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Instructional Contexts for Adolescents with Autism: Impact of Educational Setting

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Abstract

The present study describes the instructional contexts and activities of adolescents with autism in inclusive and self-contained settings for mathematics and language arts instruction. Fifteen adolescents with autism, and thirty peers of these students, participated in the study. All students were observed four times for 50 minute intervals each during math and language arts instruction to document student participation in learning situations, as well as learning partners, curriculum usage, and instructional formats for students with and without autism in different education settings. Findings indicate between group differences for those adolescents participating in inclusive and self-contained settings. Implications and future directions for are discussed.

Providing students with autism an appropriate education is a growing challenge. The prevalence of autism is increasing rapidly, with as many as one in every 150 children diagnosed with the disorder (Centers for Disease Control, 2007). Recent federal mandates hold schools accountable for student achievement in math, language arts, and science, including students with disabilities ("No Child Left Behind Act," 2001; Yell, Drasgow, & Lowrey, 2005). Additionally, special education law requires that students with disabilities have access to and make progress in the general education curriculum ("Individuals with Disabilities Education Improvement Act," 2004). As a result of these federal mandates more students with autism and other disabilities are receiving their education in general education settings (U.S. Department of Education, 2008).

Yet much remains to be known about how adolescents with autism learn core academic skills in both general and special education settings. In large measure this is due to a notion that academic skill development is less crucial than functional skills curriculum for children with autism (Dunlap, Kern, & Worcester, 2001). Thus, studies of instructional strategies for academic content knowledge for children with autism are sparse. Furthermore, many children with autism are denied access to academic skills because they are perceived to lack the cognitive abilities or readiness skills needed for academic content instruction (Kliewer & Biklen, 2001; Mirenda, 2003). Additionally, many children with autism do not follow a typical developmental sequence when developing academic skills, leaving teachers and families to believe that these children will not benefit from academic instruction (Kluth & Darmody-Latham, 2003). Despite these findings, a growing body of research has occurred in academic skill development for students with autism. For example, literacy development in people with autism has

received growing research attention (Eikeseth & Jahr, 2001; Kliewer & Biklen, 2001; Koppenhaver & Erickson, 2003; Mirenda, 2003; Nation, Clarke, Wright, & Williams, 2006; O'Connor & Klein, 2004). To a lesser extent, writing skills development (Bedrosian, Lasker, Speidel, & Politsch, 2003; Blischak & Schlosser, 2003; Schlosser & Blischak, 2004), and math development (Banda, McAfee, Lee, & Kubina, 2007; Mayes & Calhoun, 2003; Minshew, Goldstein, Taylor, & Siegel, 1994) have received research attention.

While instructional strategies and academic learning outcomes are not well understood for adolescents with autism, existing research documents the importance of student engagement on academic outcomes. For example, student engagement in academic tasks, or on-task behavior (Brooks, Todd, Tofflemoyer, & Horner, 2003; Kim & Hupp, 2005) has been associated with decreases in challenging or inappropriate behavior (Massey & Wheeler, 2000) and increases in learning and academic achievement (Bulgren & Carta, 1992; Greenwood, Horton, & Utley, 2002). Additionally, engagement in learning activities is considered an indicator of how well a student is benefitting from his or her educational program (VanDerHeyden, Snyder, Smith, Sevin, & Longwell, 2005).

Similarly, the instructional context of special and general education classrooms has received increased research attention and has documented differences between these settings (e.g(Dymond & Russell, 2004). For example, in comparisons of special and general education classrooms, time spent on academic tasks was found to differ significantly between these settings for students with significant disabilities (Logan & Keefe, 1997); significant differences have also been found in the instructional time and

learning partners of elementary aged students with severe disabilities between settings (Helmstetter, Curry, Brennan, & Sampson-Saul, 1998). In comparisons of students with and without significant disabilities within the same general education classroom, differences in instructors, instructional interactions, and time in activities have been noted (Logan & Malone, 1998; McDonnell, Thorson, & McQuivey, 2000; Schuster, Hemmeter, & Ault, 2001). Yet the impact of academic engagement and instructional context is less well understood for adolescents with autism in differing educational contexts (i.e., general education and special education settings).

With the focus on outcomes in both the Individuals with Disabilities Education Act (IDEA) and the No Child Left Behind Act (NCLB), it is important to better understand the impact of educational placement on student participation and learning outcomes. The aim of the present study is to describe the impact of educational context on participation patterns of adolescents with autism. Specifically, the following research questions are addressed: (1) How are students with autism engaged in instructional activities in math and language arts classes, (2) Do students with autism share similar patterns of participation as their peers in general and special education settings? and (3) What is the impact of educational setting (general education versus special education classrooms) on student participation?

Method

School Settings

Schools were identified for participation in the present study that had special education programs serving adolescents receiving special education services using the

California Department of Education website. From the list of schools, six school districts that were in close proximity to one another, within driving distance of the research team, had at least five students with autism in their secondary schools so we could have sufficient number of participants to recruit, and practiced inclusive and self-contained special education programs were provided information about the present study. The researchers met with school district representatives to provide information about the aims of the study. The school district representatives then invited teachers to participate, who in turn invited parents and students to participate. Following these invitations to participate, three school districts in Northern California were ultimately selected for participation as they were accessible to the research team, had sufficient numbers of children with autism, and practiced inclusive and self-contained special education in comparable numbers to allow us to stratify across districts with distinct philosophies regarding inclusion (that is, there was a sufficient population of students with autism in both inclusive and self-contained settings to be recruited for the study).

Within these three school districts, four middle schools participated, as depicted in Table 1. Two of the middle schools were in one school district that practiced inclusive education (schools C and D); one middle school practiced non-inclusion, with a mixture of students between the grades of 7 and 9 with a variety of significant disabilities (school A); and one middle school classroom was located in a school for students with autism (school B). The special education program at each school site has been on-going for at least two years prior to commencement of this study. As this is a quasi-experimental design, we did not place students in inclusive or self-contained placements. Rather, we observed students in existing programs. A review of Individual Education Plan (IEP)

records, as part of a larger study (Kurth & Mastergeorge, 2009), revealed that students were placed in inclusive or self-contained settings primarily due to school district philosophy. That is, students who resided in school districts with an inclusive philosophy and program were included, whereas students who resided in school districts with self-contained classes for students with special education needs were in self-contained programs.

Participants

Five special education teachers, nine general education teachers, fifteen adolescents with autism and thirty adolescent peers of those students with autism participated in the study. Students and teachers were recruited for participation in the study via a letter sent to school administrators. Participants did not receive incentives for participation in the study, however, a 100% response rate and participation rate was obtained.

Adolescents with Autism. Fifteen students with autism (12 males and 3 females) participated in this study with ages ranging from 12 years to 15 years with a mean age of with a mean age of 13 years old. These students had independent diagnoses of autism; all students were diagnosed with this disorder between the ages of two-and four-years-old by licensed psychologists using standardized measures consistent with use in the field at the time. All students continued to qualify for special education with autism as their primary disabling condition through middle school. None of the students had a diagnosis of Asperger Syndrome or Pervasive Developmental Disorder Not Otherwise Specific (PDD-NOS).

To determine the long-term impact of educational placement, the student participants were in middle school at the time of the study, or between sixth and ninth grade, when students typically exit elementary and enter adolescence and secondary school. Student participants thus met the following criteria: (1) The students in this study have diagnoses of autism, rather than Asperger Syndrome or PDD-NOS; (2) Students in the study do not have any co-morbid conditions, ensuring that any differences are due to autism and not other conditions such as Down syndrome; (3) The students are native English speakers so that there is no confounding effect between English language learning status and academic abilities; (4) The students have IEPs for the current school year, as well as IEPs dating to at least Kindergarten to ensure that they are presently and continuously have been enrolled in special education; and (5) The students have been continuously enrolled in either inclusive or self-contained educational settings since Kindergarten, to ensure that any differences found between students can be attributed to setting.

For the purposes of this study, programs were noted as either "inclusive" or "self-contained" using general guidelines from the United States Department of Education reports to Congress (U.S. Department of Education, 2007) and the location in which students received math and language arts instruction. For our purposes, then, a program is termed "inclusive" when students receive math and language arts instruction in a general education setting and spend 80% or more of their school day in general education settings. Students are considered be in a self-contained setting when they receive math and language arts instruction in a special education setting and spend 50% or less of their

academic day in general education. Eight students were educated in self-contained settings (SC). Seven students were educated in inclusive education settings (IE).

To determine the relative comparability of the adolescents with autism, students with autism were assessed to determine cognitive, adaptive behavior, and academic abilities in assessments conducted by their teachers and school psychologists, all of whom were blind to the research hypotheses. Specifically, special education teachers administered all academic and adaptive behavior assessments and school psychologists completed the cognitive assessments. Student familiarity with the tests prior to administration was not known, although alternate versions of the assessments were given if a student had been assessed with the instrument the previous year.

As depicted in Table 1, there were no significant differences between the cognitive and adaptive behavior scores of the adolescents with autism who were in IE and SC settings as measured by the Wechsler Intelligence Scale for Children (WISC), the Test of Non-Verbal Intelligence (TONI), and the Vineland Adaptive Behavior Scales. There were, however, significant differences in the mean academic achievement scores of these students, as measured by the Woodcock-Johnson III Tests of Achievement (WJ-3). Students in IE settings obtained significantly higher scores on the WJ-3 than students in SC settings. It is unclear if students obtained higher achievement scores as a result of being included in general education math and language arts, or if students with higher achievement were more likely to be placed in inclusive settings. As mentioned previously, however, students appeared to be placed in inclusive settings by virtue of living in, or not living in, school districts with an inclusive philosophy (Kurth & Mastergeorge, 2009).

<Table 1 here>

Adolescent Peers. Thirty adolescent peers were recruited for participation in the study. These peers were enrolled in the same math or language arts class as a student with autism who was participating in the study. Peers were matched with student with autism by grade, gender, and placement in inclusive or self-contained settings; they were not matched by specific ability level or disability label. Peers in inclusive settings did *not* have a known disability and all peers in self-contained settings *did* have a known disability, although not necessarily autism. Therefore, fourteen peers in the study did not have a disability (IE) and sixteen did have a disability (SC). For example, a male 7th grade student with autism in an inclusive language arts class was matched with another male, with no known disability, who was in 7th grade and in the same language arts class. These peers provided consent to be observed anonymously as part of this study.

Special Education Teachers. Five special education teachers were included in this study. They are the primary special education teachers for the students with autism in the study. The teachers are all fully credentialed by the state of California, and have a minimum of two years of experience teaching special education. All special education teachers had a clear credential to teach students with disabilities. Full credentialing was a criterion for this study so that teacher preparation and experience do not confound student participation or achievement. None of the special education teachers had general

education teaching credentials nor had previous teaching experience as general education teachers.

General Education Teachers. Nine general education teachers participated in the study. These teachers taught math or language arts at three middle schools. These teachers were the primary language arts or math teachers of the students in IE in the study. All teachers had clear California credentials to teach in their subject area (math or language arts) and had at least two years of teaching experience at the time of the study. Student participants with autism were included in their math or English classes. None of the general education teachers had special education teaching credentials, nor had previous experience as special education teachers.

Instruments

Observations of participation occurred four times during the academic year in the student's regular classroom during instruction in math, reading, and writing using an observation system adapted from Dymond and Russell (2004) and Helmstetter and colleagues (1998). Students were observed four times within a six week time frame as part of a larger study on the instructional contexts of adolescents with autism and the influence of educational setting on IEP goals and academic learning (Kurth & Mastergeorge, 2009). Students did not change classrooms, and teachers did not change curriculum, for the purposes of this observation scheme. Observations of participation were made of the focal student with autism and one of his or her randomly selected peer classmates. The peers were seated nearby the student with autism in the class to allow us to have a sense of what other students in the class are doing and if this is similar or dissimilar to what the focal student with autism is doing. Furthermore, peers were of the

same grade and gender of the student with autism to control for any differences in participation or activity that could be accounted for by grade or gender. Participation observations were analyzed based on seven variables: the domain of instruction, student activity, instructional format, curriculum in use, learning partner during instruction, location of instruction, and level of student participation, as depicted in Table 2.

<Table 2>

Procedures

Pilot testing occurred in the academic year prior to the study itself, and included four students with autism. Two of these students were enrolled in a self-contained class for students with autism and two students were enrolled in general education classes. The aim of our pilot study was to determine the appropriateness of our observation categories, the suitability of the computer software for data collection, and the necessary time frame for the observation sessions. Two undergraduate students were taught the data collection procedures and completed pilot testing during a four-week period in May of 2007. Based on results of the pilot study, categories in the observation scheme were refined. We also finalized a 30-second observation and recording period based on pilot testing and suggestions from the literature (Gay & Airasian, 2003).

In the final data collection scheme, observations were conducted four times for 50 minutes each during regularly scheduled classes, the length of an average instructional period in middle school. Only one focal student was observed at a time. An interval recording procedure was used so that the focal student was observed for 30 seconds and

an observer recorded his or her observations during the next 30 seconds to allow the observer ample time to observe and record each category on the observation form. If students engaged in more than one activity category during a 30-second observation window, the activity that comprised most of the 30-seconds was recorded. For example, if a student was working on math, and then got up to get a drink during the 30-second observation, the recorder noted the student was engaged in math if the student had been doing more math than drinking water during the observation. The same data collection procedures were employed in both IE and SC classrooms.

This alternating observe-record procedure lasted for 50 minutes, resulting in 25 observations per class period. The student with autism and peer classmates were observed alternately, so that the first 30-second observation was of the focal child with autism, and the next 30-second observation was of a classmate. This continued for the 50 minute session, resulting in 25 focal student observations and 25 classmate observations. As a result, a total of 100 observations of each student with autism and 100 observations of each peer were completed, with a total of 1500 observations of adolescents with autism and 1500 observations of peers. All observations were recorded on a laptop computer using the program "Filemaker Pro 6." This software allows the observer to mark a selection and record comments, thus gathering both quantitative and qualitative data. Upon data analysis, it is possible to tally by category into a spread sheet and to export comments. An example of the data collection form is depicted in Appendix A. It was determined four observations per student was sufficient for gathering preliminary information and making tentative conclusions given depth and volume of this quantitative and qualitative data.

Data collectors included trained undergraduate students. All data collectors were taught the data collection procedures prior to beginning work on the study and were blind to the research hypotheses. The data collection procedures included learning how to use the computer software and categorizing observed behaviors following the protocol found in Table 2. The observers received this training from the authors over the course of approximately one month. During this month the data collectors engaged in at least ten practice sessions that included observing and recording the student behavior. All data collectors were taught the data collection procedures prior to beginning work on the study. Inter-rater reliability was measured to ensure that observers recorded data with agreement. This was done with ten practice observation sessions categorized jointly by the authors and observers. Reliability during data collection was maintained in meetings held with observers and the authors during data collection. During these meetings any concerns or questions were addressed, and inter-reliability was evaluated in two practice observation sessions. Inter-rater reliability was established using Cohen's Kappa coefficient. Final inter-rater reliability was established with Kappa equal to .80 prior to and during data collection.

Data Analysis

Descriptive statistics were used to analyze and report all data as this was the most informative analytic method for the participation data collected (e.g. Dymond & Russell, 2004). The frequency of each category (described above) was first determined, and then totaled for all observations as being of IE math or language arts, or SC math or language arts for students with autism and their peers. A criterion score of 20% or more was used as a point for determining whether differences between students who were included or

not included were noteworthy. It was determined that at 20% a priori cutoff point was sufficient given the size of the sample and number of observations completed. In a similar observation of instructional context, Dymond and Russell implemented a 30% a priori cutoff. As our sample and number of observations is slightly larger we determined that a 20% difference was appropriate to evaluate meaningful differences in instructional context.

Results

All students were observed two times each during instruction of math and language arts, resulting in a total of four observations per student. We had expected to find differences in patterns of participation and instruction across domain of instruction (math and language arts); however, upon data analysis it was found that no marked differences existed in patterns of instruction or participation across domain area. That is, there were no instances in which differences between language arts and math classes for any category were greater than 5%. Therefore, we decided to collapse math and language arts observations into global categories (inclusive settings versus self-contained settings) rather than inclusive math versus self-contained math, for example. As depicted in Table 3, a number of important differences were noted between students with autism who were included and not included in general education classes. Namely, within IE settings participated in a similar manner regardless of disability and students within SC settings participated in a similar manner regardless of disability. The following is a description of the findings of each observation category.

<Table 3>

Student Activity

Adolescents with autism participated in a variety of activities in both their language arts and math instruction periods. As shown in Table 3, differences in student activity exist between students who are and are not enrolled in inclusive settings for teacher directed activities, individual seat work, and being on a break. Specifically, students in IE (with and without autism) spent more time in teacher directed activities (47.4% and 47.5% respectively) than their SC counterparts (3.2% and 3.6% respectively), while students with autism and their peers in SC spent more time on a break during both math and language arts instruction (32.2% and 25.1% respectively) than students with and without autism in IE (7.7% and 0.9% respectively). Lastly, adolescents in SC spent more time in individual seat work (47.5% for students with autism and 50.8% for peers) than students with and without autism in IE (27.5% and 27.7% respectively).

While marked differences (20% or more time in activity) were detected between students with autism who were educated in inclusive versus not-inclusive settings, no noteworthy differences emerged between students with autism and their peers in both general and special education settings. An inspection of Table 3 reveals that students with autism in IE participated in the same student activities as their general education peers in all categories; no differences in activity categories were greater than 7%. Likewise, students with autism in SC and their special education peers participated in essentially the same student activities. No noteworthy differences in activity categories were present. Together, these results indicate that students with autism participate in approximately the

same activities of their peers, regardless of setting. That is, in general education (inclusive settings) students with autism participate in the same activities as their general education peers and in special education (self-contained settings) students with autism participate in the same activities as their special education peers.

Domain of Instruction

The domain of instruction varied by placement in IE and SC settings as well. There was a noteworthy difference between adolescents with autism and their peers in IE and SC in the percent of time spent in math instruction. Students with autism and their peers in IE spent on average 91.3% (students with autism) and 98% (peers) of their math class time doing math, while students with autism in SC spent on average 60.6% (students with autism) and 64.8% (peers) doing math during math class. The difference in percent of time spent in math is at least partially accounted for by the differing percents of time students spent on a break in each setting (or doing "other" activities). As was evidenced in Student Activity codes, students with autism and their peers in SC spent markedly more time on breaks in all classes than students with autism in IE, again suggesting setting plays an important factor in student activity.

Location of Instruction

Although a common stereotype of inclusion is that students with disabilities can be "islands in a mainstream," no noteworthy differences in seating location were found between students in IE and SC settings and their peers in each setting. That is, students with autism were equally likely to be placed in the front, center, and back of the classroom as their peers with no differences in location greater than 2%.

Instructional Format

The format of instruction delivered by teachers was observed and categorized in both IE and SC. While the specific activities of adolescents with and without autism were coded, so too were the instructional practices of teachers while they were in the classroom. Differences between teachers in IE and SC were noted. General education teachers in IE spent most of their instructional time in whole group instruction for both students with and without autism (52.3% and 50.6% respectively); they spent the smallest amount of time in individual instruction for both students with autism and their peers (3.9% and 2.3% respectively). Special education teachers in SC settings spent the most time in individual instruction for students with autism and their peers (40.7% and 33.5% respectively), and the least amount of time in whole group instruction for both groups of students (1.2% and 1.5% respectively). General education teachers in IE settings were more likely to participate in monitoring activities than special education teachers, while special education teachers were more likely to participate in small group instruction than general education teachers. Also of note was the finding that special education teachers participated in more instances of "no instruction" for adolescents with autism and their special education peers (32.8% and 32.6%) than general education teachers, who participated in non-instructional activities less than 10% of the time. The results of these observation categories illustrate that adolescents with autism receive the same format of instruction as their peers, and that the formats of instruction delivered in special and general education settings differ markedly in terms of teacher whole group, monitoring, and non-instructional activities.

Partner

An inspection of Table 3 reveals that students with autism and their peers in IE and SC participated in activities with several types of partners, with few noteworthy differences between IE and SC and between students with autism and their peers. The only noteworthy difference detected was between general and special education peers in this series of observations. General education peers were markedly more likely to have no partner (63.1% of all observations) than special education peers (28.7%). Indeed, the results of these observations reveal that students with autism in IE have similar partner arrangements as their general education peers. Similarly, there were again no marked differences between students with autism and their special education peers in SC.

Engagement

Observations of students with autism and their peers in math and language arts classes revealed few differences in patterns of engagement between IE and SC. Two categories met the established criteria of difference: adolescents with autism in IE settings and their peers were more passively engaged (30.7% and 36.0%) than students with autism and their peers in SC (8.0% and 19.0%), while students with autism and their peers in SC were more likely to participate in activities in which no engagement was required (35.1% and 24.1% respectively). As in the previous observation categories, the areas of marked differences occurred between students in IE and SC, rather than between students with autism and their peers in the same setting.

Curriculum Materials

The types of curriculum and materials used varied markedly by placement in IE and SC. Adolescents with autism and their peers in IE were overall more likely to use grade level and adapted curriculum materials, whereas students with autism and their

peers in SC were overall more likely to use special education materials or no curriculum during the observations. Unlike previous observation categories, differences between adolescents with autism and their general education peers were noteworthy in the curriculum category. Adolescents with autism were more likely to use adapted curriculum than their general education peers, while general education peers were more likely to use grade level curriculum than adolescents with autism in their classes. These results would likely be expected, however, based on the instructional needs and IEP requirements of students with autism.

Discussion

The results of the present study reveal marked differences in instructional contexts and activities between IE and SC, but very few differences between adolescents with autism and their peers in each setting. That is, adolescents with autism participated in generally the same activities as their peers, but these activities were different in IE and SC. Specifically, adolescents with autism and their peers in IE spent most of their educational time in both math and language arts classes participating in teacher directed activities, followed by individual seat work. Students in IE participated in curricular activities 91% of instructional time with few off-task events or breaks, and accessed the core general education curriculum via grade level or adapted curriculum 87.2% of the time. Students with autism in SC settings, however, spent most of their time in individual seat work, followed by time spent on a break. Students with autism in SC were on a break for nearly one third of their instructional time and participated in instruction only about 60% of the time. They were educated in math and language arts only with other students with disabilities, and had access to the core general education curriculum via

adapted materials 0.1% of the time. As such, students in IE were primarily accessing the core curriculum in that they infrequently used special education or no curriculum. This indicates, for example, that students with autism in IE participated in reading "To Kill a Mockingbird" in some form. Students in SC, however, participated in exclusively special education or no curriculum. So rather than reading a version of "To Kill a Mockingbird," students were doing special education activities, such as "Edmark Reading" or "SRA Corrective Reading." A potential explanation for the higher WJ-3 scores of students with autism in IE is that these students had more opportunities to participate in instructional activities that are tested in the WJ-3 than students in SC, such as more opportunities for mathematical problem solving, expanded literacy, and class discussions related to critical thinking and analysis.

The manner of instruction differed markedly between special education and general education classrooms. Teachers in general education math and language arts classes primarily delivered whole group instruction, while teachers in special education classrooms primarily delivered small group and individual instruction. Special education teachers, however, also spent a substantial amount of time in non-instructional activities (approximately one third of math and language arts classes), whereas general education teachers rarely participated in non-instructional activities. These findings suggest that special education teachers perform more non-instructional tasks than general education teachers during class time, perhaps reflecting the large paperwork burden faced by special education teachers (Gartin & Murdick, 2005).

While special education teachers participated in non-instructional activities, students in their math and language arts were receiving the bulk of their instruction from

one-to-one paraeducators. Students in IE programs also received a noteworthy amount of instruction from one-to-one paraeducators, although most of the time students in IE did not have an instructional partner. This suggests that paraeducators checked in with students and then left them to complete the assigned task unassisted. This assumption is supported by notes taken during the observations, which noted that paraeducators in inclusive settings walked around the classroom, assisting all students in the class but checking in frequently with the student with autism. In SC, however, the paraeducator generally sat down next to the student with autism and left their side only when the student earned a break from the activity.

While a number of differences were found between students with autism IE and SC in this study, few differences exist between the activities of students with autism and their peers when they are placed in the same educational setting. That is, students with autism and their peers generally participated in the same activities at similar frequencies when both were in inclusive and self-contained programs. An inspection of Table 3 depicts no marked differences between adolescents with autism and their peers in any category, save curriculum in inclusive settings, whereby students with autism were more likely to have an adapted curriculum than their general education peers. While not noteworthy at the established criteria, students with autism were also more likely to have a one-to-one paraeducator in inclusive settings and general education peers were more likely to have no partner. Both of these differences between students with autism and peers can be expected based on the IEP needs of students with autism and general education peers, and are therefore not indicative of substantial differences in behavior or patterns of engagement between these students.

Limitations and Implications for Future Research

The present study described instructional contexts and participation patterns of adolescents with autism in general and special education settings, one that has not yet been conducted in autism research. Yet a number of factors limit the generalizability of these findings. First, the small sample size and limited geographic nature of the study participants prohibit broad generalization. Second, the small number of student observations (four of each student), limit our present findings, as it is possible that additional observations over a longer time period may have resulted in different findings. Third, students with autism and their peers were not matched based on ability level or disability label. Fourth, our observational scheme limits us to categorizing observed behaviors, not student intention or thinking. The ability to understand student motive or attentional focus would likely prove insightful. Fifth, it is unclear if differences in behavior categories of 20% are indeed noteworthy, especially given the small sample size of the current study. Finally, the present study describes differences in instructional context, but it is not possible with the given data to determine the impact of these differences on student learning. All of these limitations suggest the need for further research in the area of instructional context for adolescents with autism.

Specifically, additional research is needed to expand the current study to students of different grade levels, in different geographic regions, and in classes beyond math and language arts. Furthermore, the results of this study indicate the positive impact of inclusive settings on student participation in class activities and access to the core curriculum. Future studies are needed to describe the impact of inclusion proficiency,

both in terms of teacher preparation for inclusion and school-wide experience with inclusion, on student participation patterns. While the schools in the present study were either inclusive or self-contained in practice, the direct impact of teacher and administrator support, preparation, or experience with inclusion is not known. Additionally, while the sample consisted of students in inclusive and self-contained programs, limited information was available to describe how or why students were placed in these programs. Future studies are needed to describe placement decisions for students with autism in differing educational contexts, including adolescents.

As more students with autism enter public school systems, the controversy over where their instruction should occur has been gaining momentum. The results of the present study demonstrate that the adolescents with autism in this study fared well in inclusion settings for math and language arts instruction in terms of their levels of participation and engagement in curricular activities. Students with autism in special education classes also matched their peers in terms of participation and engagement, although students in SC settings were markedly less involved in the core curriculum and spent more time in non-instructional activities, such as breaks.

Student access to the core curriculum was simplified in the present study to denote simply whether or not students were using materials and curriculum based on general education or special education materials (e.g. “To Kill a Mockingbird” versus “Edmark Reading”). As the literature suggests, there are many methods and layers of adapting curricula (Cross, Traub, Hutter-Pishgahi, & Shelton, 2004; Janney & Snell, 2006; Lee et al., 2006; Wolfe & Hall, 2003). Our simplified version does not account well for the diversity or meaningfulness of specific adaptations for specific students, nor

does it describe how well students completed this adapted curricula. Future studies are needed that provide a more fine-toothed analysis of curriculum and access to the core curriculum for students with significant disabilities, such as autism, in the middle and high school years.

Findings that students with autism in self-contained settings spent nearly one third of their academic instructional time on a break demonstrates the need to develop behavioral and attentional strategies to enable students to maintain participation in learning activities while also regulating their sensory and behavioral needs. Often students with autism demonstrate attention deficits (Hazell, 2007; Scahill & Pachler, 2007), making it necessary for students to have sensory or other breaks to maintain attention and focus. Likewise, behavioral principles dictate that students with autism may "work" for something, such as edibles, breaks from activities (e.g. negative reinforcement), or other incentives to complete a task (Steege, Mace, Perry, & Longenecker, 2007; Zager, 1999). Yet the length of time students were observed on breaks in the present study is of concern. Future research is needed to better understand attention-maintaining strategies for adolescents with autism, as well as time allocation strategies so that breaks from instructional activities do not infringe upon learning opportunities.

In order to maximize learning opportunities, it is important to better understand the nature of "distracted" and "disruptive" behavior for adolescents with autism. These behaviors are difficult to quantify and easy to misinterpret. As shown in Table 2, efforts were made to describe these behaviors in measurable, objective terms. Yet it is possible for students to seem distracted without being so, as the "form" and "function" of behavior

can differ (e.g. Emerson & Bromley, 1995). For example, one student in the study was marked "distracted" as he sat in his English 8 class because he was tapping his pencil rapidly against his chin throughout class and looking around the classroom and not at the speaker. The observer noted this behavior and coded him as "distracted." However, the student was asked a question later during class and was able to answer correctly, despite being "distracted" during the lecture. Similarly, a student with autism in a self-contained class was coded "distracted" when he was observed playing with a small slinky in his lap for long periods of time. Yet again, when it was his turn to participate the student was able to correctly complete a task, suggesting that he was indeed mentally participating even though his attention had appeared to be focused on the slinky. These examples emphasize the difficulty in using broad codes to define behavior; thus, future micro-analytic studies of student behavior would be useful in determining differences between observed behavior and the intentions of these behaviors for adolescents with autism given that hind-sight explanations of behavior are not always possible.

Finally, determining correlations between instructional context and student achievement are of great importance. Additional research is needed to determine the effectiveness of various instructional contexts on student learning variables, including academic achievement, social skills development, and adaptive behavior/functional learning skills. The classroom contexts in the present study, inclusive and self-contained, differed in terms instructional practices and corresponding student participation. Yet the impact of these differences on long-term student learning, measures of quality of life, and adult employment are unknown and should be considered in future research.

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Table 1

Student Assessment Scores & Demographic Information

ID	Program	Grade	Age	School	Gender	IQ	VABS	WJ-3
1	SC	8	14	A	M	62	29	16
2	IE	9	15	C	M	69	48	78
3	SC	7	13	B	M	58	26	1
4	SC	7	12	A	M	63	50	14
5	SC	7	13	A	F	62 †	51	8
6	SC	8	14	B	M	64	53	22
7	IE	8	15	C	M	63	50	85
8	IE	9	15	C	M	68	49	82
9	SC	8	14	B	M	50 †	31	1
10	IE	7	13	C	F	50 †	33	52
11	SC	9	15	B	M	61	54	47
12	SC	9	15	B	M	60	44	8
13	IE	7	12	C	M	67	41	83
14	IE	8	13	D	M	70	47	83
15	IE	7	13	D	F	67	43	65

Table 1, Continued

Student Assessment Scores & Demographic Information

ID	Program	Grade	Age	School	Gender	IQ	VABS	WJ-3
Mean IE						*64.9*	*44.4*	*75.4*
Mean SC						*60.0*	*42.3*	*14.6*
p-Value						*.66*	*.88*	*.000**
F-Value						*.851*	*1.029*	*56.115*

† TONI was administered

* $p < .001$

Table 2

Coding System

Student Activity	Curriculum
Teacher Directed	Grade Level
Student Presentations	Adapted
Small group work (3-4 students)	Alternate
Individual seat work	No curriculum in use
Technology	
Test	
Transitioning between activities	
On a break	
Type of Instruction	Instructional Format
Math	Whole Group Instruction
Reading	Small Group Instruction
Writing	One-to-One Instruction
Other	Monitoring
	No Instruction
Location of Instruction	Partner
Special Education Room	General Education Teacher
General Education Room	Special Education Teacher
Center of Room	Peer
Back of Room	One-to-One Paraeducator
Front of Room	Group Paraeducator
	DIS Provider
	None
Engagement	
Active Engagement	
Passive Engagement	
Distracted	
Head Down / Asleep	
Disruptive Behavior	
No Participation Required	

Table 3

Percent of Time in Activity by Setting

Engagement Code	Inclusive		Self-Contained	
	Student with Autism	General Education Peer	Student with Autism	Special Education Peer
Student Activity				
Teacher Directed	47.4†	47.5†	3.2	3.6
Student Presentations	4.0	6.0	0.5	0.3
Small Group Work	5.2	10.5	4.7	9.2
Individual Work	27.5	27.7	47.5†	50.8†
Technology	0	0.1	3.6	5.7
Test	3.3	3.5	0	1.6
Transitioning	4.9	3.8	8.3	3.7
On A Break	7.7	0.9	32.2†	25.1†
Domain of Instruction				
Math	91.3†	98†	60.6	64.8
Reading	65.3	57.7	54	64.9
Writing	25	35.6†	11.7	12
Other	9.2	4.4	36.7†	29.2†

Note. † Indicates that a group of students (included or self-contained) spent at least 20% more time in activity than the other group of students (included and self-contained) students.

Table 3, Continued

Percent of Time in Activity by Setting

Engagement Code	Inclusive		Self-Contained	
	Student with Autism	General Education Peer	Student with Autism	Special Education Peer
Location				
Special Ed. Room	2.6	0.1	100†	100†
General Ed. Room	97.4†	99.9†	0	0
Center of Room	27.9	28.5	40.0	50.1†
Back of Room	43.2	41.2†	38.3	16.3
Front of Room	28.9	30.3	21.7	33.6
Instructional Format				
Whole Group	52.3†	50.6†	1.2	1.5
Small Group	6.7	7.7	12.1	28.1†
Individual	3.9	2.3	40.7†	33.5†
Monitoring	26.3	30.2†	13.2	4.3
No Instruction	10.8	9.2	32.8†	32.6†

Note. † Indicates that a group of students (included or self-contained) spent at least 20% more time in activity than the other group of students (included and self-contained) students.

Table 3, Continued

Percent of Time in Activity by Setting

Engagement Code	Inclusive		Self-Contained	
	Student with Autism	General Education Peer	Student with Autism	Special Education Peer
Partner				
GE Teacher	6.5	6.4	0	0
SE Teacher	8.9	0.4	13.0	12.6
1:1 Paraeducator	19.6	1.4	31.6	38.9†
Group Paraeducator	12.0	4.0	2.0	1.5
Peer	7.7	24.7	15.0	18.3
No Partner	45.3	63.1†	38.4	28.7
Engagement				
Active	36.9	40.5	43.6	44.4
Passive	30.7†	36.0	8.0	19.0
Distracted	19.7	12.0	11.6	10.0
Asleep/Head Down	0.5	6.0	0.5	0.5
Disruptive	3.4	1.5	1.3	2.1
None Required	9.0	4.0	35.1†	24.1†

Note. † Indicates that a group of students (included or self-contained) spent at least 20% more time in activity than the other group of students (included and self-contained) students.

Table 3, Continued

Percent of Time in Activity by Setting

Engagement Code	Inclusive		Self-Contained	
	Student with Autism	General Education Peer	Student with Autism	Special Education Peer
Curriculum				
Grade Level	27.0†	94.0†	0	0
Adapted	61.2†	3.7	0.1	0
Alternate	3.1	0	60.0†	63.1†
No Curriculum	8.7	2.3	39.9†	36.9†

Note. † Indicates that a group of students (included or self-contained) spent at least 20% more time in activity than the other group of students (included and self-contained) students.