individual process (Wertsch, 1985). For Vygotsky, higher mental processes (i.e., thinking, reasoning, and understanding) distinguish humans as inherently social beings, mediated by the cultural context in which humans live. Vygotsky defined development as “the emergence or transformation of forms of mediation, and his notion of social interaction and its relation to higher mental processes necessarily involves
meditational mechanisms” (Wertsch, 1985, p. 15). The mediators are “social, not organic or individual... they are the product of historical development and are a form of behavior unique to humans” (Vygotsky, 1981, p. 137).

Learning is first facilitated by interpsychological reasoning and understandings constructed between individuals, which are then appropriated in a second process intrapsychologically as a result of social interaction (Vygotsky, 1978). The following statement by Vygotsky highlights these processes:

“Any function in the child’s cultural development appears twice, or in two planes. First it appears on the social plane, and then on the psychological plane. First it appears between people as interpsychological category, and the within the child as an intrapsychological category. This is equally true with regard to voluntary attention, logical memory, the formation of concepts, and the development of volition” (Vygotsky 1978, p. 163).

Vygotsky’s theory specifies that as a result of these two processes, an individual becomes enculturated in the society in which they live by becoming aware and knowledgeable of the tools and social practices specific to that culture (Vygotsky, 1978). Vygotsky conceived of this type of knowledge as being possessed by older, more experienced individuals in a given society. More specifically, learning happens as a result of shared activity between individuals of differing experience and knowledge. It is in this sense that individual learning is characterized in what Vygotsky termed the zone of proximal development:

“the difference between the level of individual achievement as determined through independent problem solving and the level of potential achievement with adult guidance or in collaboration with more capable peers. The zone of proximal development defines those functions that have not yet matured but are in the process of maturation, functions that will mature tomorrow but are currently in an embryonic state. These functions could be termed the ‘buds’
or ‘flowers’ of development rather that the ‘fruits’ of development” (Vygotsky, 1978, p. 86).

The process of learning by a novice has been characterized by some scholars as internalization whereby social phenomena is transformed into psychological understanding (Wertsch, 1985, p. 63). Recently, other scholars have introduced a more nuanced conception of sociocultural learning as a process of appropriation, where instead of internalizing all information, an individual’s idiosyncratic ability to filter information is recognized (Cazden, 2001). The distinction between internalization and appropriation raises important questions regarding what types of PAL arrangements best promote cognitive and emotional growth in the zone of proximal development (ZPD).

Tharp and Gallimore (1991) highlight the recursive potential of the ZPD in a four-stage process that they call a theory of teaching as assisted performance. First an individual begins with their performance being assisted by more capable others where “the amount and kind of outside regulation a person requires depends the individuals experience and the nature of the task” (p. 48). The second stage is characterized by “the passing of control or assistance from the expert to the apprentice” (p. 52). In the third stage, performance is developed, automatized, and fossilized as “task execution becomes smooth and integrated... assistance from others is no longer needed” (p. 53). Lastly, the fourth stage is characterized by recursion back through the ZPD as “the enhancement, improvement, and maintenance of performance provide a recurrent cycle of self-assistance to other assistance” (Tharp & Gallimore, 1991, p. 54). A key aspect of the fourth stage is the
“recall or re-processing of a forgotten bit of information that can be aided by the assistance of another” (p. 54).

This stage-like model of working in (and through or beyond the ZPD) might help to explain the benefit of peer-assisted learning for both the helper and the helped. For example, when first encountering a concept or skill that needs to be learned, an individual can be said to be in the first stage where the ZPD is most readily apparent. As an individual becomes more competent, the dependence between individuals for successful task completion becomes more equalized and perhaps more symmetrical. During the process of PAL, the potential for metacognition is fostered as individuals switch roles between helper and helped which is also described by Tharpe and Gallimore (1991) as during stages two through four as skills or concepts become more fossilized and when necessary reencountered and relearned. For example, the unaided attempts by a novice learner to accomplish a task are still implicitly supported by the more expert individual who observes the process who is ready to jump in and help. Conversely, as the expert individual observes subsequent iterations of a task, especially after allowing a novice partner to attempt a task unaided, they have the opportunity to reflect upon the specific steps needed to successfully accomplish the task while directly observing the novice gain confidence in their ability and fossilization of their knowledge. Therefore, while the novice is assisted by the knowledge held by a more competent helper, the learning of the helper may be just as extensive given either the automatization or de-automatization that is taking place (Tharpe & Gallimore, 1991; p. 54-55).
Synthesis of Vygotskian and Piagetian Approaches. A basic assumption of both Vygotskian and Piagetian approaches to understanding human development is that individuals create new knowledge as a result of their goal-directed activities (Saxe, 1991). For both Piaget and Vygotsky learning is a matter of active, inquiry-based construction, the ingredients for which are to be found in the physical and social world (Pass, 2004). While there are similarities between Piaget’s concept of equilibration and Vygotsky’s concept of internalization, Vygotsky’s emphasis on the mediated character of action extends Piaget’s account of equilibration through acquisition and accommodation in important ways, specifically by adding the dimension of asymmetrical social learning (Pass, 2004). As a result, contemporary scholars have called for a broader conceptualization of socio-cognitive conflict:

“The presence of differing points of view may be a necessary ingredient of productive conflict, in this sense, but so too may be a means of securing and sustaining the joint engagement of all parties in the resolution of disagreements. The focus on verbal interaction and on the co-construction of solutions to tasks, more characteristic of Vygotskian approaches, also finds support” (Light & Littleton, 1999, p. 26).

The distinction remains, however, between Piagetian and Vygotskian approaches to understanding development, specifically in terms of learning context. Whereas Piaget takes a structural cognitive approach that treats the impetus for development as internal, Vygotsky examines the external sociocultural influences that impact development. For Piaget, the interplay between social life and cognitive developmental processes was only a peripheral concern. To explain development, Piaget argued that the learner purposefully constructs goals based on prior knowledge and creates solutions to achieve equilibrium (Saxe, 1991). Conversely, Vygotsky considered social interactions to be a critical vehicle whereby natural
cognitive processes are redirected by social and cultural influences. Nonetheless, questions of social influences on cognitive development have emerged in the work of neo-Piagetian scholars who have reconciled the two approaches to viewing development as a consilience of external (Vygotsky) and internal (Piaget) forces (Saxe, 1991). Similar to Pass (2004), Saxe (1991) argues that both Piagetian and Vygotskian theories are necessary to understand development since individual goal-directed activity needs to be placed in a sociocultural context while at the same time systematically examining internal cognitive development via assimilation and accommodation.

The ways in which individual learners are positioned in relation to their peers has the potential to dramatically impact the elements of cognitive activity and restructuring that is so essential for learning to take place. Thus, it is important to understand the process of negotiation and renegotiation of meaning between individuals relative to their social positioning in various institutional contexts (Light & Littleton, 1999).

In light of these findings, peer-assisted learning endeavors that involve smaller, well-informed groups (e.g., dyads of two students who have received training) that are equally matched in terms of age and cognitive ability, may promote a higher degree of cognitive conflict. The reasoning here is that when individuals are free from blindly adopting the majority’s opinion – as can be the case in large class learning discussions where a critical mass is achieved – students may more readily put forth their own mental conceptions when problem-solving with a peer of equal status.
Symmetrical and Asymmetrical Peer Groupings

Using Piagetian concepts of assimilation and accommodation, and the Vygotskian conception of ZPD as a foundation, PAL has often been conceived of in terms of the symmetry of the cognitive and social distance between individuals (Topping & Ehly, 1998). Asymmetrical arrangements are characterized by clearly defined roles for novice and expert, whereas symmetrical interaction assumes relative egalitarian equality (e.g., between peers of similar social status and cognitive ability rather than between a child and more expert and powerful adult). Piaget and Vygotsky both emphasized that for learning and development to take place, a person’s current knowledge must come in contact with dissonant concepts to dislodge prior misconceptions. However, Vygotskian and Piagetian perspectives as applied to PAL differ in terms of the impact of asymmetrical and symmetrical relationships.

Asymmetrical. Vygotsky emphasized the impact of interaction with a more skilled partner; his notion of the zone of proximal development focuses on “problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 86). Vygotsky’s emphasis on interaction with more skilled partners is necessary to his theory since such interaction is conceived as the means by which children become enculturated in the intellectual tools of their society. Thus the agent of socialization must thus be someone who knows more than the child about those tools (Tudge & Rogoff, 1999).

For Vygotsky, the concept of the ZPD implies not only a difference in the level of expertise but also the need for a degree of empathy on the part of the helper. An
understanding on the part of the helper in terms of the needs of the person that is to be helped is essential for the more experienced individual to gauge the information to be presented. Information that is at a level that is too advanced for the novice would not be helpful. Thus from a Vygotskian perspective, ideal partners are not equal, although their inequality should reside in understanding rather than power. However, Neo-Vygotskian scholars (e.g., Tharpe and Gallimore, 1991) highlight a shift of symmetry between learners as learning occurs (p. 52). That is, the beginning stages describe an asymmetrical relationship where comprised of clearly defined novice and expert roles, whereas later processes highlight learners becoming more equal in ability, thus resembling a symmetrical arrangement.

Foot and Howe (1998) suggest that to foster operational transacts or reasoning that is expressed in dialogue and transformed in some way, students should be grouped in terms of cognitive difference and not necessarily cognitive ability. Group collaboration between individuals who hold different conceptual understanding has been found to result in significant gains in conceptual understanding for everyone involved (Howe, Tolmie, Greer, & Mackenzie, 1995). Socially, operational transacts were more likely to occur between friends rather than mere acquaintances (Axmitia & Montgomery, 1993; Nelson & Aboud, 1985; Hartup, Brady, & Newcomb, 1983). Axmita et al. (1993) reasoned that this finding was because individuals who share language patterns and past experiences feel more comfortable challenging one another.

Symmetrical. Piaget believed that discussion between peers resulted in a greater chance for cognitive conflict than in discussions that happen between
individuals with unequal power, as is the case between an adult and a child (Foot & Howe, 1998). Interaction with an adult is essentially unequal: “it is an asymmetrical interaction in which the adult has the power, and this disrupts the condition of reciprocity for achieving equilibrium in thinking” (Piaget, 1945/1977, p. 165). Where adults may be useful for providing answers to questions, a student agreeing with an adult or peer who has more power will not lead to disequilibration and subsequent cognitive restructuring (Piaget, 1948/1959, p. 258). On the other hand, when a peer of relatively equal status has a different perspective to one’s own, a low degree of asymmetrical power between individuals exists (Tudge & Rogoff, 1999).

Piaget believed that the realm where the greatest potential for cognitive conflict and disequilibration to occur is when lively discussion where point and counterpoint are considered. Indeed, Piaget captured the sentiment of symmetrical interaction between peers of equal status in the following statement: “criticism is born of discussion, and discussion is only possible among status equals: cooperation alone will therefore accomplish what intellectual constraint failed to bring about” (1932, p. 409). According to Piaget, lessons from adults often cause young children to abandon their own ideas because their ideas are often poorly formulated and cannot enter into competition with the more developed ideas of adults (Tudge & Rogoff, 1999). In such cases, children may agree with what an adult propagates without examining the idea, which can result in not learning to verify ideas for themselves. It is only when an individual feels like they are closer in status with
their teachers that they feel like they have “conquered their internal liberty” where their ideas hold equal value to that of an adult (Piaget, 1928/1977, p. 230).

**The Process of Students Learning Together.** Now that a foundation has been established for concepts from psycho-social theories associated with PAL, it is helpful to explore key processes used when students construct knowledge together. For both Piaget and Vygotsky, the conception of interactive learning can be thought of generally as two levels of activity: the individual and environment. While a Piagetian approach highlights the role of socio-cognitive conflict in promoting individual cognitive development, a Vygotskian approach emphasizes the way in which a shared understanding can be achieved through a process that has been both termed ‘mutual construction’ (Light & Littleton, 1999) and ‘intersubjectivity’ (Rogoff & Wertsch, 1984). At the same time, as individuals construct knowledge together, they also are engaging with the knowledge of a specific culture that is manifested in the tools, signs, and symbols that mediate the process of intersubjectivity. While intersubjectivity highlights the cognitive process of learning together, the social aspects of learners relying on one another’s effort and attitude also mediate the process of interdependence. Moreover, what a learner observes and appropriates into their existing knowledge is also mediated by social processes such as intersubjectivity and interdependence.

**Mediation.** “The task of sociocultural analysis is to understand how mental functioning is related to cultural, institutional, and historical contexts” (Wertsch, 1998, p. 3). Central to a sociocultural understanding of cognitive functioning and learning is mediation: that which involves a relationship between an agent and a
‘meditational means’ or a ‘cultural tool’ (Daniels, Cole, & Wertsch, 1997). Vygotsky’s definition of mediation focused primarily on language, but he also recognized other semiotic phenomena as well. Among the signs and sign systems Vygotsky mentions are language, counting systems, algebraic symbol systems, artwork, literature, diagrams, and maps (Vygotsky, 1981, p. 137).

Cultural tools can be conceived of both material and conceptual artifacts that are developed and elaborated within a culture so that a “mathematical algorithm that allows you to do mental arithmetic is just as much a cultural tool as is a pocket calculator” (Light & Littleton, 1999, p. 12). Perhaps the most salient way to visualize the concept of mediation is to picture it oriented between the person and the objective of an activity. It is in this sense that the tool – either psychological or material – enables the individual to achieve an objective or goal (Daniels, Cole, & Wertsch, 2007).

Daniels et al., (2007) distinguish between ‘implicit’ and ‘explicit’ mediation. Implicit mediation refers to the process of incorporating signs into human action as a means of reorganizing that action (Daniels et al., 2007, p. 183). Furthermore, implicit mediation primarily functions in the communication of a sign or tool, “that is part of a pre-existing independent stream of communicative action that becomes integrated with other forms of goal-directed behavior” (Daniels et al., 2007, p. 6). Thus there are two types of implicit mediators: external symbols and tools that have a commonly agreed upon purpose, and internal ‘tools of the mind’ which were appropriated by the individual as he or she participated in a given culture. Explicit mediation refers to something that is intentionally built into mental functioning
such that it is the object of conscious reflection (Shweder, Goodnow, Hatano, LeVine, Markus, & Miller, 2007, p. 307).

The key aspect of an internal tool is that while there may exist shared understanding of the sign or tool within the broader culture, the meaning and use is specific to the individual. Learning viewed as ‘complimentary constructions of collaboration’ rooted in both Piagetian and Vygotskian theory is a “matter of active construction, the ingredients for which are to be found in the physical and social world” (Light & Littleton, 1999. p. 13).

**Intersubjectivity.** The mutual understanding that is achieved between people in communication has been termed intersubjectivity, emphasizing that understanding happens between people; it cannot be attributed to one person or the other in communication (Rogoff, 1990, p. 67). Simply put, “intersubjectivity exists when two or more individuals agree on aspects of a definition of the situation or approach to a problem” (Berg, 1997, p. 36). Intersubjective, joint problem solving in academic peer interaction has been depicted using a variety of labels including: “social interdependence” (Mugny, Perret-Clermont, & Doise, 1981), “transactive discussion” (Berkowitz & Gibbs, 1985), “cooperation in joint actions” (Ruvto & Guzman, 1984), and “co-construction of hypotheses” (Forman & Cazden, 1985).

Underlying the concept of intersubjectivity is social acceptance between partners. Whereas communication is likely asymmetrical between children and adults, individual students of relatively equal status partners communicating with each other:

“adapt to each other, with their mutual adjustments facilitating interpersonal understanding for the purpose of communication and changing the nature of
the understanding that they may bring to other situations” (Rogoff, 1990, p. 73).

The most productive interaction in terms of learning between peers appears to result from arrangements in which peers’ decision making occurs jointly, with a balanced exploration of differences of perspective (Thurston, Duran, Cunningham, Blanch, & Topping, 2009). When people with different goals, roles, and resources interact, the differences in interpretation are the seeds of cognitive conflict that ultimately provide the impetus for the construction of new knowledge (Newmann, Griffin, & Cole, 1989). However, Berg (1997) notes that intersubjectivity is dependent upon an individual’s curiosity and motivation to integrate the ideas of another into one’s existing understanding.

Berg (1997) found that although many attempts to reach a mutual consensus and definition of a problem may ensue between peers, it is often the case that these occurrences do not result in agreement. Smolka, De Goes, and Pino (1995) note that conflict that arises out of “divergent perspectives, opposition of ideas, and resistance to communication” (p. 172) may be an important step toward forming intersubjective agreement. This expanded view of intersubjectivity – beyond a definition that focuses upon mutual agreement to problem solving – helps to explain how moments of disagreement can serve as opportunities for achieving the process of intersubjectivity. The traditional models of new knowledge construction via the tenets of socio-cognitive theory are transmission (Vygotsky) and acquisition (Piaget). Rogoff (1990) extends the work of both Vygotsky and Piaget by conceiving of development as the blending of these two previously autonomous dimensions of
learning in a process labeled 'the transformation of participation' where both individual and environment are transformed through shared intersubjective agency.

Intersubjective agency links the concept of agency with the process of intersubjectivity. An agentive learner is said to be 'bound-up' in the activities they are doing (Dewey, 1916) and to show signs of purpose, aims, interest, intensity, motivation, and ownership (Bruner, 1996). Fundamental to intersubjectivity is the process in which one considers and co-constructs attitudes with one's peers in a way that can propel one's ability to articulate one's knowledge, values, needs, and interests in a certain context-specific manner. Thus, the consideration or adoption of the perspective of another is the essence of intersubjective agency which “enables a self to actively adopt and engage social standards and schemes, to be an active participant in the perspective-taking process, and to co-shape the adopted perspectives such that an agentive self can be seen as being at play” (Køgler, 2012, p. 64).

In this study, intersubjectivity is hypothesized to play a role in the degree to which students interact without the presence of a teacher to agree on an approach to a specific problem. Moreover, intersubjective understanding between peers is conceptualized here as a form of implicit mediation (e.g., Daniels et al., 2007) specifically dealing with the communication, use, and understanding of tools that are embedded within the secondary band context. However, intersubjectivity is thought to develop differently in asymmetrical and symmetrical participant arrangements. As individuals move through the ZPD in asymmetrical arrangements, mutual understanding may be contingent upon moving through the four levels of
assisted performance proposed by Tharpe and Gallimore (1991). Specifically, as ability converges and mutual understanding is more apparent to both individuals, intersubjectivity may proliferate. In symmetrical arrangements, however, intersubjectivity may develop much differently given that students are closer in cognitive ability. With the absence of an individual who is recognized for having more expertise, divergent perspectives, opposition to other’s ideas, and a resistance to communication may be more common (Smolka, De Goes, Pino, 1995). As a result, the cognitive conflict of individuals in symmetrical and asymmetrical arrangements may promote frequent discussion and clarification of one's point of view, albeit at different points in time.

**Interdependence.** While intersubjectivity emphasizes the cognitive processes of learning together, interdependence emphasizes the social and physical realm of learning together. Interdependence requires that each member of the group depend to a certain degree on the input and effort of other group members. Central to this concept is that group members “sink or swim” together (Kaplan & Stauffer, 1994). This concept can be manifested in the form of role interdependence (e.g., each group member is assigned a different yet critical job such as researcher/runner, summarizer/timekeeper, collector/recorder, and technical adviser), resource interdependence (each group shares tools such as a tuner, recording device, large sheet of butcher paper for concept mapping, etc.), or cognitive interdependence (e.g., concept jigsaw) (Cazden, 2001; Johnson & Johnson, 1999).
Hypothetically, the type of competitive or cooperative interdependence fostered among students will determine how they interact with each other. While cooperative structuring can foster interactions that promote each other’s success, competitive structures can result in students opposing each other’s success (Johnson & Johnson, 1989). Positive interdependence (Johnson & Johnson, 1999) occurs when individuals operate cooperatively in terms of achievement, interpersonal relationships, and psychological adjustment/social competence. The association between positive interdependence and increased achievement is so well confirmed by researchers that it stands alone as one of the strongest principles of social and organizational psychology (Johnson, Johnson, & Stanne, 2000). Interpersonally, students who form positive interdependence with their peers tend to make longer lasting friends and show signs of improved productivity, personal commitment to assigned work, and willingness to take on and persist in completing difficult tasks (Johnson & Johnson, 1989). Lastly, it has been widely demonstrated that individual psychological health (e.g., higher self-esteem, self-confidence, independence, autonomy) is improved when positive interdependence between students is fostered (Johnson & Johnson, 1999).

The interwoven nature of intersubjectivity and interdependence as two processes that promote learning between peers implies that each member of the group has two responsibilities: to know the material to be learned and to make sure that everyone else knows it as well. Some scholars suggest that as mediated activity grows, confidence also grows as each member of the group realizes their importance therefore increasing their willingness to contribute (Kaplan & Stauffer,
Ultimately interdependence fosters accountability and responsibility for one's learning in a way that can promote intersubjective knowledge construction (Johnson & Johnson, 1991).

**Observation and Appropriation.** PAL offers a variety of opportunity for observational learning to take place.

“The process of learning through observation likely differs dramatically depending on whether the learner is attending to a demonstration designed for their learning, a model provided by person engaged with them but not for the purpose of instruction, or a model provided by events that are directed to someone else or have no expected audience” (Rogoff, Paradise, Arauz, Correa-Chavez, and Angelillo, 2004, p. 13).

In traditional instruction, teachers or other adults often make the majority of the decisions as to how learning experiences will be organized. These decisions include determining the rules that are to be followed, how learning is to be measured, and the objectification of what is to be learned (Topping & Ehly, 1998). However, the degree to which students have the opportunity to organize their own learning experiences often determines the degree of personal agency that they develop in those specific learning environments (Blair, 2008).

Vygotsky believed that individual learning is a result of an individual’s internalization of cultural scripts, the process of which is mediated through social interaction (Vygotsky, 1978). However, the term internalization does not discriminate between the myriad everyday possibilities available for an individual to observe and learn from. Neo-Vygotskian scholars have refined this line of thought by substituting the term appropriation for internalization, hence underscoring the individual’s capacity to filter incoming information through existing mental schema and their own personal agency (Cazden, 2001; Rogoff, 1997). In the context of PAL,
the term appropriation implies that the action of knowledge-telling and knowledge-building (Roscoe & Chi, 2007; p. 535) may be an important manifestation of observational learning that may impact the ‘what’ and ‘how’ of individual learning during PAL experiences.

The underlying processes that govern an individual’s ability to learn through observation may be cultural in nature (Rogoff, Paradise, Arauz, Correa-Chavez, & Angelillo, 2004). Rogoff et al., claim that during the twentieth century, U.S. children’s opportunities to observe and participate in mature activities have been greatly curtailed whereas in earlier periods when apprenticeship learning was more common, the workplace and the home were not separate environments. While the focus during traditional classroom instruction remains on the teacher, the opportunity for peers to observe each other’s actions in PAL arrangements may be a productive way to balance apprenticeship learning with teacher-led instruction in the contemporary classroom.

**Section Summary.** As an approach to collaborative learning, the roles that individuals assume when engaging in PAL are governed by the social and cognitive symmetry between those with whom they collaborate. Drawing upon the concepts of assimilation, accommodation, and the zone of proximal development, PAL can either be arranged symmetrically or asymmetrically. Symmetrical structuring – where individuals learn with and from peers of similar cognitive ability and social status through a process of assimilation and accommodation spurred on by mutual cognitive conflict – hypothetically results in a higher amount of questioning due to the lack of authority established through prior knowledge or social standing.
Conversely, asymmetrical structuring – where individuals who are of unequal social or cognitive status working together where the skill and performance of the less experienced individual is drawn higher by engaging in mutual problem solving with a person who possesses a higher degree of expertise – hypothetically leads to fewer instances of questioning and cognitive conflict due to the authority possessed by the more experienced individual. However, more research is needed to investigate the potential effects that different symmetrical and asymmetrical PAL arrangements have on student learning and engagement, particularly in the large ensemble at the secondary level.

While the learning between individuals is mediated by the expertise of the more experienced individual in asymmetrical arrangements, symmetrical arrangements assume that learning is mediated by the cognitive conflict between individuals who are relatively similar in ability. Therefore, it is hypothesized that a higher degree of intersubjectivity, interdependence, and intersubjective agency can be fostered in symmetrical PAL arrangements that ultimately lead to higher levels of achievement and learner engagement. Moreover, observational learning is hypothesized to be an element present to varying degrees in both symmetrical and asymmetrical arrangements.

**Psychological Foundations of Peer-Assisted Learning**

There are many psychological factors that could conceivably impact the way that individuals learn in peer-assisted learning environments. The learning that occurs as a result of PAL is embedded within the process of generating dialogue with a peer and in having one’s beliefs and ideas challenged and stretched (Foot &
Howe, 1998). In PAL arrangements, an individual’s motivation orientation could potentially impact the degree to which an individual engages in learning and interacts with peers.

**Achievement goal-orientation theory.** When a student observes, teaches or communicates with a peer, the degree to which they learn may be related to the type of motivation they possess. Traditionally, the underlying motivational impetus that moves people to action has been broken down into two broad types: intrinsic and extrinsic (Deci & Ryan, 2000). The actions of people who are intrinsically motivated are propelled by curiosity, interest, and a desire to achieve self-referenced competence. Conversely, the actions of people who are extrinsically motivated are propelled by a desire for approval, status, and competence relative to others. Researchers in educational psychology refer to a person’s type of motivation as an individual’s achievement-goal orientation, where achievement goals describe an individual’s motivation to pursue competence in a given domain (Miksza, 2009).

MIRRoring intrinsic and extrinsic motivational categories, achievement-goal theory (Ames, 1992; Dweck, 1986; Elliot, 1999) is typically conceived of as comprising two realms: mastery goal orientations and performance goal orientations. Mastery goal orientations can be defined as those in which an individual is motivated to achieve competence for the sake of one’s own satisfaction or maximization of potential. Conversely, performance goal orientations are those in which an individual is motivated to achieve in order to demonstrate competence relative to other individuals (Elliot, 1999).
Hypothetically, individuals engaged in PAL who possess performance goal orientations may be more likely to compete with a partner for attention and to withhold information in an effort to maintain achievement superiority. Conversely, individuals who are more oriented toward mastery goal orientations may benefit more if they are less competitive with their partners and more willing to engage in egalitarian interactions (see Marsh, Craven, Hinkley, and Debus, 2003), which are important to spur on cognitive conflict. However, while an individuals’ goal orientation – whether extrinsically performance (ego) oriented or intrinsically mastery (task) oriented – may guide the behaviors that are brought to light when engaging in PAL, they may also impact the degree to which an individual is able to learn.

Students do not demonstrate all of the knowledge, skills, and behaviors they learn through observation. Nonetheless, it is logical that any individual would seek to perform activities they value and avoid those that they find dissatisfying. Thus, outcome expectations are important since students perform actions they believe will result in rewarding outcomes and avoid those they expect to be followed by negative outcomes (Schunk, 1987). Hence there is often a symbiotic relationship between a student’s measurable achievement and their achievement goal-orientation.

The outcome expectations that are possessed by an individual are often thought to be closely associated with an individuals’ goal orientation. Researchers have framed the outcome expectations that a person possesses in terms of approach and avoid orientation. The distinction between approach success and avoid failure
orientations can be considered a function of what Elliot (1999) called “valence”. This distinguishes between individuals who are directed by the desire to achieve a positive outcome (approach success), and those with an orientation to avoid a negative outcome (avoid failure).

This nuance in a person’s goal orientation holds important distinctions in both mastery and performance orientations. A student who possesses a mastery-approach goal orientation strives to achieve self-referenced competence, whereas a student with a mastery-avoid goal orientation strives to avoid self-referential incompetence, perhaps due to previous high achievement. Conversely, a student who possessed a performance-approach goal orientation hypothetically strives to achieve competence in comparison with their peers, whereas a student who possessed a performance-avoid goal orientation strives to avoid incompetence in relation to their peers (Elliot, 1999).

Researchers in music education have applied various forms of achievement goal-orientation theory in a variety of secondary, collegiate, and professional music contexts. Smith (2005) applied achievement goal-orientation theory to the practice habits of college undergraduate music majors. It was found that performance goals were generally unrelated to use of varying practice strategies whereas mastery goals were consistently positively related to the use of varied practice strategies. These findings suggest that individuals with mastery orientations tend to value and utilize complex learning strategies when working alone. Conversely, those whose primary concern is interpersonal comparison are less likely to view varied ways to approach learning as a means for achieving their desired outcome.
Schmidt (2005) examined relationships among students’ goal-orientations, self-concept in instrumental music, and attitude to band in relation to teachers’ ratings of performance achievement and effort for band students in grades 7-12. Schmidt adapted a two-factor model (mastery and performance) developed by Marsh, Craven, Hinkley, and Debus (2003) in academic arenas outside music. In addition to mastery and performance orientation characterization, this model further delineates defines two sub-levels of performance orientation sub-levels: approach and avoid. Among other findings, Schmidt discovered that a) students in older grades tend to possess mastery orientations, and b) that mastery orientations were positively associated with practice time, teacher ratings of performance and effort, and private lesson experience. Thus one can hypothesize that those who are more involved in music over a long period of time tend to hold mastery goal-orientations in relation to student learning.

Schmidt, Zdzinsky, and Ballard (2006) used achievement goal-orientation theory to examine the immediate and long-term career goals of undergraduate preservice music educators. It was found that undergraduate music education majors, in general, tend to define their success through achievement of personal goals and mastery of challenging tasks. No significant difference in goal-orientation was found for students with short and long-term plans to teach music in the public schools.

Matthews and Kitsantas (2007) studied goal-orientation in the context of perceptions of a mastery-involving or performance-involving climate rather than how an individual is personally motivated. The authors hypothesized that task-
involving climates (e.g., inclusion and valuation of each individual) would better predict high school band students’ perceptions of conductor support than environments that were performance-centric (e.g., conductor favoritism). The results showed that students who perceive a strong sense of collective efficacy and group cohesion and who are taught in a task-involving climate tend to see their conductors as supportive. This finding underscores the importance of teacher support and socially oriented cohesion in the instrumental music classroom.

Miksza (2009) expanded upon the previous two-factor achievement goal-orientation models by examining the four-factor model developed by Elliot and McGregor (2001) with high school band students. This model maintains mastery and performance domains while adding to each a valence (approach and avoid) orientation. Results revealed that participants rated mastery-approach goals the highest and mastery-avoid goals the lowest. The mastery-approach orientation suggests that this sample of high school band students demonstrate motivation to achieve for the sake of satisfying personal expectations, however, there is little worry over not maximizing personal achievement. Miksza notes that replication of this research is needed to confirm this finding, given that this is the first time that a 2x2 measure was used in a music education context.

Bonneville-Roussy, Lavigne, and Vallerand (2011) studied achievement goal-orientation in terms of the relationship between passion and performance for professional musicians. The authors used a measure of passion that included two factors: harmonious (e.g., playing an instrument is in harmony with other life activities) and obsessive (e.g., difficulty in controlling the obsession to
play/practice). Using a three-factor model (performance-approach, performance avoid, and mastery), the authors found that harmonious passion predicted the use of mastery goals while obsessive passion positively predicted performance-approach and performance-avoidance goals.

Collectively, the findings of music education researcher based on achievement-goal theory suggest that music students tend to a) possess mastery orientations, b) feel more supported by their conductor when everyone in the environment are valued, and c) use more varied practice strategies when they hold mastery orientations. However, there is a general lack of consistency in terms of the use of two, three, and four-factor models. This may be due, in part, to the relative newness of framing motivation in terms of achievement goal-orientation theory. While researchers who have utilized this theory have tended to focus on music practice, an individual’s motivation orientation could also have an effect on music achievement for those who participate in collaborative endeavors such as PAL, especially given the impact of the social element on achievement orientations.

**Learner Engagement.** Fundamental to the assumptions of a democratic society is that each person possesses a desire to be productive, learn, and therefore be a contributing member of society. Ideally, the benefits of engagement in such a society are fostered and modeled during formal schooling. Skinner & Belmont (1993) vividly highlight the dimensions and benefits of student engagement:

“Children who are engaged show sustained behavioral involvement in learning activities accompanied by a positive emotional tone. They select tasks at the border of their competencies, initiate action when given the opportunity, and
exert intense effort and concentration in the implementation of learning tasks; they show generally positive emotions during ongoing action, including enthusiasm, optimism, curiosity, and interest. The opposite of engagement is disaffection. Disaffected children are passive, do not try hard, and give up easily in the face of challenges... [they can] be bored, depressed, anxious, or even angry about their presence in the classroom; they can be withdrawn from learning opportunities or even rebellious towards teachers and classmates” (p. 572).

As noted by Skinner and Belmont, the opposite of engagement is disengagement, which implies the absence of engagement, including the absence of effort or persistence (Skinner, Kinderman, & Furrer, 2008). Anecdotally, researchers who have investigated PAL frequently describe it as a means to promote growth in student engagement, and overall agency. However, there is a lack of empirical evidence to confirm this or to shed light upon the collaborative participant structures in which the most growth in engagement can occur.

Although scholarly interest in learning engagement has increased in recent years, its distinction from motivation remains subject to debate. In an attempt to make a clear distinction between the two realms, some scholars have conceptualized motivation as answering the question of “why” for a given behavior while engagement reflects a person’s active involvement in a task or activity (Appleton, Christenson, Kim, & Reschly, 2006). Engagement is typically described as having multiple components. Researchers that have investigated engagement in formal learning environments (e.g., Fullarton, 2002; Skinner, Kindermann, & Furrer, 2008; Wellborn, 1991) provide a strong rationale for conceptualizing engagement as being comprised of two realms: emotional (e.g., interest, belonging, positive attitude about learning) and behavioral (positive conduct, effort, participation, self-
regulation, learning goals, and investment). Two reviews of literature on engagement in formal learning environments confirmed that engagement is comprised of these two subtypes (Fredericks, Blumenfeld, & Paris, 2004; Jimerson, Campos, & Greif, 2003).

Of the various methods that have been utilized to measure student engagement (i.e. self-report, teacher checklists and ratings scales, direct observation, work sample analyses, focused case studies), self-report measures (e.g., Wellborn, 1991) have been the most widely used and have demonstrated the most consistent results (Chapman, 2003). Several authors have successfully used student self-report measures to gain a sense of learner engagement during classroom instruction. Van Ryzin et al. (2009) found students who believe their learning environment to be supportive of their needs tend to be more engaged in their learning. These authors also found that the perception of autonomy positively impacts engagement over time. Similarly, Skinner et al. (2008) claim that engagement is strongly associated with adaptive learning behaviors (e.g., academic study time, time-on-task, deep- vs. surface cognition, study habits) and can reduce maladaptive learning behaviors (e.g., fear of failure, self-handicapping, and anxiety).

While several studies in music education have looked at engagement, no research exists to date that utilizes the two-component approach used in general education research. Hargreaves and Marshall (2003) suggest that student engagement at school is dependent upon the level of ownership, autonomy, and control that students have of their music making. Similarly, Rusinek (2008) found that for adolescents who participate in formal music instruction at school, those
who were disaffected tended to feel this way due to teachers’ declarative, textbook-based, teaching strategies. Rusinek also found that students were receptive to teacher-led instruction when they had a degree of input about what was to be performed. Students’ predilection for being musically involved with their peers and their teacher was also found by Finney and Tymoczko (2003) in a case study of school music instruction for adolescents. These findings suggest that a balance of teacher and student-led instruction to be a powerful tool to increase an individual’s engagement in music learning contexts.

Kokotsaki and Hallam (2007) investigated the perceived impact of music students’ active engagement in music making and learning in small and large ensembles. They found that musical engagement was conceived of in three domains: as a musical act which fostered a deeper understanding of musical knowledge; as a social act which fostered the active contribution to a group outcome, the sense of belonging, and sense of self-esteem and self-satisfaction; and as a sense of self and personal identity that encouraged the development of self-confidence, and intrinsic motivation. Notably, these authors found that music students found different value in small and large group music making. Specifically, participation in large groups provided inspiration and motivated students to continue in music. Working in small groups provided valuable opportunities for learning from peers, in addition to developing collaborative skills and ideas.

Researchers in music education have also conceptualized engagement in learning music through the lens of inclusive pedagogies. Burnard, Dillon, Rusinek, and Saether (2008) investigated music teachers in four different countries (UK,
Australia, Spain, Sweden) and found that while the cultural contexts studied were
diverse and complex, teachers who were successful in engaging students fostered
the co-construction of a learning environment “where music-making is both
meaningful and expressive for all” (p. 120).

**Section Summary.** Both achievement goals and learner engagement are
viewed as related to student learning in various educational contexts including
music. Researchers in music education that have investigated motivation through
the lens of goal-orientation theory have found general trends that support the
hypothesis that music students, particularly at the secondary level, are motivated to
achieve competence for intrinsic reasons. While engagement has been
conceptualized by researchers in general education and music education in various
ways, findings generally suggest that engagement in learning music is associated
with students’ feeling of autonomy as well as a sense of social relatedness with
peers. These findings also imply that a balance of student input and teacher directed
instruction may be ideal and important for developing student engagement. Since
the majority of studies in music education have dealt with student engagement
qualitatively, there is a need to investigate the direct effect that various
collaborative and teacher-led participant structures have on student engagement.
Moreover, there is no research in the music education context that has investigated
the impact of these two psychological variables on collaborative learning.
Research on Peer-Assisted Learning

General Definition and Focus of Recent PAL Research. Peer-assisted learning (PAL) as a form of collaborative learning is defined as “the acquisition of knowledge and skill through active helping and supporting among status equals or matched companions” (Topping, 2005, p. 631). While PAL has existed for centuries, what has changed as a result of recent scholarship is the reconceptualization of the role of the student in formal school learning environments. In the not so distant past, the characteristics of students who were considered good candidates for peer-assisted learning were those that were exceptionally gifted and advanced learners. In the past two decades, researchers and practitioners have demonstrated the success of a broader range of PAL arrangements. These arrangements now include strategies beyond asymmetrical, fixed role designs where a less experienced student work with a more competent and experienced peer. Beyond these fixed role designs, same-age class-wide arrangements where students have similar levels of experience can engender a higher degree of cognitive dissonance (Greenwood, Dequardi, & Hall, 1989), and reciprocal arrangements where students frequently switch between the helper and the helped have proved to be academically beneficial (Fantuzzo, Riggio, Connely, & Dimeff, 1989).

Focus of Recent PAL Research. Expectations for success and quality of peer-to-peer interaction have been shown to largely depend on prior training received by both helpers and helped (Abrami, Poulsen, & Chambers, 2004; Greer & Polirstock, 1982; LaPlante & Zane, 1994; Sheldon, 2001). Researchers have noted that a balance of instructional standardization and high degree of student autonomy is most
successful in promoting academic gains (Ginsburg-Block, Rohrbeck, & Fantuzzo, 2006; Rowman & Miller, 2007; Topping et al., 2011). Demographically, the success of PAL has been noted in a variety of suburban, urban, rural settings (e.g., Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003; Ginsburg-Block, Rohrbeck, & Fantuzzo, 2006). Specifically, PAL has been most successful in urban schools, with students who were economically disadvantaged and of minority status. While, PAL techniques have been long associated with serving special needs learners (Scruggs & Osguthorpe, 1986), recent findings highlight the success of PAL endeavors with mainstreamed students (Topping, 2005). Affectively, social and emotional learning (SEL) gains including increases in confidence, enjoyment, and motivation have been found to accompany academic gains in recent PAL research (Ginsburg-Block et al., 2006; Schunk & Zimmerman, 1994; Topping, 2005). Moreover, SEL gains have been prevalent in symmetrical peer relationships (Zins & Elias, 2006).

**Types of Peer-Assisted Learning.** Over the past three decades, several types of PAL arrangements have emerged including: peer-tutoring encompassing class-wide and reciprocal arrangements, peer-monitoring, peer-modeling, and peer-assessment. While students embodying the role of the teacher typify peer-tutoring arrangements, other forms of PAL are less direct such as modeling, monitoring, and assessing. However, taken together, these arrangements highlight a constellation of possibilities that teachers can draw from to promote collaborative learning.

**Peer Tutoring.** Peer tutoring is characterized by specific role taking where at any point someone has the “job” of tutor while the other (or others) is in the role as tutee(s) (Topping & Ehly, 2001). Peer tutoring is the most widely known PAL
method and often targets skill gains, and frequently achieves them. However, wider
gains can accrue (Cohen, Kulik, Chen-Lin, & Kulik, 1982; Rohrbeck, Ginsberg-Block,
Miller, & Fantuzzo, 2003; Sharpley & Sharepley, 1981; Topping, 1992). It goes
without saying that the impossibility of giving individual attention to all students in
a given classroom is a main source of frustration for practicing teachers. PAL, where
students work together in pairs (either fixed-role or reciprocal), transforms the
participant structure of the classroom in two important ways. First, the immediate
proximity of students to the material with a partner often promotes a higher degree
of engagement. Second, the structure of several learning dyads taking place
simultaneously allows the teacher to use a form of classroom management where
assistance can be given to the student or pair requesting it (Duran & Monereo,
(2005).

Peer tutoring methods involve the scaffolding of peer-to-peer interaction
with structured materials and structured interactive behaviors that can be applied
to curricular materials from any subject area (e.g., Glynn, 1996; Topping, 1998;
Topping & Ehly, 2001). While traditional cross-ability fixed role peer tutoring has
been shown to be effective (e.g., Tudge & Rogoff, 1999), reciprocal peer tutoring
(students switching between the roles of both helper and helped) in same-ability
pairs has also been shown to be effective (Fantuzzo & Ginsburg-Block, 1998).

Scruggs and Mastopieri (1998) reviewed the effectiveness of peer tutoring
with tutors and tutees with special needs and found that 1) students benefit
academically as both tutors and tutees, 2) tutors benefit less if there is no cognitive
challenge present, 3) improved attitudes to the curriculum are frequent, 4) more
generalized attitudinal or interactive gains are less consistent. Topping and Ehly (2001) found the same trends to be consistent when reviewing meta-analyses of PAL literature for students without special needs with the differences being more of degree rather than of nature. Other scholars have found that when using disruptive students as tutors, PAL was effective in improving the tutors’ achievement and behavior, as well as advantageous for the tutees (Madsen, Smith, & Feeman, 1988; Maher, Maher, & Thurston, 1998).

**Class-wide Peer Tutoring.** Class-wide peer tutoring (CWPT) is a specific type of peer tutoring that involves same-age students in the same classroom helping each other improve the acquisition and retention of basic academic skills (Delquadri, Greenwood, Steton, & Hall, 1983). The instructional arrangement entails all students in a given classroom being placed in dyads in a reciprocal format where individual roles are frequently switched between helper and helped. This type of reciprocal PAL has been shown to be highly successful in a variety of academic achievement areas including reading, spelling, vocabulary, music, and math (e.g., Delquadri, Greenwood, Whorton, Carta, & Hall, 1986; Harper, Mallette, Maheady, Parkes, & Moore, 1993; Darrow, Gibbs, & Wedel, 2005; Johnson, in press) and has been researched with students in grades 2-12 (e.g., Greenwood & Delquadri, 1995; Greenwood, Terry, Utely, Montagna, & Walker, 1993; Johnson, in press).

Additionally, researchers have shown that students are able to learn more in less time using CWPT as compared to traditional teacher-led instructional arrangements (Greenwood, Maheady, & Carta, 1991; Mathes & Fuchs, 1993; Arreaga-Mayer, Terry, & Greenwood, 1998). This is thought to be possible because
of the frequent role switching which is thought to develop a degree of empathy and
motivation for each individual involved (Arreaga-Mayer et al., 1998). Furthermore,
the need for peers to frequently communicate concepts and procedures is also seen
as a reason for increased achievement in PAL arrangements over participant
structures that are teacher directed (Greenwood, Carta, & Kamps, 1990; Robinson,
Schofield, & Steer-Wentzell, 2005; Rohrbeck, Rohrbeck, Fantuzzo, & Miller, 2003;
Topping, Miller, Murray, & Conlin, 2011).

While a large portion of the research that specifically looks at CWPT has
focused on second language learners and students with mild learning disabilities,
academic and social learning gains are still pronounced for students without special
needs (Arreaga-Mayer, Terry, & Greenwood, 1998). Again, the effectiveness with
varied populations might be viewed as that of degree rather than of the usefulness
in its application. Finally, it should be noted that confusion between “tutoring” and
“mentoring” is evident in the literature. Mentoring can be defined as encouraging
and supportive one-to-one relationship with a more experienced individual in a
joint area of interest. It is characterized by positive role modeling, promoting raised
aspirations, positive reinforcement, open-ended counseling, and joint problem
solving. It is often cross-age, always fixed-role, often cross institution, and tends to
be used to target disadvantaged groups (Topping, 2005).

**Reciprocal Peer Tutoring.** Reciprocal peer tutoring (RPT) is a peer-assisted
learning intervention that was developed originally for pairs of low-achieving
urban, elementary students (Fantuzzo, King, & Heller, 1992). RPT has now been
widely accepted as a PAL technique for used with students beyond those who are
low-achievers given the equal opportunity for each peer to engage in teacher and student roles (Johnson, in press; Mastropieri, Spencer, Scruggs, & Talbott, 2000; Topping, 2005). In contrast to mixed-ability peer tutoring arrangements where the teacher supports the higher ability student’s efforts to help the lower functioning student, RPT employs relatively same-age students who are close in ability with the objective of keeping both tutor and tutee engaged in constructive academic activity (Fantuzzo, Ginsburg-Block, 1998). When examining the interactivity of adolescent students engaged in reciprocal vs. fixed role arrangements in language acquisition programs, Duran and Monereo (2005) found that there was a significant amount of shared knowledge construction for both tutor and tutee in both fixed and reciprocal PAL arrangements.

Of particular interest are the roles that individual students gravitate toward in RPT if left to their own devices. Duran and Monereo (2005) found that tutors and tutees often show and uneven predominance in the different forms of communication in which they engage: students who more readily embrace the tutor role often show an active pattern where initiation, feedback, and tutorial cooperation is most present and the students who more readily embrace the role of the tutee show a reactive pattern where response and collaborative cooperation are present. These results suggest that the development of the role of tutor or tutee in the fixed or reciprocal form of interaction determines the style of interaction. Whereas in fixed role designs tutors tend to monopolize cooperative efforts, RPT best combines the roles of tutor and tutee. Moreover, the patterns of asymmetrical interaction in RPT become blurred (Duran & Monereo, 2005, p. 196).
Topping and Ehly (1998) cite the importance of relatively similar cognitive abilities and prior subject-specific experience when attempting to promote achievement gains for both members of a PAL dyad. Students who are more closely related in terms of competence and confidence are more likely to engage in reflective knowledge building which involves a high frequency of explaining and questioning (Roscoe & Chi, 2007). Of additional importance in reciprocal arrangements is the degree freedom that students have to determine goals and structures that are free of teacher input (Rohrbeck, Ginsburg-Block, & Fantuzzo, 2003). While it has been found to be important for teachers to be available for student questions and performance feedback in RPT (e.g., Duran & Monereo, 2005; Duhon, Mesmer, Gregerson, & Witt, 2009), teacher goal setting is less effective in promoting peer collaboration than when giving individual written performance feedback (Digennaro, Martens, & Kleinmann, 2007).

**Peer Modeling.** Peer modeling is the intentional highlighting of a competent exemplar, who possesses a desirable learning behavior, with the intention that members of a group will imitate that behavior (Topping & Ehly, 2001). Rooted in Vygotskian asymmetrical collaborative arrangements, peer modeling is likely to be associated with stronger connections arising between students who are peers rather than between adult teacher and student. This is most likely due to the social distance of the mastery model (Schunk, 1987).

Peer modeling can take may forms including cognitive, mastery and coping, and self-modeling. Cognitive modeling involves a student explaining and demonstrating most often through verbalization of the model's thoughts as well as
reasons for performing actions (Meichenbaum, 1977). While cognitive modeling is often a strategy used by adult teachers, students who can cognitively model as well as provide referent models for other students can be effective (Schunk, 1998). Mastery and coping models teach skills and help students to develop a higher degree of self-efficacy about their own learning. Rather than making underlying processes overt, as is the case with cognitive modeling, mastery and coping models demonstrate a high degree of competence from the outset and at the same time illustrate how determined effort and positive self-thoughts can overcome difficulties (Shunk, 1998). Self-modeling typically involves a student reflecting on their own performance by watching a recording of their own performance (Dowrick, 1983; Schunk, 1996).

It has also been observed that various forms of peer modeling are likely to be associated with attributions of success and effort (Topping & Ehly, 2001). Through observing a more competent peer, the observer may be allowed the time and space to perceive the elements of competent performance that might not be transparently understood before observation occurred (Rogoff, 1990). Given that peer modeling happens to a certain degree informally and on a consistent basis in a person’s life, overtly bringing the discrete forms of modeling into the classroom may help promote the awareness needed for students to consciously engage in the zone of proximal development (Vygotsky, 1978, p. 87).

**Peer Monitoring.** Peer monitoring involves peers observing and checking whether their partners are engaged in appropriate and effective processes and procedures of learning (Topping & Ehly, 2001). Peer monitoring as a structured
activity involve both a group goal and a division of labor between group members where work is done independently, yet always tied to the goals of the group (Foot & Howe, 1998). As a more formalized endeavor, Henington and Skinner (1998) identify two realms of peer monitoring: observation and self-recording. Whereas observation can occur informally, self-recording involves the observation of a peer and recording observed behaviors. This type of intervention may promote awareness of teacher-desired outcomes and on-task behavior, however, recorded observation has not been shown to promote improved academic or behavior outcomes (Kanfer, 1971; Henington & Skinner, 1998; McCurdy & Shapiro, 1992).

Others have found that monitoring by peers has been effective in promoting on-task behavior of the part of the monitor (Brown, Topping, Heningon, & Skinner, 1999). The concept of ‘intent participation’ is closely connected with monitoring in that learning through observation and listening is a central form of learning in cultures around the world (Rogoff, Paradise, Arauz, Correa-Chavez, Angelillo, 2004). These authors suggest that, “during the twentieth century, U.S. children's opportunities to observe and participate in mature actives has been greatly curtailed” (Rogoff, et al., p. 14). Learning through observation, situated in the cultural community in a broad sense, perhaps can shed light on the notion that observational learning can be of a contrived nature in classrooms. Given the mixed results of observational learning as a stand-alone instructional strategy, peer monitoring is perhaps best used as a behavioral intervention for chronically disruptive students or left to informal spontaneous processes that arise during formalized instruction.
**Peer Assessment.** Peer assessment is an arrangement for peers to consider the level, value or worth of the work, products or outcomes of learning with others (Topppping & Ehly, 2001). The central concern of peers providing qualitative and quantitative judgments of a relative status equal is the outcome of evaluations. The vast majority of peer assessment interventions within the realm of PAL have been of an informal or formative nature, forgoing the obvious problems of reliability with peer-generated summative assessment (Topping, 2010). However, feedback between peers is an essential component if learning is to occur. One reason, as previously mentioned, is in the fostering of cognitive dissonance, such as is the process in argumentation. Research on argumentation suggests that both person A and person B benefit from critical examination as person A will likely engage in high-level cognitive reasoning when person B provides well-warranted counterarguments to the performance or reasoning of person A (Leitao, 2000).

Cho and MacArthur (2010) focused experimentally on relative effects of types of feedback. The authors found that non-directive (i.e., feedback that was directed at a generalized other) was most effective for promoting performance for school-aged students. Topping (2010) suggests that non-directed feedback might be associated with greater psychological safety rather than feedback that is directed at a specific individual. While this is a relatively new area of research, it has been found that the effectiveness of peer assessment depends on the state of development of the assessors and assesses suggesting that critical feedback may only be possible in a trusting relationship. It has also been shown that the difference in competence
between individuals matters in that feedback from a highly competent peer is most effective when the feedback is again non-directive (Topping, 2010).

While immediate verbal feedback from a peer may be perceived as threatening, feedback in writing from a peer has been seen as a way to diffuse this tension and has also proved to be at least as effective as written feedback from a teacher (O’Donnell & Topping, 1998). Given these findings, it is most likely that in-process feedback of no consequence that is specifically tied to a discrete skill or cognitive process be employed during initial PAL endeavors until partners develop a trusting relationship when more critical assessments may arise naturally.

Section Summary. Informally, all types of PAL are most likely present when students work together collaboratively. However, specific contextual factors such as age and experience need to be considered before a PAL arrangement is chosen. In situations where students are relatively similar in ability and age, class-wide designs that are reciprocal can give each student the opportunity to play both the part of the helper and the helped. In situations where student’s ability and age are divergent, cross-age fixed-role designs that target specific skills are perhaps the most appropriate. In the secondary music classroom, there are potential applications for both designs. However, due to scheduling limitations, many secondary music ensembles consist of students that are in the same grade, especially at the middle school level. Therefore, given that the students possess relatively similar skills, a class-wide same-age design where students can experience being both the teacher is perhaps the most appropriate. However, given that no two students are exactly equal, the varied symmetry of reciprocal designs
may reveal a more nuanced interpretation of how reciprocal designs influence student achievement and engagement.

Peer-Assisted Learning in General Education

Meta analyses. Over the past three decades, education researchers (Cohen, Kulik, Chen-Lin, & Kulik, 1982; Ginsburg-Block, Rohrbeck, & Fantuzzo, 2006; McMaster, Fuchs, & Fuchs, 2006; Robinson, Schonfield, & Steers-Wentzell, 2005; Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003; Roscoe & Chi, 2007) have conducted several meta-analyses of research regarding PAL. In a review of sixty-five independent evaluations of tutoring programs in K-12 schools from 1966 to 1980, Cohen, Kulik, Chen-Lin, and Kulik (1982) found that in general, PAL programs have positive effects on the academic performance and attitudes of those who receive tutoring. Three guidelines were used to delimit the pool potential studies from five-hundred to the final set of sixty-five. First, studies had to take place in elementary or secondary school classrooms. Second, studies had to report on quantitatively measured outcomes in both tutored group and a non-tutored group. Third, studies had to be free from threats to internal validity such as not controlling for aptitude level or “teaching to the test” in one or both of the groups.

Out of the sixty-five studies that met these criteria, fifteen different variables were defined. Four of the variables described the types of tutoring programs used in the studies: structured (ES=.32) vs. non-structured tutoring (ES=.34); cross-age (ES=.35) vs. same-age pairing (ES=.28); tutoring as a supplement (ES=.20) vs. tutoring as a substitute for classroom instruction (ES=.40); tutor training (ES=.34) vs. no training (ES=.32). Three variables were found to be related to aspects of the
experimental design: random (ES=.46) vs. non-random assignment of students to comparison groups (ES=.46); control for teacher effects by having the same teacher instruct both comparison groups (same instructor [ES=.41], different instructor [.36]); and the standardization of examinations (ES=.27) vs. teacher designed instruments (ES=.84). Lastly, six variables described the setting: duration of the program (0-4 weeks [ES=.95], 5-18 weeks [ES=.42], 19-36 weeks [ES=.16]); class level of tutors (1-3 [ES=.39], 4-6 [ES=.25], 7-9 [ES=.24], 10-12 [ES=.36]); class level of tutees (1-3 [ES=.45], 4-6 [ES=.25], 7-9 [ES=.33]); subject matter (math [ES=.62], reading [ES=.29], other [ES=.30]); average ability tutees (low [ES=.42], high [ES=.33]); and level of skill tested on exams (low order [ES=.76], mixed [ES=.24]).

Effects were assessed in three major outcome areas: student academic achievement, student attitude toward subject matter, and self-concept. In forty-five out of fifty-two studies, tutee achievement was found to be significantly higher for students engaging in PAL than for those receiving conventional classroom instruction. On average, a child engaging in PAL scored at the 66th percentile (ES = .40) of the students in the comparison group. Tutees attitude toward subject matter was reported in eight studies and student attitude was found to be more positive in classrooms with tutoring programs in all studies. Lastly, tutee self-concept was found to be higher for students in classrooms with tutoring programs in seven out of nine studies. However, the average effect was not large enough to be statistically reliable.

Thirty-eight out of sixty-five studies examined achievement effects on tutors and in thirty-three of these studies, tutors scored higher than students who were
Tutor attitude toward subject matter was found to positively increase in four out of five studies (ES=.42). Lastly, tutor self-concept in twelve out of sixteen studies was found to be higher for tutors versus students who did not serve as tutors (ES=.18, SD=.12). Most notable in these findings are: 1) tutoring programs have a positive effect on the academic performance of tutors and tutees, 2) students who are tutored and serve as tutors generally have more positive attitudes toward the subject being studied, 3) dramatic changes in self-concept are atypical, and 4) effect sizes were highest for studies of mathematics (ES=.62) versus those for reading (mean ES=.21).

In a meta-analytic review of PAL interventions with elementary school students, Rohrbeck, Ginsburg-Block, Fantuzzo, and Miller (2003) found that interventions were most effective with younger, urban, low-income, and minority students. Moreover, studies that provided students with more autonomy had higher effect sizes. Initially, the meta-analysis included a broad range of nearly four thousand studies in cooperative learning, peer teaching, peer tutoring, and small group learning. To narrow this number down the authors limited analyses to studies that: evaluated a peer tutoring evaluation (rather than simply describing one), used experimental or quasi-experimental group design, and lasted for more than one week. These parameters resulted in a sample of ninety studies.

The profile of the sample PAL literature included a wide variety of demographic characteristics. The age range of students represented was from six to twelve years of age and tutors were found to be older in general than tutees, revealing a trend of cross-age PAL formats. Male and female participants were
equally represented. Twenty-three percent of studies reported that minority students accounted for more than 50% of the participants. Additionally, nearly 40% of studies included samples where over 50% of participants were low-SES students. Lastly, 29% of schools were in urban settings, 21% in suburban settings, 8% in rural settings, where as 42% of studies did not report the school’s setting.

Intervention parameters were analyzed according to duration, sessions per week, and length of session in hours. Results showed a large range of intervention duration (Range = 1-144 weeks; $M = 15$ weeks), a moderate number of sessions per week ($M = 3.5$), and a reasonable session length ($M = 41$ minutes). Effect sizes for achievement outcome variables were overall positive in a wide variety of subjects: reading (ES = .26), math (ES = .22), social studies (ES = .49), science (ES = .62), spelling (ES = .21), writing (ES = .33), language (ES = .21). The authors found that achievement outcomes were greater for students in younger grades (1-3; ES = .45) over students in older grades (4-6; ES = .25).

Interestingly, a significant negative relationship was found between collaborative and competitive orientations. A competitive participant structure is one where students are not rewarded for working together and are dissuaded from such activity. This finding suggests that learning environments that are entirely didactic may limit student growth and achievement. Students living in urban settings had overall greater achievement gains than suburban or rural students, and students from low-income families tended to demonstrate larger achievement gains than students from middle or high-income families. Lastly, minority rather than non-minority students showed greater achievement outcomes as a result of PAL.
These findings suggest that PAL interventions are effective for promoting academic achievement gains for all students, particularly with students in lower grades, minority students, students attending urban schools, in addition to students from low income families.

McMaster, Fuchs, and Fuchs (2006) reviewed studies from 1988-2003 that involved classwide peer tutoring in reading using an instructional intervention known as Peer-Assisted Learning Strategies for Reading (PALS). Classwide peer tutoring is a collaborative learning strategy that pairs all students in a classroom to work simultaneously on academic tasks. Student roles are reciprocal in that in each session, students have the opportunity to serve as tutor and tutee. It is intended to “increase the proportion of instructional time that all students engage in academic behaviors and to provide pacing, feedback, immediate error correction, high mastery levels, and content coverage” (Greenwood, Delquadri, & Hall, 1989, p. 372). Components of Peer-Assisted Learning Strategies for Reading involves training students to use specific prompts, corrections, and feedback in addition to providing frequent verbal feedback. Additionally, learning activities are structured using specific collaborative reading techniques such as Partner Reading with Retell (partners taking turns reading, tracing, and correcting), Paragraph Shrinking (theme summarization), and Prediction Relay (reader makes prediction about text to come and then confirms/disconfirms with partner).

McMaster et al. (2006) reported that both classwide peer-tutoring and Peer-Assisted Learning Strategies for Reading have been effective in classrooms grades K-12. Research findings for kindergarten students of minority, impoverished, and
middle class status indicates that after twenty weeks of instruction, students receiving treatment significantly outperformed comparison group students (e.g., Fuchs, Fuchs, Thompson, Otaiba, Yen, Yang, Braun, & O’Connor, 2001a & 2001b; Fuchs, Fuchs, Mathes, & Martinez., 2002). Similar results were found for interventions with students, grades one through six.

Interventions for high school students using these techniques differ, however, from those from lower grades. In high school interventions, students switch partners every day rather than every four weeks, they are extrinsically rewarded, and typically read from expository rather than narrative text in an effort to connect reading with issues more pertinent to their lives at that point. Using these techniques, only high school students who have large reading deficiencies have been empirically investigated. This limited sample of the total population has shown significant improvements in reading comprehension in comparison to similar students receiving traditional instruction. Whereas results for these instructional interventions have shown to be largely successful, they have not been shown to increase reading achievement for a moderate proportion of low-achieving non-disabled students and students with learning disabilities. The authors provide no concrete or speculative reasons for these trends.

In a meta-analytic review of twenty-eight PAL studies in math, Robinson, Schonfield, and Steers-Wentzell (2005) found that intervention designs that utilized same and cross-age formats were positively related to academic achievement outcomes for minority and non-minority students alike. Analyses included K-12 PAL studies in math published in or after 1988, and excluded studies composed
exclusively of children with learning disabilities. Outcomes of the studies selected were reported in a wide variety of areas including: tutee academic achievement, tutor academic achievement, other school-related outcomes, school-related attitudes and behaviors, and socio-emotional outcomes. Additionally, the effects related to the following design parameters were reported: amount and duration of tutoring experience, type and amount of training, reciprocal vs. non-reciprocal design, use of rewards. Lastly, the following dyad characteristics relating to tutoring outcomes were reported: tutees’ and tutors’ initial level of academic achievement, gender composition, and ethnic composition of student dyads. The following paragraph will briefly discuss the effect of these variables.

Eighty-seven percent of the evaluated studies showed higher achievement outcomes for students who received tutoring over students who did not (ES=.33). Most notable was the finding that effect sizes for cross-age tutoring were often above .75 and often above 1.0. Academic achievement gains for tutors followed similar trends, with students in tutoring roles making greater gains than students in non-tutoring roles (ES=.62). Outcomes that are often used as a predictor of academic achievement that concern an individual’s ability to be a good student including increased time on-task and improved classroom behavior were also observed to generally increase.

School-related attitudes and behaviors have been shown to improve as a result of reciprocal PAL arrangements. Studies that examine the academic achievement for students who engage in reciprocal PAL versus students who receive traditional teacher-led instruction or study alone often report effect sizes
larger than 1.0 (e.g., Fantuzzo, King, & Heller, 1992, [ES=1.18]; Fantuzzo, Davis, & Ginsburg, 1995, [ES=1.3]). Additionally, it was found that attendance rates for students in reciprocal (symmetrical) PAL arrangements versus students receiving traditional instruction were higher (ES=1.73). The following socio-emotional outcomes have been found for tutors and tutees: social acceptance for students in reciprocal PAL versus those who are not (ES=1.47), positive self-reporting of social skill development for students in reciprocal PAL versus those who are not (ES=1.09), and higher scholastic competence scores for students engaging in reciprocal PAL versus those who are not (ES=1.46).

Program characteristics related program outcomes revealed that longer PAL programs do not necessarily produce better academic outcomes. However, the degree of training in PAL techniques including non-verbal reinforcement, interpersonal skill development, time management, and on-task behavior was seen to positively influence the degree of instructionally sound interactions. Nevertheless, Schoenfield et al. report that the bulk of this evidence is anecdotal. Reciprocal versus non-reciprocal programs often report effect sizes over .5 in favor of reciprocal designs. Effect sizes for non-reciprocal and cross-age programs were reported to be in the .2-.5 range.

Studies that compared the effect of reward structures versus those that offered extrinsic reward typically had large effect sizes (ES=1.18). Rewards were found to typically fall in the realm of extra recess time, additional class privileges, or token items such as pencils and other scholastic ware. Few studies were found to address whether initial achievement level influences the effectiveness of same and
cross-age tutoring. The results show that many studies reveal benefits for low-achieving students in all PAL arrangements (same-age, cross-age, and reciprocal). Other studies have shown similar results for moderate and high-achieving tutors and tutees (e.g., Early, 1998; Cohen, 1982). Gender composition was seen to matter insofar as same-sex pairs demonstrated higher academic achievement gains than mixed-sex pairs. However, the authors do not report on how and if age of the students influences these outcomes. Lastly, the authors report that there were no studies at that time that investigated the effect of ethnic composition on academic achievement in PAL arrangements.

In light of the results presented by Robinson et al., the following implications can be inferred. First, same and cross-age PAL should be considered as mechanisms for improving student achievement, specifically in mathematics. Decisions about the selection of same or cross-age tutors should take into account that serving as a tutor has been shown to consistently improve academic achievement. Additionally, the role of the tutor should not be reserved for high achieving students. Reciprocal PAL arrangements should be strongly considered given the consistency in improvement in academic and social skills shown for all students involved. Of particular importance is that the age/grade gap in cross-age tutoring programs should be relatively small if the program is intended to be academically beneficial for all students. This finding supports the use of symmetrical designs in-line with Piagetian developmental theory. Lastly, single-sex dyads may be more effective than mixed-sex dyads.
In a meta-analytic review of peer-tutoring research in general and special education, Roscoe and Chi (2007) critically examine how peer learning occurs across a variety of formats, students, and domains including cross-age & same-age (asymmetrical), and reciprocal (symmetrical) designs. Similar to other meta-analyses, their findings suggest that all peer learning formats are not equal in terms of effect size in that tutor achievement is often higher with asymmetrical cross age designs (ES=.52) rather than symmetrical same age designs (ES=.36). Conversely, effect sizes for symmetrical reciprocal designs (ES=.49) were higher than fixed role designs (ES=.39) which are either symmetrical or asymmetrical. Designs where students had more autonomy (ES=.94) were higher than designs where students had less autonomy (ES=.30).

In a meta-analytic review of social, self-concept, and behavioral outcomes of PAL, Ginsburg-Block, Rohrbeck, and Fantuzzo (2006) found that specific PAL components were related to effect size. Specifically, student autonomy, individualized evaluation, structured student roles, interdependent group rewards, and same-gender grouping were associated moderated outcome measures of PAL interventions. Similar to Rohrbeck et al. (2003), the authors focused upon three sets of inclusion criteria for delimitation of over four-thousand studies that involved the investigation of collaborative learning, peer teaching, peer tutoring, and small group learning.

In contrast to Rohrbeck et al., (2003) only interventions with non-academic outcomes were retained in this study, resulting in thirty-six studies of same-age PAL interventions. The authors chose to only focus upon same-age PAL intervention
studies given that previous meta-analyses of PAL literature suggest that cross-age asymmetrical PAL studies may represent a distinct set of studies in the literature due to additional heterogeneity introduced that may impact psychological factors (e.g., Rohrbeck et al.). A final group of thirty-six studies met the outlined criteria, and were included in the review.

In examining the PAL research literature, the Rohrbeck et al., (2003) focused upon questions in five main topic areas. The first set of questions focused upon the degree that PAL interventions promote social, self-concept, and behavioral outcomes for elementary students. The authors make the argument that previous meta-analyses suggest that collaborative learning positively affects self-esteem (i.e., Johnson & Johnson, 1989, Cohen et al., 1982), but that a more updated analyses was needed to draw more robust conclusions about psycho-social domains. Results pertaining to this set of questions revealed the effect sizes for the following variables: social skill outcomes (ES=.40), self-concept outcomes (ES=.65), and positive behavioral changes (ES=.65). These results indicate that students who received PAL performed nearly half of a standard deviation higher on social, self-concept and behavioral outcomes than did students who received traditional teacher-led instruction.

A second set of questions focused upon the relationship between PAL’s academic and non-academic outcomes. Specifically, previous authors have suggested that PAL’s effectiveness in promoting academic achievement lies within its ability to promote social-emotional and behavioral learning. In terms of behavior, researchers have linked on-task behaviors often associated with PAL with positive
academic outcomes (Ginsburg-Block & Fantuzzo, 1997; Greenwood, Delquadri, & Hall, 1989; Webb, 1985; Webb & Farivar, 1994). Results pertaining to this set of questions revealed that both social and self-concept outcomes were positively correlated with academic achievement, whereas the relationship between behavior and academic achievement was found to be non-significant.

A third set of questions focused upon the relationships between major PAL intervention components and nonacademic outcomes in an effort to identify specific components that might be focused upon in future research. Previous literature identifies the following socio-emotional and behavioral outcomes: using interdependent group-reward contingencies, providing opportunities for student autonomy, structuring opportunities for learning, and individualizing classroom curriculum and evaluation procedures. Results for this set of questions revealed that (a) interdependent group rewards were a significant moderator for both social and self-concept outcomes but not for behavior, (b) the degree of student autonomy significantly moderated both self-concept and social outcomes but again not behavioral outcomes, (c) the degree of structure significantly moderated self-concept and social outcomes and not for behavior (this finding was that less structure produced higher outcome ES), (d) individualized curriculum procedures moderated student social outcomes but did not moderate self-concept or behavioral outcomes, and (e) individualized evaluation procedures moderated self-concept and behavioral outcomes, but not social outcomes.

The fourth set of questions the academic and non-academic learning of vulnerable student groups such as minority, low-income, urban, and younger
students. Results from the fourth set of questions revealed that PAL interventions were more effective for low-income versus higher income students, urban versus suburban-rural students, minority versus non-minority students, and for students in grades 1-3 versus grades 4-6.

Finally, a fifth set of questions examined implementation parameters (grouping strategies and intervention duration) in addition to socio-emotional outcomes. Results from the fifth set of questions revealed that assigning students to groups of the same gender was associated with significantly greater outcomes than for groups of mixed gender. However, dyad gender did not moderate behavior outcomes. In terms of intervention duration, a comparison between studies of less than 900 minutes and 900 minutes or more revealed that studies above this median point did not have significantly greater effect sizes than those below the median for social, self-concept, or behavioral outcomes.

Synthesis of Meta-Analyses. Given the large number of intervention studies reviewed as part of several meta-analyses, it seems apparent that PAL is regarded as an important topic in the current educational landscape. Meta trends that have emerged from this sizeable body of literature as reviewed in several meta-analyses (Cohen, et al., 1982; Ginsburg-Block, et al., 2006; McMaster, et al., 2006; Robinson, et al., 2005; Rohrbeck, et al., 2003; Roscoe et al., 2007) reveals first and foremost that PAL has the power to dramatically increase academic and social achievement gains alike. All of the meta-analyses presently reviewed present overwhelming evidence of the effectiveness of PAL in a wide range of subject areas, age levels, ethnicities, and economic levels.
The most commonly discussed trend was in the realm of symmetrical versus asymmetrical design. When comparing the effectiveness of cross-age (asymmetrical) versus same-age (symmetrical) intervention designs, the results were mixed. Cohen et al. (1982) and Robinson et al. (2005) found that effect sizes for cross-age and same-age designs were relatively equal, whereas Roscoe et al. (2007) found higher effect sizes for cross-age designs. When looking deeper, Roscoe et al. (2007) found that reciprocal designs where students played both the part of the tutor and tutee had higher effect sizes than those where roles were fixed. Moreover, when comparing reciprocal designs with traditional teacher-led instruction, Robinson et al., found that effect sizes were often larger than 1.0 suggesting that students who engage in reciprocal PAL often score more than one standard deviation unit higher than their counterparts who receive traditional instruction.

Another striking trend is that the majority of studies reported that PAL environments where students more autonomy to organize their own experience overwhelmingly reported higher effect sizes over those that were more structured. However, Robinson et al. (2005) found that the degree of training significantly impacts the quality of student-to-student interaction. On a related note, extrinsic reward structures (e.g., in class free time and extended recess periods) were found to significantly moderate achievement and behavior outcomes. Ginsburg et al. (2006) found that social and self-concept outcomes but did not significantly moderate behavioral outcomes. However, it was found that collaborative learning environments were found to be associated with higher effect sizes than competitive
teacher-led learning environments where only individual achievement is recognized and fostered.

Several demographic variables emerged as important factors when considering PAL. First, students in urban schools were found to make higher achievement gains as a result of PAL than their suburban or rural counterparts. Moreover, similar trends were found for students who were economically disadvantaged and who were of minority status (e.g., Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003; Ginsburg-Block, Rohrbeck, & Fantuzzo, 2006). Additionally, the majority of studies indicated that PAL was most effective with younger elementary-age students; however, moderate effect sizes were found for secondary students as well. Lastly, only studies that investigated elementary-age students indicated that same gender groupings were more effective than mixed gender groupings. Gender trends were not reported when looking at studies of secondary-age students.

While Ginsburg et al. (2006) and Cohen et al. (1982) were the only studies to look explicitly at the socio-emotional effects either as dependent or moderating variables, all studies to some extent discussed the positive effect that PAL has on social, self-concept, and behavioral outcomes. Specifically, growth in the social-emotional arenas (e.g., social competence and interpersonal skills, academic self-concept, and positive behavior modification) was positively correlated with academic achievement. The demographic characteristics associated with positive socio-emotional growth resulting from PAL follow the same trends as academic growth: minority students grow more than non-minority students, urban students
grow more than suburban students, younger students grow more than older
students. While gender moderated social and self-concept gains, it did not impact
behavioral gains for students working in dyads. Lastly, the duration of the study did
not impact socio-emotional outcomes.

**Topping & Ehly’s conceptual model.** Topping and Ehly (2001) synthesized
existing peer-learning research in general education into a theoretical model of
peer-assisted learning (see Figure 1). This interactive model organizes and
operationalizes the complex process of peer-assisted learning in the cognitive
domain. The model assigns the main sub-processes supported by the research
literature into five distinct organizational categories: organization and engagement,
cognitive conflict, scaffolding & error management, communication, and affect.

These five sub-processes feed into a larger operational process where
participants mutually extend their declarative knowledge, procedural skill, and
conditional application of knowledge and skills. As learners become
interdependently reliant on each other as a result of intersubjective knowledge
creation, the progress through several layers of knowing. The first of these levels of
interaction are characterized by participants adding to and extending current
capabilities (accretion), modifying current capabilities (re-tuning), or restructuring
new information. The second level represents the implicit factors of practice,
fluency, automaticity, and retention. As participants become more familiar and
comfortable with skills and concepts they grow along a continuum of knowledge
supported by others progressing toward independent knowledge. The last levels of
the model have to do with aspects of feedback and reinforcement, self-regulation,
self-attribution, self-esteem, and metacognition. The authors conceive of the process as being a continuously rotating loop whereby individuals may engage in various organizational or procedural levels at differing levels of specificity depending on their current level of knowledge and experience. A central aspect of this model that relates to the findings of meta-analyses is the relative distribution of scaffolding and error management versus cognitive conflict recalling Vygotskian and Piagetian psycho-social theories of development respectively. Specifically, the current study will reference these organizational factors by examining the balance of symmetry between peers and how that balance impacts music achievement and engagement.
Figure 1. Theoretical Underpinnings of Peer-Assisted Learning (Topping & Ehly, 2001). Reprinted with permission.
Peer-Assisted Learning in Music Education

Although the number of research studies on PAL in music education is vastly smaller than in general education, researchers in music education have found peer-based instruction to also produce positive achievement results (Alexander & Dorrow, 1983; Darrow, Gibbs, & Wedel et al., 2005; Goodrich, 2007; Leber, 2007). While the existing research in music has focused on elementary student populations, a variety of participant designs have been investigated. Darrow, et al. (2005), used a reciprocal model of instruction where each student played the part of both the teacher and learner. Nonreciprocal models were defined as, “a relationship in which one student always plays a subordinate role” (p.21) such as cross and same-age models. Participants in this study were 104 fifth-grade general music students (48 girls and 56 boys) ranging in age from 9 to 11 years at two elementary schools in a Midwestern college town. Students were administered pre and post-tests measuring their knowledge of key signatures. The intervention included scripted instruction, which allowed students to take turns teaching the elements of key signature identification. Immediate knowledge acquisition was realized for students playing the part of ‘learner’ and delayed knowledge acquisition for students playing the part of teacher. Darrow and colleagues speculated that individuals who exhibited delayed acquisition lacked the opportunity to see the students whom they taught demonstrate knowledge in action, thus minimizing the potential for effective modeling and reinforcement of important concepts.

Studies in music education that have employed a nonreciprocal model of peer-instruction have yielded different, although noteworthy, findings. Alexander
and Dorrow (1983) used an asymmetrical model in a study of beginning band students. The authors found that after a three-week intervention, students who received instruction from a peer who was granted teacher status (based upon prior achievement scores) showed significantly greater achievement gains than students who received teacher-led instruction. In a controlled intervention, the authors included 54 fourth-grade beginning band students in three suburban elementary schools. Students were divided into control and treatment groups. Students in the control group received normal instruction from their classroom teacher. Students in the treatment group were divided into two groups based upon playing test scores using one-line exercises from their beginning band method book. Individuals who scored above fifty-percent were identified as teachers. This group was then divided and trained in two groups based on type of feedback: approvals and disapprovals. The approval group was trained to focus on positive aspects of the tutees playing. The disapproval group was trained to focus on elements that needed correction. After a three-week intervention, students who were teaching and learning in the positive feedback group showed the largest post-test performance achievement gains ($d = .95$). Treatment group students overall demonstrated greater achievement gains than students in the control group.

Notably, only a handful of researchers have examined the effects of PAL at the secondary level in music. Using an experimental design, Johnson (in press) investigated a diverse group of urban-fringe high school band and choral students music performance achievement in one of two instructional settings. One comparison group utilized reciprocal PAL where students were randomly assigned
to dyads and over the course of five, twenty-five minute sessions engaged in rhythm reading materials designed to increase their rhythm reading competence. A teacher-led comparison group engaged in normal classroom instruction covering the same material over the same duration of time. Additionally, music self-concept was examined as a moderating variable. Results showed that students in the PAL group scored significantly higher on a post-test that assessed their rhythm sight-reading capabilities. Neither music nor rhythm reading self-concept (measured using the Music Self-Perception Inventory, (Vispoel, 1994)) was found to moderate rhythm reading achievement. However, ensemble type was found to moderate achievement scores with choral students in the PAL group scoring significantly higher than their choral counterparts who received traditional teacher-led instruction.

Scruggs (2009) investigated ways that a learner-centered instrumental music education classroom environment can promote musical growth and independence. Utilizing mixed-methods design, the study incorporated measures to compare performance outcomes, musical growth, and learner and teacher dispositions in learner-centered and teacher-centered middle school orchestra classrooms. Research participants included four in-service middle school orchestra teachers and one hundred and fifty middle school string musicians. Two teachers delivered traditional teacher-centered instruction. The remaining two teachers were trained and delivered learner-centered instruction that included collaborative learning activities such as peer-tutoring, student conducting, and facilitation of student leadership. The teachers implemented learner-centered or teacher-centered environments in four intact classrooms that included 155 student participants. No
differences were found in terms of performance outcomes between learner-centered and teacher-centered ensembles. However, students in learner-centered classrooms showed increased musical growth and greater musical independence. Additionally, students in these environments indicated higher perceptions of choice and leadership opportunities in their classrooms than students who received traditional teacher-led instruction. Moreover, learner-centered teachers indicated that they observed increased engagement and leadership skills from their students. While this study only tangentially integrated aspects of PAL, these findings indicate that music ensemble directors can develop a learner-center classroom environment that engages students musically, promotes independence and leadership.

Furthermore, in light of findings in other subject areas it is not surprising that this type of environment can help students to develop higher order thinking skills while attaining performance standards at or above those of typical middle-school instrumental musicians.

Research on musical collaboration between school-aged peers has revealed that social status influences movement through the ZPD. In a case study of the verbal and nonverbal interactions of two high school chamber ensembles, Berg (1997) highlights how social status can impact students’ ability to learn from each other as they construct an interpretation of the music. In one setting, group members were often focused on the “problem” of establishing one’s musical and social identity in the group instead of the musical problem and its solution (Berg, 1997, p. 252). Berg also noted that in situations where group members are more closely affiliated or familiar with each other as a result of having been an established
group for several years, individuals might spend more time negotiating their social status. Thus, intersubjectivity was observed to be in the form of divergent perspectives and opposition to other's ideas inline with the observations of Smolka, De Goes, and Pino (1995).

The use and impact of varied social participation structures (full ensemble, rehearsing in pairs, simultaneous individual practicing) emerged as a theme in Berg’s work. Specifically, the use of different structures, particularly rehearsing in pairs, enabled increased opportunities to work in the ZPD as individuals actively contributed to the conversation, thus enabling members to assume and exchange the leader role more easily than during the full group ensemble rehearsals (Berg, 1997, 240). However, Berg noted that the shared participation structure did not guarantee learning in the ZPD since it was often the case that some individuals placed higher importance on gaining leadership opportunities than on solving musical problems. Although Berg focused on the chamber music setting, PAL, in particular the effectiveness and challenges of working in pairs, might also be explored in the large ensemble context. Additionally, as Berg found evidence of the teacher being a kind of tool (e.g., encouraging students to “try it different ways”), students taking on the role of teacher in an effort to assist a peer might also be a useful tool, and form of ventriloquation (i.e., students acting out the culturally specified role of “teacher”) during PAL involving everyone in the large ensemble setting. Moreover, PAL experiences that include all students do not involve the extra commitment to music often embodied by many students who participate in the chamber music experiences outside of school. Therefore, this is another way that
the differences in participant structure could potentially influence the degree of positive interdependence between students in different musical settings.

In a case study of two high school jazz combos, Fodor (1998) focused on how students and coaches used verbal and nonverbal interactions to achieve musical goals. Fodor found that over time, patterns of interaction included movement through a ZPD in both coach-to-peer and peer-to-peer settings. More specifically, Fodor found that students progressed from imitative to assimilative, and eventually assimilative to innovative stages of jazz performance. In addition to verbal and musical interactions, a wide variety of hybrid interactions including combinations of playing, talking, and singing were observed as catalysts for moving students from imitative to innovative stages of musical achievement.

Over the five-week period of observation, Fodor found that there were both long stretches of time where students focused upon only one problem and periods of time where multiple problems were addressed. Fodor noted that the availability of a variety of tools, including numerous hybrid interactions that combined playing, singing, and talking, were available to the students as a result of the varied levels of expertise present between students and between students and coaches. While this study is an example of both symmetrical and asymmetrical interactions naturally occurring in secondary instrumental ensembles, it would be helpful to know if student’s ability to learn from one another was different for symmetrical and asymmetrical interactions.

In a yearlong case study, Goodrich (2007) found that peer expectations and teacher support for naturally occurring peer-based instruction inspired students to
share knowledge and increase performance achievement. Goodrich examined how peer-based instruction functions in a high school jazz context. The setting for this study was a jazz band with a long history of excellence at a large suburban high school in the southwestern United States. The findings of this study were classified into five themes: (a) mentoring from the adult perspective (i.e., the placement of younger students with older students in the same ensemble); (b) peer mentoring for musicianship; (c) mentoring in rehearsals; (d) mentoring outside rehearsals; and (e) social mentoring (i.e., situations where students encouraged peers toward more positive attitudes). These findings imply that a variety of positive social and skill based outcomes in a variety of formal and informal settings can result as peers are encouraged to engage in disciplinary specific discourse. The implementation of peer-based instruction studied by Goodrich appears to rely heavily on the context of jazz performance, where communication between players is paramount.

Berg (1997), Fodor (1998), and Goodrich (2007) bring focused attention to PAL in secondary instrumental settings while further developing an understanding of how social status, varied levels of expertise, and expectations for peer-to-peer interaction can impact PAL in important ways. However, it is important to note that these studies investigated isolated experiences in comparison to PAL activities in which all students in a class participate. Hence, it would also be helpful to know how PAL impacts achievement, motivation, and engagement for students at the secondary level when an entire classroom of students are involved. Given that previous PAL research in music has been limited to the elementary and high school settings, it would be especially useful to gain more information regarding the effect
of PAL on achievement and engagement in the middle school band setting. Moreover, it is necessary to investigate how achievement and engagement is impacted when comparing different levels of expertise between students (i.e., symmetrical and asymmetrical arrangements).

Albeit with a different target population, unstructured popular music collaborations have been successful in promoting music achievement with college students in addition to promoting a sense of autonomy, self-efficacy, and performance achievement (Leber, 2007). Leber investigated a college-level Australian popular music program that employed a collaborative learning model. All classes across a 26-course curriculum adopted a ‘master-less instruction model’ where students were entirely responsible for providing assessment and feedback to their peers. Forty-one students participated in the study and provided data in the form of questionnaires, group and individual interviews, and formal and informal feedback detailing their involvement in a master-less, self-directed learning community. Results indicated that students were able to develop a greater sense of autonomy, self-efficacy, and performance achievement as a result of peer-based learning and assessment. Students also felt a greater sense of respect for the abilities of their peers as a result of a master-less program.

Section Summary. Collectively, the handful of researchers in music education who have investigated PAL highlight the potential benefits of various strategies for continuing to employ and expand the use of PAL in the music classroom. All three models of peer-based instruction -- reciprocal, nonreciprocal, and master-less -- yielded performance achievement gains for music students.
Beyond performance achievement, researchers have reported or implied that peer-based instruction increases motivation and enhances peer feedback. Goodrich (2007), for example, found that it was an “unwritten rule” that upper classmen work with younger players in and outside of school to develop their musical ability. As a result of this tradition, students were intrinsically motivated -- without the suggestion of their teacher -- to help each other to develop improvisatory skill. What remains to be examined is the degree that PAL can influence music achievement in the large ensemble classroom. Moreover, there is a lack of empirical research in music education that investigates the relative effects of symmetrical and asymmetrical arrangements and to what degree these instructional arrangements are influenced by motivational factors and to what extent they promote engagement in learning.

**Chapter Summary**

Based on Piagetian and Vygotskian psycho-social theories, PAL encompasses a broad array of instructional approaches that foster interaction and learning between peers in formalized school settings. Learning that happens in PAL arrangements has been thought to be governed by the participant structures that are influenced by the cognitive and social distance between peers who collaborate together. Two arrangements common to formalized peer-to-peer interaction are symmetrical (students working together who are relatively equal in cognitive ability and social standing) and asymmetrical (students who possess divergent cognitive abilities and social standings) student groupings. Both symmetrical and
asymmetrical collaborative learning arrangements have been operationalized via two theories of socio-cognitive development.

The theory of human development presented by Jean Piaget that views learning as a process of cognitive assimilation and accommodation fueled by cognitive conflict and resolution has been associated with symmetrical arrangements. According to Piaget and later highlighted by Doise et al. (1998) and Light and Littleton (1999), inequalities of power and status tend to work against the effectiveness of this process. Thus, learning between peers is at its best when individuals feel free to challenge one another’s opinions, thought processes, and answers.

The socio-cultural developmental theory of Lev Vygotsky operationalizes learning as the transmission of cultural knowledge and practices through proximal positioning where a novice works with a person who holds more expertise or social status (i.e., is older and more experienced). Collaborative learning that takes place between novice and expert creates a “zone” where the distance in ability between individuals helps to raise the performance of the novice. Tharpe and Gallimore (1991) theorized that this process of learning is not only beneficial for developing the skills of novice peers, but also valuable for expert peers given the automatization or de-automatization that takes place.

While both the developmental theories of Piaget and Vygotsky support different peer grouping strategies, both theoretical viewpoints highlight collaborative learning as a process of cognitive co-construction. Intersubjectivity, as a process of moving toward mutual understanding, is a centerpiece of both theories.
and considered to be the substantive fuel of learning. Socially, Johnson and Johnson (1999) highlight interdependence as a factor that binds individuals together that symbiotically reinforces intersubjective knowledge creation. Hypothetically, as peers learn and create shared meanings together, cognitive and social competence is fostered through interdependent thinking. However, it remains unclear how this process is different in symmetrical and asymmetrical arrangements since what is thought to mediate the learning in these arrangements is vastly different.

Research regarding PAL in general education domains has shown that a variety of asymmetrical and symmetrical arrangements can be successful in improving student competence and confidence outcomes. In music education, a significantly smaller body of research has confirmed similar results. However, there is insufficient evidence regarding differential PAL arrangements in the secondary ensemble-based music classroom. More research is needed to understand the influence that PAL has on student learning in these settings.

While student achievement is of direct concern, it is also important to understand how motivation and engagement influences and interacts with learning in different PAL arrangements as compared with teacher-led instruction. Findings from research on student engagement suggest that students who feel a sense of autonomy tend to be more engaged in learning. Moreover, researchers in music education have found that secondary music ensemble students tend to possess mastery orientations (Schmidt, 2005; Miksza, 2009). In light of the association of student autonomy with successes in PAL arrangements (e.g., Topping et al., 2011; Roscoe et al., 2007), and the tendency for instrumental music students to possess
intrinsic mastery goal-orientations, it seems plausible that PAL would yield positive music achievement and engagement gains. However, it remains unclear if this is the case in the contemporary, middle school level instrumental music classroom.
CHAPTER III

Methodology

Achievement and learner engagement are both important factors to consider when investigating collaborative learning arrangements such as peer-assisted learning (PAL). As an alternative instructional strategy, much needs to be learned regarding how PAL can be used to enhance the learning experience that students receive in secondary instrumental music classrooms. The purpose of this study was to extend the body of knowledge in music education regarding the impact of PAL on individual music achievement and student engagement. Using a quasi-experimental intact-groups study design, low-to-middle SES 7th grade band students were randomly assigned to one of two treatment conditions: symmetrical (matched ability) reciprocal PAL, or asymmetrical (divergent ability) reciprocal PAL. Both comparison groups engaged in a combination of peer-assisted learning and regular teacher-led instruction during the intervention period.

At the beginning and end of a four-week intervention period, student competency in music was assessed using objective measures of music notation knowledge and sight-reading skill. Student engagement was assessed using an established self-report measure, which was adapted to a secondary band context. Individual socio-economic status and achievement goal orientation also were measured in an effort to assess any moderating effects associated with those variables (see more information under the sampling subheading). A range of statistical analyses were used to determine the effect of method of instruction on various outcome variables (e.g., music achievement and engagement) and to
determine any potential moderating effects of individual difference variables (SES and achievement goal orientation) for 7th-grade band students.

**Sampling**

Researchers in a variety of educational subjects have found that socioeconomic status significantly impacts learning outcomes as a result of PAL, and that efforts to improve student learning may be moderated by differences in student socioeconomic status (e.g., Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003; Ginsburg-Block, Rohrbeck, & Fantuzzo, 2006). Similarly, little is known as to how PAL might benefit students representing diverse racial/ethnic or socioeconomic backgrounds. Given the general lack of peer-assisted learning (PAL) research in music education, and the fact that previous PAL studies in music education have been restricted to elementary and high school age participants, information regarding the effectiveness of PAL at the middle school level is needed. This is especially pertinent given that intervention studies of middle school age students in music education are extremely rare (Miksza & Johnson, 2012). Due to these considerations, a purposive sampling strategy was used to identify one Colorado Front Range school district comprised of several middle schools enrolling students of varied socio-economic status (SES) grouped in band classes by age rather than ability. Moreover, this study focused on 7th grade band so that students had at least one year of playing experience and had been introduced to beginning sight-reading and music notation concepts in the large ensemble setting. This strategy ensured that students of varied musical backgrounds and ability participated, provided a reasonable degree of control over extraneous variables, and maximized the
generalizability of findings to the student populations and school contexts of interest.

The Rocky Mountain region school district that participated in this study encompasses a wide range of demographics, communities and settings. Pioneer Public Schools has a total of eight traditional middle schools that are of non-charter and non-alternative status with a total enrollment of 7,485 out of 43,000 K-12 students district-wide. Demographically, the district is diverse: 29% White/Caucasian, 62% Hispanic, 5% Asian/Pacific Islander, 3% African-American, 1% Native American. Geographically, all 8 schools serve suburban or urban fringe communities.

Six middle schools were selected for participation in the study based upon (a) their grouping of students by grade rather than ability, (b) their non-charter status, (c) the existence of only one 7th grade band, and (d) the longevity of employment of the teacher being over one year. Each school that was invited to participate agreed to participate. Participating schools were randomly assigned to one of two experimental conditions: symmetrical PAL and asymmetrical PAL.

**Learning Environment Characteristics.** Each of the six schools involved in this study had only one 7th-grade band. In this particular school district, students have their first opportunity to study an instrument beginning in 6th-grade, but are not required to enroll in instrumental music. Band classes are organized according to grade level and void of ability grouping. A specified focus in this district – as is the case with most middle school band classrooms in Colorado and the U.S. – is upon performance and notation literacy. Students spend their first couple of years
studying traditional young concert band literature including folksongs, marches, movie music, and arranged pop tunes. Additionally, students spend a great deal of time working out of band method books that emphasize basic literacy, historical aspects of classical and jazz music, and instrument-specific technique. A high number of students in this sample reported that they do not participate in musical activities outside of school or musical activities at school other than band, 92% and 87% respectively, whereas students in all schools reported listening to music of diverse styles outside of school (92% Rap/Hip-Hop, 61% DubStep, 21% Country, 19% Rock).

Teacher participants had an average of 15.3 years of public school teaching experience (teacher 1 = 8.5 years; teacher 2 = 26 years; teacher 3 = 9 years; teacher 4 = 18.5 years; teacher 5 = 16.5 years; teacher 6 = 13 years). Anecdotally, teachers in each classroom tended to demonstrate that they care an equal amount about their student’s well being in addition to their achievement. Teachers tended to be open minded and did not maintain an authoritarian presence.

**Power analyses and sample size.** In an effort to increase the chances of obtaining a statistically significant result, power analyses were performed to determine what would constitute adequate sample size. At maximum, one independent variable (method of instruction) and two individual difference moderator variables (individual SES, achievement goal-orientation) were included in regression model comparisons to predict three outcomes: sight-reading achievement, knowledge of music theory, and learner engagement. Power analyses using a very modest estimate of effect size (true eta-squared $\geq 0.1$) and a sample size
of $N=110$ for a model with one dependent variable and two predictor variables indicated that there was an 83.7% chance of obtaining a statistically significant result. Cohen (1977) suggests that power should equal at least .80 before proceeding. When effect size (eta-square) is increased to a still modest .2, the power increases to 99.6%. The sample for this study was 261 7th grade band students, which was well above the minimum threshold of 110 participants needed to likely to produce a statistically significant result.

**Measures**

**Sight Reading Achievement.** To assess the level of sight-reading ability, a researcher-constructed etude was used. Specifically, this etude is based upon exercises 20-60 from the *101 Rhythmic Rest Patterns* (Yaus, 1985), which was used as instructional materials by both comparison groups during the intervention period. The etude is sixteen measures in length and is the same for all instruments. The melodic range is restricted to the first five pitches of the concert Bb major scale, and transposed for each instrument to fall within an appropriate range for beginning and intermediate players. Rhythmic concepts include simple to moderately difficult syncopated rhythms and rests (e.g., half, quarter, eighth, and sixteenth notes and rests). The meter is restricted to 4/4 time and tempo is quarter note $= 78$ beats per minute). No tempo or dynamic changes are included.

Because individual sight-reading ability was assessed before and after the intervention period, two versions of the etude were constructed (i.e., each version was based upon the same rhythms, time and key signatures, and range) to ensure that changes in sight-reading achievement across time reflected group differences
rather than a testing effect or familiarity with the etude format. Scoring was conducted using the SmartMusic assessment feature in which each student played the etude reading off a computer screen and was assigned a percentage score based upon their note and pitch accuracy (0-100%). SmartMusic assesses performance using software designed to compare recorded performance with temporal and pitch accuracy when compared with a notated exercise.

**Music Theory Knowledge.** A researcher-developed paper-and-pencil test was constructed to assess individual knowledge of major key signatures. This one-page, ten-item test assesses students’ ability to list (a) the order of flats and sharps (e.g., Bb, Eb, Ab, Db, Gb, Cb, Fb), (b) identify major key signatures through flats and sharps including the key of C, and (c) to construct a circle of fifths diagram that lists major keys and the number of flats and sharps that correspond with each key.

The ten-item test included two questions asking students to list the order of flats and sharps (14 points), eight questions asking students to identify major key signatures (16 points), and one question regarding the construction of the circle of fifths (6 points) totaling 36 points. As with the measure of sight reading performance, two separate versions of the test (with different but equivalent items) were utilized to allow for pre and post-treatment administration.

**Learner Engagement.** Established models of student motivation indicate that student engagement (behavioral and emotional) is promoted when social context of learning meets students’ basic psychological needs for relatedness, competence, and autonomy (Skinner, Kinderman, & Furrer, 2007). Skinner et al. (2007) note that engagement is fostered in a context that provides involvement,
structure, and autonomy support, while neglectful, chaotic, or coercive learning contexts can lead to disaffection.

Band student engagement was measured using a researcher adaptation of Wellborn's (1991) Engagement vs. Dissaffection with Learning Scale. This twenty item self-report measure assesses students’ level of engagement in classroom activities in two dimensions: behavioral engagement (i.e., effort and attention) and emotional engagement (i.e., interest and enjoyment). Each of the two subscales contains five positively worded items (reflecting engagement) and five negatively worded items (reflecting disaffection). Wellborn’s original item stems were worded generally (i.e., “When I’m in class, I feel good”) but for the purposes of this study were oriented to the music classroom (i.e., “When I’m in music class, I feel good”). The original measure uses a 4-point “trueness” scale, where 1 = not at all true, 2 = not very true, 3 = sort of true, and 4 = very true. Item scores are added to obtain subscale scores, with negatively phrased items being reverse coded (see Furrer & Skinner, 2003).

Previous researchers have utilized the scale with a wide range of school-aged students including elementary, middle, and high school participants (e.g., Furrer & Skinner, 2003; Patrick, Skinner, & Connell, 1993; Van Ryzin, Gravely, & Roseth, 2009; Wellborn, 1991). These authors have consistently reported high overall reliability scores (Cronbach’s alpha) at or above .90. Furthermore, to establish construct validity, Van Ryzin et al. (2009) performed factor analyses (Promax rotation) and found that behavioral and emotional engagement items loaded on a single factor. On this basis – as with most previous studies that have used this
measure – responses to items representing each subscale were combined to yield a single engagement score ranging from 20 to 120.

2x2 Achievement Goal-Orientation Questionnaire. Originally developed by Elliot and McGregor (2001), Miksza (2009) adapted this 2x2 achievement goal-orientation measure for use with secondary music students. The original questionnaire consists of 12 items, with 3 items designated to measure each motivation orientation; mastery-approach, mastery-avoid, performance-approach, and performance-avoid. Miksza reworded the Elliot and McGregor measure to reflect the specific context of instrumental music. For example, the item, “It is important for me to do well when compared to other in this class” was reworded to “It is important for me to do well when compared to others in Band.”

Subjects respond to each item using a 7-point Likert-type scale ranging from 1 (not at all true of me) to 7 (very true of me). The items representing each orientation are presented in random order. Reliability, using Cronbach’s alpha for the original orientation subscales, ranged from .82 to .96 (Elliot & McGregor, 2001). Several researchers have tested the construct validity for the 2x2 measure in comparison with trichotomous and dichotomous models and have found the 2x2 model to be relatively stable across the four dimensions (e.g., Conroy, Elliot, & Hofer, 2003; Elliot & McGregor, 2001; Finney, Pieper, & Barron, 2004; Wang, Biddle, & Elliot, 2007). Similarly, using the comparative fit index (CFI), Miksza (2009) found the 2x2 model to be the best fit in an secondary band context (CFI= .98) surpassing the traditional .95 value considered to be indicative of good fit (Hu & Bentler, 1999). Additionally, internal consistency in the secondary band context was found to be
adequate for three sub-scales (mastery-approach = .76; mastery-avoid = .75; performance-approach = .82) and marginal for performance-avoid (.69). Miksza noted that these results were similar to those reported in other studies using the Elliot and McGregor (2001) measure (e.g., Finney, Pieper, & Barron, 2004; Wang, Biddle, & Elliot, 2007).

**Composite Measure of Individual Socioeconomic Status.** A component measure of individual socioeconomic status (SES) was developed by Ensminger, Forrest, Riley, Kang, Green, Starfield, and Ryan (2000) and was adapted for use in music education by Austin and Miksza (2010).

To establish content validity the original eight facets of SES were grouped into three content areas: financial capital (i.e., parent employment status), human capital (i.e., parent education level), and social capital (i.e., number of family members living at home). Criterion-related validity was established by comparing student responses to questions about financial, human, and social capital with a parent report of household income and indicated a relatively high agreement between student and parent reports (Ensminger et al, 2000). Construct validity was established by determining the degree of adolescent health (i.e., illness such as fever, fatigue, wheezing, toothache, and sexually transmitted disease) as several previous studies (e.g., Liberatos, Link, & Kelsey, 1988) found health to be related to occupation, education, and income level (Ensminger et al, 2000).

The adapted measure reduced the number of constructs from eight domains to six: father’s employment, mother’s employment, father’s education, mother’s education, family structure, and school lunch subsidy (excluding food stamps and
aid to families with dependent children. The adapted six question composite self-report measure included a three-level rating scale for each of the six domains. For the purposes of this study, the items were reworded to reflect a middle school reading level and to reflect the range of education levels for this sample (i.e., change some high school education to no high school education).

### Procedures

**Teacher training**

The quality of interaction and learning in PAL has been shown to largely depend on the prior training received by both teachers and their students (Greer & Polirstock, 1982; LaPlante & Zane, 1994; Sheldon, 2001). Training is easier with instructional standardization (Rowman & Miller, 2007), however it also is important to allow students to make decisions that are free of adult teacher input (Ginsburg-Block, Rohrbeck, and Fantuzzo, 2006). Given the importance of teacher training to the success of a PAL intervention, teachers were trained during one three-hour researcher-led training session three weeks prior to the beginning of the study.

Teachers were trained in PAL techniques using materials from *Peer assisted learning: A practical guide for teachers* (Topping, 2000). The goal of this training was to: a) orient the teachers’ understanding of reciprocal peer-assisted learning, b) familiarize teachers with instructional materials, and c) standardize the instructional training that they subsequently provided to their students. Specifically, the following teacher-oriented PAL training materials constructed by Topping (2000) and Topping and Ehly (2001) were used: setting up the classroom context, defining the objectives, helping technique and student discourse, contact time,
instructional materials, training students, process monitoring and the role of the
teacher, assessment of students, evaluation of the experience, teacher and student
feedback. Moreover, teacher-training focused upon reciprocal peer interaction, the
characteristics of symmetrical and asymmetrical pairing, and allowing for student
autonomy while helping to guide student’s determination of effective goals,
objectives, and processes (see Appendix X for teacher training protocol).

**Research Design & Treatment Conditions**

This study utilized a quasi-experimental intact groups design with two
comparison groups – each group representing a different form of reciprocal PAL.
Quasi-experimental design, which is one of the most commonly employed in
educational research, is limited in that random assignment cannot occur at the
individual level and instead must be done at the intact group level. Most major
threats to internal validity can be controlled, however, by addressing any inherent
group differences found through pretesting procedures. Slavin (1992) observes that
random assignment of several schools to each condition will increase experimental
control; in the proposed study, three middle schools will be randomly assigned to
each condition. One advantage of research designs using intact groups is that there
is a minimal threat of communication (cross-treatment contamination) between
participants from different conditions given that they are in entirely different
buildings and communities and do not share the same teacher.

**Group one.** Students were paired symmetrically – matched with a partner of
relatively equal ability as determined by their mean rank for both achievement
pretests. Starting with the lowest ranked case, each person was paired with the next lowest ranked individual.

**Group two.** Students in group two were paired asymmetrically – a high achieving student was matched with a low achieving student as determined by pretest measures of sight-reading performance and knowledge of music theory. To facilitate the process of assignment to dyads, student’s pretest scores for each test were ranked and then averaged between the two tests. The pairing procedure consisted of the lowest scoring student below the median rank being paired with the lowest scoring student above the median rank. This process continued until all students were paired.

**Treatment schedule**

After six intact 7th-grade band classes were identified and assigned to one of two treatment groups (three to symmetrical PAL and three to asymmetrical PAL), teachers introduced the study and distributed permission forms to their students in English and Spanish. Students were allowed three days to return signed permission slips, indicating if they intended to participate in the study. After all permission forms were returned, each student completed the pretest achievement measures as well as the Learner Engagement and the 2x2 Achievement Goal-Orientation questionnaires. Once all pretest measures were completed, collected, and scored by the researcher, students were assigned partners following the procedures previously described. Teachers followed instructions provided during the teacher-training seminar, and trained their students in PAL techniques during one 30-
minute in-class session. The intervention period commenced during the following class period.

The intervention period was delimited to a six-week period (September-October, 2012) to allow teachers to have the flexibility to choose a period of time that worked best for their particular teaching situation. Each teacher chose a four-week period (12 instructional sessions total, with an average of 3 sessions per week) in which PAL or teacher-led instruction took place. Each intervention period consisted of a five-minute ‘transition/getting settled’ period followed by 20 minutes of peer-led instruction totaling 240 minutes of instruction time. Teachers recorded the overall peer-led instruction time on a log sheet that was provided to them.

At the end of the 12-session intervention period, students again completed the learner engagement questionnaire and the non-performance achievement test of basic theory skills. Over the course of the three class meetings following the completion of the paper and pencil posttest measures, students were individually pulled out of class to assess sight-reading achievement. (See intervention calendar below)
<table>
<thead>
<tr>
<th></th>
<th><strong>Group 1</strong></th>
<th><strong>Group 2</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Symmetrical Reciprocal PAL</td>
<td>Asymmetrical Reciprocal PAL</td>
</tr>
<tr>
<td><strong>Student/Parent Consent Forms</strong></td>
<td>Distributed: 9/17&lt;br&gt;Due: 9/20</td>
<td>Distributed: 9/17&lt;br&gt;Due: 9/20</td>
</tr>
<tr>
<td><strong>Student Engagement &amp; PALS questionnaires</strong></td>
<td>September 23</td>
<td>September 23</td>
</tr>
<tr>
<td><strong>Sight Reading Achievement Pretest</strong></td>
<td>September 24-26</td>
<td>September 24-26</td>
</tr>
<tr>
<td><strong>Basic Theory Achievement Pretest</strong></td>
<td>September 27</td>
<td>September 27</td>
</tr>
<tr>
<td><strong>PAL Student Training</strong></td>
<td>September 30</td>
<td>September 30</td>
</tr>
<tr>
<td><strong>Intervention (days 1-2)</strong></td>
<td>October 1-2&lt;br&gt;(R&amp;S#1; F&amp;S#1)</td>
<td>October 1-2</td>
</tr>
<tr>
<td><strong>Intervention (days 3-4)</strong></td>
<td>October 7-8&lt;br&gt;(R&amp;S#2; KS#1)</td>
<td>October 7-8</td>
</tr>
<tr>
<td><strong>Intervention (days 5-6)</strong></td>
<td>October 9-10&lt;br&gt;(CO#1; KS#2)</td>
<td>October 9-10</td>
</tr>
<tr>
<td><strong>Intervention (days 7-8)</strong></td>
<td>October 11 &amp; 14&lt;br&gt;(R&amp;S#3; CoF#1)</td>
<td>October 11 &amp; 14</td>
</tr>
<tr>
<td><strong>Intervention (days 9-10)</strong></td>
<td>October 15-16&lt;br&gt;(CO#2; CoF#2)</td>
<td>October 15-16</td>
</tr>
<tr>
<td><strong>Intervention (days 11-12)</strong></td>
<td>October 17-18&lt;br&gt;(R&amp;S#4)</td>
<td>October 17-18</td>
</tr>
<tr>
<td><strong>Learner Engagement Questionnaire Posttest</strong></td>
<td>October 18</td>
<td>October 18</td>
</tr>
<tr>
<td><strong>Basic Theory Achievement Posttest</strong></td>
<td>October 21</td>
<td>October 21</td>
</tr>
<tr>
<td><strong>Sight Reading Achievement Posttest</strong></td>
<td>October 21-24</td>
<td>October 21-24</td>
</tr>
<tr>
<td><strong>Follow-Up Interviews</strong></td>
<td>October 21-24</td>
<td>October 21-24</td>
</tr>
</tbody>
</table>

R&S= Rhythm and Sight Reading; F&S=Flats and Sharps; KS=Key Signatures<br>CoF=Circle of Fifths; CO=Composition
Instructional materials

Instructional materials were organized in two main categories. The first category consisted of materials that pertained to developing sight-reading achievement. Specific exercises were presented in the form of worksheets in the following areas: rhythm reading, sight-reading etudes, and composition exercises. The second category consisted of materials that pertained to developing knowledge of music theory. Specific exercises and worksheets were constructed in the following areas: order of flats & sharps, construction of key signatures, and circle of fifths.

Instructional Materials for Developing Sight Reading Skills

Rhythm Reading & Sight Reading. Rhythm reading materials emphasized a counting system using numbers (e.g., 1e&a, 2e&a, etc.) and drew on three different types of materials: a) rhythm worksheets that sequentially introduced simple to moderately complex rhythms and rests in 4/4 time (e.g., dotted quarter, eighth, and sixteenth notes; eighth note triplets; half, quarter, and eighth note rests), and b) selected exercises from the 101 Rhythmic Rest Patterns (Yaus, 1985). Students counted rhythms using egg shakers to produce pulse and performed rhythms on a single pitch as well as reading rhythmically challenging etudes notated for their respective instruments.

Composition. Given that composition activities have been found to be one of the most stable predictors of sight-reading achievement (Mishra, 2011), composition exercises were used to give students a creative outlet where they could incorporate and synthesize rhythm and pitch concepts. Students were provided
with structured composition worksheets in which they were prompted to incorporate specific rhythms in 4/4 time within a specified range and pitch set appropriate for their instrument. Compositions were restricted to 8 measures in length and were in the form of duets which required them to interact with their partner to make critical decisions as to (a) what rhythms to choose, and (b) which pitches sound best when played together. Additionally, students wrote in the counts for their compositions, counted them with their partner using egg shakers, and performed their compositions with their partner.

**Instructional Materials for Developing Knowledge of Music Theory**

**Order of Flats and Sharps.** Students were presented with worksheets that prompted them to identify, construct, and notate the order of flats and sharps. Exercises included acrostic and mnemonic devices.

**Key Signatures.** Students were presented with worksheets that prompted them to label, identify, and construct major key signatures up through 4 flats and 4 sharps. Exercises were provided in both bass and treble clefs.

**Circle of Fifths.** Students were presented with worksheets that prompted them to identify, construct, and conceptualize the circle of fifths including the ordering and visual representation of key signatures as well as the corresponding number of flats and sharps.

**Data collection**

Pre-test data were collected for sight-reading achievement, knowledge of music theory, and learner engagement domains. Additionally, students’ achievement goal-orientation and individual SES data were collected only during the pre-test
period for both groups. Posttest data included sight-reading achievement, knowledge of music theory, and learner engagement.

Student performance representing sight-reading achievement (both pre and posttest) were audio-recorded using digital MP3 devices to serve as a backup to SmartMusic assessments. To identify each recording, the beginning of each performance was preceded by a spoken identification sequence (location name, pretest or posttest, and participant number).

A paper-and-pencil test of music theory knowledge was administered before and after the treatment. The measure of learner engagement was administered before and after the treatment period with the second administration being on the last day of the intervention period. The 2x2 Achievement Goal-Oriented questionnaire was administered to all participants prior to the beginning of the intervention period.

**Data analysis**

**Analysis.** Data analyses were organized into four distinct phases. First, descriptive statistics (means, standard deviations, range, skewness) were tabulated for all variables. Second, to determine construct validity, factor analyses were performed to examine the underlying dimensionality of student responses to measures of learner engagement and achievement goal orientation. Additionally, internal reliability estimates were calculated using Cronbach's alpha (goal-orientation and learner engagement) and Kuder-Richardson-20 (music theory achievement).
Third, correlational analyses were performed to clarify relationships among all variables. Lastly, hierarchical linear modeling techniques (HLM) were used to examine the effect of method of instruction on changes in outcome variables in addition to how individual difference variables of interest might impact outcome variables at different levels. HLM is a class of multilevel modeling techniques in which traditional linear regression is manipulated to test hypotheses about how variables measured at a lower nested level effect relationships occurring at higher group levels (Bryk & Raudenbush, 1992). In contrast to single-level regression analysis, HLM is increasingly used in the social sciences and education to analyze data nested within different levels of hierarchical organization, such as students within classes (level 1) and classes within schools (level 2).

A fundamental assumption of HLM – as compared to traditional regression – is that a single linear model is not appropriate for the analysis of data across multiple hierarchical levels. Thus, a hierarchical multilevel model must be specified that examines within group effects (level 1) and between group effects (level2) while simultaneously accounting for multiple sources of variation within and between groups (Singer, 1998). Problems with traditional inferential approaches to data analysis typically include the restriction of data to vary at individual level and group levels. Specifically, individual-level analysis ignores variability at a higher group level which violates the independence of data assumption, leading to misestimated standard errors (standard errors are smaller than they should be). For example, this happens in education research when analyses are limited to the variability within classrooms, ignoring variability in the next level of grouping such
as classes within schools or schools within districts. Conversely, group-level analysis aggregates data and ignores situations where individual variables may not exert the same degree of influence as group-level variables (e.g., individual SES and school-level SES). Hierarchical models provide a solution to these problems by allowing the examination of individual and group-level effects simultaneously, thus reducing the chance of Type I error (falsely rejecting the null hypotheses of no group difference).

The building blocks of HLM are the specification of fixed and random effects. Fixed or structural effects are variables of interest and can include continuous and categorical variables. In this study, fixed effects were a) method of instruction (categorical) and b) individual difference variables (continuous). Random or error effects (sometimes called stochastic effects) are the different sources of error present in the data and in HLM are called covariance parameters. Simultaneously computed using HLM, covariance parameters at level 1 estimate the error associated within groups (or in this case within classes) and at level 2, estimate the error between groups (or in this case between schools assigned to symmetrical or asymmetrical PAL conditions). Although it might not seem readily obvious, the inclusion of random effects at multiple levels allows for intercepts and slopes to vary within one model, whereas traditional linear regression does not (Singer & Willet, 2003).
CHAPTER IV

Results

The purpose of this study was to examine the effect of peer-assisted learning (PAL) on student achievement and engagement in the middle school instrumental music classroom. More specifically, 7th-grade band students’ sight-reading achievement, music theory knowledge, and self-reported learner engagement were compared across two PAL instructional arrangements that paired students in either symmetrical or asymmetrical dyads. Additionally, socio-economic status and achievement goal orientation were examined for potential moderating effects.

Data obtained from 261 participants representing six 7th-grade middle school bands were analyzed using the Statistical Analysis System (SAS, version 3.1 for Windows, 2012), R64 (version 2.15.1, 2012), and the Statistical Package for the Social Sciences (SPSS, version 21, 2012). Results are presented in three major sections: descriptive results including reliability and factor analyses, correlations between dependent and individual difference variables, and inferential tests of main effects and interactive effects for method of instruction and individual difference variables using hierarchical linear modeling.

In addition to basic descriptive and reliability analyses, construct validity was evaluated using factor analysis to determine the underlying dimensions of achievement goal orientation and student engagement measures. Correlational analyses were performed to determine the relationships between achievement and individual difference variables. Finally, to examine the direct and interactive effects of group condition on student achievement and engagement, hierarchical linear
modeling (HLM) analyses were used to examine data nested within naturally occurring hierarchies (i.e., students nested within one classroom, and classrooms nested within schools). Abstract and fitted models are provided.

**Descriptive Analyses**

**Participant Data.** A total of six middle schools from a major Rocky-Mountain metropolitan school district were included in this study. Data corresponding to group assignment, school enrollment, student race/ethnicity and economic diversity are summarized below in Table 1.

Table 1

<table>
<thead>
<tr>
<th>School</th>
<th>Group</th>
<th>School Enrollment</th>
<th>School Demographic Profile</th>
<th>Lunch Subsidy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>African American</td>
<td>Native American</td>
</tr>
<tr>
<td>1</td>
<td>Sym</td>
<td>1104</td>
<td>0.01%</td>
<td>0.03%</td>
</tr>
<tr>
<td>2</td>
<td>Asym</td>
<td>1098</td>
<td>0.50%</td>
<td>0%</td>
</tr>
<tr>
<td>3</td>
<td>Asym</td>
<td>1120</td>
<td>1%</td>
<td>0.50%</td>
</tr>
<tr>
<td>4</td>
<td>Sym</td>
<td>1013</td>
<td>1.50%</td>
<td>0.40%</td>
</tr>
<tr>
<td>5</td>
<td>Asym</td>
<td>748</td>
<td>1.50%</td>
<td>0.10%</td>
</tr>
<tr>
<td>6</td>
<td>Sym</td>
<td>674</td>
<td>0.40%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Each middle school had a total of one 7th-grade band with an average enrollment of 43 (enrollment ranged from 31-63 students) for a total of 261 participants across all six schools. Student participants had been playing their band instruments for an average of 14.67 months (SD=1.13). Private study participation
was relatively limited at 4.7%, while 59% of all students reported having at least one sibling or a parent that plays a musical instrument.

**Factor Analyses.** Factor analysis refers to a range of statistical techniques applied to a single set of variables when a researcher is interested in discovering which variables are correlated with one another but largely independent of other variables that combine to form interpretable factors (Tabachnick & Fidell, 2007). Two types of factor analysis are common: Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). While CFA relies upon *a priori* assumptions provided by a guiding theory, EFA is not predicated upon the guidance of preexisting theory to identify underlying factors (Vogt, 2005). Despite these differences, both types of factor analysis are commonly used to determine the construct validity of a test or research measure (Gorsuch, 1983).

Exploratory factor analyses were used to investigate the underlying dimensions of student responses to achievement-goal orientation (Elliot & McGregor, 2001; Miksza, 2009) and learner engagement (Skinner, Kinderman, & Furrier, 2008; Wellborn, 1991) measures. The measure of learner engagement used in this study was originally constructed based upon a 2x2 model of where engagement and disaffection dimensions are each represented by a behavioral and emotional sub-domain. Similarly, the measure of achievement goal orientation was constructed based upon a 2x2 model where mastery and performance orientations are each represented by approach and avoidance sub-domains.

A primary concern for researchers when employing factor analysis is sample size and the selection of factors. In order to ensure a relatively stable and reliable
correlation matrix, a general rule is that the sample either needs to be larger than 100 participants or that the ratio of participants to variables be greater than 5:1 (Brown, 2009). The data in this study exceed the minimum threshold for both sample and ratio expectations. The sample size and participant to variable ratios for each measure analyzed using factor analysis is presented in Table 2. To determine the number of factors extracted from the data, eigenvalues of 1.00 or higher were considered in addition to a priori subscales based upon existing theory.

<table>
<thead>
<tr>
<th>Measure</th>
<th># of Respondents</th>
<th># of Variables</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement Goal Orientation</td>
<td>261</td>
<td>12</td>
<td>22:01</td>
</tr>
<tr>
<td>Engagement</td>
<td>261</td>
<td>20</td>
<td>13:01</td>
</tr>
</tbody>
</table>

Because neither the engagement or achievement goal orientation measures had been used in a middle school band context, the goal of conducting these factor analyses was to a) determine whether the underlying factor structure of each measure corresponds to the related theories (e.g., 2 x 2 model), and b) to identify more simple factor structures, as suggested by previous researchers (e.g., Van Ryzin et al., 2009) if empirically supported.

Factor Analyses for Engagement. Participant responses to the measure constructed by Wellborn (1991) for assessing engagement (i.e., active, goal-directed, persistent, and focused interactions with the intent for social, cognitive, and physical learning) and adapted by the researcher for use in a middle school band context were factor analyzed. A principal axis extraction method was used and oblique (oblimin and promax) and orthogonal (varimax) rotations were compared.
In all comparisons, the eigenvalue for Factor 1 was of a much greater magnitude than the eigenvalues for all other factors (e.g., factor 1=6.98, factor 2=1.28, factor 3=1.25, factor 4=1.02). The analysis that produced a one-factor solution (promax rotation with Kaiser normalization) required the fewest number of iterations (8) to converge, yielded the most clearly interpretable results, and accounted for the greatest amount of cumulative variance (58.06%). Additionally, given that interfactor correlations were, on average, above .5 for the multi-factor solutions, a one-factor solution treating engagement as a unidimensional construct, and supported by the findings of Van Ryzin et al. (2009), was adopted for subsequent correlational and HLM analyses.

**Factor Analyses for Achievement Goal Orientation.** Participant responses for the measure assessing achievement goal orientation (Elliot & McGregor, 2001; Miksza, 2009) were factor analyzed. A principal axis extraction method was used and oblique (oblimin and promax) and orthogonal (varimax) rotations were compared. A four-factor solution using promax rotation with Kaiser normalization required the fewest number of iterations (4) to converge, provided the greatest conceptual clarity and yielded the greatest amount of cumulative variance (52%). The pattern of factor loadings provided partial support for the findings of previous researchers (e.g., Miksza, 2009, Schmidt, 2005). However, only mastery-approach sub-scale scores were chosen to be used in further analyses on the basis that a) mastery-approach items accounted for nearly half of the proportion of the total variance (24%) in achievement goal orientation, b) mastery-approach items yielded the highest levels of reliability and internal consistency ($\alpha = .89$), and c) previous
research in motivation has shown a mastery-approach orientation to be associated with high achievement and engagement (e.g., Elliot, 1999; Elliot & McGregor, 2001).

**Reliability of Dependent Variables.** Reliability analyses were calculated for the researcher-constructed measure that assessed music theory knowledge. Items on this measure were dichotomously scored (i.e., 0 for an incorrect response; 1 for a correct response) which requires the use of the Kuder-Richardson 20 test of internal consistency (Kuder & Richardson, 1937). The KR-20 test is similar to Cronbach’s alpha, which is used to measure reliability for continuous variables such as Likert-type response items. Analyses indicate a high degree of internal consistency among responses to the music theory knowledge measure (.91).

Reliability analyses for the measure of learner engagement were computed using the Cronbach’s alpha estimate of internal consistency. Analyses indicate a moderately high reliability coefficient for the measure (α=.74) as a whole in addition to each of the four sub-scales (α=.71-.76). These findings are consistent with the reliability coefficients reported by previous researchers with high school students (e.g., Skinner, Kindermann, & Furrier, 2008).

*SmartMusic reliability.* The assessment feature included in SmartMusic © (2012), provides immediate assessment information to the performer regarding pitch and rhythmic accuracy. Using a percentage correct approach, the program tabulates a percentage (0-100) score by subtracting any incorrect pitches and rhythms from a total number of points possible, then dividing this number by the total number of points possible. Total possible points for pitch are determined by
assigning each notated pitch one point regardless of rhythmic value (e.g., one measure of 4/4 time with four quarter notes would represent 4 possible points). Conversely, notated rhythmic values are compared to a background subdivision at the 16th note level at the chosen tempo, where each rhythmic subdivision represents one point (e.g., one measure of 4/4 time would represent 16 possible points).

Previous studies have established the validity and reliability of the SmartMusic © assessment feature. A high degree of concurrent validity (.84–.91) has been found by technology developers and independent scholars alike (e.g., Karas, 2005; Lee, 2007; Sidwell-Frame, 2009), by comparing the scores of independent judges with computer generated scores. Independent evaluation of assessment consistency using test-retest methods with live student performances has also revealed a high degree of reliability (.82) (Buck, 2008; Karas, 2005). Moreover, SmartMusic © developers have also established a high degree of reliability using test-retest methods (Massoth, D., personal correspondence, December 3, 2012).

**Individual Difference Variables.** Socio-economic status (composite SES measure) and motivation (mastery-approach achievement orientation) were conceived in this study as individual difference variables and not as main outcome variables. Thus, SES and motivation were treated as covariates that might potentially moderate the influence of method of instruction on outcome variables of interest (sight-reading achievement, music theory knowledge, learning engagement).
Socioeconomic Status. Individual socio-economic status was measured by asking participants to respond to six questions regarding their parents’ employment, parents’ level of education, current family structure, and lunch subsidy. Individuals responded to one of three options for each question, where a score of “3” equated to highest level of SES and a score of “1” equated to the lowest level of SES. Responses for all six items were combined to yield a single SES score with a maximum of 18 (high SES) and a minimum of 6 (low SES). Means and standard deviations, reflecting individual student SES aggregated at the school level, are presented below in Table 3. On average, participants in schools 1-4 reported moderately high SES while those in schools 5-6 reported moderate to moderately low SES. Additionally, the standard deviations for schools 5-6 are higher than those for schools 1-4, reflecting greater variability in socio-economic status among 7th grade band students attending those schools and participating in the study.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Individual SES Means and Standard Deviations by School Band</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>School</td>
</tr>
<tr>
<td>Father Current Employment</td>
<td></td>
</tr>
<tr>
<td>Mother Current Employment</td>
<td></td>
</tr>
<tr>
<td>Father’s Education</td>
<td></td>
</tr>
<tr>
<td>Mother’s Education</td>
<td></td>
</tr>
<tr>
<td>Current Family Structure</td>
<td></td>
</tr>
<tr>
<td>Lunch Subsidy</td>
<td></td>
</tr>
<tr>
<td>Cumulative Average</td>
<td></td>
</tr>
</tbody>
</table>

Note. The possible response range for subscales is 0-3 and for the measure overall is 0-18, with higher scores representing higher levels of SES. Employment: 1=not working; 2=part-time; 3=full-time. Education: 1=some HS; 2=HS Grad; 3=College Grad. Family Structure: 1=One Parent; 2=Parent & Step-parent; 3=Mother & Father. Lunch Subsidy: 1=free lunch; 2=reduced cost lunch; 3=no subsidy.
**Achievement-Goal Orientation.** Individual achievement goal orientation was measured by asking participants to indicate the degree to which they felt like each of twelve statements accurately described their motivation in band. Participant responses were measured on a 5-point Likert-type scale (1=not at all true of me; 3=somewhat true of me; 5=very true of me). These statements address different aspects of mastery and performance goal orientations in band. Examples included: “I want to learn as much as possible about playing my instrument,” and “It is important for me to do well when compared to other students in band.” The scoring of negatively phrased items was reversed to reflect each participant's level of motivation. Each of the four underlying motivation orientations (mastery-approach, mastery-avoid, performance-approach, performance-avoid) was addressed through three questions, with a total of twelve questions comprising all four achievement-goal orientation domains. Each of the four domains had a maximum possible score of 15. Tests of internal consistency (Cronbach's alpha) yielded moderately high reliability for the mastery-approach sub-scale (.81) and adequate reliability for mastery-avoid and performance approach subscales (.75 and .77 respectively), but less-than-adequate reliability for the performance-avoid sub-scale (.56).

Means and standard deviations for each school broken down by motivation orientation are included below in Table 4. On average, students reported high mastery-approach orientations, moderate mastery-avoid orientations, and relatively high performance approach and avoid orientations.
Outcome Variables. Outcome variables included pre and post testing in the following areas: sight-reading performance, knowledge of key signatures (music theory), and learner engagement.

Sight-Reading Achievement. Individual sight-reading achievement was measured for each student twice; once before the treatment period began to establish a baseline measurement, and once after the treatment concluded to determine the effect of method of instruction. On both occasions, each student individually performed a 16-measure melodic etude on his or her instrument using SmartMusic. While the researcher-composed pre and post etudes were not exactly the same, each etude was performed at quarter note=78 beats per minute and delimited to the first five notes of the concert Bb scale and syncopated rhythms using eight, quarter, and half note values in 4/4 time (dotted rhythms were excluded). Scores for sight-reading achievement were calculated using the SmartMusic Assessment Feature whereby each student was given a score between 0-100% depending on their pitch and rhythmic accuracy after completing the exercise. Means and standard deviations for sight-reading achievement, by school

<table>
<thead>
<tr>
<th>School</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery Approach</td>
<td>14.4</td>
<td>0.94</td>
<td>12.9</td>
<td>2.7</td>
<td>13.5</td>
<td>1.7</td>
</tr>
<tr>
<td>Mastery Avoid</td>
<td>6.75</td>
<td>3.5</td>
<td>8</td>
<td>3.1</td>
<td>7.8</td>
<td>3.2</td>
</tr>
<tr>
<td>Performance Approach</td>
<td>9.39</td>
<td>3.64</td>
<td>10.98</td>
<td>3.5</td>
<td>9.94</td>
<td>3.26</td>
</tr>
<tr>
<td>Performance Avoid</td>
<td>11.34</td>
<td>3.12</td>
<td>11.6</td>
<td>3</td>
<td>12.5</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Note. Sub-scale range is from 0 to 15 with higher values representing higher levels of specified achievement goal orientation.
and comparison group, are presented in Table 5. Mean sight-reading achievement increased for student participants in each school while standard deviations remained relatively stable.

Table 5
Means and Standard Deviations for Sight-Reading Achievement

<table>
<thead>
<tr>
<th>School</th>
<th>Group</th>
<th>SR Pre M (SD)</th>
<th>SR Post M (SD)</th>
<th>Pre-Posttest SR Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Symmetrical</td>
<td>35 (18.1)</td>
<td>47.2 (19.5)</td>
<td>12.2</td>
</tr>
<tr>
<td>2</td>
<td>Asymmetrical</td>
<td>25.9 (17.5)</td>
<td>38.6 (17.5)</td>
<td>12.7</td>
</tr>
<tr>
<td>3</td>
<td>Asymmetrical</td>
<td>35.6 (19.8)</td>
<td>43.2 (19.4)</td>
<td>7.6</td>
</tr>
<tr>
<td>4</td>
<td>Symmetrical</td>
<td>39.2 (15.3)</td>
<td>45.9 (16.5)</td>
<td>6.7</td>
</tr>
<tr>
<td>5</td>
<td>Asymmetrical</td>
<td>27.2 (12.9)</td>
<td>39.2 (18.7)</td>
<td>12.1</td>
</tr>
<tr>
<td>6</td>
<td>Symmetrical</td>
<td>12.8 (8.0)</td>
<td>18.1 (9.2)</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Note. SR achievement scores range from 0-100.

Theory Knowledge Achievement. Music theory knowledge was measured using a researcher-constructed test that was comprised of 36 questions pertaining to the order of sharps and flats, major key signature identification, and the construction of the circle of fifths. The music theory knowledge test was administered to each student twice; once before the treatment period began and once after treatment period had concluded. The range of possible scores was 0-36. Means and standard deviations, broken down by school and comparison group, are presented in Table 6 below. On average, the mean scores for each school increased while standard deviations grew larger on the post-test, indicating improvement, but also a greater degree of variability in achievement scores, following PAL.
Table 6
Means and Standard Deviations for Music Theory Achievement

<table>
<thead>
<tr>
<th>School</th>
<th>Group</th>
<th>Theory Pre M (SD)</th>
<th>Theory Post M (SD)</th>
<th>Pre-Posttest Theory Diff Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Symmetrical</td>
<td>14 (4.1)</td>
<td>22.9 (6.8)</td>
<td>8.9</td>
</tr>
<tr>
<td>2</td>
<td>Asymmetrical</td>
<td>7.1 (6.3)</td>
<td>15.9 (8.0)</td>
<td>8.7</td>
</tr>
<tr>
<td>3</td>
<td>Asymmetrical</td>
<td>10.1 (7.8)</td>
<td>16.9 (6.7)</td>
<td>6.8</td>
</tr>
<tr>
<td>4</td>
<td>Symmetrical</td>
<td>3.6 (1.9)</td>
<td>14.9 (7.4)</td>
<td>11.3</td>
</tr>
<tr>
<td>5</td>
<td>Asymmetrical</td>
<td>2.5 (2.0)</td>
<td>12.1 (5.9)</td>
<td>9.6</td>
</tr>
<tr>
<td>6</td>
<td>Symmetrical</td>
<td>3.1 (1.6)</td>
<td>9.9 (7.2)</td>
<td>6.8</td>
</tr>
</tbody>
</table>

Note. Music Theory Achievement range is from 0 to 36.

Learner Engagement. Individual learner engagement was measured using the learner engagement student report, as constructed by Wellborn (1991) and adapted by the researcher. The 20-item measure includes statements regarding behavioral and emotional engagement with the learning environment. Students indicate the extent that they agree with each statement using a four-point Liker-type scale; 1=not at all true of me; 2=slightly true; 3=moderately true; 4=very true. Examples of statements include: “In band, I work as hard as I can,” “When I’m in band, I listen carefully,” and “when I’m in band, I just act like I’m working.” The negatively phrased items were reverse scored to properly reflect each student’s level of engagement. Pre and post treatment means and standard deviations, by school and comparison group, are listed below in Table 7. Engagement scores were remarkably stable across all schools and both PAL conditions.
Method of Instruction. The experimental design of this study included the comparison of two types of peer-assisted learning: symmetrical PAL where students were paired with a partner of relatively equal ability, and asymmetrical PAL where students were paired with a partner of divergent ability. Three schools were assigned to each instructional arrangement. Means and standard deviations for each outcome (dependent) variable, across the two PAL conditions, are presented below in Table 8. A visual inspection of pretest-to-posttest mean differences suggests that students assigned to the asymmetrical PAL arrangement may have experienced improved sight-reading achievement to a greater extent than those assigned to the symmetrical PAL instructional arrangement. Differences for music theory knowledge and learning engagement are small by comparison and/or in relation to the scale metrics. More definitive interpretations require a statistical test for group differences (see group level analyses reported below).
Correlational Analyses

Few researchers have considered PAL effects on both achievement and motivational outcomes, nor have they explored how such outcomes might be related. Table 9 below presents simple bivariate correlations (Pearson r) for all pretest outcome variables (i.e., sight-reading, music theory, and engagement) and individual difference (covariate) variables (mastery approach goals/motivation or MotMAP, and socioeconomic status or SES).

Table 9

<table>
<thead>
<tr>
<th>Outcome Variables</th>
<th>SR Pre</th>
<th>Theory Pre</th>
<th>Eng Pre</th>
<th>MotMAP</th>
<th>SES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR Pre</td>
<td>1</td>
<td>.257**</td>
<td>.170**</td>
<td>.164**</td>
<td>.289**</td>
</tr>
<tr>
<td>Theory Pre</td>
<td>1</td>
<td>.156*</td>
<td>.127*</td>
<td>.244**</td>
<td></td>
</tr>
<tr>
<td>Eng Pre</td>
<td>1</td>
<td>1</td>
<td>.762**</td>
<td>.350**</td>
<td></td>
</tr>
<tr>
<td>MotMAP</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>.248**</td>
<td></td>
</tr>
<tr>
<td>SES</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).
As can be seen in table 9, all outcome and individual difference variables are significantly and positively correlated, but most of the relationships are of a weak to modest magnitude \((r = .30\) or less). Overall, the strongest relationship is between motivation and engagement. As motivation theory would suggest, students who possess higher levels of mastery-approach goal orientation also exhibit higher levels of engagement \((r = .762)\). There also is a moderate relationship \((r = .350)\) between SES and learning engagement. The relatively small relationships between knowledge/skill outcomes (sight-reading and music theory) and the other variables suggest that student achievement in 7th-grade band is not directly linked to their motivation or socio-economic status. Lastly, the modest correlations between sight-reading and music theory outcomes demonstrate that while these facets of student achievement in sight reading and music theory knowledge are somewhat related, they clearly represent different forms of musical knowledge and skill.

**Group Level (Method of Instruction) Analyses**

Hierarchical linear modeling techniques (HLM) were used to examine the effect of method of instruction on changes in outcome variables in addition to how individual difference variables of interest might impact outcome variables at different levels. HLM is a class of multilevel modeling techniques in which traditional linear regression is manipulated to account for non-independence due to the nesting of students or classes within schools. As a result, a researcher can examine variation both within schools between students (level 1) and between schools (level 2) (Bryk & Raudenbush, 1992). In contrast to single-level regression analysis, HLM is increasingly used in the social sciences and education to analyze
data nested within different levels of hierarchical organization, such as students within classes (level 1) and classes between schools (level 2). If the traditional regression approach were used, with such nested groups, the independence assumption would likely be violated.

A fundamental assumption of HLM, as compared to traditional regression, is that a single linear model is not appropriate for the analysis of data across multiple hierarchical levels due to different variances at different levels within a preexisting hierarchy. Thus, a hierarchical multilevel model must be specified that examines within school effects between students (level 1) and between school effects (level 2) while simultaneously accounting for multiple sources of variation within and between schools (Singer, 1998).

The building blocks of HLM are the specification of fixed and random effects. Fixed or structural effects are variables of interest and can include continuous and categorical variables. In this study, fixed effects were a) method of instruction (categorical) and b) individual difference variables (continuous) and their interactions. Random or error effects (sometimes called stochastic effects) are the different sources of error present in the data and in HLM are called covariance parameters. Simultaneously computed using HLM, covariance parameters at level 1 estimate the error associated within groups (or in this case within classes between students) and at level 2, estimate the error between groups over and above any fixed effects (or in this case residual between schools in terms of symmetrical or asymmetrical PAL conditions). Although it might not seem readily obvious, the inclusion of random effects at multiple levels allows for intercepts and slopes to
vary within one model, whereas traditional linear regression does not allow for this variation (Singer & Willet, 2003).

The presentation of HLM results will focus first on random effects to establish that there are no between group differences to address the independence of observation assumption required when using inferential statistics. After this assumption has been satisfied, the results pertaining to fixed effects (i.e., the effect of independent variables on dependent variables including the moderating effects of SES and motivation) will be reported.

**Abstract Models.** Abstract hierarchical models for analysis, which can be applied to each dependent outcome variable, are constructed and specified below. Pre-posttest change in sight-reading achievement was used as the outcome (dependent) variable in these illustrative models. However, the basic model designs remain the same when substituting the other two outcome variables (pre-post theory achievement difference, and pre-post engagement difference). While level 1 and level 2 models are specified below to make it clear how each hierarchical level functions abstractly, it is the full models that are being used for HLM analyses in this study.

*The effect of method of instruction on sight-reading achievement*

\[ Y_{ij} = \beta_{0j} + e_{ij} \]  
\[ Y_{ij} \]: is the pre-post difference SR achievement for the 'i'th student in the 'j'th school
\[ \beta_{0j} \]: the mean difference in SR for the 'j'th school
\[ e_{ij} \]: random variation in SR difference for the 'i'th student in the 'j'th school

*This model is analogous to a one-way ANOVA*
\[ \beta_{0j} = a_{00} + a_{01} \text{Group} C + \mu_{ij} \]  
(level 2 – between school)

\[ \beta_{0j}: \text{mean pre-post SR difference for each school} \]
\[ a_{00}: \text{the overall SR difference mean across schools} \]
\[ a_{01}: \text{slope estimates the mean difference between groups in pre-post SR achievement} \]
\[ \text{Group} C: \text{centered level 2 variable indicating PAL group (-1 for sym; +1 for asym)} \]
\[ \mu_{ij}: \text{variation in the school means around the mean for their respective group} \]

\[ Y_{ij} = a_{00} + a_{01} \text{Group} C + \mu_{ij} + e_{ij} \]  
(full model)

*Both error terms (\( \mu_{ij} \) and \( e_{ij} \)) are included to account for level 1 & 2 dependence due to school allowing for a different error term for between within schools (level 1) and between schools (level 2).*

The next two models presented below are designed to test the interaction effects of SES and motivation as covariates.

*The effect of method of instruction on sight-reading achievement moderated by Mastery-Approach goal orientation*

\[ Y_{ij} = \beta_{0j} + \beta_{1j} \text{Mot} C_{ij} + e_{ij} \]  
(level 1 – within school)

\[ Y_{ij}: \text{is the pre-post SR achievement for the } i^{th} \text{ student in the } j^{th} \text{ school} \]
\[ \beta_{0j}: \text{the mean difference in SR for the } j^{th} \text{ school controlling for motivation} \]
\[ \beta_{1j}: \text{the effect of motivation on SR change in the } j^{th} \text{ school} \]
\[ \text{Mot} C_{ij}: \text{level 1 covariate (motivation) used to predict changes in SR difference} \]
\[ e_{ij}: \text{random error (within school) in SR difference for the } i^{th} \text{ student in the } j^{th} \text{ school} \]

controlling for their motivation

\[ \beta_{0j} = a_{00} + a_{01} \text{Group} C + \mu_{0j} \]  
(level 2 – between school)

\[ \beta_{1j} = a_{10} + a_{11} \text{Group} C + \mu_{1j} \]

\[ \beta_{0j}: \text{school-level means for pre-post SR difference (symmetrical PAL group)} \]
\[ \beta_{1j}: \text{school-level means for pre-post SR (asymmetrical PAL group)} \]
\[ a_{00}: \text{the overall SR difference mean controlling for group and within group motivation} \]
\[ a_{01}: \text{the overall mean difference in SR achievement controlling for between group and within group motivation} \]
\[ a_{10}: \text{the mean motivation effect across schools (does motivation relate to change)} \]
\[ a_{11}: \text{the interaction effect of group by motivation on SR change (estimates the mean difference in motivation and SR change for the two groups)} \]
\[ \text{Group} C: \text{contrast coded centered level 2 predictor indicating PAL group (-1 for symmetrical; +1 for asymmetrical)} \]
\( \mu_{0j} \): error around the overall SR difference mean for (-1 for sym)

\( \mu_{1j} \): error around the overall SR difference mean for (+1 for asym)

\[ Y_{ij} = a_{00} + a_{01} \text{GroupC} + a_{10} \text{MotC} + a_{11} \text{GroupCxMotC} + \mu_{0j} + \mu_{ij} \text{MotC} + e_{ij} \] (full model)

* Three error terms \( (\mu_0, \mu_{ij}, \text{and } e_{ij}) \) are included to account for level 1 & 2 random error

**The effect of method of instruction on sight-reading achievement moderated by SES**

\[ Y_{ij} = \beta_{0j} + \beta_{1j} \text{SESC}_{ij} + e_{ij} \] (level 1 – within school)

\( Y_{ij} \): is the pre-post SR achievement for the 'i'th student in the "j"th school

\( \beta_{0j} \): the mean difference in SR minus error for the "j"th school

\( \beta_{1j} \text{SESC}_{ij} \): level 1 covariate (SES) to predict changes in SR difference

\( e_{ij} \): random variation in SR difference for the 'i'th student in the "j"th school

\[ \beta_{0j} = a_{00} + a_{01} \text{GroupC} + \mu_{0j} \] (level 2 – between school)

\[ \beta_{1j} = a_{00} + a_{11} \text{GroupC} + \mu_{1j} \]

\( \beta_{0j} \): school-level means for pre-post SR difference (symmetrical PAL group)

\( \beta_{1j} \): school-level means for pre-post SR (asymmetrical PAL group)

\( a_{00} \): the overall SR difference mean controlling for group and within group SES

\( a_{01} \): the overall mean difference in SR achievement controlling for between group and within group SES

\( a_{10} \): the mean motivation effect across schools (does SES relate to change)

\( a_{11} \): the interaction effect of group by SES on SR change (estimates the mean difference in motivation and SR change for the two groups)

\( \text{GroupC} \): contrast coded centered level 2 predictor indicating PAL group (-1 for symmetrical; +1 for asymmetrical)

\( \mu_{0j} \): error around the overall SR difference mean for (-1 for sym)

\( \mu_{1j} \): error around the overall SR difference mean for (+1 for asym)

\[ Y_{ij} = a_{00} + a_{01} \text{GroupC} + a_{10} \text{SESC} + a_{11} \text{GroupCxSESC} + \mu_{0j} + \mu_{ij} \text{SESC} + e_{ij} \] (full model)

* Three error terms \( (\mu_0, \mu_{ij}, \text{and } e_{ij}) \) are included to account for level 1 & 2 random error

**Analysis of Pre-Posttest Sight-reading Achievement Change.** Results for the model using treatment condition to explain overall pre-posttest changes in sight-reading achievement are shown in Table 10. Tests of fixed effects indicate a significant change in pre-post sight reading achievement for the overall sample
(t=7.7, p<.01), however no significant differences in pre-posttest sight reading achievement between symmetrical and asymmetrical PAL conditions were found (t=-.83, p>.05). Parameter estimates indicate that, on average, individuals improved roughly 9.6% on sight-reading achievement between pre and posttests regardless of method of instruction.

Tests of random effects to examine the error distribution between students within each school indicate that variance for pre-post differences in sight-reading achievement is significantly different than 0 (z=11.26, p<.0001), while variance in pre-posttest sight-reading differences between schools were non-significant (z=.038, p>.05). This indicates that variability between students within each individual classroom was relatively similar for all schools on pre-posttest change in sight-reading achievement while differences in pre-posttest variance in sight-reading achievement between schools was nominal.

Table 10

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>df</th>
<th>t value (z value)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (between group error)</td>
<td>0.000301</td>
<td>0.000787</td>
<td></td>
<td>(0.038)</td>
<td>0.351</td>
</tr>
<tr>
<td>Residual (within group error)</td>
<td>0.0269</td>
<td>0.002394</td>
<td></td>
<td>(11.26)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Fixed Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (test of SR diff entire group)</td>
<td>0.096</td>
<td>0.01247</td>
<td>2.68</td>
<td>7.7</td>
<td>0.0067</td>
</tr>
<tr>
<td>groupc (test for effect of group on SR diff)</td>
<td>-0.0104</td>
<td>0.01247</td>
<td>2.68</td>
<td>-0.83</td>
<td>0.4721</td>
</tr>
</tbody>
</table>

Note. Group is a contrast coded predictor (-1 symmetrical; +1 asymmetrical) and centered. Tests of significance for Random Effects are reported using standardized scores (z).

Tests of random effects in the model using SES and treatment condition to explain pre-post sight-reading change (Table 11) indicate that the error distribution between treatment groups controlling for average SES (SES is centered using the
grand-mean) does not significantly vary from 0, regardless of treatment condition. The error distribution within schools on pre-posttest sight reading change, however, is significant ($z=11.34, p<.0001$). This indicates that schools vary similarly in their distribution of residual error (level 2) while within school distribution of (between student) residual error (level 1) on pre-post sight reading change controlling for average SES is significant regardless of treatment condition. In other words, when controlling for SES, the spread of sight-reading scores within each school was similar across all schools.

**SES and sight-reading achievement.** Tests of fixed effects indicate that pre-posttest changes in sight-reading achievement remain significant when controlling for average SES regardless of treatment condition ($t=9.31, p<.0001$). The effect of treatment condition on pre-posttest sight-reading change controlling for the average level of SES was non-significant ($t=-1.31, p=.19$). However, a marginally significant interaction effect was found between treatment group and average SES ($t=-1.72, p=.085$). Further examination of this interactive relationship is warranted, especially given the difficulty of finding significant moderating effects when using HLM with samples of under eight hundred participants (Singer & Willet, 2003).
As shown in Figure 2, the marginally significant impact of SES on pre-posttest sight-reading change is dependent upon treatment condition. While pre-posttest sight-reading change scores remain relatively similar for students in the symmetrical PAL condition, sight-reading change scores are more varied for students at different levels of SES in the asymmetrical group. Students with average SES tend to have higher pre-post sight-reading change in the symmetrical PAL condition than in the asymmetrical group. Students with SES scores one standard deviation lower than the average SES score (15.3-2.42= 12.88) tend to have relatively similar pre-posttest sight-reading achievement gains. However, students in the symmetrical PAL condition who are one standard deviation above the average SES score (15.3+2.42= 17.72) tend to have roughly 5% higher sight-reading achievement gains than do students in the asymmetrical PAL condition. Again, this effect is only marginally significant but given the exploratory nature of this study the results are shown here to highlight an interaction that may warrant further investigation.
Motivation and sight-reading achievement. As was the case with SES, the random error distribution between schools regarding changes in pre-post sight-reading achievement when controlling for motivation is non-significant. Moreover, random error in motivation between schools does not vary significantly from 0. However, as was the case when examining SES, when controlling for motivation, random error within schools on pre-posttest sight-reading achievement does vary significantly ($z=11.19, p<.0001$).

Tests of fixed effects indicate that when controlling for motivation and treatment condition, the changes in pre-posttest sight-reading scores are significant across all participants ($t=8.62, p<.05$). However, the main effect for motivation (mastery approach goal orientation) and the interaction effect for motivation and treatment condition were non-significant.
Table 12

The effect of Treatment Group and SES on Pre-Posttest Differences in Sight-Reading Achievement

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>df</th>
<th>t value (z value)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (between group error)</td>
<td>0.000094</td>
<td>0.000719</td>
<td>0.13</td>
<td>0.4478</td>
<td></td>
</tr>
<tr>
<td>motmapc (between group error)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Residual (within group error)</td>
<td>0.02719</td>
<td>0.002413</td>
<td>11.19</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>Fixed Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (test of SR diff entire group)</td>
<td>0.09564</td>
<td>0.0111</td>
<td>2.01</td>
<td>8.62</td>
<td>0.0129</td>
</tr>
<tr>
<td>groupc (test for effect of group on SR diff)</td>
<td>-0.01006</td>
<td>0.0111</td>
<td>2.01</td>
<td>-0.91</td>
<td>0.4599</td>
</tr>
<tr>
<td>motmapc</td>
<td>0.004344</td>
<td>0.005151</td>
<td>108</td>
<td>0.84</td>
<td>0.4009</td>
</tr>
<tr>
<td>groupc*motmapc</td>
<td>-0.00242</td>
<td>0.005151</td>
<td>108</td>
<td>-0.47</td>
<td>0.6393</td>
</tr>
</tbody>
</table>

Note. Mastery-Approach goal orientation is centered on the grand mean and Group is contrast coded (-1, +1) and centered. Tests of significance for Random Effects are reported using standardized scores (z).

Summary. Analyses indicate that significant gains in pre-posttest sight-reading achievement were made for all students. However, there were no significant differences in sight-reading achievement due to method of instruction. This remained true when controlling for the effect of SES. A marginally significant interaction was found between SES and method of instruction indicating that SES may impact sight-reading achievement differently depending on type of PAL received. Specifically, while all students engaging in symmetrical PAL experienced similar gains in sight-reading achievement, sight-reading gains for students receiving asymmetrical PAL depended somewhat on their level of SES (see Figure 1). However, given the marginal significance of this interaction effect, further investigation is needed to confirm the impact of SES on method of instruction when studying sight-reading achievement. In terms of motivation, analyses indicated that, regardless of method of instruction, mastery-approach goal orientation had little to no impact on sight-reading achievement.
Analysis of Pre-Posttest Music Theory Knowledge Change. Tests of random effects for the model using treatment condition to predict pre-posttest music theory change (Table 13) indicate that variance between schools was non-significant \( z=.89, p=.18 \) while within schools variances were significant \( z=11.3, p<.0001 \). Tests of fixed effects indicate that pre-posttest change in music theory knowledge across all participants was significant \( t=11.38, p<.001 \). Treatment condition (symmetrical vs. asymmetrical PAL) had no significant effect \( t=.58, p=.58 \) indicating that music theory achievement gains were made by all students regardless of method of instruction.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>df</th>
<th>t value (z value)</th>
<th>p</th>
</tr>
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<tr>
<td>Intercept (between group error)</td>
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<tr>
<td>Residual (within group error)</td>
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<tr>
<td>Fixed Effects</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (test of theory diff entire group)</td>
<td>8.7061</td>
<td>0.765</td>
<td>4.2</td>
<td>11.38</td>
<td>0.0003</td>
</tr>
<tr>
<td>groupc (test for effect of group on theory diff)</td>
<td>0.4473</td>
<td>0.765</td>
<td>4.2</td>
<td>0.58</td>
<td>0.5888</td>
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</tbody>
</table>

Note. Group is a contrast coded predictor (-1 for symmetrical; +1 for asymmetrical) and is centered. Tests of significance for Random Effects are reported using standardized scores \( z \).

SES and music theory knowledge. Tests of random effects using both SES and treatment condition to explain changes in pre-post music theory achievement (Table 14) show that between school distribution of random error in pre-posttest music theory achievement change controlling for average SES is not significantly different than 0 \( z=.89, p=.18 \). The distribution of random error for SES when accounting for music theory change between schools was also not significantly different from 0.
Tests of fixed effects for the same model (Table 14) indicate that pre-posttest changes in music theory achievement were significant, controlling for treatment condition and at the average level of SES (t=10.89, p<.001). In other words, regardless of treatment condition, students representing the average level of SES made significant gains in music theory knowledge. No significant interaction effects were found between method of instruction and SES on pre-posttest music theory change (t=-1.62, p=.109).

### Table 14

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>df</th>
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<th>p</th>
</tr>
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</tr>
<tr>
<td>Intercept (between group error)</td>
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<td>2.6817</td>
<td>(0.89)</td>
<td>0.1859</td>
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</tr>
<tr>
<td>sesc (between group error)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Residual (within group error)</td>
<td>56.9059</td>
<td>5.0523</td>
<td>(11.26)</td>
<td>&lt; .0001</td>
<td></td>
</tr>
<tr>
<td>Fixed Effects</td>
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<td></td>
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</tr>
<tr>
<td>Intercept (test of SR diff entire group)</td>
<td>8.6349</td>
<td>0.7929</td>
<td>3.88</td>
<td>10.89</td>
<td>0.0005</td>
</tr>
<tr>
<td>groupc (test for effect of group on SR diff)</td>
<td>0.3816</td>
<td>0.7929</td>
<td>3.88</td>
<td>0.48</td>
<td>0.6562</td>
</tr>
<tr>
<td>sesc</td>
<td>-0.05501</td>
<td>0.1923</td>
<td>72.3</td>
<td>-0.29</td>
<td>0.7756</td>
</tr>
<tr>
<td>groupc*sesc</td>
<td>-0.3115</td>
<td>0.1923</td>
<td>72.3</td>
<td>-1.62</td>
<td>0.1096</td>
</tr>
</tbody>
</table>

*Note. Group is a contrast coded predictor (-1 for symmetrical; +1 for asymmetrical) and is centered. SES scores were centered around the grand mean. Tests of significance for Random Effects are reported using standardized scores (z).*

**Motivation and music theory knowledge.** Results pertaining to the model using motivation orientation (mastery-approach) and treatment condition (symmetrical PAL vs. asymmetrical PAL) to predict changes in pre-posttest music theory achievement are shown in Table 15. Tests of random effects show that the distribution of random error between schools relating to pre-posttest change in music theory knowledge controlling for motivation is not significantly different from 0 (z=.92, p=.17). The between school differences in motivation are also not significantly different from 0 (z=.29, p=.38). As with previous tests, the within group
(between student) distribution of random error relating to music theory change at average levels motivation was significantly different from 0 ($z=11.2$, $p<.001$).

Test of fixed effects for the same model indicate that the overall pre-posttest music theory achievement changes are significant, controlling for method of instruction and motivation ($t=10.48$, $p<.001$). Tests for interaction effects between motivation and treatment condition and their effects on music theory change were also non-significant ($t=.89$, $p=.40$).

Table 15

<p>| The Effect of Treatment Condition and Motivation on Pre-Posttest Music Theory Change |</p>
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>$df$</th>
<th>t value (z value)</th>
<th>$p$</th>
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<td>Random Effects</td>
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<td></td>
</tr>
<tr>
<td>Intercept (between group error)</td>
<td>2.7637</td>
<td>2.99</td>
<td>(0.92)</td>
<td>0.1777</td>
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</tr>
<tr>
<td>motmapc (between group error)</td>
<td>0.06016</td>
<td>0.2097</td>
<td>(0.29)</td>
<td>0.3871</td>
<td></td>
</tr>
<tr>
<td>Residual (within group error)</td>
<td>57.0474</td>
<td>5.0935</td>
<td>(11.2)</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>Fixed Effects</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (test of theory diff entire group)</td>
<td>8.7457</td>
<td>0.8342</td>
<td>3.86</td>
<td>10.48</td>
<td>0.0006</td>
</tr>
<tr>
<td>groupc (test for effect of group on theory diff)</td>
<td>0.4447</td>
<td>0.8342</td>
<td>3.86</td>
<td>0.53</td>
<td>0.6232</td>
</tr>
<tr>
<td>motmapc</td>
<td>-0.2101</td>
<td>0.2694</td>
<td>6.64</td>
<td>-0.78</td>
<td>0.4623</td>
</tr>
<tr>
<td>groupc*motmapc</td>
<td>0.2392</td>
<td>0.2694</td>
<td>6.64</td>
<td>0.89</td>
<td>0.4056</td>
</tr>
</tbody>
</table>

**Note.** Group is a contrast coded predictor (-1 for symmetrical; +1 for asymmetrical) and is centered. Mastery-approach Motivation Orientation scores were centered around the grand mean. Tests of significance for Random Effects are reported using standardized scores (z).

**Summary.** Analyses indicate that all students made significant pre-posttest gains in music theory achievement. However, as was the case with sight-reading achievement, there were no significant differences in music theory achievement due to method of instruction. When comparing the impacts that SES and motivation might have on music theory achievement, no significant interactions were found indicating that neither SES nor motivation moderates the relationship between method of instruction and music theory achievement.
Analyses of Pre-Posttest Learner Engagement Change. Results for the model using treatment condition to predict changes in pre-posttest learner engagement are shown in Table 16. Tests of random effects indicate that the distribution of random error between schools in pre-posttest engagement was not significantly different from 0, while within group variation on pre-posttest engagement was significant ($z=11.38, p<.0001$). As with previous analyses, this is important to note because it shows that error variance within classes, between students, on engagement change is similar across all groups and treatment conditions.

Tests of fixed effects indicate that differences in pre-posttest engagement scores across all students controlling for treatment are marginally significant ($t=1.68, p=.09$). However, as with previous analyses, the effect of treatment condition on pre-posttest engagement change was non-significant ($t=.65, p=.51$).

Table 16

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>df</th>
<th>t value (z value)</th>
<th>p</th>
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<tr>
<td>Random Effects</td>
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</tr>
<tr>
<td>Intercept (between group error)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Residual (within group error)</td>
<td>56.2927</td>
<td>4.9467</td>
<td>(11.38)</td>
<td>&lt;.0001</td>
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</tr>
<tr>
<td>Fixed Effects</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (test of E diff entire group)</td>
<td>0.7812</td>
<td>0.4646</td>
<td>259</td>
<td>1.68</td>
<td>0.0939</td>
</tr>
<tr>
<td>groupc (test for effect of group on E diff)</td>
<td>0.3009</td>
<td>0.4646</td>
<td>259</td>
<td>0.65</td>
<td>0.5178</td>
</tr>
</tbody>
</table>

Note. Group is a contrast coded predictor (-1 for symmetrical; +1 for asymmetrical) and is centered. Tests of significance for Random Effects are reported using standardized scores ($z$).

SES and learner engagement. Results for the model using treatment condition and SES to predict changes in pre-posttest engagement scores are shown in Table 17. Tests of random effects for this model again show that the distribution of
random error between schools for pre-posttest change in learner engagement controlling for SES was not significantly different from 0. Similar to previous analyses, the distribution of random error within schools relating to pre-posttest changes in learner engagement was significantly different from 0 (z=11.34, p < .0001).

Tests for fixed effects indicate that pre-posttest changes in engagement controlling for treatment condition and the average level of SES were non-significant (t=1.53, p=.12). However, the effect of SES on engagement change, controlling for treatment condition was significant (t=-3.23, p=.001) indicating that as SES increases by one point, pre-posttest engagement change decreases by .52 points. This relationship is also true in the opposite direction (i.e., as SES decreases by one point, engagement increases by .52 points).

Table 17
The Effect of Treatment Condition and SES on Pre-Posttest Engagement

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>df</th>
<th>t value (z value)</th>
<th>p</th>
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<td>Random Effects</td>
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<td></td>
</tr>
<tr>
<td>Intercept (between group error)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sesc (between group error)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Residual (within group error)</td>
<td>53.3993</td>
<td>4.717</td>
<td>(11.34)</td>
<td>&lt; .0001</td>
<td></td>
</tr>
<tr>
<td>Fixed Effects</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (test of E diff entire group)</td>
<td>0.695</td>
<td>0.4548</td>
<td>257</td>
<td>1.53</td>
<td>0.1277</td>
</tr>
<tr>
<td>groupec (test for effect of group on E diff)</td>
<td>0.156</td>
<td>0.4548</td>
<td>257</td>
<td>0.34</td>
<td>0.7319</td>
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<tr>
<td>sesc</td>
<td>-0.5245</td>
<td>0.1624</td>
<td>257</td>
<td>-3.23</td>
<td>0.0014</td>
</tr>
<tr>
<td>groupec*sesc</td>
<td>-0.3257</td>
<td>0.1624</td>
<td>257</td>
<td>-2.01</td>
<td>0.0459</td>
</tr>
</tbody>
</table>

Note. Group is a contrast coded predictor (-1 for symmetrical; +1 for asymmetrical) and is centered. SES scores were centered around the grand mean. Tests of significance for Random Effects are reported using standardized scores (z).

Additionally, SES was found to significantly moderate the relationship between method of instruction and pre-posttest change in learner engagement (t=-2.01, p=.045). As shown in Figure 3, pre-posttest changes in learner engagement are
relatively similar for all students in the symmetrical group regardless of level of SES. However, the pre-posttest changes in learner engagement for students receiving asymmetrical PAL are dependent upon the level of SES. Specifically, students who are one standard deviation below the mean SES \((15.3-2.42=12.88)\) have significantly larger gains in engagement as a result of receiving asymmetrical PAL. Perhaps most dramatic is the pre-posttest change in learner engagement for students of high SES (one standard deviation above mean SES \([15.3+2.42=17.72]\)). These students, scoring at nearly the highest level of SES (18 is the highest possible SES score), experience dramatically larger gains in engagement when participating in symmetrical PAL, as compared with asymmetrical PAL where they tend to become less engaged.

Figure 3
The Interaction Effect of Treatment Group and SES on Pre-Posttest Change in Learner Engagement

Motivation and learner engagement. Results for the model using treatment condition and motivation (mastery-approach achievement goal orientation) to
predict pre-posttest changes in learner engagement are shown in Table 18. As with previous models, tests of random effects indicate that the distribution of random error between schools on pre-posttest change in learner engagement controlling for motivation was not significantly different from 0 \((z=.24, p=.40)\). Within group (between student) distribution of random error relating to pre-posttest changes in learner engagement was significant \((z=11.16, p<.0001)\).

Tests of fixed effects indicate that pre-posttest change in learner engagement change is non-significant when controlling for method of instruction and motivation \((t=1.13, p=.32)\). The effect of method of instruction controlling for motivation is also non-significant \((t=.02, p=.98)\). However, the effect of motivation on pre-posttest change in learner engagement controlling for method of instruction is significant \((t=-3.03, p=.04)\). According to the parameter estimates for motivation and learner engagement, this finding indicates that, regardless of method of instruction, a one-point gain in motivation (mastery-approach goal orientation) results in a 1.18 point decrease in engagement. Put a different way, students with lower levels of motivation experienced greater changes in learner engagement as a result of PAL. However, when examining the relationship between method of instruction and motivation on pre-posttest engagement change, no significant interactions were found \((t=-0.8, p=.46)\).
### Table 18

**The Effect of Treatment Condition and Motivation on Pre-Posttest Music Theory Change**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>df</th>
<th>t value (z value)</th>
<th>p</th>
</tr>
</thead>
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<tr>
<td><strong>Random Effects</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (between group error)</td>
<td>2.7637</td>
<td>2.99</td>
<td>(0.92)</td>
<td>0.1777</td>
<td></td>
</tr>
<tr>
<td>motmapc (between group error)</td>
<td>0.06016</td>
<td>0.2097</td>
<td>(0.29)</td>
<td>0.3871</td>
<td></td>
</tr>
<tr>
<td>Residual (within group error)</td>
<td>57.0474</td>
<td>5.0935</td>
<td>(11.2)</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td><strong>Fixed Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (test of theory diff entire group)</td>
<td>8.7457</td>
<td>0.8342</td>
<td>3.86</td>
<td>10.48</td>
<td>0.0006</td>
</tr>
<tr>
<td>groupe (test for effect of group on theory diff)</td>
<td>0.4447</td>
<td>0.8342</td>
<td>3.86</td>
<td>0.53</td>
<td>0.6232</td>
</tr>
<tr>
<td>motmapc</td>
<td>-0.2101</td>
<td>0.2694</td>
<td>6.64</td>
<td>-0.78</td>
<td>0.4623</td>
</tr>
<tr>
<td>groupe*motmapc</td>
<td>0.2392</td>
<td>0.2694</td>
<td>6.64</td>
<td>0.89</td>
<td>0.4056</td>
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</tbody>
</table>

*Note. Group is a contrast coded predictor (-1 for symmetrical; +1 for asymmetrical) and is centered. Mastery-approach Motivation Orientation scores were centered around the grand mean. Tests of significance for Random Effects are reported using standardized scores (z).*

**Summary.** Analyses indicate that small, yet significant learning engagement gains were made by all students regardless of method of instruction. However, gains in learner engagement were dependent on level of SES. Specifically, students assigned to asymmetrical PAL with high SES tended to show decreases in engagement whereas students with low SES tended to show increases in engagement. This is in stark contrast with learner engagement scores for students assigned to symmetrical PAL whom, overall, reported similar changes in pre-posttest engagement across all levels of SES. Moreover, as was the case with analyses involving sight-reading and music theory outcomes, motivation did not moderate the relationship between method of instruction and pre-posttest changes in learner engagement.
CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study was to investigate the effect of peer-assisted learning (PAL) on music achievement and learner engagement in the middle school band context. Two specific types of PAL were compared using six different 7th-grade bands: a symmetrical arrangement where students worked together with a peer of like-ability to develop sight-reading performance and music theory knowledge, and an asymmetrical arrangement in which students worked together with a peer of divergent ability to develop sight-reading and music theory knowledge. Both types of PAL were reciprocal in that students were paired in groups of two and took turns switching between the role of teacher and student.

The sample included 261 7th-grade students in bands from six middle schools (grades 6-8) from the same school district. Following teacher and student training, students worked with a partner in twelve, twenty-minute sessions during a four-week intervention period in addition to experiencing traditional, teacher-led band rehearsals. During PAL sessions, partners worked together to improve their sight-reading ability and knowledge of basic music theory concepts using researcher-constructed materials. To examine the effect of these types of PAL learning arrangements, data on these achievement outcomes as well as learner engagement were collected before and after the four-week intervention period via researcher-constructed measures of music achievement and a preexisting measure of learner engagement (Wellborn, 1991). Additionally, data on individual student SES and
motivation orientation (i.e., mastery-approach goal orientation) were collected to examine the potential impact that these factors might have on achievement and engagement outcomes.

Initially, data were analyzed using descriptive and correlational techniques to investigate relationships among outcome and individual difference variables. Second, hierarchical linear modeling techniques were used to compare within and between-school differences and to investigate potential moderating effects of instructional arrangement, motivation, and socioeconomic status on music achievement and learner engagement outcomes. Results from analyses indicate that students across the entire sample experienced significant gains in achievement and engagement outcomes regardless of PAL arrangement. While outcomes were not found to be dependent on level of motivation, learner engagement was found to be dependent upon level of SES. Additionally, a marginally significant interaction was found between SES and sight-reading achievement suggesting that achievement in this domain may be dependent upon level of SES. Moreover, the effect that SES had on these outcomes varied by type of PAL arrangement (i.e., symmetrical or asymmetrical grouping). These results will be discussed in further detail below.

In this chapter, I will begin by summarizing the results for research questions one through five, organized by outcome variable (sight-reading and music theory achievement, and learner engagement) and further delineated by moderating variable (SES and motivation). I will then discuss the relationship between salient findings and prior research as well as key theoretical concepts including intersubjectivity, positive interdependence, cognitive conflict, and various types of
explicit and implicit mediation. In addition I will discuss the implications of the findings for practicing teachers in the secondary instrumental music context and present suggestions for future research. Lastly, I will discuss the advantages and limitations of PAL as an instructional strategy in light of these findings.

**Summary of Major Research Findings**

**Achievement Outcomes.** Results pertaining to sight-reading achievement indicate that overall, students made significant gains and improved their sight-reading ability. An examination of the spread in pretest scores reveals a large range in average sight-reading ability for each school. Despite this fact, students in all schools experienced relatively similar pre-posttest improvements suggesting that PAL may be an effective way to improve sight-reading ability. When comparing sight-reading achievement in terms of symmetrical and asymmetrical PAL groupings, the type of PAL arrangement did not significantly impact sight-reading gains. Put another way, students scored equally well in both symmetrical and asymmetrical PAL conditions.

Similar results were found when examining the effect of method of instruction on music theory achievement. Overall, students in all schools made significant gains in pre-posttest music theory achievement, regardless of PAL arrangement. Taking a closer look at music theory pretest scores, however, indicates that overall variability was larger than what was observed for pretest sight-reading scores. When interpreting these results, it is important to note the nature of the two tasks; sight-reading requires “on the spot” performance whereas the recognition and labeling of major key signatures requires a certain degree of
knowledge recall. Moreover, when completing the assessment of major key signatures, students were able to sit and reason through their answers whereas with sight-reading assessment, students were required to bring together more complex facets of music performance (e.g., the coordination and interpretation of fingerings, rhythms, articulation, etc.) after only a short amount of time to prepare. The variability in pretest achievement scores suggests that students may have been more comfortable with sight-reading tasks as compared with paper-and-pencil recall of music theory knowledge and that many students may have started this study with relatively little knowledge of music theory concepts.

Results show weak to moderate positive correlations between pretest sight-reading and music theory scores. This indicates that while scores in sight-reading improve, scores in music theory achievement also improve. The weak magnitude of this relationship, however, reveals the relative independence of these two forms of musical knowledge and ability for this sample, which are traditionally thought to be important curricular elements in the secondary instrumental music classroom.

*Relationships between Music Achievement, Motivation, and SES.* While students overall made achievements gains in sight-reading and music theory knowledge, it is important to note that other facets of individual students’ profiles, including SES and motivation may impact their ability to make achievement gains in this context. Relationships between pretest sight-reading achievement and mastery-approach motivation orientation indicate only a small positive relationship, whereas the relationship between pretest sight-reading achievement and SES is much more pronounced. This suggests that ability to sight-read has more to do with SES than it
has to do with level of motivation. Similar relationships were found between music theory achievement, motivation, and SES. These results indicate that in-terms of music achievement, motivation as measured in this study (mastery approach goal orientation) matters only marginally and that individual SES may be more related to achievement. However, the weak to moderate correlations should not be overstated as they only account for a small amount of the overall variance between these constructs.

Upon examining the relationships between music achievement outcomes and individual difference variables measured on a pretest basis (i.e., SES and motivation), it is important to note that they are all positively correlated. This suggests an overall trend, whereas one discrete achievement or individual difference variable increases, on average, so do the others. Conversely, this is true in the opposite direction, which suggests that students from less economically wealthy homes who report that they are less engaged in band, on average, demonstrate lower levels of music achievement. However, as will be reported in the next section, the impact that motivation and SES have on music achievement outcomes varies depending on type of PAL arrangement.

The Influence of Motivation and SES on Achievement. The moderating impact of motivation, specifically mastery-approach goal orientation, on sight-reading and music theory achievement was found to be nominal. This finding indicates that regardless of a students desire to achieve competence for the sake of maximizing one’s potential, achievement gains in sight-reading and music theory achievement as a result of PAL are not significantly impacted. Put another way, regardless of type
of PAL or level of motivation, students still made gains in their sight-reading performance and knowledge of major key signatures.

When examining the impact of socio-economic status, a marginally significant interaction was found for SES when examining the effect of method of instruction on pre-posttest changes in sight-reading achievement. Specifically, sight-reading achievement gains as a result of PAL may have depended on level of SES and type of PAL arrangement. Given the exploratory status of this study, this marginally significant interaction is a potentially important finding and warrants further investigation. Even within the context of a marginally significant interaction, the pronounced difference in achievement is still somewhat surprising when considering the fact that students who received symmetrical PAL showed relatively similar achievement gains regardless of level of SES. Potential implications of this finding will be presented in the discussion and implications sections below.

**Learner Engagement Outcomes.** Results indicate that students experienced small gains in learner engagement across all schools. However, while trends across all schools show positive growth, a comparison between pretest and posttest scores indicate the difference in scores to be only marginally significant. Empirically, this result is not surprising given the fact that pre-posttest changes were minimal and the variability in scores when comparing pre-posttest standard deviations were relatively equal. It is of interest to note, however, that the two schools with the lowest average SES experienced larger gains in engagement that all of the other schools in the sample combined. While this can be interpreted in many different
ways, these findings suggest that SES plays an important role when considering the potential for PAL to improve learner engagement.

*Relationships Between Engagement, SES, and Motivation.* Among all of the correlations computed between outcome and individual difference variables, the relationship between engagement and motivation (mastery-approach orientation) was the most pronounced. Not surprisingly, this relationship supports the notion that high levels of mastery-approach goal orientation are associated with high levels of learner engagement. More specifically, students who are driven to achieve competence for the sake of one’s own satisfaction and personal fulfillment also tend to be more engaged. Furthermore, as has been suggested by previous researchers (e.g., Miksza, 2009; Schmidt, 2005) many of the students who are engaged in the secondary instrumental music context may tend to be so for self-fulfilling reasons.

The relationship between pretest learner engagement and SES was also moderately strong. Specifically, as SES goes up, so does engagement. In fact, engagement is more strongly correlated with SES than either of the achievement outcome variables. This suggests that SES may have more to do with learner engagement than it does with the music achievement outcomes measured in this study. As noted previously, all of the correlations between individual difference and outcome variables were positive and of a modest to moderate magnitude, with the exception of engagement and motivation which were strongly correlated.

*The Influence of Motivation and SES on Learner Engagement.* As with achievement outcomes, the impact of method of instruction on learner engagement was not dependent upon level of motivation (mastery-approach goal orientation).
This is somewhat surprising given the strong correlation between these two factors. However, this finding pertains only to the degree to which pre-posttest changes in engagement occurred and should not be interpreted as meaning that a significant relationship does not exist. When examining the relationship between motivation and pre-posttest engagement scores, a negative correlation was found indicating that students with lower levels of motivation make larger gains in pre-posttest engagement. In other words, students who had relatively high levels of motivation to begin with experienced little change. Conversely, students with low motivation and low pretest levels of learner engagement experienced larger gains in learner engagement despite having relatively low motivation. The positive implications for this finding are presented in the discussion section below.

The effect of method of instruction on pre-posttest engagement change was found to be dependent upon level of SES. Specifically, students in the asymmetrical condition experienced more disparate changes in their pre-posttest engagement than did students in the symmetrical condition. In fact, students with high and average levels of SES experienced decreases in learner engagement as a result of asymmetrical PAL. Conversely, students of low SES in the asymmetrical PAL condition experienced increases in learner engagement. This interactive effect for asymmetrical PAL and SES is of particular interest given that all students in the symmetrical condition experienced gains in learner engagement regardless of SES. These findings suggest that symmetrical PAL might promote improved engagement for students of varying SES while asymmetrical PAL may actually be detrimental to engagement for students with moderate to high SES. Implications and further
discussion of this interesting finding in terms of previous research and existing theoretical rationales are discussed in subsequent sections.

Discussion

**PAL Grouping.** Symmetrical and asymmetrical peer-assisted learning with school-age students has proven beneficial across a wide variety of contexts and outcomes (Topping, 2005). Given this fact, it is not surprising that the findings of this study confirm improvements in music achievement, and learner engagement are also possible when applying PAL in the secondary instrumental music context. A unique and important finding, however, is that middle school band students benefitted equally regardless of the type of ability grouping (e.g., symmetrical or asymmetrical) underlying their PAL experience. These results suggest that PAL may be implemented flexibly as a supplement to traditional instrumental music instruction in an effort to enhance sight-reading skills, improve music theory knowledge, and sustain engagement. Moreover, there is no evidence that PAL has detrimental effects on such outcomes, which is a point of concern often raised by music teachers who are skeptical of collaborative instructional approaches.

It is somewhat puzzling that music achievement and learner engagement gains were equal for students in both groups, especially given that previous research has revealed that asymmetrical PAL often produces higher achievement gains than symmetrical arrangements (e.g., Roscoe et al. 2007). However, other studies have found relatively equal achievement gains when comparing symmetrical and asymmetrical conditions (e.g., Cohen et al., 1982; Robinson et al., 2005). Similarly, both arrangements have been successful in music education contexts (e.g.,
Alexander & Dorrow, 1983; Darrow, Gibbs, & Wedel, 2005; Goodrich, 2007; Johnson, in-press). While overall trends remain somewhat inconclusive, the results of this study provide evidence for the potential success of either the symmetrical or asymmetrical arrangements in the secondary instrumental music context.

So why did students in both symmetrical and asymmetrical conditions demonstrate equal growth? The success of both models in this study, however, may be a result of applying a reciprocal format to both symmetrical and asymmetrical arrangements. This approach is somewhat unique in that asymmetrical PAL is typically fixed role, meaning that partners do not take turns being the teacher and student. In this study, however, students acted as both helper and helped regardless of the ability of their partner. Since achievement and engagement gains were significant for both groups, this suggests that when given the opportunity to be both the helper and the helped, students at the middle school level can make meaningful gains regardless of their ability. Given the prior studies that have investigated reciprocal PAL in music at the elementary level (e.g., Darrow, et al. 2005) and high school level (Johnson, in-press), this finding also expands the evidence of success using reciprocal PAL at the middle school level. This important finding ultimately translates into the adaptability of these models in a wide variety of secondary large-ensemble settings, including those where students with varying abilities are grouped into one class.

From a developmental learning perspective, PAL has historically been associated with both the theories of Jean Piaget and Lev Vygotsky. The incorporation of both theories seems essential to adequately explaining the
effectiveness of both symmetrical and asymmetrical PAL arrangements on an individual and sociocultural basis. Symmetrical PAL has traditionally been associated with the Piagetian notion that egalitarian interactions between individuals of a lateral or ‘horizontal’ nature. Collaborations between students of like-ability are thought to promote a high degree of cognitive conflict resulting in individual growth and development (Doise & Mugny, 1984). The results of this study suggest that band students with a little over one year of experience playing an instrument possess the knowledge necessary to improve their own skills in addition to those of a peer. Given the exploratory status of this study, however, this notion is important to test in subsequent research with beginning to intermediate secondary instrumental music students. Guided by the assumption that growth for students in the symmetrical group was a result of cognitive conflict, undergirded by patterns of assimilation, accommodation, and equilibration, the gains in this study serve to confirm Piaget’s notion. Moreover, these findings would appear to refute the hypothesis put forth by Mugny, De Paolis, & Carugati (1984) who assert that interactions between peers of equal intellectual ability might make cognitive conflict unlikely.

Asymmetrical PAL has its foundation in Vygotskian theory, specifically the zone of proximal development. The assumption that achievement gains observed for students in this condition were due to this phenomenon suggests that problem solving with a more capable peer leads to meaningful and measurable growth. Importantly, the observed increases in achievement also suggest that it is not only the less developed student in this arrangement that benefits; growth for all students
indicates that the more advanced student also benefitted. This finding coincides with the notion presented by neo-Vygotskian scholars (e.g., Tharpe and Gallimore, 1991) who highlight a shift of symmetry that occurs between individuals who spend time in the ZPD. Specifically, as individuals interact and assume various degrees of responsibility for shared tasks and goals, individuals become more equal in ability. Hence, the learning for the more advanced student is another layer of depth in the ZPD. This phenomenon may to be facilitated by a process of de-automatization where the fossilized knowledge of the more advanced student increases in flexibility as efforts are made to communicate and teach their partner. Importantly, as part of this process, more advanced students may also be able to reify their own skills by observing mistakes made by their partner. However, as will be discussed, this process may also be dependent upon level of SES.

It is critical when comparing results in terms of PAL grouping, however, to consider the context and methods that were used to pair students in symmetrical and asymmetrical conditions. While symmetrical PAL is clearly defined as individuals of equal ability working together, asymmetrical PAL has a much wider possible range of pairings than what was realized in this study. Specifically, even though students in each class possessed different ability levels, variability was still restricted by same-age grouping in addition to similar levels of experience playing an instrument. It is also important to note that pretest scores were overwhelmingly higher and less variable for sight-reading than they were for music theory knowledge. This suggests that ability differences between students were primarily in the area of sight-reading and that the majority of students had only a novice
understanding of basic music theory concepts. However, given that between-student ability was as divergent as possible for students in the asymmetrical condition, the question that remains is what exactly was mediating student learning in both conditions other than level of ability.

Referring to Daniels et al. (2007) conceptualization of mediation as previously discussed in chapter two, it is probable that a variety of implicit and explicit mediators made learning possible in both conditions. Whereas implicit mediation refers to the incorporation of signs into human action as a means of reorganizing that action, explicit mediation is something that is intentionally built into mental functioning such that it is the object of conscious reflection (Miller, 2007; Wertsch, 2007). In the realm of explicit mediation, the successful learning for more advanced students in this study may have been due to the reflection that was induced by the communication and de-automatization of preexisting knowledge (Tharpe & Gallimore, 1991). A similar interpretation was suggested by Alexander et al. (1983) who employed asymmetrical groupings in a fixed-role format with same-age first year 5th-grade band students. The findings of the present study extend this notion by showing that this process is also possible in reciprocal formats with older students.

Explicit mediation in the form of positive interdependence among partners was intentionally fostered during the training sessions that teachers provided to students. While it was the choice of the students to adopt this perspective, teachers throughout the intervention emphasized that partners were responsible for each other’s success and promoted a “sink together or swim together mentality,” as noted
by Johnson and Johnson (1991). Given that most students were encountering music theory concepts for the first time as reflected in their pretest scores, it may have been the case that positive interdependence aided in the communication of sight-reading skills between students of divergent ability. Additionally, all teachers anecdotally reported that interdependence was reinforced musically through composition exercises where students constructed duets using specified pitches and rhythms rather than simply composing a single etude to be performed independently. Similar to the studies of Alsup (2003) and Blair (2008), who also used group composition exercises as a form of collaborative learning, significant gains in students’ knowledge of music theory suggest that the incorporation of organized composition exercises may be a useful and authentic way to foster positive interdependence between students.

An important implicit mediator may have been intersubjectivity, which exists when two or more individuals agree on aspects of a definition of the situation or approach to a problem (Rogoff, 1990). As noted in Chapter Two, intersubjective understanding between peers is conceptualized in this study as a form of implicit mediation (e.g., Daniels et al., 2007) that specifically deals with the communication, use, and understanding of music-specific tools that are embedded within the secondary band context (e.g., counting systems, keeping a beat, circle of 5ths, music notation, etc.). Materials that students utilized were constructed in such a way that, on many occasions, knowledge was jigsawed amongst partners, requiring them to interact to construct mutual understanding. Examples of this included dividing key signature knowledge so that each student had different parts of the circle of 5ths,
which required individuals to converse and reason together to find the answer to a specific question. Additionally, sight-reading materials were organized so that one student was responsible for the counting structure for an exercise while the other student would attempt to play the exercise on their instrument. Through intentionally breaking up aspects of knowledge between students that would normally be possessed by one student who can successfully complete a task, students were required to agree on a solution to be able to proceed with success.

Concomitantly, additional implicit mediation may have taken the form of procedures embedded in the instructional materials including numeric counting systems for interpreting rhythms, the use of egg shakers to keep steady time, developing pneumatic devices for remembering key signatures, in addition to elements as engrained as navigating the musical staff and reading notation. The use of these tools, which are specific and germane to beginning and intermediate instrumental music contexts, are examples of how students may have achieved the intersubjective understanding necessary learn from each other and extend their own skills. Similar to the findings of Fodor (1998) who used the expression “hybrid interactions” to describe the use and availability of a variety of tools, teachers anecdotally reported that they observed students frequently making use of numerous communicative tools including playing, singing, talking, counting, clapping, marking each other’s music, and using an egg shaker.

An additional important mediator may have been the students’ use of verbal interaction or dialogue to reason through points of cognitive conflict and achieve understanding. Referred to as operational transacts (Berkowitz & Gibbs, 1983), the
process of one partner expressing an idea that is transformed by the other partner into action is thought to be a naturally occurring facet of musical interaction in this context. Specifically, when observing a partner putting their ideas into action, individuals may have become more aware of how their own correct and incorrect conceptions play out. This hypothesis is supported by other researchers in music education who have noted the presence of dialogue as a mediator in peer-to-peer interactions, specifically as a tool for elaboration, extension, and clarification of a peers actions, thoughts, or overall approach to a particular problem (e.g., Berg, 1997; Fodor, 1998; Goodrich, 2007; Leber, 2005).

Summary. It is possible that both aspects of Piagetian and Vygotskian foundations may help to frame and understand the gains experienced by students in both symmetrical and asymmetrical PAL conditions. Similar to the argument presented by Saxe (1991), both Piagetian and Vygotskian theories are necessary to understand development since individual goal-directed activity needs to be placed in both sociocultural and internal development contexts. In this study, sociocultural factors included implicit and explicit mediators such as researcher-constructed materials, musical tools, and preexisting knowledge and ability. Additionally, given that the vast majority of students had only been playing their instruments for a little over one year and did not engage in music instruction outside of the 7th-grade band classroom, the narrowness of the ZPD likely resulted in a high degree of cognitive conflict in both symmetrical and asymmetrical conditions. This is supported by the observation that even the highest achieving students had knowledge deficiencies
revealed on pretest measures as they answered less than half of the music theory items correct and scored in the same range for sight-reading.

It is somewhat surprising, however, to note that the pattern of interaction between students was relatively similar between symmetrical and asymmetrical classrooms. Teachers anecdotally reported in all instances that the vast majority of students jumped into activities with their partner and continued for several sessions before any evidence of disinterest appeared. While teachers also noted that some students did not fully engage in PAL activities, the fact that the majority did engage suggests that at the middle school level after playing for only one year, students are willing to collaborate to help a partner regardless of their ability. However, teachers did report overall that many students initially approached activities in a “division of labor” fashion (i.e., assigning tasks to be completed independently). This reluctance to adopt a stance of positive interdependence may be a result of students being used to cooperative learning arrangements where students are responsible for “parts of the whole” rather than working together during every step along the way. Teachers anecdotally reported that while some students were initially reluctant to adopt a collaborative approach, after several days of working together, a majority of the reluctant students did begin to work together. These findings are also noted by Goodrich (2007) and Darrow et al., (2005) who suggest that PAL is not readily adopted by all students and that some students prefer to work alone or not engage at all.

**Motivation.** Motivational behaviors and thoughts are generally seen as being closely linked to achievement outcomes and intricately related to students’ goals
and aspirations. The results of this study, however, indicate that motivation did not significantly moderate achievement or engagement gains. Given factor analysis and reliability analysis results for the 2x2 achievement goal measure, and in an effort to avoid what has become known as the ‘Jingle-Jangle’ fallacy (Craven, Hinkley, & Marsh, 2003), only mastery-approach goal orientation was included as a motivational variable. This was done with the thought that a student’s desire to achieve self-referenced competence, fulfillment, and satisfaction in music should hypothetically contribute to students attaining higher levels of achievement. The finding that this was not the case is surprising yet supported by the fact that correlations between mastery orientation and each of the outcomes of interest – sight-reading performance, music theory knowledge, and learner engagement – were merely small to moderate in strength.

Upon further examination of the descriptive data, some degree of explanation emerges as to why a mastery-approach goal orientation did not contribute substantively to pre-posttest differences in outcome variables. First, mastery-approach scores were extremely skewed toward the high end of the scale indicating that the overwhelming majority of students began the study reporting strong mastery orientations. Considering that achievement outcomes were not similarly skewed, this may represent a form of self-report bias in relation to culturally established norms. Moreover, the mastery-approach scores exhibited limited variability, indicating that the majority of the students possess relatively similar levels of mastery-approach motivation. Hence, the combined influence of rating scale attenuation (i.e., ceiling effect due to positive skew and/or self-report
bias) and lack of variability may have constrained the magnitude of the correlations between mastery goal orientation and the three outcome variables.

Alternatively, it is possible that any differences in pre-posttest outcomes had more to do with other factors than they had to do with motivation. In prior research with secondary band students mastery-approach orientations were rated highest in comparison to other orientations (Schmidt, 2005; Miksza, 2009). Looking at the mastery-approach sub-scale item questions (“I want to learn as much as possible about playing my instrument,” “It is important for me to understand what we learn in band as well as I can,” “I want to completely master the things we learn in band,”) it becomes apparent that students who agree with these statements want to be in band. Secondary students who enroll in band are a self-selected population. Specifically, students are not required to be in band and therefore the ones who are in band likely chose to be there above and beyond other competing options. It is not hard to imagine that the baseline for learning is then set amongst individuals that are already highly motivated. This may help to explain why interactive effects are found in other “required” subject areas between motivation and achievement. Put another way, if the variability of motivation levels in band classes were similar to those found in required math classes, it is more than likely that the more motivated students would have far outdone their less motivated compatriots, thus resulting in significant interactive effects.

Master-approach orientation did have a significant interactive effect on pre-posttest differences in engagement. That is, students who had high initial engagement (a) did not experience large gains in engagement and, (b) these
students began the study with high degrees of mastery orientation. Conversely, students who experienced larger gains in engagement due to PAL tended to have lower levels of motivation to begin with. This nuance is important as it highlights that PAL works to improve engagement for students with lower levels of motivation, whereas engagement remains at high levels for students with high motivation.

A possible explanation for this is that when students with varying levels of motivation interact, students experience the positive effect of the ZPD. Given the same-age grouping context of this study, this finding supports Topping and Ehly’s (1998) hypothesis that students who are closer in age feel closer in status resulting in a higher degree of trust, particularly in reciprocal arrangements. However, given that there were relatively few students who had low of mastery motivation to begin with, situations such as that previously described may not have occurred frequently enough to moderate the relationship between method of instruction and achievement and engagement outcomes.

Summary. Mastery goal orientation is positively correlated with all three outcomes, but the magnitude of the relationship with achievement outcomes (sight-reading skill, music theory knowledge) is markedly smaller than with learner engagement. This likely reflects the fact that goal orientation and engagement are both motivational in nature and were both measured through the use of self-report questionnaire formats. Of greater importance, however, is the fact that mastery-approach goal orientation moderated the effects of PAL on student engagement, Engagement scores improve nominally for students with high motivation, whereas students with lower relative levels of motivation tend to experience larger
engagement gains, regardless of PAL condition. This finding suggests that regardless of motivation level, students become more engaged when sharing ideas and working together to improve their musical skills.

**Socioeconomic Status and Achievement.** The absence of main-effects between treatment conditions is arguably “good news” regarding the flexible implementation of PAL. However, a more nuanced interpretation suggests that student SES may contribute to differences in achievement between symmetrical and asymmetrical arrangements. The findings of this study indicate that low SES students perform well in both symmetrical and asymmetrical PAL, whereas achievement gains for high SES students were most pronounced in symmetrical groupings. However, it is important to note that despite low SES students making greater progress overall, all students showed achievement gains. These findings are in line with previous PAL research, which indicates that students who are economically disadvantaged make more pronounced achievement gains as a result of PAL when compared to middle and high SES students (e.g., Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003; Ginsburg-Block, Rohrbeck, & Fantuzzo, 2006). Because these findings are only marginally significant, they certainly warrant further investigation. However, since music achievement and learner engagement gains varied by SES only in the asymmetrical condition, the pertinent question is why does SES matter so much?

One hypothesis is that low and high SES students exhibit differences in knowledge and understanding because they are not advantaged equally with respect to resources and access to specific learning tools that promote engagement
in academic discourse and school-related learning (Payne, 1996). However, the lack of available tools needed to engage in productive learning does not explain the relative similarity in engagement gains for students in the symmetrical group or that lower SES students did well in both conditions. One possible reason for this is that while certain tools were readily available to both groups via instructional materials, high SES individuals who were the more advanced student in their asymmetrical pair may not have known how to share the use of these tools with a partner of lesser ability. High achieving students who also had high SES were among the highest achievers overall, and may have had difficulty verbalizing their knowledge of how to read rhythms and perceive or generate steady tempo.

A somewhat related explanation is that this difference is due to experience rather than development. That is, after only one year of playing experience, students with more developed abilities may not be comfortable enough with their abilities to know how to externalize and de-automatize the process of how they developed their abilities to a peer. In this scenario, neither student benefits as students of lesser ability are left on their own while students of higher ability do not recursively exercise their skills as described by Tharpe and Gallimore (1991). In contrast, students in symmetrical arrangements may have experienced cognitive conflict on similar issues together, thus enabling them to more readily build upon each other’s development. For students at low SES levels, achievement was very low to begin with in both symmetrical and asymmetrical conditions, suggesting that students may have encountered many of the same cognitive conflicts regardless of PAL condition. Furthermore, novice students with highly developed abilities may need to
live with their knowledge and ability for a longer period of time in order to describe them to a peer, let alone develop a thorough personal understanding. Given this hypothesis, it may be most productive to pair high achieving students together in the middle school band context.

**SES and Learner Engagement.** While PAL has been anecdotally associated with increased levels of learner engagement, the results of this study indicate that for the majority of this sample, engagement does not falter as a result of reciprocal symmetrical and asymmetrical PAL. In fact, the results suggest that learner engagement may be a difficult psychological construct to influence as compared with achievement outcomes.

However, for students in the asymmetrical condition, levels of engagement decreased as levels of SES increased. One possible explanation is that students in high SES environments who display a lower than normal degree of engagement may be perceived by their peers as not caring as much about their musical development, thus presenting a perceived lack of willingness to engage. This raises the question regarding the effectiveness of interactions between high SES students of divergent abilities. Being that social emphasis in middle class settings is often on self-governance and self-sufficiency (Payne, 1996), it may be that when cognitive conflict is encountered for students in asymmetrical settings, individuals with higher levels of SES may not want reveal that they don’t understand and falsely display a sense of confidence. This ultimately can result in a lack of skill development, particularly for the student with lesser ability. Hence, students who do not want to risk looking incompetent simply do not engage. Concomitantly,
students of higher ability may simply give up on a peer who doesn’t understand or displays lack of engagement making the PAL experience a futile exercise. In this scenario, the desire and ability to form interdependence and intersubjectivity between partners is hindered as the more advanced student goes through the task alone and does not have the opportunity to engage with a peer to explore cognitive conflict or the de-automatization necessary to learn. This may explain why there were still modest achievement gains made by high SES students in the asymmetrical condition, whereas levels of engagement for the same students decreased. Moreover, the fact that students with high levels of SES felt less engaged in asymmetrical PAL as compared with teacher-led instruction alone (assumed to be indicated by their pretest engagement score), suggests a degree of dependency on teacher-led instruction. However, any such dependency for high SES students seems to be thwarted when engaging in symmetrical PAL.

Summary. While it is clear that SES impacts achievement and engagement differently in symmetrical and asymmetrical PAL arrangements, the context of the secondary instrumental music classroom must be considered. This environment is rampant with external demonstrations of ability that everyone can see which may cause students to be hypersensitive about the status of their own ability. This relationship may also be based upon the variability of abilities within one classroom; students in classrooms where the distance between higher and lower achieving is great, such as was observed for higher SES schools in this study, may have more difficulty working together. Conversely, if the spread in abilities is narrow, as was observed in low SES schools in this study, students may be more
able to help each other improve. This conclusion also supports why higher SES students in asymmetrical PAL arrangement become less engaged given that it may be intimidating to work with a student whose ability is so much more developed or that students become frustrated when working with lower ability peers.

**Threats to Internal Validity.** Internal validity refers to the degree that group differences can be attributed to the treatment intervention rather than to other confounding effects. While the quasi-experimental design used in this study is often used in educational research due to the inability to randomize students who are nested within classes, it is necessary to examine various facets that may have contributed to group differences other than the type of PAL received.

Potential history effects were minimized by sampling groups from schools that have only one teacher, one 7th grade band, and where students were grouped by grade rather than ability. Further steps were taken to only choose schools in which formal school band study started in 6th grade. However, effects such as time of day in which classes met, and other effects such as teacher absences could not be controlled. To ensure that all teachers followed the intervention calendar and day-by-day intervention time limits, teachers submitted weekly logs that documented that the agreed upon schedule relating to PAL activities was followed.

To attempt to minimize maturation effects, the intervention period was delimited to a four-week period. However, some individual pre-posttest differences may have been in part due to regression to the mean, especially for students with particularly high or low pretest scores. Additionally, a degree of the pre-posttest change could have been due to their regular band experience during the treatment
period. To minimize testing effects, pre and posttest measures of sight-reading were administered using different researcher constructed etudes that addressed similar concepts. Moreover, alternate forms of the music theory knowledge measure were used for pre and posttests.

To minimize the “John Henry” effect where student performance was a result of competition with other schools, students were not informed that other schools were participating in the study until after the treatment period ended. However, this effect could not be minimized for students within classes who may have felt the need to compete with other student pairs.

**Implications for Teaching**

The results of this study suggest that PAL can successfully be integrated alongside teacher-led large ensemble at the middle school level. The fact that the PAL was successful for both like and divergent ability student pairs yields a variety of PAL arrangements for teachers to consider. However, results indicate that teachers also need to consider the population they are working with when choosing which model to apply.

This consideration needs to be applied to how students are paired. First, results of this study indicate that when working with who have average to high levels of SES, symmetrical arrangements where students are paired with other students who are alike in ability may yield greater gains in achievement and engagement as compared to asymmetrical arrangements. Conversely, results indicate that both symmetrical and asymmetrical models yield positive results for students who have lower levels of SES. Thus, to make this determination is
important for teachers to carefully consider the students’ achievement levels specifically related to the concepts intending to be exercised as part of PAL. Second, teachers should avoid pairings where students have already demonstrated problems working together such as personality conflicts or prior discipline issues.

Third, teachers should also carefully examine the outcomes that they are seeking to improve by including PAL into their classroom activities. While the outcomes of this study suggest that both performance, cognitive, and engagement outcomes can be improved as a result of PAL, it is important to consider the difficulty of the tasks that students will be working on in PAL groups. Specifically, sight-reading and music theory achievement outcomes were not brand new concepts for students in this study. Students came into the study with a basic understanding of how to approach sight-reading, which had been introduced to them by teachers during the first year of instrumental music instruction. Students were also familiar with the basic concept of major key signatures. What this suggests is that PAL may be a great way for students to deepen and exercise their understanding of concepts that have been introduced during large group, teacher-led instruction.

*Informal Teacher Feedback.* After the study concluded and during informal conversations teachers indicated that they believe PAL might be even more successful if spread out over a longer period of time. Specifically, several teachers mentioned that they would continue using PAL once a week rather than two to three times per week as was part of this study. Multiple teachers mentioned that while most students experienced a willingness to work together, the novelty of PAL wore
off after about four to five sessions and at that point, teachers needed to remind students to stay on task. Furthermore, all teachers mentioned that composition exercises were among the students’ favorite activities, therefore such activities might be strategically introduced to maximize engagement. Taken together, these observations suggest that a greater time interval between PAL tasks that involve a variety of activities might yield more success in lieu of more repetitive and tasks that are paired closely together.

An important implication for the successful implementation of PAL is how teachers meet the challenge of fostering interdependence and intersubjectivity. While the realization of both concepts is critical to PAL, there are several steps teachers can take to mitigate potential challenges. In relation to interdependence, all teachers mentioned that the “default setting” for many students to initially decide how work was going to be divided and then attempt to work independently. This could be due to the fact that cooperative learning where students engage in a division of labor and work independently is common in most classrooms (Smialek & Boburka, 2006). The concept of “sink or swim together” described by Johnson and Johnson (1991) appears difficult for students to grasp initially. However, teachers reported after repeated reminders, reluctant students began to take this concept more seriously. Implicitly, reluctance to adopt this view may be that individual students feel uncomfortable “wearing” the authority that is necessary to correct, question, and direct the performance of a peer. Thus, teachers may play an important role in setting this expectation by modeling this behavior in rehearsal or
during PAL experiences, thus briefly relieving students of this responsibility until individuals become comfortable working together.

Another interesting aspect reported by teachers was that intersubjectivity was readily apparent for groups who adopted the view that their partner’s success was dependent upon their ability as a teacher. Specifically, teachers mentioned that it groups often came up with unique counting systems and novel ways of actively modeling sight-reading etudes. Moreover, multiple teachers reported that they observed student pairs sitting together at lunch or in the hallway after school quizzing each other’s knowledge of key signatures. These observations imply that while taking an active approach to making tools available for students, teachers should also allow enough autonomy and flexibility for students to adapt tools in unique ways or construct completely new tools to meet their own needs.

Implications related to traditional teacher-led large ensemble rehearsal include ways that PAL can be integrated alongside more traditional formats. The findings of this study indicate that PAL is a way to vary traditional instructional activities to improve achievement and engagement. While a large PAL project may be a daunting proposition given the multiple demands put upon teachers, it is important to remember that PAL can begin with activities as simple as stand partners sharing ideas they have about music being rehearsed. As previously discussed, a balance and variety of teacher-led instruction, PAL, and individual work and practice may be the best way to maximize achievement growth, engagement, and space for students to own a part of the learning process.
An important aspect to note was that all teachers in this study were actively preparing concert performances during the intervention period. After the study was over, teachers were surprised by the fact that the quality of their performances did not suffer as a result of devoting time to PAL activities. In fact, teachers became aware of how future PAL activities could be focused specifically on aspects of music being performed. This is one example of how teachers can use PAL in an effort to take on the “conductor as servant-leader” disposition suggested by Wis (2002).

**Implications for Future Research**

This investigation into the effects of varied PAL arrangements on music achievement, cognitive, and engagement outcomes has illuminated several areas of research that will need to be explored to establish a more complete understanding of PAL in the secondary instrumental music context. Theoretical, sampling, measurement, analysis, and methodological implications recommendations for future research are discussed below.

**Theoretical Implications.** Several areas relating to the theoretical framework have arisen due to the results of this study. First, since teachers indicated that students initially tried divide work cooperatively rather than using more collaborative structures, it is necessary to further explore the challenges of achieving interdependence between students in the music context. Second, given the relatively narrow ability range used to establish asymmetrical arrangements, is necessary to compare a wider variety of asymmetrical arrangements such as cross-age designs within and between middle school and high school levels. This is
especially true, as there exists a body of research indicating that asymmetrical arrangements tend to promote higher levels of achievement.

Third, the notion that the process of developing intersubjectivity between individuals engaged in PAL is a form of implicit mediation needs to be examined in greater depth. Specifically, a more specific understanding of the cognitive, verbal, non-verbal, and physical tools that students use to build mutual understanding could help to build a more nuanced view of how development occurs as a result of PAL in the secondary band context.

Fourth, future studies should examine how the use of less structured instructional materials impacts achievement and engagement. While previous studies indicate that less structured PAL results in higher levels of achievement, this has yet to be confirmed in a music education context. Fifth, while the examination of varied outcomes in music continues to grow, future studies should empirically compare an even wider variety of musical outcomes such as composition and more complex forms of performance such as improvisation and musical expressivity. Lastly, an examination of the implicit and explicit tools available to students of varied economic and cultural backgrounds may help to understand how PAL supports or hinders development in school music contexts.

**Sampling Implications.** First, while sampling is often contingent upon funding resources and school district access, it is necessary to explore the results of this study using a random rather than purposive sample. This approach will assist in the generalizability of results to a wider population of secondary schools. Second, again to increase generalizability of results, it is also important to compare the
results of this study with a larger sampling of secondary schools from multiple school districts and geographical regions. Third, given the success of PAL models with low SES students, it is necessary to investigate this phenomenon with students from a diverse array of low SES backgrounds that represent a variety of ethnicities, geographic locations, and access to musical involvement.

**Measurement Implications.** Hypothetically, a variety of psychological and economic factors could be associated with PAL. First, as the examination of associated factors is a relatively new development future research should continue to explore multiple psychological constructs such as agency, engagement, self-concept, and self-efficacy in a variety of PAL arrangements. Second, given the complexities inherent to measuring motivation, future approaches that examine the existence of “motivation profiles” representing multiple domains using cluster and confirmatory factor analyses might provide a more nuanced approach to understanding how motivation impacts PAL in the music environment.

Third, the results of factor analyses of self-report engagement measures indicate that behavioral and emotional engagement can be collapsed into a single measure of engagement. While this finding is supported by other recent research, the use of the measure in this way needs to be continually examined to establish its validity. Fourth, given the ways that PAL changes the role of the teacher, it may be necessary to include teacher-reported measurements of student engagement and achievement to establish the (a) concurrent validity of measures employed, and (b) to examine the ways that teachers view student participation in PAL environments compared with teacher-led environments. Lastly, Given that results of the SES
measure favored students that had higher levels of SES, it may be necessary to expand the range of possible response options to include graduate degrees, parents that stay at home by choice instead of out of necessity, and a wider array of family arrangements.

**Analysis Implications.** Estimates of statistical significance for interaction effects were often only marginal (i.e., between .05 and .10). Given the exploratory status of PAL in the secondary music education context, future studies should reexamine these interactions. While this study investigated a diverse sample representative of a single school district, interaction effects may have been subdued by only having six different schools included in the sample. The statistical power of multilevel models is contingent upon the number of nested levels, especially those at higher levels such as multiple classes within schools and multiple schools within districts. Thus, to increase the power of hierarchical linear models (HLM) to explore the moderating effects of PAL it is important to increase the power of these models by increasing the number of schools within one school district in addition to multiple districts within one geographical region. Additionally, as mentioned previously, it is important that future researchers continue to explore the underlying constructs that represent motivation measures using cluster and confirmatory factor analysis.

**Methodological Implications.** In an effort to contextualize the positive results of PAL in this study, future studies should compare symmetrical and asymmetrical PAL designs with a teacher-led control group. Given that students may experience higher degrees of cognitive conflict by having shorter PAL sessions
between longer teacher-led instruction periods, future research should utilize a repeated-measures design where achievement can be examined in more nuanced ways overtime. To better understand the nature of student interactions when engaging in PAL, multiple case studies are needed to investigate how intersubjectivity and interdependence manifest as a result of PAL. Moreover, studies that examine the patterns of discourse between students are needed to better understand the social implications of PAL in the music setting.

**The Advantages and Disadvantages of PAL**

A current debate amongst the critics of collaborative learning is that this type of instructional arrangement leads to inefficient use of valuable classroom time and is a detriment to the development of student creativity (e.g., Cain, 2012). Moreover, many see this type of instructional arrangement as a “pooling of ignorance” whereby individuals are denied interaction with an expert individual (Gartner, 1998). In traditional secondary-instrumental music ensembles, however, students often only receive teacher-led instruction and have few to no opportunities for peer-to-peer collaboration (Johnson, 2011; Scruggs, 2009). This is particularly troubling given the interactive nature of music performance in an ensemble setting.

A rich student learning environment is one that promotes multiple participant structures that recursively enhance one another. For example, after a teacher initially introduces a concept, students need time to practice alone and grow their own ability to perform and understand musical concepts. This works until individuals hit a wall – either by reaching the limits of their current capacity or by not being able to see tasks, processes, and behaviors modeled which hypothetically
can result in a lack of motivation. Moreover, the difficulty of the task, determined by degree that assimilation or accommodation can take place, may also limit the productivity and length of individual practice sessions.

When a student reaches this juncture, it is beneficial for the student to come into contact with teacher-led instruction to receive additional support and scaffolding for continued growth. However, when students have reached the limits of their own abilities, the opportunity to interact with a peer to exercise the developing concept, opportunities for additional, more nuanced degrees of cognitive conflict may arise. Moreover, when students interact by attempting to teach and learn in a reciprocal fashion, their misperceptions and accuracies in relation to the developing concept are brought to bear (Topping, 1998).

It is an interesting proposition that when novice students engage in a teacher-role an empathetic disposition toward teaching can emerge, perhaps making it more possible in turn to learn from an adult teacher. A fundamental assumption of PAL is that by going through the act of teaching, however bumpy or inaccurate, an awareness of knowledge or lack thereof is grown and reified leading the student to want to address previously underdeveloped misconceptions. Simply put, when teaching a concept that is new or foreign, students quickly learn what they don’t know and what questions need to be asked. However, learning in the secondary music context may not be this simple, as students bouncing back and forth between PAL and teacher-led instruction still need time to work alone.

A learning cycle devoid of time to (a) personally develop through solitary practice, (b) encounter knowledge from a teacher, and (c) to create a bridge
between the two by exercising knowledge with a peer, is unbalanced and incomplete. Moreover, a scenario devoid of one of these three elements does not create a situation where students are ready to take on the individual musical responsibility called for by Kirchoff (1999) and Wis (2002). This is especially true given that most aspects of large-ensemble performance require collaborations with other musicians.

The critics of collaborative learning are correct in their assertion that this instructional arrangement engenders meek prospects for individual growth when individuals have no knowledge to bring to the table. This aspect of collaborative learning, which is often labeled by contemporary critics as “GroupThink” (e.g., Berukin, 2012; Cain, 2012; Lehrer, 2012), is when collaborative learning may fail. Claims by critics that creativity is best cultivated alone, however, may have taken it a step too far, specifically when painting the picture of the lone genius completely separated from society. While learning in music requires individual practice, it is also important to remember that music is a fundamentally aural tradition that is passed down from generation to generation and that all musicians are influenced by their social interactions.

What the results of this study suggest is that when PAL is incorporated along with teacher-led instruction (which traditionally includes expectations for individual home practice), students make meaningful gains in achievement and engagement. While individuals need to interact with peers of similar developmental status, they also need time in solitude to think and practice alone in order to develop their skills. It is in light of these assertions that PAL be incorporated into student
learning environments in instrumental music classrooms along side home practice and teacher-led traditional large-ensemble rehearsals.

Closing Vignette

I have chosen to end this dissertation with a vignette to help illustrate the value of using PAL in the large ensemble context. The following normative vignette, defined as impressionistic accounts of critical events or stories (Lecompte & Schensul, 1999; Van Mannen, 1988), is based upon observations and conversations with the many teachers and students involved in this study. By using a vignette, I hope to bring to life some of the aspects of PAL that are important to consider, especially for teachers who may wrestle with concerns relating to the process of how students experience PAL.

How it can be...

“Working with other students terrifies me... Mrs. Borders makes us work together with other kids in band on mini projects where we have to teach each other stuff... I don’t know why she doesn’t just TEACH us herself!” reads Stacy’s most recent Facebook update to her friends from her old school. Stacy is a 7th grade band student who just transferred to Progress Elementary from a school on the west coast. In her former school, Stacy was first chair flute, a spot that she earned by winning the chair-challenge system that Mr. Commonplace had been running for years. Stacy was used to being the model student in rehearsals; sitting up straight, never speaking out of turn, and always performing to the level that Mr. C required were hard earned accomplishments in band that made her proud to be there. In her new school, Stacy doesn’t know what to make of the peer teaching in band – she feels like there is a whole new set of rules.

On Wednesday’s, all of the band students work together on what Mrs. Borders calls “form projects,” which involves students working with the same partner each week to learn more about different musical forms. Discovery of the rondo form is what the students currently are working on. They draw form maps depicting rondo form, listen to a piece they are rehearsing in class to see if they can discover the underlying rondo form. They also work with their partner each week on short duet compositions in rondo form that they will eventually record and make part of their band assessment portfolio.
Stacy’s partner is a trombone player named Emmanuel who has long hair that covers his eyes. She noticed him right away when she moved because she thought he was cute but was put off by how much he goofed off in band. Initially, they didn’t get much done as Sarah sat silently during their interactions while Manny talked to his friends. Mrs. Borders would walk by and gently remind them to get to work, which would only happen as long as she remained in the proximity. Stacy was frustrated and Manny didn’t care. Stacy thought, “This is just a giant waste of time!” Stacy preferred when Mrs. Borders would present lessons on the rondo form to the entire class during rehearsals and really didn’t like being paired with Manny, especially when seeing her new friends work so well with their partners.

After the third “form project” session, Mrs. Borders announced that she had selected a couple of students from the 8th grade band to come in next week and help the groups with their compositions. The student that was assigned to Stacy and Manny’s group was Brianna, also a trombone player. When Brianna sat down with Stacy and Manny she played the YouTube performance of the rondo duet that she and her partner had written last year, which she also mentioned was also performed at the school-wide talent show. The recording got Manny’s attention. When it was finished playing, he asked Brianna how she learned to play so well. Her coy reply to him was “I worked really hard with my partner, silly... we worked on this thing for months.” Stacy was excited to have Brianna around, not only because she made Manny pay attention, but also because she had really cool ideas that helped them to write a better form map and to improve their duet. Both Stacy and Manny asked Brianna to come back and she said she would.

For the next few weeks Stacy and Manny worked on their composition – Manny even shocked his mother by practicing at home. Things were going along fine until they tried to play it together at the same time. It sounded awful and didn’t know how to make it sound better. They could both play their parts independently, but couldn’t make it fit together. Mrs. Borders gave them an egg shaker and suggested that one of them keep time while the other person played. Stacy thought this helped, because she learned Manny’s part and was even able to point out where he was playing wrong rhythms. Manny had the idea that he could sing his part and keep time with the egg shaker while Stacy played her part. After doing this a few times, the light bulb went off... in four different measures Manny pointed out where Stacy had notated the wrong number of beats. Manny was proud, verging on arrogant, that he had caught this mistake, and proceeded to tease Stacy about it. Stacy just rolled her eyes; however, from that point forward, Manny made a lot more comments not only about Stacy’s playing but also about his own.

The next time Brianna came back to help, she listened to a run-through and was impressed. Stacy and Manny flashed a smile at each other because this was the first time they made in all the way through without completely falling apart. Brianna noticed that their composition wasn’t quite in rondo form as the A section sounded really similar to the C section. She said pointing at their form map “these should sound different.” Brianna played her 7th grade recording again and remembered that Mrs. Borders had shown her and her partner how to write their major melody in minor using smoother rhythms. Brianna showed Stacy and Manny how to do this for their composition and they had a hard time initially, but over the next several weeks
they also worked on minor keys in class, which made writing their composition a little easier. When back in 8th grade band, Brianna the full band was working on a piece also in rondo form and Mrs. Borders stopped to ask “what made the C section of this piece so different?” Brianna was the first to raise her hand and say “C sections in rondo form are often in minor” to which Mrs. Borders asked her if she remembered that from the 7th grade form project. Brianna replied that she had actually forgotten about it until last week when she worked with Stacy and Manny on their project.

Later on, at the end of the semester, Mrs. Borders had Stacy and Manny present their composition during an open house for in-coming students. This made their parents really proud. When a future 6th grader and his parents stopped by to listen to the YouTube video, Stacy and Manny both went on and on about how cool band was... Stacy’s mother quietly commented to Mrs. Borders “whatever you did with Stacy was remarkable because now Stacy talks about how much she loves music, composition, and comes home talking about the other kids in band... at her previous school, she only talked about trying hard because Mr. Commonplace expected her to.”

**Final Statement**

By suggesting that collaborative learning structures such as PAL be used in conjunction with teacher-led instruction, it is my hope that music educators might see a path forward where PAL is used as a vehicle to cultivate student interest and knowledge between peers and reduce the dependence of students upon teachers. While a teacher has much to give, students who can organize and take responsibility for their own learning are more in-line with the student roles called for by Wis (2002) and Krichoff (1999). Moreover, the evidence that various forms of reciprocal PAL can be successful in the secondary band context provides teachers with the flexibility to incorporate diverse instructional models in an effort to develop a comprehensive understanding of music.

A fundamental assumption of PAL is that knowledge becomes more valuable and better understood when it is shared and discussed. This assumption is critically important to the development of lifelong learning because ultimately, the behaviors
and curiosity that typify passionate and successful adult learners need to be first cultivated during a person’s youth. The goal of preserving the richness of the tradition of the large ensemble is important, however, allowing room for a variety of participant structures – especially those which can be accomplished without a teacher’s assistance – can help to develop and promote in students the seeds for a lifetime of musical learning, enjoyment, and fulfillment.
REFERENCES


Shively, J. (2004). In the face of tradition: Questioning the roles of conductors and ensemble members in school bands, choirs, and orchestras. *Questioning the music education paradigm, 11*(2), 179-190.


APPENDIX A

HRC CERTIFICATE OF APPROVAL
10-Aug-2012

Initial Approval - Expedited

Johnson, Erik
Protocol #: 12-0411
Title: THE EFFECT OF SYMMETRICAL AND ASYMMETRICAL PEER-ASSISTED LEARNING STRUCTURES ON MUSIC ACHIEVEMENT AND STUDENT ENGAGEMENT IN THE SECONDARY LARGE ENSEMBLE

Dear Erik Johnson,

The Institutional Review Board (IRB) has approved this protocol in accordance with Federal Regulations at 45 CFR 46. You must use the IRB approved informed consent form when obtaining consent from subjects participating in this protocol.

Initial Approval Date: 10-Aug-2012
Expiration Date: 09-Aug-2013

Associated Documents:* 12-0411 Parent Permission Form (10Aug12); 12-0411 Teacher Consent Form (10Aug12); 12-0411 Protocol (10Aug12); Sight Reading Achievement Measure; Music Theory Knowledge Measure; Parent Permission Form (Spanish); Student Questionnaire; Protocol; Child Assent Form (Spanish); IRB Proposal; Parent Permission Form (English); Child Assent Form; Student Recruitment Script; 12-0411 Student Assent Form - Spanish (10Aug12); 12-0411 Parent Permission Form - Spanish (10Aug12); 12-0411 Student Assent Form (10Aug12); Initial Application - eForm;
Number of subjects approved: 252
Review Cycle: 12 months
Expedited Category: 7

* To find the approved documents log into eRA, open this protocol, expand the Management folder, and click on the Versions subfolder.

Regulations require that this protocol be renewed prior to the above expiration date. The IRB will provide a reminder prior to the expiration date, but it is your responsibility to ensure that the continuing review form is received in sufficient time to be reviewed prior to the expiration date.

Changes to your protocol must be submitted to the IRB for review and approval prior to their implementation. This includes changes to the consent form, principal investigator, protocol, etc.

All events that meet reporting criteria must be submitted within 10 business days from notification of the event. Any study-related death must be reported immediately (within 24 hours) upon learning of the death.

The IRB has approved this protocol in accordance with federal regulations, university policies and ethical standards for the protection of human subjects. In accordance with federal regulation at 45 CFR 46.112, research that has been approved by the IRB may be subject to further appropriate review and approval or disapproval by officials of the institution. The investigator is responsible for knowing and complying with all applicable research regulations and policies including, but not limited to, Environmental Health and Safety, Scientific Advisory and Review Committee, Clinical and Translational Research Center, and Wardenburg Health Center and Pharmacy policies. Approval by the IRB does not imply approval by any other entity.

Please contact the IRB office at 303-735-3702 if you have any questions about this letter or about IRB procedures.

Douglas Grafel
IRB Admin Review Coordinator
Institutional Review Board
APPENDIX B

PARENT CONSENT AND CHILD ASSENT FORMS
UNIVERSITY OF COLORADO BOULDER
PARENTAL PERMISSION FOR PARTICIPATION IN A RESEARCH STUDY

September 1, 2012

Study Title: THE EFFECT OF PEER-ASSISTED LEARNING STRUCTURES ON MUSIC ACHIEVEMENT AND STUDENT ENGAGEMENT IN THE SECONDARY LARGE ENSEMBLE

Principal Investigator: Erik Johnson

Key Personnel:

<table>
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<tr>
<th>Name</th>
<th>Role</th>
<th>Department</th>
<th>Phone Number</th>
<th>E-mail</th>
</tr>
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<tbody>
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Your child's participation in this research study is voluntary. Please think about the information below carefully. Feel free to ask questions before making your decision whether or not your child may participate. If you decide your child may participate, you will be asked to sign this form and will receive a copy of the form. Signing this form will indicate that you have been informed about the study and that you give permission for your child to participate in this research. Once you provide your permission, your child will also be asked to provide his or her assent to participate. Your child may not participate in the study unless BOTH you and your child agree.

Purpose and Background

Collaborative learning is one of the important ways that students learn at school. However, in the music classroom, the intricacies of this type of learning are largely not understood well enough to help students collaborate to improve their own abilities. The purpose of this study is to investigate the differences in learning that occur as a result of peer-to-peer interactions in music classrooms. Additionally, information will be gathered about student engagement and motivation as a learner in music. Approximately 300 students currently enrolled in middle school band in your child’s school district will be invited to participate in this research study.

Duration and Procedures:

Participation should take a minimal amount of class time extending over a four week period. The research activity will take place at school during music class, and materials learned during the study are derived from the Colorado Content Standards for 7th grade music and are intended to help students become better music readers.

Your child will be assigned either to a treatment/study group or to a no-treatment “control” group. Students will be randomly divided into equal groups before the study begins. To prevent bias in the study, neither you nor the investigators will know initially which group your child is in.

As part of the study, your child will be administered a questionnaire that asks students to respond to questions about their motivation, engagement, and musical background. Here are examples of some of the questions that may be asked where the students will indicate how much they agree with statements such as the following:

A. When we work on something in band, I get involved.

1 of 3
B. Sometimes I’m afraid that I may not understand what we learn in band as well as I’d like.

Participation in this research will include audio taping. These tapes will be used for assessment of music reading ability and will have no impact on the student’s grade. To ensure confidentiality, the audio recordings will be labeled using codes rather than student names. Recordings will be retained by the researcher for one year after the completion of the study and then destroyed.

Study Withdrawal
Your child has the right to stop participating at any time, and to refuse to answer any question(s) or participate in any procedure for any reason. (Declining to participate will not adversely affect your child’s grades or standing in class)

Risks and Discomforts
There are no foreseeable risks for your child to participate in this study.

Benefits
The materials that all students involved in this study will experience are designed to improve your child’s ability to read and comprehend music. At the end of the study, your child may have a deeper understanding of these concepts, however, this is not a certainty.

Confidentiality
These are some reasons that we may need to share the information your child gives us with others:

- If it is required by law.
- If we think you or someone else could be harmed.
- Sponsors, government agencies or research staff sometimes look at forms like this and other study records. They do this to make sure the research is done safely and legally. Organizations that may look at study records include:
  i. Office for Human Research Protections or other federal, state, or international regulatory agencies
  ii. The University of Colorado Boulder Institutional Review Board
  iii. The sponsor or agency supporting the study: University of Colorado, College of Music, Department of Music Education

Incentives
You will not be paid to participate in this study.

Participant Rights
Taking part in this study is your choice and your child's. You and your child may choose either to take part or not take part in the study. If you and your child decide to take part in this study, he or she may leave the study at any time. No matter what decision you or your child make, there will be no penalty to your child in any way. Neither you nor your child will lose any of your regular benefits. We will tell you if we learn any new information that could change your mind about being in this research study. For example, we will tell you about information that could affect your child's health or well-being.
Contacts and Questions

For questions, concerns, or complaints about this study, call 303.735.5162

If you have questions about your rights as a research study participant, you can call the Institutional Review Board (IRB). The IRB is independent from the research team. You can contact the IRB if you have concerns or complaints that you do not want to talk to the study team about. The IRB phone number is (303) 735-3702.

Signing the Consent Form

I have read (or someone has read to me) this form. I am aware that my child is being asked to be in a research study. I have had a chance to ask all the questions I have at this time. I have had my questions answered in a way that is clear. I voluntarily give permission for my child to be in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

Name of Participant (printed) ___________________________ ___________________________ __

Name of Parent or Guardian (printed) _____________________________________________________

Signature of Parent or Guardian ___________________________ Date ______________

Name of Person Obtaining Consent (printed) ____________________ ____________________________

Signature of Person Obtaining Consent ________________________________ Date ______________
Child Participant Assent Form

The Effect of Symmetrical and Asymmetrical Peer-Assisted Learning Structures on Music Achievement and Student Engagement in the Secondary Large Ensemble

Erik A. Johnson, Researcher

I am willing to take part in a research study called ‘The Effect of Symmetrical and Asymmetrical Peer-Assisted Learning Structures on Music Achievement and Student Engagement in the Secondary Large Ensemble.’ I have been told that my music teacher and a researcher from the University of Colorado, College of Music are hoping to learn about peer-based teaching. The information used for this study will come from my usual music class activities. I will be asked about how I feel as a music learner and will be audio recorded performing a short rhythm exercise. This study will last about four-weeks.

I do not have to be in this study if I don’t want to and I can quit the study any time I want. If I don’t like a question, I don’t have to answer it and, if I ask, my answers will not be used in the study. Nothing bad will happen to me if I decide that I don’t want to participate. My grades in school will not be affected at all.

All information collected from me during this study will be kept in a locked cabinet in the researcher’s university office. All audiotapes, numerical codes and data will be destroyed one year following the study.

Your participation in this study is completely voluntary. Participating or not participating will not affect your grades at school. You may stop participating at any time without penalty. Even if your parents have approved your participation, you may decide not to participate if you don’t want to.

Other than the researchers, no one will know my answers, not parents, other teachers, and/or other students.

Name ____________________________________________
Signature _______________________________________
Date _________________________ Age __________________________
APPENDIX C

PARTICIPANT BACKGROUND, MOTIVATION, ENGAGEMENT, AND SES QUESTIONNAIRE
Research Study Questionnaire

**Code Name** (choose a short 5-6 letter code name that is different than your name but is something that you can easily remember – your code should end with the first two letters of your last name)

Your Code Name: ____________________________

**Section One: Musical Background Information**

**Directions:** The questions in this section ask you about your current and previous musical activities. For each question, please list all of the information you can think of. You do not need to use full sentences. There are no right or wrong answers.

1. Do you, or have you taken private lessons on your instrument? If so, when and for how long?
   ____________________________________________________________________________________________________________

2. Do you play any other instruments than the one you play in band? If so, list all of the instruments you play
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________

3. What types of music do you like to listen to?
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________

4. Do you participate in musical activities outside of school? If so, what are they?
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________

5. Do you participate in musical activities at school other than band? If so, what are they?
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________

6. Do other members of your family make music? If so, please describe what they do. If you are involved with the musical activities of other members of your family, please describe how you are involved.
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________
   ____________________________________________________________________________________________________________

**Section Two: How I Feel About Band**

**Directions:** Read each statement carefully then mark how much you agree or disagree by circling a letter after each statement. There are no “right” or “wrong” answers. You will probably agree with some items and disagree with others. If you find that the letters do not match your own opinion, use the one that is closest to the way you feel.

**GIVE YOUR OPINION ON EVERY STATEMENT**

1. I try hard to do well in Band.
   A) Not at all true   B) Slightly true   C) Moderately true   D) Very true

Go on to Next Page
2. I enjoy learning new things in Band.
   A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

3. When we work on something in Band, I feel discouraged.
   A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

4. In Band, I do just enough to get by.
   A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

5. Band is fun.
   A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

6. In Band, I work as hard as I can.
   A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

7. When I get stuck on a problem, it really bothers me.
   A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

8. When I'm in Band, I listen very carefully.
   A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

9. When I have a problem with my part in Band, I feel worried.
   A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

10. When we work on something in Band, I get involved.
    A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

11. When I'm in Band, I think about other things.
    A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

12. When we work on something in Band, I feel interested.
    A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

13. Band is not all that fun for me.
    A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

14. When I'm in Band, I just act like I'm working.
    A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

15. When I'm in Band, I feel good.
    A) Not at all true  B) Slightly true  C) Moderately true  D) Very true

16. When I'm in Band, my mind wanders.
Research Study Questionnaire

17. When I’m in Band, I participate in class discussions.
   A) Not at all true       B) Slightly true       C) Moderately true      D) Very true

18. When we work on something in Band, I feel bored.
   A) Not at all true       B) Slightly true       C) Moderately true      D) Very true

19. I don’t try very hard in Band.
   A) Not at all true       B) Slightly true       C) Moderately true      D) Very true

20. I pay attention in Band.
   A) Not at all true       B) Slightly true       C) Moderately true      D) Very true

Section Three: My Motivation in Band

Directions: Read each statement carefully then mark how much you agree or disagree by circling a number after each statement. There are no “right” or “wrong” answers. You will probably agree with some items and disagree with others. If you find that the numbers do not match your own opinion, use the one that is closest to the way you feel.

GIVE YOUR OPINION ON EVERY STATEMENT

The scale represents answers that range from:
“1” – Not at all true of me        “3” – Somewhat true of me        “5” – Very true of me

1. I want to learn as much as possible about playing my instrument.  1 2 3 4 5

2. It is important for me to understand what we learn in band as well as I can.  1 2 3 4 5

3. I want to completely master the things we learn in band.  1 2 3 4 5

4. I am worried that I may not learn all that I possibly could in band.  1 2 3 4 5

5. Sometimes I’m afraid that I may not understand what we learn in band as well as I’d like.  1 2 3 4 5

6. I am sometimes worried that I may not learn all that there is to learn in band.  1 2 3 4 5

7. It is important for me to do better than other students in band.  1 2 3 4 5

8. It is important for me to do well when compared to other students in band.  1 2 3 4 5

9. My goal in band is to get a better evaluation than most of the other students in band.  1 2 3 4 5

Go on to Next Page
### Research Study Questionnaire

A) Not at all true   B) Slightly true   C) Moderately true   D) Very true

17. When I’m in Band, I participate in class discussions.  
   A) Not at all true   B) Slightly true   C) Moderately true   D) Very true

18. When we work on something in Band, I feel bored.  
   A) Not at all true   B) Slightly true   C) Moderately true   D) Very true

19. I don’t try very hard in Band.  
   A) Not at all true   B) Slightly true   C) Moderately true   D) Very true

20. I pay attention in Band.  
   A) Not at all true   B) Slightly true   C) Moderately true   D) Very true

### Section Three: My Motivation in Band

**Directions:** Read each statement carefully then mark how much you agree or disagree by circling a number after each statement. There are no “right” or “wrong” answers. You will probably agree with some items and disagree with others. If you find that the numbers do not match your own opinion, use the one that is closest to the way you feel.

**GIVE YOUR OPINION ON EVERY STATEMENT**

The scale represents answers that range from:  
“1” – Not at all true of me   “3” – Somewhat true of me   “5” – Very true of me

1. I want to learn as much as possible about playing my instrument.  
   1 2 3 4 5

2. It is important for me to understand what we learn in band as well as I can.  
   1 2 3 4 5

3. I want to completely master the things we learn in band.  
   1 2 3 4 5

4. I am worried that I may not learn all that I possibly could in band.  
   1 2 3 4 5

5. Sometimes I’m afraid that I may not understand what we learn in band as well as I’d like.  
   1 2 3 4 5

6. I am sometimes worried that I may not learn all that there is to learn in band.  
   1 2 3 4 5

7. It is important for me to do better than other students in band.  
   1 2 3 4 5

8. It is important for me to do well when compared to other students in band.  
   1 2 3 4 5

9. My goal in band is to get a better evaluation than most of the other students in band.  
   1 2 3 4 5

Go on to Next Page
Research Study Questionnaire

10. I just want to avoid doing poorly in band. 1 2 3 4 5
11. My goal in band is to avoid performing poorly. 1 2 3 4 5
12. My fear of performing poorly in band is often what motivates me. 1 2 3 4 5

Section Four: Parent and Family Background

Directions: Answer each question below about your parent’s background and education. Please choose the answer for each question. There are no right or wrong answers.

1. What is your father’s current employment
   a. Not working
   b. Working part-time
   c. College graduate

2. What is your mother’s current employment
   a. Not working
   b. Working part-time
   c. College graduate

3. What is your father’s level of education
   a. Some high school
   b. High school graduate
   c. College graduate

4. What is your mother’s level of education
   a. Some high school
   b. High school graduate
   c. College graduate

5. What is your current family structure at home
   a. Single parent
   b. Parent and step-parent
   c. Mother and father

6. Do you receive school lunch benefit?
   a. Yes, free lunches
   b. Yes, reduced cost lunches
   c. No subsidy

End of Questionnaire
APPENDIX D

SIGHT-READING ASSESSMENT
Sight Reading Assessment (version 2)
APPENDIX E

MUSIC THEORY KNOWLEDGE ASSESSMENT
Music Theory Knowledge Survey

Directions: Please answer the following questions to the best of your ability. You may not know the answer to all of the questions below. That is OK. Please just write down what you know and leave the questions that you do not know blank. The purpose of this sheet is to see how much you know about music theory and WILL NOT effect your grade in this class at all.

1. In the space below, please write down all of the flats as they appear in key signatures on the staff:

2. In the space below, please write down all of the sharps as they appear in key signatures on the staff:

3. In the space provided below, please complete the key signatures around the circle of fifths.

4. How many flats are in the key of Eb? 

5. How many sharps are in the key of D? 

6. How many flats are in the key of F? 

7. How many flats are in the key of Bb? 

8. How many sharps are in the key of G? 

9. How many flats are in the key of Ab? 

10. How many sharps are in the key of A?
APPENDIX F

SAMPLE OF INSTRUCTIONAL AND TRAINING MATERIALS
# Experiment Checklist

Each day, check off the items that you and your partner have completed

<table>
<thead>
<tr>
<th>Days 1-2:</th>
<th>Rhythm Counting</th>
<th>Sight Reading</th>
<th>Key Signatures</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>_ Rhythm Sheet #1</td>
<td>_ Exercise #1</td>
<td>_ Flats &amp; Sharps #1</td>
<td>_ Composition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>_ Exercise #2</td>
<td>_ Flats &amp; Sharps #2</td>
<td>Exercise #1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>_ Exercise #3</td>
<td>_ Partner Quiz</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>_ Exercise #4</td>
<td>_ Flashcards</td>
<td></td>
</tr>
<tr>
<td>Days 3-4:</td>
<td>_ Rhythm Sheet #2</td>
<td>_ Exercise #5</td>
<td>_ Writing in Flats and Sharps on the Staff</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>_ Exercise #6</td>
<td>_ Constructing the Circle of 5ths</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>_ Exercise #7</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>_ Exercise #8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days 5-6:</td>
<td></td>
<td></td>
<td>_ Decoding the Circle of 5ths</td>
<td>_ Composition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exercise #1</td>
<td></td>
</tr>
<tr>
<td>Days 7-8:</td>
<td>_ Rhythm Sheet #3</td>
<td>_ Exercise #9</td>
<td>_ Understanding the Circle of 5ths</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>_ Exercise #10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days 9-10:</td>
<td></td>
<td></td>
<td>_ Remembering the Circle of 5ths</td>
<td>_ Composition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exercise #2</td>
<td></td>
</tr>
<tr>
<td>Days 11-12:</td>
<td>_ Rhythm Sheet #4</td>
<td>_ Exercise #11</td>
<td>_ Practicing the Circle of 5ths</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>_ Exercise #12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Learning About Peer-Teaching

Student Training Worksheet

Teacher Key

How will you set daily goals with your partner?
- Refer to the checklist?
- Did you finish your tasks on the other days?
- Are there ideas or concepts that you don’t understand?

How will you talk to your partner?
- Telling language or Asking language? A combination of both?
- “know it all” tone or “respect for others” tone?
- Will you use their name?
- Praise-Suggestion-Praise?
- Pause-Think-Prompt-Praise?

How will you listen to your partner?
- Will you listen with your eyes?
- Will you interrupt them?
- Will you try to use what they say to do a better job?

What kind of questions will you ask your partner?
- Will you ask them to explain something you don’t understand?
- Will you ask them to talk out-loud through how they are completing a problem?
- Will you ask them if they understand? If they don’t, what will you do?

How will you decide who takes turns?
- Will you trade every couple of minutes?
- Will you trade every measure of music? Every line of music? Every worksheet?
- Will you figure out who knows more and go with that?

How will you teach your partner?
- Show and tell?
- Try it together?
- Speak Aloud Alone (SAA)?
- Ask “how did I do?”

How will you and your partner stay on-task?
- Pay attention to only your partner?
- Avoid talking to other groups?
- Keep your goals in mind?
- Keep an eye on the clock?
- Look at the checklist to see if you completed everything?

Who will get the materials?
- Should each person have a job?
- Who will get the 2 egg shakers? Who will put them back?
- Who will get the brown worksheet folder? Who will put it back?
Steps to Peer Teaching

**Step 1**

**Show and Tell:** Student verbalizes while performing the task and peer observes

Example: Watch while I write in the counts and count this measure out loud. Before I count, I will tell you how I'm going to do it.

**Step 2**

**Try it Together:** Peer performs under the guidance of the model’s instruction

Example: Both students work together to write in the counts and count the rhythm out loud. Work together until you both have it figured out. Sink or Swim together!

**Step 3**

**Speak Aloud Alone:** Peer performs while instructing him-or herself aloud

Example: On my own, I am going to talk my way through each step while I do it. The other student watches and corrects any mistakes afterward.

**Step 4**

**How did I do?:** Model provides feedback to their peer based upon their performance and repeats steps above if necessary

Example: The student who was watching in step 3 gives the other some feedback.
Rhythm Exercises

Before You Start!
With your partner, decide how often you will take turns switching between playing the teacher and the student.

Step One (8th Note Numbers)

**Student:** Using numbers, write in all of the 8th note counts for one measure.

**Teacher:** Make sure that the numbers are equally spaced and underneath the beat that they belong to.

![Correct vs Incorrect example]

Step Two (Brackets)

**Student:** Using brackets, group the beats that sound together.

**Teacher:** Point with your pencil to the notes that should be in brackets while your student draws the brackets.

![Correct vs Incorrect example]
**Step Three (Arrows)**

**Student:** Place an arrow under each count that you will say out loud. Here are the rules:
- a. You say all notes that are not in brackets
- b. The only note that you say in the brackets is the first one

**Teacher:** Watch closely as your student places arrows above beats 1, 2, 3, 4. Correct them as they go.

---

**Step Four (Saying the Counts)**

**Student:**
1. Get the egg shaker going on steady 8th notes. Your tempo should be very slow.
2. Look at the measure and think of what counts you will say and will not say.
3. Count yourself off by saying “1 & 2 & 3 & 4 &”
4. Count the measure.

**Teacher:**
1. Using a pencil, point at notes that were said correctly.
2. Using a pencil, point at notes or areas of notes that were said incorrectly.
3. Using the egg shaker, slowly count the measure with your student trying to say all the notes correctly.
4. Work on this until both of you can count correctly without making a mistake.
Composition Exercise #1

**Task**
Together with your partner, work together to compose a duet by following these steps:

1. Choose who will be the top line and bottom line
2. Write in the appropriate clef (treble or bass)
3. Rhythm Rules
   a. You can choose from any of the 4 rhythms to the right
   b. You can only use each rhythm twice (once in the top part and once in the bottom part)
   c. Each bar in parts 1 and 2 must have different rhythms
4. Write in the counts for your duet and count it out loud with your partner
5. Play the duet with your partner!!
6. Change the notes to make it sound even better!!
Instructions for Day 1-2  
Writing out the Order of Sharps & Flats

Things to know:
1. There are only 7 flats!
   a. BEADGCF
2. There are only 7 sharps!
   a. FCGDAEB
3. The sharps are the flats backwards
   a. Flats: BEADGCF  Sharps: FCGDAEB
4. There is a sharp and flat for each of the seven notes

Tasks to Complete
1. Individually without the help of your partner, complete the worksheet on the next page. If you need help, look at the “things to know” section above.
2. After you have finished, compare your answers with your partner.
3. Working together with your partner, complete the third page of this packet without looking at your previous answers for help.
4. Quiz your partner by asking them to say the order of flats and the order of sharps from memory. Have them say “B-flat, E-flat, A-flat, D-flat, G-flat, C-flat, F-flat, rest… F-sharp, G-sharp, D-sharp, A-sharp, E-sharp, B-sharp, rest…”
5. Using the blank 3x5 cards attached, create four flash cards:
   a. Flash Card #1
      i. Front: B-flat, E-flat, A-flat, D-flat, G-flat, C-flat, F-flat, rest…
      ii. Back: “Order of Flats”
   b. Flash Card #2
      i. Front: F-sharp, C-sharp, G-sharp, D-sharp, A-sharp, E-sharp, B-sharp, rest…
      ii. Back: “Order of Sharps”
   c. Flash Card #3
      i. Front: Question – Say the Order of Flats
      ii. Back: Answer - Bb, Eb, Ab, Db, Gb, Cb, Fb, rest…
   d. Flash Card #4
      i. Front: Question – Say the Order of Sharps
      ii. Back: Answer – F#, C#, G#, D#, A#, E#, B#, rest…