Utilizing Peers to Support Academic Learning for Children With Autism Spectrum Disorder

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Abstract

The inclusion of students with autism spectrum disorder in academic settings is becoming more common. However, most practices focus on increasing social skills even though students also struggle in academic areas. There is a need for strategies that address both social and academic skill deficits, are evidence based, and are easy to implement in the classroom. Peer-mediated interventions have evidence supporting their use in promoting social and academic behavior change and are socially valid and cost-effective. The purpose of this paper is to present examples of how to implement 2 common peer-tutoring strategies: Classwide Peer Tutoring and Peer-Assisted Learning Strategies. Examples for implementing both strategies are provided using a hypothetical student in a general education setting, followed by a brief summary of evidence supporting the peer-mediated academic instruction.

Keywords Autism · Peer instruction · Academic skills · Evidence-based practice

Jacob is a freshman in high school. Diagnosed with autism spectrum disorder (ASD) in early elementary school, he has relied on one-to-one adult support in all academic coursework. When the paraprofessional providing support was absent during middle school, Jacob would struggle to engage in class and socialized less with his peers. His current special education teacher and his behavior analyst have observed that Jacob is more socially connected to adults than to peers. Jacob chooses to spend most of his time with adults (e.g., teachers, janitors, administration, and paraprofessionals), whereas same-age peers talk around lockers or sit in groups at lunch while on their cell phones. His math teacher, Mr. Matthews, is completing a master's degree in special education with an emphasis in applied behavior analysis and utilizing evidence-based practices. Researching with the university library online databases; What Works Clearinghouse, an organization aimed at providing educators information about research and evidence-based practices suited for their needs; and Google Scholar, Mr. Matthews found repeated references to

practices to increase skills in students with ASD, including peer tutoring, peer-mediated instruction (PMI), peer supports, and Classwide Peer Tutoring (CWPT). Mr. Matthews spoke with Jacob's special education teacher and the behavior analyst about implementing PMI in his classroom, specifically CWPT.

Peer-Mediated Instruction

PMI is recognized as one of the most effective educational strategies available (Higgins et al., 2016; Zeneli & Tymms, 2015). Using peers to provide instruction to one another is not a new concept (Asselin & Vasa, 1981; Delquadri, Greenwood, Whorton, Carta, & Hall, 1986; Scruggs, Mastropieri, & Richter, 1985), and research conducted across grades and ages indicates PMI is a valid strategy. Prominent methods include CWPT (Delquadri et al., 1986) and Peer-Assisted Learning Strategies (PALS; Fuchs, Fuchs, Mathes, & Simmons, 1997).

Furthermore, CWPT and PALS demonstrate positive social and academic results for students with disabilities (Bowman-Perrott et al., 2013; Lane, 2004; Ryan, Reid, & Epstein, 2004; Vannest, Harrison, Temple-Harvey, Ramsey, & Parker, 2011), including ASD, and are endorsed by the What Works Clearinghouse in specific subject areas (U.S. Department of

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Education, Institute of Education Sciences, What Works Clearinghouse, 2007, 2012).

However, the effects of PMI in math and specific content areas in specific grades cannot be assumed (see Table 1). Additionally, Table 1 describes skills previously taught across subjects and grades for students with ASD.

Classwide Peer Tutoring

CWPT was designed by the University of Kansas as a program to improve instruction for students who are minority, disadvantaged, or disabled. CWPT is made up of instructional principles, such as opportunities to respond, a functionality of key academic skill areas, and behavioral principles. Opportunities to respond are the chances students are provided to reply to antecedents or prompts; ideally, it is best to have ample opportunities to respond when learning new material. The functionality of key academic skills is identifying targets used to measure what students are expected to learn. Behavior principles include the use of reinforcement, contingencies, and corrective feedback.

CWPT is useful in various settings and can be implemented in 30-min intervals. CWPT begins by training students with teaching, modeling, and role-playing the expectations, followed by providing corrective feedback. The teacher explains the rules, how teams function, and how points are earned. Teachers demonstrate the tutoring process by having students act as the tutees and the teacher as the tutor. Points are delivered and corrective feedback is given. The procedure is demonstrated again with two students acting as tutor and tutee while the teacher provides feedback, reinforcement, and correction. These demonstrations

are repeated until the teacher is confident all the students understand. Students then practice the skills as the teacher monitors and provides feedback, reinforcement, and correction of errors. Sessions may take longer when training younger students.

During CWPT, a timer is set for 10 min. As the tutee engages in the material to earn points for his or her team, the tutor observes the tutee and awards points or corrects errors. Two points are awarded if the tutee reads the passage without errors, one point is awarded if the tutor corrects an error, and no points are awarded for word omissions, substitutions, or hesitations. When the tutor corrects the error, he or she correctly pronounces the word and has the tutee reread the sentence. Points are awarded based on the written or oral response for spelling, math, and writing sessions. Two points are awarded for no errors and one point is awarded if the tutee responds correctly after receiving feedback from the tutor. The teacher actively supervises by providing assistance when needed and awarding points to tutors who use correct tutoring behaviors. Bonus points are given for quick responses and cooperation with peers. At the conclusion of the 10 min, roles are switched and the procedure is repeated. Points are added together and graphed at the end of each session, and the winning team is selected after a predetermined time (e.g., day, week, or month). The winning team receives applause and praise and the losing team is praised for making a respectable effort (Delquadri et al., 1986). Figure 1 provides a scoring sheet students can use when engaged in peer tutoring.

Jacob's math teacher decided to utilize CWPT in his algebra class due to his concern for Jacob's progress and social skills. The school's behavior analyst, familiar with CWPT, provided Mr. Matthews with training and support on how to properly carry out CWPT in the class. Mr. Matthews then provided training to

Table 1 Targeted skills across grade and subject using peer-mediated instruction

Subject area	Elementary Kindergarten–Fifth Grade	Middle Sixth–Eighth Grade	High Ninth–Twelfth Grade
English language arts	Expressive language (Kamps, Locke, Delquadri, & Hall, 1989)	Academic engagement and curriculum contact (Carter, Cushing, Clark, & Kennedy, 2005)	Writing skills (Bedrosian et al., 2003) Academic engagement and curriculum contact (Carter et al., 2005)
Reading	Oral reading (Kamps et al., 1989) Words read per minute and reading comprehension (Kamps, Barbeta, Leonard, & Delquadri, 1994) Academic scores (Kamps, Leonard, Potucek, & Garrison-Harrell, 1995) Reading comprehension and fluency (Regelski, 2016)	Reading comprehension and fluency (Regelski, 2016) Reading fluency (Scott, 2013)	—
Math	—	—	—
Science	—	Academic engagement and curriculum contact (Carter et al., 2005)	Academic engagement and curriculum contact (Carter et al., 2005)
History	Academic scores and engagement (Dugan et al., 1995)	Test scores (Marshak, Mastropieri, & Scruggs, 2011)	—

Note: — indicates data not available

Fig. 1. Scoring sheet for CWPT and PALS

Scoring sheet for CWPT and PALS

Activity Scoring Sheet for Group					
	Review of the material	Tally Number of Times	Total Number	Points	Total Points
	Correct			2	
	Incorrect with feedback			1	
	Incorrect no feedback			0	

the students and began the procedure after his initial direct instruction.

Using Jacob as an illustration, the following steps are used for implementing CWPT:

1. Teach the procedure using explanation, modeling, role-play, and corrective feedback, similar to behavioral skills training: Mr. Matthews explains to the class that, following the lecture, they will work with each other to practice math skills. The teacher models the steps involved with a student volunteer. Mr. Matthews acts as the tutor and asks the student to complete each step of the math problem. He provides praise when a step is completed correctly. The student is asked to make a mistake on the next problem; Mr. Matthews models how to tell the student to correct the error. He and the student switch roles and Mr. Matthews provides feedback to the student about delivering reinforcement and feedback.
2. Explain rules for teams and how to earn points and reinforcement (e.g., praise): During role-playing and modeling, Mr. Matthews explains that groups receive two points when the student gets a problem correct without assistance. Groups receive one point if a correction is made and no points if an error is made and not corrected.
3. Have students role-play while providing feedback: Mr. Matthews pairs Jacob with Samuel, a student who has shown proficiency in class and has taken an interest in supporting Jacob. Mr. Matthews provides math problems for the class to complete. He walks around praising students implementing the tutoring process correctly and gives feedback to those who make an error. Samuel is helping Jacob with a math problem when Mr. Matthews walks by; he sees Samuel is correcting an error and praises him. Later, he notices Samuel not correcting an error; he stops and points out the error and models to Samuel what he should do, then praises both for working cooperatively. The roles are reversed, and Mr. Matthews gives feedback to Jacob when he is tutoring Samuel.
4. During implementation, pair students of high and low proficiency and set a 10-min timer: Mr. Matthews is confident the students understand what to do after a few days of practice. The groups that practiced together remain the same, but

Mr. Matthews checks to ensure lower performing students are paired with higher performing students. Once he finishes his daily lecture, Mr. Matthews starts the 10-min timer as the student pairs begin working on the assigned math problems.

5. Have the tutee engage in the subject materials and reinforce with points for going over materials correctly: Samuel begins by having Jacob independently work on the problem. Jacob works through the problem correctly and explains how each step is completed. Jacob receives praise and two points for each correct answer.
6. Correct errors by modeling and having the tutee review the material: Samuel provides feedback if Jacob misses a step or explains a step incorrectly. Jacob repeats what is taught by Samuel, fixes his error, and receives praise and one point.
7. Have peers switch roles after 10 min: The timer goes off after 10 min, and the students switch roles. Jacob monitors Samuel as he works through the problems selected by Mr. Matthews and implements the same point system.
8. Actively monitor sessions and reinforce correct implementation: Mr. Matthews walks around and awards points to teams working well together and provides clarification as needed.
9. Assess impact: Jacob's test and homework scores improve after a few weeks. Mr. Matthews reports Jacob demonstrates increased confidence in his math skills by asking and answering more questions. He also relays that Jacob is socializing more with his peers outside of class.

Mr. Matthews discussed the success he has seen with CWPT with Jacob's reading teacher, Mrs. Li. Interested in helping Jacob academically, as well as decreasing his reliance on the one-to-one support, she used Google Scholar to search for a CWPT model designed for reading and found PALS.

Peer-Assisted Learning Strategies

The PALS program was initially developed to teach reading to kindergarten through sixth-grade students but has expanded to secondary settings (Fuchs et al., 2001; Fuchs, Fuchs, &

Kazdan, 1999). Student pairs are based on ability level, typically with one student proficient in an area whereas the other student is not. In contrast to CWPT, pairs are rotated so students have the chance both to serve as tutor and tutee and to work with multiple partners; lessons typically last 35 min and are implemented at least three times per week. Activities include partner reading, paragraph “shrinking,” and prediction relay. Partner reading entails the tutor reading the passage first. Reading the passage provides the opportunity for the tutee to hear the passage and study words that are more difficult before he or she reads aloud and receives corrective feedback for mispronunciations. Each student reads for 5 min before switching roles. Students engaged in paragraph “shrinking” provide a summary of the passage, giving sequential details of essential events, and state the main idea. A prediction relay consists of the students guessing what will happen, reading the next page, and summarizing what was read. The tutor decides if the tutee made a correct prediction. As with partner reading, students switch roles every 5 min.

The kindergarten and first-grade PALS curriculum consist of 70 precreated lesson sheets. Teachers select reading material based on student needs. First-grade lessons begin by reviewing sounds and words for 15 min to emphasize hearing and identifying sounds, sounding out words, identifying sight words, and practicing reading the passages. Next, the students work on story sharing by predicting what will happen in the story, reading aloud, and recounting stories. Lessons for students in second through sixth grade are geared to improving the accuracy of reading, fluency, and comprehension.

Additionally, PALS can be used to teach high school students how to read for information and take notes. Students are motivated and reinforced by earning points for their respective teams if no errors occur while reading sentences, they demonstrate effort, and they correctly identify the subject and main idea of the passage. Points assigned by teachers and tutors are recorded on scorecards. The PALS process is taught through workshops via modeling and role-play, and manuals are given outlining the curriculum (Fuchs et al., 1997).

Mrs. Li began using the PALS program in her reading class after attending a workshop. She taught her students how to work as teams and utilize paragraph shrinking, partner reading, and prediction relays. Mrs. Li recorded improved academic performance and better engagement with peers as a result.

Using Jacob as an illustration, the following steps are used for implementing PALS:

1. Teach students with an explanation, modeling, role-play, and corrective feedback: Mrs. Li explains that the students will begin working with each other in reading class. She models the steps with a student volunteer. Mrs. Li starts in the role of tutor and begins partner reading: reading the passage aloud for 5 min. She explains this allows the tutee to hear the passage correctly. The student then reads for 5 min as Mrs. Li (as the tutor) provides feedback for mispronunciations and omissions. During paragraph shrinking, the student reads the paragraph as Mrs. Li silently follows along; she then asks the student to summarize the reading and provides feedback as necessary. To demonstrate prediction relays, Mrs. Li models the role of the tutor by reading a page to the student and asking him to guess what will happen next. The student provides his answer. Mrs. Li reads the next page and reinforces correct predictions. She responds to incorrect guesses by pointing out areas in the passage that may have suggested the correct prediction.
2. Identify rules for teams and how to earn points and reinforcement (e.g., praise): During the role-play and modeling stage, Mrs. Li explains that the group receives two points when the reader implements the strategies correctly. If a correction is made during the activity, the group receives one point. The group does not receive points if an error is made and not corrected.
3. Have students role-play while providing feedback: Mrs. Li decides she will change pairs each time a new book is started. She pairs Jacob with Sylvia for the first book because Sylvia has volunteered to read books to younger students in the past. Mrs. Li gives the class new reading materials. She circulates around the room and gives praise to students tutoring correctly and feedback to those who make an error. Sylvia is helping Jacob with word pronunciation when Mrs. Li walks by; she sees Sylvia is correcting the error and praises her. Later, she notices Sylvia did not correct during paragraph shrinking; she stops and points out the error and models to Sylvia what she should do, then praises both for working together appropriately. The roles are reversed, and Mrs. Li gives feedback to Jacob as he tutors Sylvia.
4. Pair students of high and low proficiently and set a 5-min timer: Mrs. Li is confident the students understand what to do after a few days of practice. She pairs her students based on ability and need, keeping Jacob and Sylvia together. She instructs the students to begin reading the assigned book with their partners. A timer is set for 5 min, and students begin.
5. Have the tutor engage with subject materials: Sylvia reads to Jacob for 5 min.
6. Have peers switch roles after 5 min: The students switch when the timer indicates the end of the 5 min. Jacob then reads the same passage, and Sylvia provides feedback if words are mispronounced or omitted. If Jacob reads the passage without errors, he is given praise and two points.
7. Have tutors correct errors by modeling and having the tutee review the material: If Sylvia makes corrections for any of the activities, the group receives one point. Jacob

- then repeats what is read or corrected by Sylvia, fixes his error, and receives an additional point and praise.
8. Circulate during sessions and award points and reinforcement for correct implementation: During PALS, Mrs. Li moves around the room and assigns points for teams working well together and helping with problems needing clarification. The steps are repeated when engaging in paragraph shrinking and prediction relays.
 9. Assess impact: Mrs. Li graphs Jacob's homework and test scores and sees an increasing trend after implementing PALS. Mrs. Li reports that Jacob seems more eager to participate in class and is socializing more with his peers while reading.

Conclusion

As a result of policies such as Individuals with Disabilities Education Improvement Act (2004) and the Every Student Succeeds Act (2015) (Klein, 2016), the majority of students with ASD spend 40% or more of their time in general education settings (Snyder, de Brey, & Dillow, 2016; Zablotzky, Black, Maenner, Schieve, & Blumberg, 2015). Additionally, students with ASD included in general education settings perform better on academic achievement measures (Kurth & Mastergeorge, 2010).

Because the prevalence of ASD has risen to 1 in 59 people (Centers for Disease Control [CDC], 2018), it is essential that effective and efficient intervention strategies are employed in order to increase social and academic success. Teachers face challenges: difficulty in modifying instruction, in accommodation of differences, in managing challenging behaviors, and in providing opportunities for students with ASD to interact and foster relationships with their peers (Lindsay, Proulx, Thomson, & Scott, 2013). A lack of knowledge about strategies and implementation can lead to poor academic and social outcomes for students with ASD (Carnevale, Smith, & Strohl, 2013; Newman et al., 2011).

Academic achievement for students with ASD is often treated as secondary to communication and social skills (Petrina, Carter, & Stephenson, 2017). As a result, research regarding academic achievement in the population is less prevalent than research about communication and social skills (Keen, Webster, & Ridley, 2016; Wong et al., 2013). Although students do face barriers to successful inclusion, such as anxiety, poor social skills, adaptability problems, and stereotypical behaviors (Carter et al., 2014; Lindsay et al., 2013), many students with ASD demonstrate shortcomings in core subject areas (Keen et al., 2016; Kurth & Mastergeorge, 2010; Wei, Christiano, Yu, Wagner, & Spiker, 2015). Deficits in reading and math are detected as early as preschool (Miller et al., 2017), and

parents report frustration or displeasure with the academic progress for children with ASD (Mackintosh, Goin-Kochel, & Myers, 2012; McDonald & Lopes, 2014; Starr & Foy, 2012).

The use of peers has demonstrated improved academic and social outcomes for students with ASD. PMI is a promising strategy because it demonstrates benefits for tutors and tutees (Dineen, Clark, & Risley, 1977; Franca, Kerr, Reitz, & Lambert, 1990; Schaefer, Cannella-Malone, & Carter, 2016), is less socially stigmatizing than traditional specialized instruction (Broer, Doyle, & Giangreco, 2005; Carter, Sisco, Melekoglu, & Kurkowski, 2007), and is cost-effective (Hoff & Robinson, 2002). Peers are instrumental in keeping students on task throughout independent work (Hoff & Robinson, 2002; McCurdy & Cole, 2014), aid in generalization, and are an easily accessible resource (McCurdy & Cole, 2014). PMI also generates time for teachers to focus on instruction and provide individualized support when needed (Hoff & Robinson, 2002).

PMI is easy to implement and beneficial for both tutors and tutees (Asselin & Vasa, 1981; Delquadri et al., 1986; Scruggs et al., 1985). Both students improve social and academic skills, gain confidence in their skills, and create or strengthen friendships (Asselin & Vasa, 1981; Bedrosian, Lasker, Speidel, & Politsch, 2003; Carter et al., 2015; Franca et al., 1990; Huber, 2016; Huber, Carter, Lopano, & Stankiewicz, 2018; Scruggs et al., 1985). Positive outcomes for students and teachers make PMI a promising, easily implemented, cost-efficient strategy that can be used across grade levels and subject areas. PMI not only improves social deficits in students with ASD but also can improve academic skills in some areas, bridging the gap between behavioral and academic achievement.

Both CWPT and PALS are strategies recognized as effective by the What Works Clearinghouse. Although more research needs to be conducted to expand the conditions under which PMI can best benefit students with ASD across content areas, PMI has already demonstrated success in supporting students with ASD in general education settings with the acquisition of academic, social, and communication skills.

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Compliance with Ethical Standards

Conflict of Interest April Haas declares that she has no conflict of interest. Kimberly Vannest declares that she has no conflict of interest. Sandy D. Smith declares that she has no conflict of interest.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

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