



# Effects Of Co-Teaching Instructional Strategy On Students' Academic Achievement In Mathematics

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## ABSTRACT

It has been observed that students' achievement in Mathematics still remains low and mode of teaching has been aptly described as the bedrock of academic success. As Mathematics teachers strive to meet state and federal accountability mandates to improve the achievement of every student, Mathematics classes should explore various inclusive service delivery models to fulfill the needs of diverse learners. A pretest-posttest quasi experimental control group design was employed to determine the effects of Mathematics teaching through the co-teaching instructional strategy on students' academic achievement in Mathematics using two hundred and forty SS 2 students in their intact classes who were randomly selected from four senior secondary schools in Ogbomoso. One hundred and twenty (120) students were selected as the experimental group while the remaining One hundred and twenty (120) students served as the control group. The treatment group was taught Mathematics using two teachers while the control group was taught using the conventional method of a teacher teaching. Two equivalent reliable and validated objective Achievement Tests (AT) ( $r=0.86$ ) were the instruments in the study. Seven hypotheses were tested ( $p<0.05$ ) using mean, standard deviation and Analysis of Covariance (ANCOVA) and the results showed significant main effect of treatment on students' achievement in Mathematics ( $F_{(1,228)} = 3214.86$ ;  $\eta^2 = 0.93$ ); significant main effect of gender on students' achievement in Mathematics ( $F_{(1,228)} = 97.96$ ;  $p < 0.05$ ;  $\eta^2 = 0.30$ ); significant main effect of mental ability on students' achievement in Mathematics ( $F_{(2,228)} = 145.42$ ;  $p < 0.05$ ;  $\eta^2 = 0.56$ ) and significant interaction effect of gender and mental ability on students' achievement in Mathematics ( $F_{(2, 228)} = 9.66$ ;  $p < 0.05$ ;  $\eta^2 = 0.08$ ). The implications to Mathematics teaching were discussed and Co-teaching mode of instruction was recommended among others.

**Keywords:** Co-teaching, inclusive education, Mathematics teaching, conventional method.

## INTRODUCTION

Mathematics has been considered as an important school subject for the development of human reasoning faculties. Mathematics plays an important role in developing abilities like thinking, reasoning, conceptual understanding, procedural knowledge and problem solving skills required to become good citizens. Knowledge of Mathematics is used by every individual in daily life and provides foundation for a nation's

scientific and technological advancements. These have made Mathematics a compulsory subject at the primary and secondary school levels in almost every part of the world.

Mirza and Iqbal (2014) recognised the importance of Mathematics as they contend that the intellectual and cultural development of an individual cannot take place without studying Mathematics and explained that Mathematics has many characteristics that distinguish it from other subjects. These characteristics according to them range from peculiarity of language and symbols to abstraction of concepts, and reported that as a result of its abstract nature, unique language and symbols, students face difficulty in learning Mathematics which may be difficult for a single teacher teaching in a Mathematics' classroom to solve and later advocated for the extension of co-teaching instructional strategy to general Mathematics classroom.

Rexroat-Frazier (2017) described co-teaching as an instructional delivery model applicable to teaching students with disabilities in least restrictive integrated classroom settings in which general and special educators share responsibility for planning, delivering, and evaluating instructional practices for all students. According to Ploessland Rock (2014), co-teaching was identified as the most common approach to special education service provision in inclusive classrooms and define co-teaching as two or more professionals jointly delivering substantive instruction to a diverse, or blended, group of students in a single physical space. Ploessl and Rock definition is similar to that of Meier and Fisk (2016) who explained that Co-teaching refers to having one general education teacher and one special education teacher with both providing inclusive instruction to a diverse group of students in a single classroom.

Texas Education Agency/Education Service Center (TEA/ESC, 2018) elucidated that Co-teaching is a service delivery option, a way to provide students with disabilities or other special needs the special instruction to which they are entitled while ensuring that they can access the general curriculum in the least restrictive environment .It is considered as a service delivery option in which two or more certified/licensed professionals share the responsibility of lesson planning, delivery of instruction, and progress monitoring for all students assigned to their classroom. In some instances, other licensed professionals such as, occupational therapists or speech language pathologists, may be one of the co-teachers. As a team, these professionals share the same physical classroom space, collaboratively make instructional decisions, and share the responsibility of student accountability.

Co-teachers share a common belief that each partner has a unique expertise and perspective that enriches the learning experience; together they provide opportunities for students to learn from two or more people who may have different ways of thinking or teaching. They work together to achieve common, agreed-upon goals. Paraprofessionals are not included in the definition of co-teaching because their roles are to provide instructional support. The paraprofessional is not accountable for student achievement and their certification is not equivalent to that of a certified/licensed professional. Co-Teaching is not teachers teaching alternating subjects; one person teaching while the other makes materials or grades student work; one person teaching a lesson while the others sit, stand, and watch without function or assignment neither is it when one person's ideas determine what or how something should be taught nor one person acting as a tutor(TEA/ESC, 2018).

Parker (2010) described Co-teaching as an instructional strategy where two teachers share a classroom of students in which some are learning disabled but the majority are not. One teacher is a certified content specialist. The other teacher is certified in special education. Both teachers collaborate together in the planning, executing, and evaluating of the daily lessons.

Chitiyo (2017) expounded that Co-teaching is a practice that is rooted in the philosophy of inclusive education and it involves two teachers collaborating in delivering instruction to a group of students with diverse learning needs, including those with disabilities, in a single classroom. Co-teaching according to Chitiyo (2017) can take different formats ranging from station teaching, parallel teaching, alternative teaching, teaming to one teach-one assist, depending on the instructional needs of the students.

From the definitions above, it is evident that, rather than pulling out (for whatever reason under the disguise of disability) certain students for instruction in separate classrooms, in the co-teaching model, students remain in general education classroom, receiving collaborative instruction by general education and special education teachers for one or more content areas. The teachers share instructional

responsibilities and this includes working together in delivering instruction, designing student assessments, and classroom management. This collaboration relieves the instructional burden from either the general education teacher or the specialist teacher. General education teachers can be viewed as the content specialists or providers while special education teachers provide access to the content in the instructional process (Chitiyo, 2017).

According to TEA/ESC (2018), inclusive education is a belief system that values diversity and fosters a shared responsibility to help all students to reach their potential. An inclusive belief system requires schools to create and provide whatever is necessary to ensure that all students have access to meaningful learning. It does not require students to possess any particular set of skills, abilities or disabilities as a prerequisite to belonging. In inclusive environments, placement considerations and decisions regarding the delivery of supplementary aids and services are based on student data to assure that the needs of the student are the primary consideration. Highly inclusive schools may offer some services in separate settings. Schools that describe themselves as having full inclusion are often referring to where students sit rather than to the beliefs of the educators providing services.

Inclusive education according to Parker (2010) was referred to the attendance of students with identified learning disabilities in the same schools as students without any identified disabilities including the participation of disabled students in general education classrooms with age-appropriate peers and Learning Disabilities was referred to as the range of characteristics displayed by students who do not achieve on level as compared to peers in areas of communicating, reading, writing, spelling, reasoning or organizing.

Arising from these definitions, there should be a shift of idea of learners' disabilities from only physical learning disabilities to general learning disabilities like physical, psychological, mental, emotional, social, etc. Any disability (of any form) which makes an individual learner different in the classroom that calls for the monitoring of individual learner's difference (which is a major concept even in general classes) should not only be limited to special education classes. General education classes should also be view as the collection of learners with various learning disabilities.

In this view, as educational personnel strive to meet state and federal accountability mandates to improve the achievement of every student, there is the need for Mathematics classes to shift from the conventional monopoly of teaching by only one teacher, Mathematics classes should explore various inclusive service delivery models to fulfill the needs of diverse learners. The co-teach model is one effective model allowing general educators to differentiate and deliver instruction with assurances that all students have full access to the expectations of the general curriculum.

Today's Mathematics classrooms characterized by conventional monopoly of teaching by only one teacher have students with a diverse range of abilities and needs that bring unique challenges to teaching in a standards-based learning environment. Co-teaching brings together two or more certified/ licensed professionals who can use their expertise to design rigorous learning experiences tailored to meet the unique needs of all students. This could take different forms from classroom to classroom: one Teaching, One Observing; Station Teaching; Parallel Teaching; Alternative Teaching; Teaming and One Teaching, One Assisting.

TEA/ESC (2018) reported that Co-teaching instructional strategy can have positive impact on student outcomes. Kohler-Evans (n.d) research findings have yielded mixed results on the effects of co-teaching. Some studies (Schulte, Osborne & McKinney, 1990; Marston, 1996) have indicated that students with disabilities showed larger gains in Mathematics and equal gains in reading when compared to students receiving pull out services and that consultation plus co-teaching was as effective as other service delivery models.

Boudah, Schumaker and Deshler (1997) found that performance of students with high-incidence disabilities worsened during co-teaching. Other studies (Dieker, Stephan & Smith, 2013; Magiera&Zigmond,2005; Murawski,2008) have indicated that for high-risk students and students with learning disabilities, co-teaching is an effective practice. Rea, McLaughlin and Walther-Thomas (2002) reported that students with learning disabilities in co-taught classes performed better than students in single-teacher classes. In another study, Murawski and Swanson (2001) conducted a meta-analysis to

establish the effectiveness of co-teaching and found that the strongest positive impact of co-teaching was on reading/language arts with moderate effects on Mathematics.

Vaughn, Elbaum, Schumm and Hughes (1998) found co-teaching to have a positive impact on reading achievement for all students. They also found a positive relationship between co-teaching and the development of more positive social relationships for students with disabilities. Gray (2009) found that students with disabilities in co-taught classes improved homework completion from 43% to 100% weekly. Aside from enhancing student outcomes, co-teaching has also been shown to benefit teachers involved. Austin (2001) found that, general education teachers developed an appreciation of inclusive education while special education teachers cited an increase in content knowledge. In another study, Walther-Thomas (1997) found that teachers who participated in co-teaching assignments reported appreciation of collaborative teaching as well as inclusive education.

From the reviewed literature, it is evident that one of the primary ways schools are addressing the need for accountability and individualization is through a technique known as co-teaching. Although co-teaching has become a popular approach to special education service provision of inclusive classrooms. One suggestion for improvement of students' academic achievement is to extend co-teaching to students in the regular Mathematics classes. This study therefore sought the effect of co-teaching instructional strategy on students' academic achievement in general Mathematics classrooms.

### **Statement of the Problem**

Mathematics has many characteristics that distinguish it from other subjects. These characteristics that range from peculiarity of language and symbols to abstraction of concepts are making students to face difficulty in learning Mathematics as evident from students' poor performance in the subject. These peculiarities resulting to various learning peculiarities for individual student may be difficult for a single teacher teaching in a Mathematics' classroom to solve. The study therefore, sought to evaluate the effect of co-teaching instructional strategy on students' academic achievement in Mathematics.

### **Hypotheses**

**Ho<sub>1</sub>:** There is no significant main effect of treatment on students' achievement in Mathematics.

**Ho<sub>2</sub>:** There is no significant main effect of gender on students' achievement in Mathematics.

**Ho<sub>3</sub>:** There is no significant main effect of mental ability on students' achievement in Mathematics.

**Ho<sub>4</sub>:** There is no significant interaction effect of treatment and gender on students' achievement in Mathematics.

**Ho<sub>5</sub>:** There is no significant interaction effect of treatment and mental ability on students' achievement in Mathematics.

**Ho<sub>6</sub>:** There is no significant interaction effect of gender and mental ability on students' achievement in Mathematics.

**Ho<sub>7</sub>:** There is no significant interaction effect of treatment, gender and mental ability on students' achievement in Mathematics.

### **Research Design**

A pretest-posttest, quasi experimental control group design was adopted in this study.

### **Sample and Sampling Technique**

The sample of the study comprised two hundred and forty (240) SS 2 students in their intact classes who were randomly selected from four senior secondary schools in Ogbomosho. Two groups of participants in their intact classes were formed in each school (one experimental and one control groups per school). The sample consisted of 240 students, 120 of whom were in the experimental group and 120 in the control group. In the experimental group were 57 male, 63 female, 35 low mental ability, 57 average mental ability and 28 high mental ability students, while in the control group were 52 male, 68 female, 40 low mental ability, 57 average mental ability and 23 high mental ability students.

### **Instrumentation and Method of Data Collection**

In the study, there were one experimental and one control groups. The Control Group is the group taught using only one Mathematics teacher in an intact Mathematics classroom, the Experimental Group is the group taught using two Mathematics teachers in an intact Mathematics classroom. Mathematics Teaching Program was developed in the study to teach the Mathematical concepts in the scheme of work. Two sets

of eighty (80) parallel multiple choice objective tests were developed by the researcher and given to experts in Science and Mathematics Education for review in terms of content, relevance, scope of coverage, language of presentation, clarity of expression and overall adequacy. Based on their comments, some of the items were modified while some were removed. Two sets of fifty (50) parallel multiple choice objective items survived the experts' scrutiny. The achievement tests were then pilot tested at a school in Oyo. The reliability coefficient of the instruments was calculated using Kuder Richardson 20 (KR-20) method and the instruments yielded a reliability index of 0.86, thirty (30) of the items with extreme (high or low) difficulty indices were removed leaving a total of 50 items on the test with a reliability index of 0.86 and an average item difficulty value of 0.51. Items with difficulty level of 40% - 70% were selected, others with difficulty level above 70% and below 40% were discarded for being too easy or too difficult respectively. The first set of the instrument was presented as a pre-test to these groups in different classrooms but with equal learning environmental conditions. Their answer scripts were collected for marking and recording after the stipulated time. The students were informed to report at their different classrooms for lessons in a week time. With the help of the prepared lesson plans according to the mode of the teaching, lessons were delivered to each group accordingly. The post-test was conducted to these students the following week. Their answer scripts were marked and recorded accordingly. It is believed that whatever findings that comes out of this study can be generalized as implying a reflection of the role of mode of instruction in teaching and learning of Mathematics in schools.

#### **Data analysis**

To be able to make meaningful deductions, the data obtained were statistically analyzed using mean, standard deviation and Analysis of Covariance (ANCOVA) with the pre-test scores as covariates to test the hypotheses at 0.05 level of significance.

**Testing the Null Hypotheses**

**Ho<sub>1</sub>:** There is no significant main effect of treatment on students' achievement in Mathematics.

**Table 1:** Descriptive Statistics of Students' Achievements

TREATMENT	GENDER	MENTAL_ABILITY	Mean	Std. Deviation	N
EXPERIMENTAL (CO-TEACHING)	MALE	LOW MENTAL ABILITY	74.34	2.55	18
		AVERAGE MENTAL ABILITY	79.42	3.52	26
		HIGH MENTAL ABILITY	85.62	2.36	13
		Total	79.25	5.07	57
	FEMALE	LOW MENTAL ABILITY	81.35	1.06	17
		AVERAGE MENTAL ABILITY	82.65	1.85	31
		HIGH MENTAL ABILITY	86.60	1.59	15
		Total	83.24	2.53	63
	Total	LOW MENTAL ABILITY	77.77	4.03	35
		AVERAGE MENTAL ABILITY	81.18	3.16	57
		HIGH MENTAL ABILITY	86.14	2.01	28
		Total	81.34	4.41	120
CONTROL (CONVENTIONAL)	MALE	LOW MENTAL ABILITY	49.78	3.51	18
		AVERAGE MENTAL ABILITY	54.77	2.53	26
		HIGH MENTAL ABILITY	62.25	1.67	8
		Total	54.19	4.99	52
	FEMALE	LOW MENTAL ABILITY	56.23	5.54	22
		AVERAGE MENTAL ABILITY	58.77	3.31	31
		HIGH MENTAL ABILITY	65.53	2.39	15
		Total	59.44	5.26	68
	Total	LOW MENTAL ABILITY	53.33	5.69	40
		AVERAGE MENTAL ABILITY	56.95	3.58	57
		HIGH MENTAL ABILITY	64.39	2.66	23
		Total	57.17	5.75	120
Total	MALE	LOW MENTAL ABILITY	62.08	12.84	36
		AVERAGE MENTAL ABILITY	67.10	12.81	52
		HIGH MENTAL ABILITY	76.71	11.81	21
		Total	67.29	13.53	109
	FEMALE	LOW MENTAL ABILITY	67.18	13.29	39
		AVERAGE MENTAL ABILITY	70.71	12.32	62
		HIGH MENTAL ABILITY	76.07	10.90	30
		Total	70.89	12.64	131
	Total	LOW MENTAL ABILITY	64.73	13.24	75
		AVERAGE MENTAL ABILITY	69.06	12.62	114
		HIGH MENTAL ABILITY	76.33	11.17	51
		Total	69.25	13.15	240

**Table 4.2: Summary of Analysis of Covariance of 2x2x3 Factorial Analysis on Students' Achievement, Gender and Mental Ability**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	39224.97 <sup>a</sup>	11	3565.91	389.66	0.00	0.95
Intercept	1013123.22	1	1013123.22	110706.72	0.00	1.00
TREATMENT	29420.49	1	29420.49	3214.86	0.00	0.93
GENDER	896.47	1	896.47	97.96	0.00	0.30
MENTAL ABILITY	2661.67	2	1330.84	145.42	0.00	0.56
TREATMENT * GENDER	9.52	1	9.52	1.04	0.31	0.01
TREATMENT * MENTAL ABILITY	53.84	2	26.92	2.94	0.06	0.03
GENDER * MENTAL ABILITY	176.87	2	88.44	9.66	0.00	0.08
TREATMENT * GENDER * MENTAL ABILITY	14.52	2	7.26	0.79	0.45	0.01
Error	2086.52	228	9.15			
Total	1192385.00	240				
Corrected Total	41311.50	239				

a. R Squared = 0.95 (Adjusted R Squared = 0.95)

Table 4.2 reveals a significant main effect of treatment on students' achievement in Mathematics ( $F_{(1,228)} = 3214.86$ ;  $p < 0.05$ ;  $\eta^2 = 0.93$ ). Therefore,  $H_{01}$  is rejected.

Table 4.3 shows that the main effect of treatment is as a result of significant difference in the experimental and control groups. This implies that students exposed to co-teaching mode of instruction performed significantly better than those exposed to single teacher (conventional) mode of instruction.

**Table 4.3: Estimated Marginal means of the Treatment, Gender and Mental Ability on Students' Achievement in Mathematics**

TREATMENT	Mean	Std. Error
EXPERIMENTAL (CO-TEACHING)	81.67	0.29
CONTROL (CONVENTIONAL)	57.89	0.30

Table 4.3 reveals that those exposed to co-teaching mode of instruction had higher achievement in Mathematics (81.67) compared to those exposed to conventional mode of instruction (57.89).

**H<sub>02</sub>:** There is no significant main effect of gender on students' achievement in Mathematics.

The summary of ANCOVA shown in Table 4.2 indicates that gender had significant main effect on students' achievement in Mathematics ( $F_{(1,228)} = 97.96$ ;  $p < 0.05$ ;  $\eta^2 = 0.30$ ). Therefore,  $H_{02}$  is rejected. Table 4.1 reveals that female students had higher achievement in Mathematics (70.89) than their male counterparts (67.18).

**H<sub>03</sub>:** There is no significant main effect of mental ability on students' achievement in Mathematics.

The summary of ANCOVA shown in Table 4.2 indicates that mental ability had significant main effect on students' achievement in Mathematics ( $F_{(2,228)} = 145.42$ ;  $p < 0.05$ ;  $\eta^2 = 0.56$ ). Therefore,  $H_{03}$  is rejected. Table 4.1 reveals that mentally high students had highest achievement mean score than their average and low mental ability counterparts. The difference was significant; it is not as a result of chance.

**H<sub>04</sub>:** There is no significant interaction effect of treatment and gender on students' achievement in Mathematics.

Table 4.2 indicates that treatment and gender had no significant interaction effect on students' achievement in Mathematics ( $F_{(1,228)} = 1.04$ ;  $p > 0.05$ ;  $\eta^2 = 0.01$ ). Therefore,  $H_{04}$  is not rejected.

**H<sub>05</sub>:** There is no significant interaction effect of treatment and mental ability on students' achievement in Mathematics.

Table 4.2 indicates that treatment and mental ability had no significant interaction effect on students' achievement in Mathematics ( $F_{(2,228)} = 2.94$ ;  $p > 0.05$ ;  $\eta^2 = 0.03$ ). Therefore,  $H_{05}$  is accepted.

**H<sub>06</sub>:** There is no significant interaction effect of gender and mental ability on students' achievement in Mathematics.

Table 4.2 indicates that gender and mental ability had significant interaction effect on students' achievement in Mathematics ( $F_{(2, 228)} = 9.66$ ;  $p < 0.05$ ;  $\eta^2 = 0.08$ ). Therefore, H<sub>06</sub> is rejected.

**H<sub>07</sub>:** There is no significant interaction effect of treatment, gender and mental ability on students' achievement in Mathematics.

Table 4.2 reveals that treatment, gender and mental ability had no significant interaction effect on students' achievement in Mathematics. ( $F_{(2, 228)} = 7.26$ ;  $p > 0.05$ ;  $\eta^2 = .001$ ). Therefore, H<sub>07</sub> is not rejected.

## DISCUSSION OF FINDINGS

The obtained results show significant main effects of treatments on students' achievement in Mathematics; significant main effect of gender on students' achievement in Mathematics where female students had higher achievement in Mathematics than their male counterparts; significant main effect of mental ability on students' achievement in Mathematics which shows that mentally high students had highest achievement mean score than their average and low mental ability counterparts, likewise, there was significant interaction effect of gender and mental ability on students' achievement in Mathematics.

The findings of this study revealed that learning takes place regardless of the method employed, teaching is supposed to bring learning, however, in a positive way. This has rightly justified the essence of teaching, nonetheless, how to teach Mathematical concepts to students is a significant issue, the mode employed in the process of teaching will go a long way in determining the level of assimilation of the learners. These results indicate that co-teaching mode of instruction significantly enhanced students' achievement in Mathematics better than the conventional mode. Students in co-teaching mode of instruction performed better by obtaining higher mean score in the achievement test.

The observed significant effect of co-teaching mode of instruction can be explained on the integration of both teachers interactive teaching. Teachers had the opportunity of maintaining the highest level of class management and invariably gained students' maximum attention. Individual differences and learning disabilities of students in the treatment group were skillfully taken care of. These findings agree with those of Rea, McLaughlin and Walther-Thomas (2002); Dieker, Stephan and Smith, (2013); Magiera and Zigmond (2005) where it was reported that students with learning disabilities in co-taught classes performed better than students in single-teacher classes as co-teaching had proved to be an effective practice. These results also lend support to the findings of TEA/ESC (2018) and Murawski, (2008) who reported that Co-teaching instructional strategy can have positive impact on student outcomes. It also corroborates the findings of Schulte, Osborne and McKinney (1990); Marston (1996) and Murawski and Swanson (2001) where it was indicated that students with disabilities showed larger gains in Mathematics and equal gains in reading when compared to students receiving pull out services and that consultation plus co-teaching was as effective as other service delivery models.

The finding of this study is however in contrary with that of Boudah, Schumaker and Deshler (1997) who found that performance of students with high-incidence disabilities worsened during co-teaching.

## CONCLUSION

Mathematics teaching aims at developing an individual culturally and intellectually, it is therefore expected that students who learn Mathematics should perform well when tested. Hence, Mathematics teaching and learning should be done through a pedagogical method that values diversity and fosters a shared responsibility to help all students reach their potentials. This study is in the support of the idea that, Mathematics (and sciences) should be taught using Co-teaching mode of instruction in order to enhance achievement.

## RECOMMENDATION

Based on the findings of this study, the following recommendations were made:

- Mathematics teaching should strive to meet state and federal accountability mandates to improve the achievement of every student.

- Co-teaching mode of instruction should be extended to general Mathematics classes.
- More Mathematics teachers should be employed to meet the challenge of insufficient manpower.

## REFERENCES

- Austin, V. L. (2001). Teachers' beliefs about co-teaching. *Remedial and Special Education*, 22(4), 245-255.
- Boudah, D., Schumaker, J. B., & Deshler, D. D. (1997). Collaborative instruction: Is it an effective option for inclusion in secondary classrooms? *Learning Disability Quarterly*, 20, 293-316.
- Chitiyo, J. (2017). Challenges to the use of co-teaching by teachers. *International Journal of Whole Schooling*, 13(3), 55-66.
- Dieker, L. A., Stephan, M., & Smith, J. (2013). Secondary mathematics inclusion: Merging with special education. *Mathematics Teaching in the Middle School*, 18(5), 292-299.
- Gray, A. (2009). Co-teaching in inclusive classrooms: The impact of collaboration on attitudes, efficacy, and student achievement (Dissertation). Arizona State University.
- Kohler-Evans, P. A. (n.d.). Co-teaching: How to make this marriage work in front of the kids.
- Magiera, K. & Zigmond, N. (2005). Co-teaching in middle school classrooms under routine conditions: does the instructional experience differ for students with disabilities in co-taught and solo-taught classes? *Learning Disabilities Research & Practice*, 20(2), 79-85.
- Marston, D. (1996). A comparison of inclusion only, pull-out only, and combined service models for students with mild disabilities. *Journal of Special Education*, 30, 121-132.
- Meier, B. S., and Fisk, J. S. (2016). Five ways to ensure a positive co-teaching experience for co-teachers and students. *Wisconsin English Journal Volume*, 58, 2.
- Mirza, M. S., and Iqbal, M. Z. (2014). Impact of Collaborative Teaching (CT) on Mathematics Students' Achievement in Pakistan. *Journal of Research and Reflections in Education*, 8(1), 13-21. <http://www.ue.edu.pk/jrre>.
- Murawski, W. W. (2008). Five keys to co-teaching in inclusive classrooms. *School Administrator*, 65(8), 29.
- Murawski, W. W., & Swanson, H. L. (2001). A meta-analysis of co-teaching research: Where are the data? *Remedial and Special Education*, 22(5), 258-267.
- Parker, A. K. (2010). The impacts of co-teaching on the general education student (Doctoral dissertation). University of Central Florida, Orlando, Florida.
- Ploessl, D. M., and Rock, M. L. (2014). E-coaching: The effects on co-teachers' planning and instruction. *Teacher Education and Special Education*, 37(3), 191-215. doi:10.1177/0888406414525049.
- Rea, P. J., McLaughlin, V. L., & Walther-Thomas, C. (2002). Outcomes for students with learning disabilities in inclusive and pullout programs. *Exceptional Children*, 68(2), 203-222.
- Rexroat-Frazier, N. M. (2017). Best practices in co-teaching mathematics, teacher efficacy, and teacher and student perceptions. *SMTC Plan B Papers*, 51. [http://repository.uwyo.edu/smtc\\_plan\\_b/51](http://repository.uwyo.edu/smtc_plan_b/51).
- Schulte, A., Osborne, S., & McKinney, J. (1990). Academic outcomes for students with learning disabilities in consultation and resource programs. *Exceptional Children*, 57, 162-172.
- Texas Education Agency / Education Service Center, (TEA/ESC, (2018)). *Co-teaching. A how-to guide: Guidelines for co-teaching in Texas*.
- Vaughn, S., Elbaum, B. E., Schumm, J. S., & Hughes, M. T. (1998). Social outcomes for students with and without learning disabilities in inclusive classrooms. *Journal of Learning Disabilities*, 31(5), 428-436.
- Walther-Thomas, C. S. (1997). Co-teaching experiences: The benefits and problems that teachers and principals report over time. *Journal of Learning Disabilities*, 30(4), 395-407.