Academically Gifted Co-Teaching in the Wake County Public School System: Implementation, Perceptions and Achievement

WAKE COUNTY PUBLIC SCHOOL SYSTEM

DATA, RESEARCH & ACCOUNTABILITY

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Abstract

Following the recommendations of a 2013 instructional audit, the Academically or Intellectually Gifted department implemented a co-teaching instructional strategy in 41 volunteer schools starting in the 2014-15 school year. Implementation data and discussions with central office staff suggest that while implementation fidelity was relatively strong in the first year, it declined in 2015-16. Still, the first year of implementation offered evidence to guide any future co-teaching implementation. First, the "one teach, one assist" method of co-teaching was most frequently observed, suggesting that co-teachers may have defaulted to one of the less optimal instructional strategies under the model. Second, AIG teachers and co-teachers perceived the initiative similarly but differed on a few particularly meaningful survey items pertaining to the perceptions and role of the specialist. Third, AIG students and non-AIG students in co-taught classrooms were similarly engaged. Finally, students in co-taught classrooms significantly outperformed their non-co-taught peers in science, but not in math or reading.

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SUMMARY

The roots of the modern co-teaching model reach back at least half a century, when scholar and activist J. Lloyd Trump, challenging existing approaches to teacher education, argued for "team teaching." Rather than remain "locked into a self-contained classroom," teachers should "learn from each other and profit from better utilization of their own special talents" (Trump, 1962). In the decades since, team teaching has evolved and expanded to take on myriad forms and serve diverse groups of students, including disabled students, English language learners and gifted students (Friend, Reising, & Cook, 1993). Today, the co-teaching model has coalesced around six different instructional approaches and is, through the partnership of a generalist and a specialist, considered largely distinct from Trump's earlier conception of generalized team teaching (Friend et al., 2010).

This evaluation explores the characteristics and impact of WCPSS's co-teaching model that was piloted by the Academically or Intellectually Gifted (AIG) department. AIG staff included the development and implementation of co-teaching in its 2013-2016 local AIG plan, a document submitted cyclically to the North Carolina Department of Public Instruction (NCDPI) and required by state statute. Various departments have promoted components of co-teaching for years and AIG joined forces with them in order to develop a common co-teaching framework prior to the 2014-15 school year. At the time, Academics leadership requested an evaluation of AIG co-teaching and as such, this report includes findings related only to AIG co-teaching. By and large, AIG co-teaching was moderately implemented in 2014-15, weakly implemented in 2015-16 and not implemented in 2016-17—though individual schools may have utilized select approaches. As such, we report findings drawn mainly from data collection and observations from 2014-15 since the quality of these data was stronger in the launch year. Despite the fact that AIG co-teaching is no longer implemented, we hope that the findings herein can help inform any subsequent co-teaching discussions.

Since schools voluntarily adopted the co-teaching model (37 elementary and four middle schools), we are not able to determine the causal impact of the initiative on outcomes. Table 1 summarizes the various research designs and conclusions these designs support. We report here descriptive findings that offer suggestive evidence but do not allow us to infer that co-teaching caused a certain outcome to occur.

Table 1

Nature of the Data Provided and Valid Uses

Research Design	Conclusions that Can be Drawn
☐ Experimental	We can conclude that the program or policy caused changes in outcomes because the research design used random assignment.
☐ Quasi-Experimental	We can reasonably conclude that the program or policy caused changes in outcomes because an appropriate comparison strategy was used.
☑ Descriptive ☑ Quantitative ☑ Qualitative	These designs provide outcome data for the program or policy, but differences cannot be attributed directly to it due to lack of a comparative control group.

Sources: List, Sadoff, & Wagner (2011) and What Works Clearinghouse (Clearinghouse, 2014).

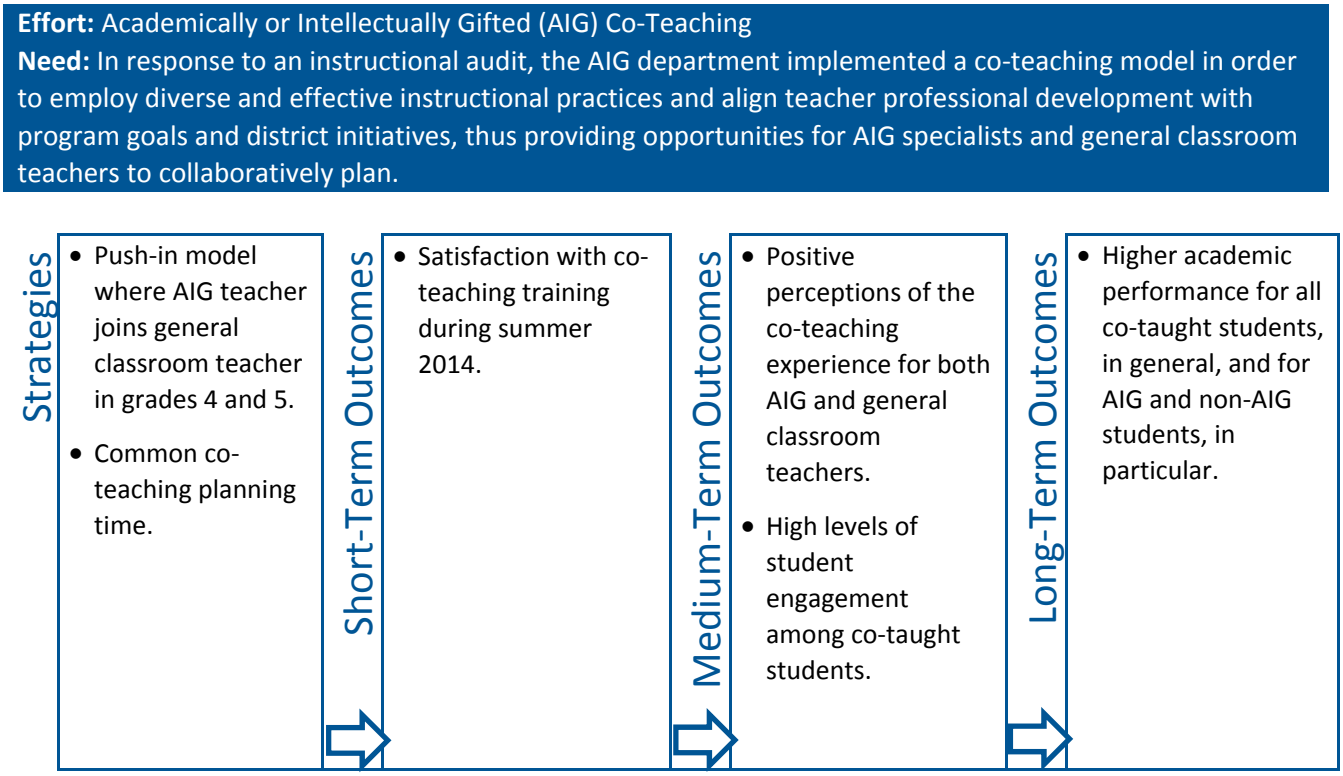
Results

We asked five main questions about the implementation of AIG co-teaching and its association with student achievement:

1. How did the composition of AIG co-teaching schools compare to district averages and how did these co-teaching classrooms differ from non-co-teaching classrooms?
   - Despite the voluntary adoption of AIG co-teaching by schools—a process that introduced selection bias—characteristics of co-teaching schools largely resembled those of the district. At the classroom-level, co-teaching classrooms largely resembled non-co-teaching classrooms on nearly all observable characteristics.
2. Which co-teaching methods and strategies were most prevalent?
   - Among the six most commonly cited co-teaching instructional methods, "one teach, one assist" was the most frequently observed in 2014-15 and tied for second most frequently observed in 2015-16. The most frequently observed method in 2015-16 was "station" co-teaching. Strategies built around two of the four "C"s—collaboration and communication—were the most frequently observed among seven co-teaching strategies (distinct from the six methods).
3. How did perceptions of AIG co-teaching vary between AIG and general classroom teachers?
   - Both AIG and general classroom co-teachers perceived co-teaching more similarly than differently based on survey responses. But on a few items, rather large differences emerged on items critical to the co-teaching relationship.
4. How did student engagement vary between AIG and non-AIG students in co-taught classrooms?
   - On nearly all items included in the district's spring student survey, which mostly consists of items related to student engagement, AIG and non-AIG students in co-taught classrooms responded more similarly than differently.
5. Was co-teaching associated with changes in student achievement?
   - A higher percentage of co-taught students generally scored Level 3 or higher on grade 4 and grade 5 end-of-grade tests. On math and science, though not reading,

co-taught students tended to exceed expectations for growth. Controlling for other factors, students nested in co-taught classrooms significantly outperformed their counterparts in science, but not in math or reading. This was consistent for both non-AIG and AIG students, though the finding is difficult to explain since co-teaching occurred only during math and reading instruction.

Figure 1
Pathway of Change



BACKGROUND AND EVIDENCE

The most common approach to co-teaching involves integrating students with disabilities into the general education classroom. Gately & Gately Jr. (2001) define co-teaching as the "collaboration between general and special education teachers for all of the teaching responsibilities of all students assigned to a classroom." While this report describes co-teaching as a push-in strategy for gifted students—as opposed to students with disabilities or English language learners—the core components of the co-teaching model have remained consistent. Cook & Friend (1995) describe co-teaching as having four main components: two certified educators, usually one general education teacher and one specialist; both teachers delivering instruction; heterogeneous grouping of students with and without special classification; and a single classroom where both groups of students receive instruction.

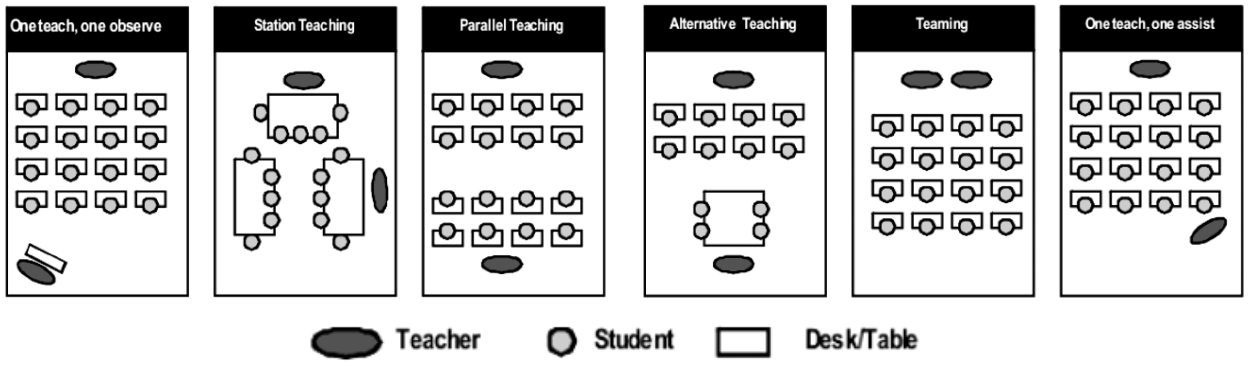
Within this context, co-teachers generally decide to approach instruction at any given time using one of six organizational methods. They are:

1. One teach, one observe: One teacher leads while the other gathers data on specific students or the class group;
2. Station teaching: Instruction occurs at three separate groups, two of which are led by a co-teacher while the third group works independently until all rotate;
3. Parallel teaching: Co-teachers each present the same lesson to half of the class in order to increase the likelihood of differentiation and participation;
4. Alternative teaching: One co-teacher works with a large group while the other focuses on remediation or enrichment with a small group;
5. Teaming: Both co-teachers lead large-group instruction with the goal of offering different approaches to solving the same problem; and
6. One teach, one assist: One co-teacher leads while the other circulates in order to provide individual assistance (Friend et al., 2010).

Figure 2 provides graphical representations of each of these six co-teaching methods.

Figure 2

Six Common Co-Teaching Methods



Sources: Friend et al. (2010), adapted from Friend & Bursuck (2002).

The co-teaching model represents a departure from general classroom instruction taught by a single teacher or pull-out instruction led by a specialist. How, then, should co-teachers be trained and supported to engage in this integrated approach to instruction? Many studies of co-teaching professional development provide helpful insights about potential best practices (Friend et al., 2010), but often lack substantive evidence to inform conclusions. In a notable exception, a survey of 129 mid-Atlantic teachers across five districts found a strong relationship between the frequency of in-service training on positive perceptions of co-teaching among generalists and specialists alike. Moreover, in-service training appeared especially important for veteran teachers, who may not have received training in co-teaching during their pre-service professional development in years prior (Pancsofar & Petroff, 2013).

Whether co-teaching as an instructional strategy "works" largely depends on the stated goals for implementing it. Friend et al. (2010) identified three bodies of work exploring the

effectiveness of co-teaching, namely its impacts on co-teachers' relationships (e.g., perceptions and attitudes), program logistics (e.g., planning time and scheduling) and student learning (e.g., achievement and discipline). Broadly speaking, the research literature suggests that co-teachers enjoy their collaborative work environment but would benefit from additional training and planning time (Scruggs, Mastropieri, & McDuffie, 2007). On the relationship between co-teaching and achievement, most studies to date have employed research methods that failed to yield reliable impact estimates. This can occur when sample sizes are too small or intervention groups are not clearly defined. One review of 89 studies found that only six contained necessary criteria for inclusion (Murawski & Swanson, 2001). Others have reported decidedly mixed results on the impacts of co-teaching on achievement (Nevin, Thousand, & Villa, 2009; Salend & Duhaney, 1999; Tremblay, 2013).

Adoption of AIG Co-Teaching in WCPSS

Students identified as gifted in WCPSS have traditionally been served through a "pull-out" model, whereby they temporarily leave their general education classroom in order to receive instruction directly from the school's AIG teacher. Following recommendations from a district-authorized curriculum audit in July 2013, the district transitioned to a "push-in" model (Curriculum Managment Systems, 2013).[1] Here, the AIG teacher joins the general classroom teacher to provide instruction to AIG and non-AIG students. The specific instructional practice depends on the co-teaching approach that both teachers agree to adopt. Co-teaching was formally articulated in the district's 2013-2016 local AIG plan, which was submitted to the North Carolina Department of Public Instruction—all LEA's must submit a plan on a cyclical basis—and is required by state statute (WCPSS, 2013).[2]

In spring 2014, AIG staff recruited schools to volunteer for co-teaching implementation in the 2014-15 school year. A total of 45 schools responded—41 elementary schools and four middle schools. Prior to the start of the school year, four elementary schools withdrew, leaving 41 total schools participating in AIG co-teaching in 2014-15. (See Appendix, Table A1 for a list of participating schools.) Summary statistics about the participating schools, such as calendar, magnet status, area, and size, are presented in Table 2. Compared with district averages, the sample of volunteer schools was overrepresented by year-round schools and relatively balanced with respect to magnet and Title I schools. The sample of schools that volunteered for AIG co-teaching was relatively balanced by both area and size.

[1] AIG staff developed the district's co-teaching model in response to a 2013 curriculum audit conducted by Curriculum Management Systems, Inc.

[2] For more information about co-teaching as specified in the AIG Local Plan, see Appendix D: Co-Teaching and Collaborating, pp. 101-120 in the AIG Local Plan, 2013-2016. See http://www.ncpublicschools.org/docs/sbe-archives/meetings/2012/article9b.pdf for North Carolina statute language.

Table 2

Descriptive Information about AIG Co-Teaching Schools, 2014-15

	Co-Teaching Schools		WCPSS (K-8)	
	Number	Percent	Number	Percent
Traditional Calendar	16	39%	89	63%
Year-Round Calendar	25	61%	48	34%
Magnet	6	15%	31	22%
Title I	17	41%	60	42%
Area				
Elementary Support	3	7%	12	9%
Central	7	17%	20	14%
Eastern	5	12%	15	11%
Northeastern	5	12%	16	11%
Northern	5	12%	20	14%
Southern	5	12%	18	13%
Southwestern	6	15%	18	13%
Western	5	12%	22	16%
Size				
Less than 500 students	5	12%	18	13%
500 to 750 students	16	39%	51	36%
750 to 1,000 students	14	34%	43	30%
1,000 to 1,250 students	4	10%	21	15%
Over 1,250 students	2	5%	7	5%

Note: The percentages representing the first four rows of this table are not mutually exclusive (e.g., a traditional calendar school can also be a magnet school) and therefore do not sum to 100%.

Training occurred during summer 2014, when four cohorts of general education and AIG teachers received two days of professional development. AIG teachers received follow-up training on four separate occasions throughout late summer and fall, and principals received one day of training. As part of the training, the district hired Bob Iseminger of Roanoke, VA-based Creative Curriculum Catalysts to present "Co-Teaching and Collaboration for AIG and Highly Capable Students." On the district side, staff from Special Education Services and AIG were involved in coordinating professional development.

In late 2014, AIG staff presented the district's co-teaching model to the WCPSS Board of Education Student Achievement Committee, defining AIG co-teaching as "a model that will assist all students within the general education classroom setting to be successful academically, emotionally and socially through the collaborative team efforts of specialists and general education teachers." The overarching stated goal was to increase the academic performance of AIG and non-AIG students who received collaborative instruction in co-teaching classrooms. At the time, the local press reported that most board members were in general agreement with the new approach despite some specific criticism that a push-in model might not serve the unique academic needs of some gifted students (N&O, 2013).

Table 3 presents the demographic characteristics of students in co-taught and non-co-taught classrooms across the 41 AIG co-teaching schools in 2014-15. Overall, the demographics of students in these two groups were quite similar, with a slightly higher proportion of students identified as gifted in co-taught classrooms.

Table 3
Demographic Characteristics of Co-Taught and Non Co-Taught Classrooms at Co-Teaching Schools, 2014-15

	Non Co-Taught Classrooms	Co-Taught Classrooms
Grade 4	2,696	878
Grade 5	2,360	799
Total	5,056	1,677
Female	48.9%	51.1%
Male	51.1%	48.9%
Asian	5.2%	6.0%
Black	21.6%	22.2%
Hispanic	17.3%	16.2%
Multiracial	4.3%	4.1%
White	51.3%	51.1%
LEP	6.8%	5.8%
SWD	14.3%	12.8%
AIG	25.3%	29.9%

IMPLEMENTATION

Throughout two years of implementation, district staff completed 70 observations of co-teaching classrooms. Nearly two-thirds (44) of these observations were conducted in 2014-15 and the remainder (26) in 2015-16. Staff observed grades ranging from 4th to 8th, with most observations occurring at elementary schools. Each observation lasted roughly 45 minutes and adhered to a fidelity checklist developed by Central Savannah River Area (CSRA) Regional Educational Service Agency (RESA) and the East Division of the Georgia Learning Resources System (GLRS).[3]

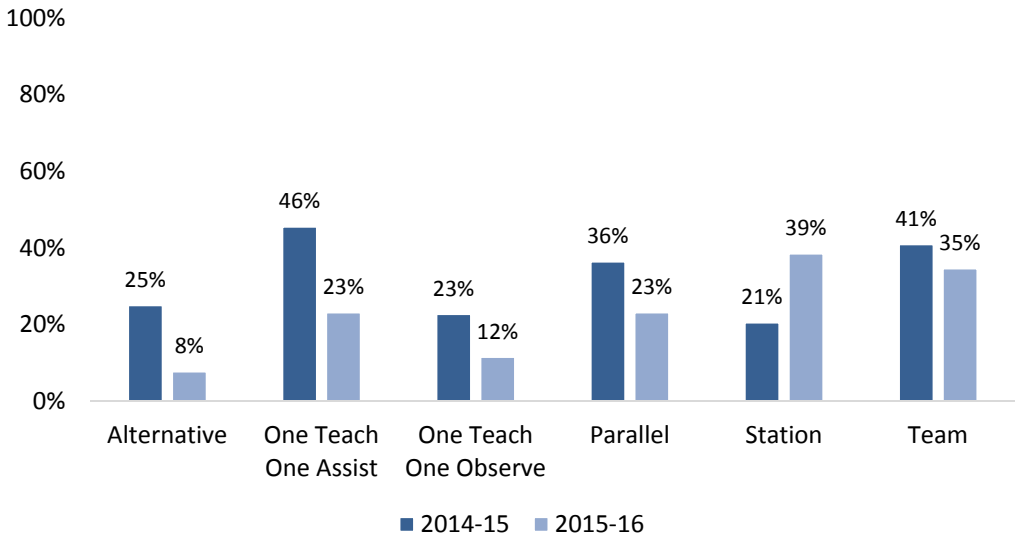
Observers recorded all visible co-teaching methods, more than one of which could have been noted during any single observation. In fact, 40 of the 70 observations recorded more than one co-teaching method. Figure 3 shows that in 2014-15, the most frequently observed co-teaching methods were "One Teach, One Assist," observed in nearly half of classroom observations, and "Team Teaching," observed in 41% of classrooms observed. In 2015-16, the most frequently observed co-teaching methods were "Station" co-teaching, observed in more

[3] See http://laspdg.org/files/CoTeachingObservationChecklistRevised.pdf for a copy of the original fidelity checklist.

than two-thirds of classrooms and "Team Teaching," observed in a similar proportion of classrooms.

Figure 3

Frequency of Observed Co-Teaching Methods, 2014-15 and 2015-16 Observations

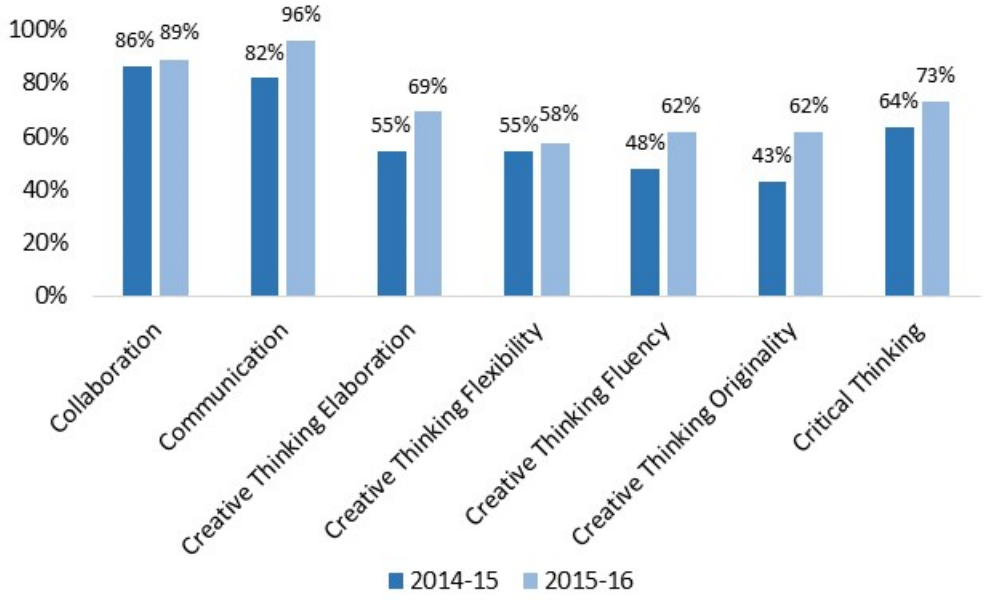


Note: The six co-teaching methods are widely cited in the academic literature (Friend et al., 2010), were adopted by WCPSS's co-teaching implementation team, and are included in the fidelity checklist.

In addition to prompting observers to identify co-teaching methods, the fidelity check called for observed gifted differentiation strategies, which included the "Four Cs" (critical thinking, communication, collaboration and creativity). In most cases, more than one gifted differentiation strategy was observed in the classroom. Figure 4 shows that the most frequently observed strategies in 2014-15 were Collaboration (86% of classrooms) and Communication (82% of classrooms). These strategies remained the most frequently observed in 2015-16, while the frequency with which all strategies were observed increased.

Figure 4

Frequency of Observed Differentiation Strategies, 2014-15 Observations



Note on terms:

- Collaboration: Contributes to group activities, considers ideas, perspectives of others and provides / receives feedback constructively
- Communication: Ability to read, write, speak, listen and use non-verbal skills
- Creative Thinking Elaboration: Enhancing ideas by providing more detail
- Creative Thinking Flexibility: Ability to see things from different points of view, to use many different approaches or strategies
- Creative Thinking Fluency: Great number of ideas or alternate solutions to a problem
- Creative Thinking Originality: Ideas that are unique or unusual, it involves synthesis or putting information about a topic back together in a new way
- Critical Thinking: Student-directed skillful analyzing, assessing and reconstructing of idea

The frequencies of instructional practices observed in 2014-15 and 2015-16 are presented in the Appendix, Table A2. Observers noted the use of instructional practices even if these practices were observed during a small portion of the observation period or if some component of the described instructional practice was in place. The instructional practices on the checklist were noted as "Clearly Evident" in most classrooms. The frequency with which each instructional practice was "Clearly Evident" increased from 2014-15 to 2015-16 with a few exceptions. There were statistically different rates of "Clearly Evident" practices from year to year for three of the 19 observed practices.

PERCEPTIONS

From May to June 2015, staff administered a survey that measured the experiences with and perceptions about co-teaching to both AIG and general classroom teachers who participated in the initiative in 2014-15. The survey instrument was adapted from *Working Together: Tools for Collaborative Teaching* (DeBoer & Fister, 1995). Over 80 teachers—47 classroom teachers and 37 AIG teachers—responded to the 39-question survey. Responses included a 4-point Likert scale ranging from "strongly disagree" to "strongly agree."

The results compared the average responses on the 4-point scale and the percentage of teachers agreeing or strongly agreeing with each statement. The complete results are presented in the Appendix, Table A3. Overall, responses from both AIG and classroom teachers indicate that they believed that they were able to more effectively teach students through AIG co-teaching and that they enjoyed collaborating professionally. The response of both AIG and general classroom teachers to the question about planning time suggested that insufficient planning time may have been a barrier to implementation. From roughly a quarter of AIG teachers to one-third of classroom teachers agreed that they had sufficient time to plan for instruction. Central office staff confirmed to us that this was a major barrier to implementation and was potentially made worse by the lack of a master schedule for AIG co-teaching. Tests of statistical significance (two-sample t-tests) revealed differences in the responses of classroom and AIG teachers on two of the 39 survey items. In particular, a larger percentage of AIG teachers agreed that the co-teaching team could adapt instruction to meet individual student needs, while a larger percentage of classroom teachers agreed that their AIG counterparts accepted them as equal partners.

The survey also asked teachers to report on the frequency with which they participated in AIG co-teaching during the school year. While most AIG teachers (34 of 37) reported that they co-taught the entire school year, only 22% (8 of 37) reported that they co-taught exclusively (did not pull students out) in their co-teaching classrooms. Eleven AIG teachers reported that they pulled students out more often than they co-taught in their co-teaching classrooms, and one reported that she had done little to no co-teaching during the school year.

In addition to surveying AIG and classroom teachers, we reviewed 2014-15 student survey data to explore whether co-taught students were more engaged than students who were not co-taught.[4] Specifically, 5th-grade students who were co-taught responded differently compared with their counterparts on three of 49 questions. Co-taught students reported lower levels of agreement to "I feel safe at school" and higher levels of agreement to "My teachers give me challenging work" and "The tests in my classes do a good job of measuring what I'm able to do" than non-co-taught students. The percentage of students agreeing or identifying with each survey item is presented in the Appendix, Table A4.

[4] The districtwide student survey was administered to students in grades 5, 8 and 9 in spring 2015.

STUDENT ACHIEVEMENT

In its presentation to the Board of Education's Student Achievement Committee in late 2014, AIG staff noted that a primary goal of its co-teaching model was to "increase [the] academic performance of AIG identified students, as well as non-AIG identified students." We examined the relationship between co-teaching exposure and achievement in three ways.

The first approach was to compare proficiency levels across the two conditions. Table 4 presents the percentage of students scoring Grade Level Proficient (GLP; scoring Level 3, 4, or 5) or College or Career Ready (CCR; scoring Level 4 or 5) on the 2014-15 End-of-Grade (EOG) tests. Similar percentages of AIG students in co-taught and non-co-taught classrooms scored GLP and CCR. A slightly higher percentage of non-AIG students in co-taught classrooms scored GLP and CCR in 4th grade reading, 4th and 5th grade math, and science than non-AIG students in non-co-taught classrooms.

Table 4

Percentage of GLP and CCR Students in Co-Taught and Non-Co-Taught Classrooms, 2014-15

		Percent GLP		Percent CCR	
		Co-Taught	Non-Co-Taught	Co-Taught	Non-Co-Taught
Grade 4 Math	AIG	99.2%	99.5%	96.7%	98.4%
	Not AIG	57.1%	55.3%	49.7%	47.5%
	Overall	68.8%	65.3%	62.8%	59.1%
Grade 4 Reading	AIG	98.8%	98.5%	98.4%	95.6%
	Not AIG	62.2%	57.0%	49.3%	44.2%
	Overall	72.5%	66.5%	63.1%	55.9%
Grade 5 Math	AIG	98.4%	98.7%	98.1%	97.9%
	Not AIG	59.7%	56.5%	53.8%	50.3%
	Overall	72.1%	68.5%	68.0%	63.8%
Grade 5 Reading	AIG	98.1%	96.7%	93.8%	93.0%
	Not AIG	50.7%	50.4%	37.3%	38.9%
	Overall	65.9%	63.6%	55.5%	54.3%
Grade 5 Science	AIG	97.7%	99.6%	95.3%	97.3%
	Not AIG	68.3%	62.7%	56.9%	50.4%
	Overall	77.7%	73.2%	69.2%	63.7%

Second, we examined estimated student growth[5] on EOG tests across co-taught and non-co-taught students. The estimated student growth is the difference between students' EOG percentile and the projected percentile provided by EVAAS. Students fall into one of three categories: *Did not Meet Expectations* if the difference between the actual and projected percentile is less than -5, *Met Expectations* if the difference between the actual and projected percentiles is between -5 and 5, or *Exceeded Expectations* if the difference between the actual

[5] Note: "Student growth" here is a district-designed measure and not affiliated with SAS's Education Value-Added Assessment System (EVAAS) measure.

and projected percentiles is more than 5. The percentage of students in co-taught and non-co-taught classrooms in each category of growth is presented in Table 5. A larger percentage of students in co-taught classrooms exceeded growth in mathematics than did students in non-co-taught classrooms. The percentage of co-taught and non-co-taught students exceeding growth in reading was similar, while the percentage of non-AIG students exceeding growth in science was greater in co-taught classrooms than in non-co-taught classrooms.

Table 5

Estimated Student Growth of Co-Taught and Non-Co-Taught Students, 2014-15

		Did Not Meet Expectations		Met Expectations		Exceeded Expectations	
		Co-Taught	Non-Co-Taught	Co-Taught	Non-Co-Taught	Co-Taught	Non-Co-Taught
Math	AIG	10.1%	14.0%	47.6%	49.8%	42.3%	36.2%
	Not AIG	28.6%	29.9%	24.9%	28.4%	46.5%	41.7%
	Overall	22.1%	24.8%	32.9%	35.2%	45.0%	40.0%
Reading	AIG	21.8%	22.6%	42.3%	40.0%	35.6%	37.5%
	Not AIG	34.3%	33.0%	30.1%	29.2%	35.2%	37.8%
	Overall	29.9%	29.7%	34.7%	32.6%	35.4%	37.7%
Science	AIG	23.4%	22.6%	34.7%	35.6%	41.9%	41.9%
	Not AIG	24.7%	28.8%	20.3%	21.9%	55.0%	49.4%
	Overall	24.2%	26.8%	25.4%	26.2%	50.4%	47.0%

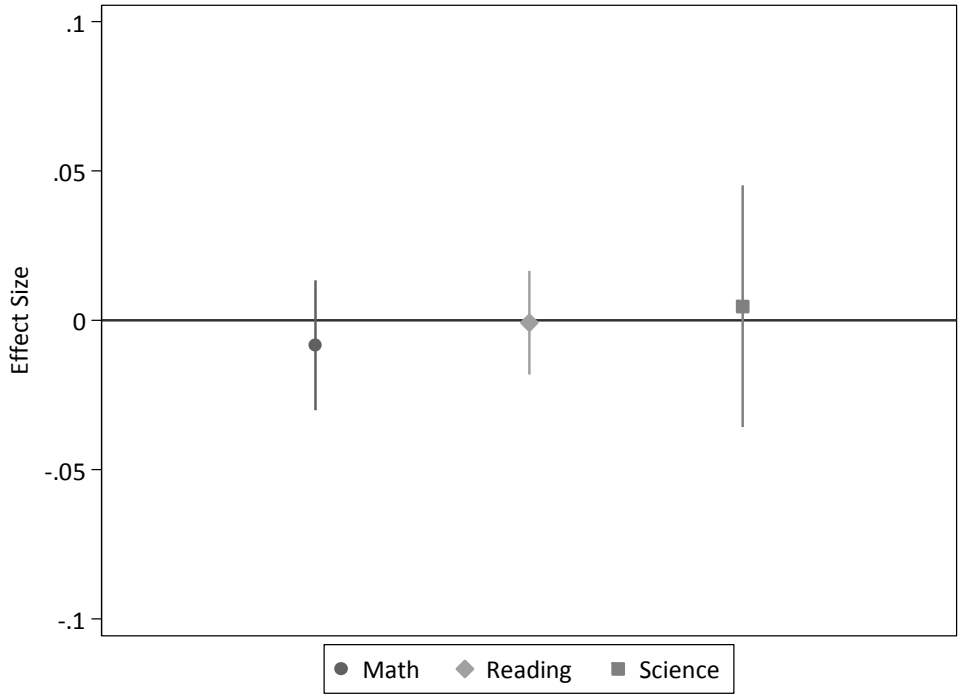
Third, we explored the relationship between co-teaching and test performance using multilevel regression modeling. Since co-teaching was offered in elementary schools to grades 4 and 5, we used mathematics and reading EOG scores as our outcome for these two grades and science for grade 5—the only elementary school grade with a science EOG. In 2014-15, the full sample included roughly 23,500 students, of which 1,700 were enrolled in co-taught ***classrooms***. Of these co-taught students, about 500 were classified as AIG and 1,200 were not.

To graphically display the relationship between the AIG co-teaching condition and student achievement, we used a "coefficient plot." In the plot, the relationship is illustrated with a marker that sits above or below the horizontal line marked with a zero. If the marker is above the horizontal line, the association between co-teaching and achievement was positive. If it is below the line, the association was negative. If the vertical lines radiating from the marker—known as confidence intervals (CI)—touch the zero line, then the association was not statistically different from zero.

Figure 5 shows the relationship between co-teaching at the school-level and student achievement in mathematics, reading and science. In the case of math and reading outcomes, the "treatment" group consisted of 4th and 5th grade students attending a school that volunteered for co-teaching. The "control" group consists of their counterparts who attended non-co-teaching schools. The science results are for students in grade 5 only. If there was a positive association in the co-teaching schools, we could argue that the co-teaching model has

potential benefits for the entire school—not just specific classrooms. The graph shows that there was no statistically significant difference in mathematics, reading, or science performance between the roughly 8,500 4th and 5th graders who attended co-teaching ***schools*** and their nearly 15,000 non-co-taught counterparts.

Figure 5
Co-Teaching and EOG Performance at the School-Level, 2014-15



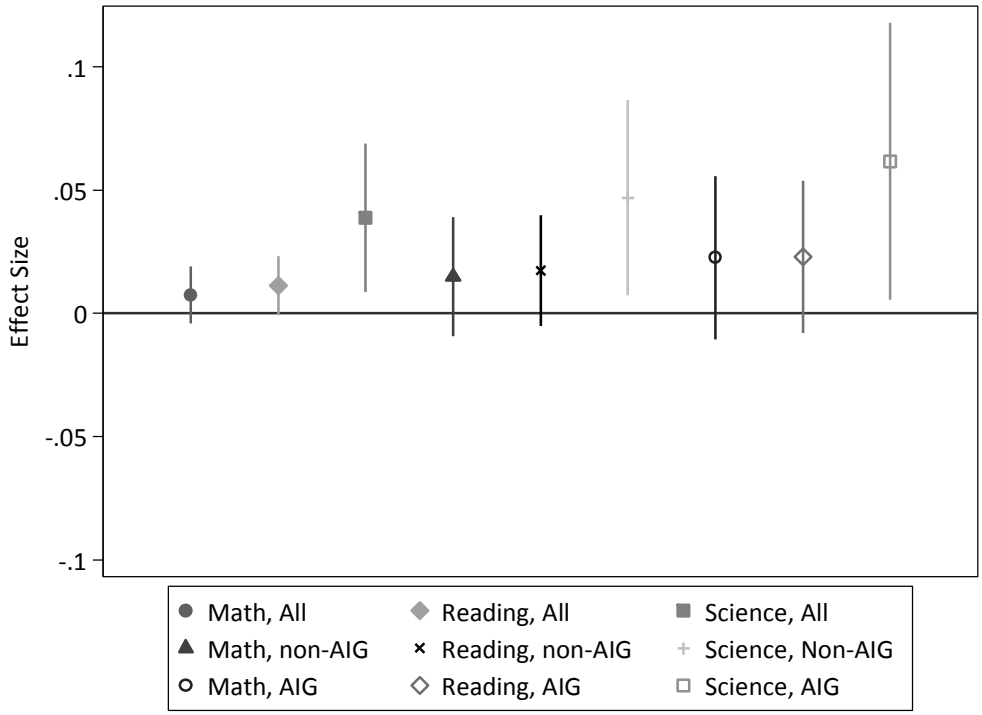
Note: This chart shows standardized effect sizes. The markers (round, diamond and square) indicate the size of effect. Markers below the horizontal line at zero indicate a negative effect and those above it indicate a positive one. The vertical lines are 95% confidence intervals (CI). If the CI touches the horizontal line at zero, the effect itself is zero ($p < .05$).

The student-level analyses define the "treatment" group as those students who were enrolled in co-teaching ***classrooms***—not merely schools. Thus, this group is significantly smaller—roughly 1,700 students—and does not include students in the same co-teaching school that are not enrolled in a co-teaching classroom. The "control" group, then, consists of nearly 22,000 students not enrolled in a co-teaching classroom—either across schools or within the same school.

The analyses in Figure 6 show the relationship between the co-teaching and non-co-teaching conditions in the three tested subjects for three groups of students: All students, non-AIG students and AIG students. Figure 6 illustrates two noteworthy results. The first is that the relationship between co-teaching and student performance was always positive in direction. Second, the effect size was statistically significant for science EOG results in each instance but was not significantly different from zero for mathematics or reading.

Figure 6

Co-Teaching and EOG Performance at the Student-Level, 2014-15



Note: This chart shows standardized effect sizes. The markers indicate the size of effect. Markers below the horizontal line at zero indicate a negative effect and those above it indicate a positive one. The vertical lines are 95% confidence intervals (CI). If the CI touches the horizontal line at zero, the effect itself is zero ($p < .05$).

In both mathematics and reading for all students, non-AIG students, and AIG students, the co-taught students outperformed their counterparts by less than 0.03 standard deviations (*SD*), which is small in magnitude and not statistically different from zero in either case. On the other hand, in science performance, students in co-taught classrooms outperformed their non-co-taught counterparts by roughly 0.05 *SD*, which was statistically significant in the case of AIG students, non-AIG students and the full sample ("All").

It is worth reiterating that these results are not causal—we cannot infer that co-teaching caused an increase in science performance. Moreover, co-teaching did not occur during science instruction, so the results could be driven by any number of other factors. The results herein provide merely a snapshot of the relationship between co-teaching and student achievement and serve to inform any future co-teaching implementation in the district.

CONCLUSIONS

In an effort to transition from a "pull-out" to a "push-in" model of instructional service delivery, the AIG department adopted a co-teaching approach to classroom instruction beginning in the 2014-15 school year. The decision to adopt co-teaching came on the heels of a curriculum audit of the AIG department that recommended changes to instructional delivery practices and in advance of submission of the district's local AIG plan to NCDPI.

The AIG co-teaching model was ultimately implemented by voluntary adoption in 37 elementary schools and four middle schools. The characteristics of AIG co-teaching schools largely reflected those of the district except in the case of the school calendar, where co-taught classrooms were slightly overrepresented by the year-round calendar. Within schools that adopted co-teaching, the characteristics of students enrolled in co-teaching classrooms largely mirrored their within-school peers who were not co-taught. Despite the fact that co-teaching was implemented on a voluntary basis, it is encouraging that students in co-taught and non-co-taught classrooms largely resembled each other on observable characteristics.

Co-teaching frameworks typically utilize six different instructional methods. In 2014-15, the most commonly observed method was "one teach, one assist," in which one teacher leads instruction while the other supports it through individual student assistance and small-group activities. In 2015-16, the most commonly observed method was "station" teaching, in which students are divided into three groups, two are taught a mini-lesson by a co-teacher while the third works independently and then rotated between co-teachers. Observers also noted a high incidence of two of the four Cs—collaboration and communication—which was evident between 80% and 90% of the time across two years of observations. Classroom teachers tended to perceive co-teaching more favorably and were more likely to want to co-teach again. Both classroom and AIG teachers believed they needed more joint planning time. According to student survey results, co-taught students and non-co-taught students exhibited similar levels of engagement on nearly all indicators.

Co-taught students had slightly higher grade-level proficiency (GLP) and college and career ready (CCR) proficiency rates in 2014-15 compared with their non-co-taught counterparts. With respect to growth, a larger percentage of co-taught students exceeded expectations in mathematics and science compared with their non-co-taught counterparts. A more rigorous analysis revealed that students in co-taught classrooms outperformed their non-co-taught peers on the 5th-grade science EOG test. This was true for both non-AIG and AIG students.

Taken together, these results should be interpreted with caution because they largely reflect a single year in which implementation was strongest. We include one year of performance data because we learned throughout the 2015-16 school year that the AIG co-teaching model was not being intentionally implemented. The recommendations below draw both from the evidence offered in this report and maintain an eye toward any subsequent rollout of co-teaching.

RECOMMENDATIONS

Reduce overreliance on "one teach, one assist." The "one teach, one assist" approach to co-teaching was the most frequently observed strategy in 2014-15 and tied for the second most observed in 2015-16. While accepted as one of six primary co-teaching approaches, research suggests that the "one teach, one assist" instructional strategy could diminish the role of the co-teaching specialist (Patel & Kramer, 2013). Any future co-teacher training should emphasize strengths and weaknesses of each approach and ensure that both co-teachers enhance their presence and impact.

Increase and optimize co-teachers' collaborative planning time. Only one-third of general classroom teachers and AIG teachers believed they had sufficient planning time to prepare for co-taught lessons. Co-teachers in a range of prior research studies share this view. As part of co-teaching training and professional development, central office staff, implementation team members and co-teachers themselves should develop strategies to optimize co-teachers' collaborative planning time, since effective co-teaching arguably cannot happen in the absence of co-planning.

Explore reasons behind co-teachers' perception gaps. AIG teachers and general classroom teachers exhibited varying levels of agreement on some important perception-related survey items. Notably, AIG teachers more generally felt like unequal partners in the eyes of both parents and their general classroom co-teacher. Moreover, smaller percentage of AIG teachers believed that collaborative instructional strategies were superior to those they could develop independently. While co-teacher perceptions were largely more similar than different, variation in these few but critical items could portend challenges in some co-teachers' collaborative relationships.

Explore the potential contribution of co-teaching to science achievement. The results herein suggest that co-teaching may help to promote marginally higher achievement in science. This was true for growth among non-AIG students and when directly comparing AIG and non-AIG co-taught students to their non-co-taught peers when controlling for other potential influences on achievement. Although it was small in magnitude, this finding is perplexing since AIG co-teaching was not implemented during science instruction. However, there may have been a spillover effect from math or reading instruction that influenced science performance in these classrooms.

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APPENDICES

Table A1

Schools Participating in AIG Co-Teaching Initiative

Elementary Schools

- Ballentine ES
- Banks Road ES
- Brassfield ES
- Carpenter ES
- Combs ES
- Durant Road ES
- Forrestville Road ES
- Harris Creek ES
- Heritage ES
- Hodge Road ES
- Hunter ES
- Jeffreys Grove ES
- Joyner ES
- Lake Myra ES
- Middle Creek ES
- Morrisville ES
- North Forest Pines ES
- Oak Grove ES
- Olds ES
- Olive Chapel ES
- Pleasant Union ES
- Rand Road ES
- Riverbend ES
- Root ES
- Salem ES
- Stough ES
- Sycamore Creek ES
- Timber Drive ES
- Turner Creek ES
- Walnut Creek ES
- Wendell ES
- West Lake ES
- Wilburn ES
- Wildwood ES
- Wiley ES
- Willow Springs ES
- York ES

Middle Schools

- East Cary MS
- Rolesville MS
- Heritage MS
- West Lake MS

Note: Nineteen of 37 participating elementary schools and all four middle schools are on the year-round calendar. During the call for volunteers, 45 schools agreed to participate but four schools—Dillard Drive ES, Holly Ridge ES, Martin MS, and Weatherstone ES—withdrew prior to implementation.

Table A2

Frequency of Observed Instructional Practices, 2014-15 and 2015-16

	Clearly Evident 2014-15	Clearly Evident 2015-16	Diff. (14-15 to 15-16)
Research-based instructional strategies are utilized in the classroom	68.3%	88.5%	20.2%
Lesson/projects are differentiated.	62.8%	87.5%	24.7%*
Graphic organizers/study/note taking strategies appropriate to lesson and content are used. Thinking Maps (if applicable) are integrated into the lesson. Graphic Organizers are differentiated according to level of student.	50.0%	65.4%	15.4%
Technology is integrated and age appropriate. Both teachers and students use technology. Technology use should match the standard(s).	34.1%	42.3%	8.2%
Students are engaged in respectful work. Work is relevant to student and life experiences; rigorous content during instructional time is in place.	77.3%	96.2%	18.9%*
Students are participating in lesson activities by both answering and asking questions. Teachers give appropriate wait time for students. Teachers continuously seek ways to engage all students in dialogue or discussions. Higher level DOK questions should be used.	86.4%	80.8%	-5.6%
Instruction looks significantly different with two adults present in the classroom. Both teachers actively participate in the presentation of the lesson, correcting errors, questioning, summarizing. When groups are used, both teachers teach all students or the specialist teacher may be working with the general education students.	79.5%	88.0%	8.5%
Both teachers provide feedback to all students to guide their learning as needed.	84.1%	88.0%	3.9%
Both teachers' names are in the classroom.	13.6%	12.0%	-1.6%
Both teachers' voices are heard in the teaching/learning process. Both teachers work in tandem with all students consistently.	76.7%	84.0%	7.3%
Lessons are presented in a variety of ways. Content is re-taught or extended as needed using varied modalities.	63.6%	69.2%	5.6%
Both adults interject ideas for clarification of lesson content.	84.1%	80.0%	-4.1%
Both teachers are simultaneously present bell to bell.	95.5%	100.0%	4.5%
Both teachers provide feedback to all students to guide their learning as needed.	79.5%	88.0%	8.5%
Both teachers are actively involved in the lesson presentation and assessment process-shared classroom responsibilities.	75.0%	92.0%	17.0%
Both adults move around the classroom assisting and monitoring all students learning.	77.3%	80.0%	2.7%
Rituals and routines are in place and adhered to by students.	93.0%	100.0%	7.0%
Inclusive language is used by both teachers in class.	52.3%	84.0%	31.7%*
Teachers utilize nonverbal communication during lesson activities to effectively manage classroom behavior and direct instruction.	63.6%	84.6%	21.0%

Note: * = Statistically significant at $p < .05$.

Table A3

Agreement of AIG Teachers and Classroom Teachers on AIG Co-Teaching Survey Items

	AIG Teachers (n=37)	Classroom Teachers (n=47)	Diff (AIG – Classroom)
The AIG/classroom teacher and I continually discuss our mutual goals, our roles and responsibilities, and how to share resources.	86.5%	87.2%	-0.7
The AIG/classroom teacher and I are able to work out our roles during classroom instruction.	100%	93.6%	6.4
The AIG/classroom teacher and I continually evaluate our collaborative teaching arrangements and our roles.	83.8%	78.7%	5.1
The AIG/classroom teacher and I continually evaluate our interpersonal and communication skills.	78.4%	83.0%	-4.6
Students accept us as equal partners during instruction.	91.9%	89.4%	2.5
Parents accept us as equal partners in the classroom.	67.6%	83.0%	-15.4
Administrators accept us as equal partners in the classroom.	86.5%	93.6%	-7.1
I learn new instructional strategies from my partner.	91.9%	87.2%	4.7
I learn new behavioral and motivational strategies from my partner.	89.2%	78.7%	10.5
I have more confidence in my ability to work with students with learning and behavioral problems.	70.3%	72.3%	-2.0
The strategies that the AIG/classroom teacher and I design collaboratively are superior to those I have designed on my own.	59.5%	74.5%	-15.0
I enjoy and benefit from the professional companionship.	97.3%	95.7%	1.6
The strategies that the AIG/classroom teacher and I design and implement produce positive academic changes for students.	97.3%	95.7%	1.6
The strategies that the AIG/classroom teacher and I design and implement produce positive interpersonal skills for students.	94.6%	89.4%	5.2
Students are learning to accept and support their individual differences.	94.6%	91.5%	3.1
Alternative strategies to meet individual needs are considered during planning.	94.6%	89.4%	5.2
Strategies are designed for monitoring the effectiveness of instruction.	86.5%	89.4%	-2.9
Students receive more individual help during class discussion.	91.9%	95.7%	-3.8
The AIG/classroom teacher and I are able to more effectively teach all students in the class.	91.9%	97.9%	-6.0
The AIG/classroom teacher and I are able to more effectively teach students learning strategies.	91.9%	93.6%	-1.7
The AIG/classroom teacher and I are able to more effectively teach students higher-order thinking skills.	94.6%	97.9%	-3.3

The AIG/classroom teacher and I are able to more effectively adapt curriculum, instruction and assessment to meet individual needs.	100%	89.4%	10.6*
The AIG/classroom teacher and I are able to more effectively adapt instructional and testing materials and equipment.	75.7%	85.1%	-9.4
The AIG/classroom teacher and I are able to more effectively implement cooperative learning structures.	91.9%	89.4%	2.5
The AIG/classroom teacher and I are able to more effectively teach students social/communication skills.	94.6%	89.4%	5.2
The AIG/classroom teacher and I are able to more effectively monitor learning through performance-based assessment/measurement.	89.2%	95.7%	-6.5
I use the strategies we design in other classes.	91.9%	85.1%	6.8
The AIG/classroom teacher and I have sufficient time to plan for instruction.	27.0%	34.0%	-7.0
Collaborative planning time focuses on designing appropriate instruction for all students in the class.	81.1%	83.0%	-1.9
The amount of time the AIG/classroom teacher and I need to plan decreases as the year progresses.	48.6%	57.4%	-8.9
The AIG/classroom teacher listens to me and is sensitive to my concerns and style.	97.3%	100%	-2.7
My knowledge of individual students is valued and considered during instructional planning.	97.3%	100%	-2.7
My ideas about alternative strategies are valued and considered during instructional planning.	94.6%	100%	-5.4
I feel comfortable taking risks with the AIG/classroom teacher in the classroom.	97.3%	100%	-2.7
I feel I am accepted by the AIG/classroom teacher as an equal during classroom instruction.	83.8%	100%	-16.2*
The strategies, designed to meet individual needs, are manageable in the classroom.	97.3%	100%	-2.7
Collaborative teaching between general and AIG services needs to be more widely implemented in the school/district.	78.4%	87.2%	-8.8
I would choose to collaboratively teach again with the AIG/classroom teacher.	89.2%	93.6%	-4.4
I would like to collaboratively teach again with other teachers.	89.2%	91.5%	-2.3

Note: * = Statistically significant at $p < .05$.

Table A4

Percentage of 5th-Grade Students Agreeing or Identifying with 2014-15 Student Survey Items

	Percent Agree	
	Not Co-Taught	Co-Taught
Overall, adults at my school treat students fairly.	88.8	87.0
Adults at my school listen to the students.	86.4	86.2
At my school, teachers care about students.	95.0	96.2
My teachers are there for me when I need them.	89.6	89.8
The school rules are fair.	81.4	81.5
Overall, my teachers are open and honest with me.	89.3	90.5
I enjoy talking to the teachers here.	84.6	85.2
I feel safe at school.	88.4*	84.3*
Most teachers at my school are interested in me as a person, not just as a student.	76.8	77.6
My teachers give me challenging work.	78.9*	83.3*
I work hard to meet my teachers' expectations.	96.5	96.0
The tests in my classes do a good job of measuring what I'm able to do.	87.0*	90.3*
Most of what is important to know you learn in school.	88.2	87.3
The grades in my classes do a good job of measuring what I'm able to do.	87.1	85.9
What I'm learning in my classes will be important in my future.	90.7	91.9
After finishing my schoolwork I check it over to see if it's correct.	80.8	81.4
When I do schoolwork I check to see whether I understand what I'm going.	92.8	91.7
Learning is fun because I get better at something.	75.3	75.8
When I do well in school it's because I work hard.	95.8	95.6
I feel like I have a say about what happens to me at school.	71.0	68.6
Other students at my school care about me.	77.2	77.1
Students at my school are there for me when I need them.	78.8	80.1
Other students here like me the way I am.	83.5	84.0
I enjoy talking to the students here.	92.9	93.1
Students here respect what I have to say.	72.8	72.6
I have some friends at school.	97.1	97.6
I plan to continue my education following high school.	98.3	97.9

	Percent Agree (cont.)	
	Not Co-Taught	Co-Taught
Going to school after high school is important.	97.5	97.3
School is important for achieving my future goals.	97.0	97.9
My education will create many future opportunities for me.	97.0	96.9
I am hopeful about my future.	97.9	97.2
I believe I can make a difference in my community.	89.2	91.2
When I'm old enough, I plan to vote in most elections.	83.9	83.7
I care a great deal about who is elected to be out next president.	82.2	81.7
I pay attention to what's going on in the news.	67.1	70.6
I think politics and government are boring.	47.0	46.0
I participate in projects in my community.	75.0	74.4
My family/guardian(s) are there for me when I need them.	96.9	96.8
When I have problems at school my family/guardian(s) are willing to help me.	95.7	96.0
When something good happens at school, my family/guardian(s) want to know about it.	95.8	94.4
My family/guardian(s) want me to keep trying when things are tough at school.	98.3	97.5
	Percent Identifying with Statement	
	Not Co-Taught	Co-Taught
New ideas and projects sometimes distract me from previous ones.	34.5	34.0
Setbacks (delays and obstacles) don't discourage me. I bounce back from disappointments faster than most people.	53.6	52.1
I have been obsessed with a certain idea or project for a short time but later lost interest.	37.5	34.3
I am a hard worker.	85.4	87.7
I often set a goal but later choose to pursue (follow) a different one.	43.3	41.6
I have difficulty maintaining (keeping) my focus on projects that take more than a few months to complete.	34.7	36.2
I finish whatever I begin.	72.8	72.0
I am diligent (hard working and careful).	81.8	84.9

Note: * = Difference between percent agreeing/identifying with statement is statistically significant at $p < .05$.