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What Instructional Leaders Need to Know About the Effects of Inclusion*

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Abstract: Effective school administrators and teachers are those who provide the least restrictive learning environments for all students. The main goal of this study was to analyze the effects of inclusive science education on the general education population of middle school students' scientific conceptual understandings. The study was designed as a quasi-experimental model and conducted in a middle school in a large urban school district in Midwestern US. Approximately 4% of students in the school were receiving special education services. The participants in the study were selected through non-random selection. The participants of this study included 20 students without disabilities in each classroom with a total number of 120 students from a total of six different middle school classrooms. The study included two classrooms (one inclusive and one non-inclusive) for each grade level (6, 7, and 8). The conceptual change of students without disabilities was measured using the Density Assessment, which included 20 multiple choice questions. SPSS program was used for data analyses. Paired samples t-test and a multivariate group analysis test were conducted to investigate significant differences on students' conceptual understandings. The findings showed that the effect of inclusive education was significant and positive on the conceptual understanding of students without disabilities in inclusive science classrooms.

Keywords: *Conceptual understanding, inclusive education, school leaders.*

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Introduction

The numbers of students with disabilities have been increasing over the last two decades both in general population and schools. The voice of human rights advocates, parents, community leaders, and positive outcomes of inclusive education encouraged policymakers to include more and more students with learning disabilities in inclusive classrooms to receive educational services with their non-disabled peers. Students with no disabilities refer to students receiving education in general education classrooms. In addition, Students with disabilities refer to students receiving education either in special education classrooms or inclusive classrooms. In the US, legislation such as No Child Left Behind was passed to hold all schools accountable for the success of all students including the ones with disabilities. However, most students with disabilities continue to lag behind peers with no disabilities in science, reading, writing, and math. One of the reasons why such students fall behind their peers may be because of ineffective instructional leadership provided in public schools (Hehir & Katzman, 2012).

The role of educational leaders in schools is crucial in ensuring meaningful outcomes for all students including those

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with special needs. The literature related to management of schools has shown that still much effort is needed in developing the strategic skills necessary to provide critical needs for students with disabilities (Okut ve Ontaş, 2015; Ontaş, 2016). Research suggests that one of the strategies that makes inclusion successful is a commitment to a set of core school values by teachers and administrators (Scruggs & Mastropieri, 1996). When values are shared, teachers may be able provide effective instruction to all students and thus may receive a lot of support and positive feedbacks from their school administrators (Waldron, McLeskey, & Redd, 2011). Shared values would create a strong commitment and eventually motivate both teachers and school administrators to engage in the difficult school tasks involving services needed for students with special needs (Leithwood & Sun, 2012). School administrators, special education teachers, and general education teachers should work collaboratively to effectively deliver special education services. School principals have to be familiar with the tasks provided by general education teachers as they bring knowledge of the curriculum usually delivering most of the instruction for students served in inclusion (Fletcher, 2009). In addition, the principals need to be familiar with the tasks provided by special education teachers as they bring knowledge of specific curriculum mainly focusing on special education (Forness et al., 2000). Having such knowledge would enable school principals to develop critical strategies for inclusive classrooms so that all students in such environments may affect one another in positive ways (Fletcher, 2009; Salend & Duhaney, 1999).

Since current reports show that students with disabilities in the U.S. are included more in mainstream classrooms and have more exposure to the general education curriculum than ever before (U.S. Department of Education, Office of Special Education Programs, 2006), instructional leaders need to create a least restrictive setting in order to provide an inclusive setting, which may be beneficial for both students with disabilities and their non-disabled peers (Mastropieri et al., 2006). Having said that inclusive education is a situation where students with disabilities receive special education services within classrooms including students without disabilities (Smoot, 2011). Many students in special education receive combined services from a resource room within a self-contained special education classroom and from an inclusive classroom in the general education classroom where they receive special education services (Halvorsen & Neary, 2001). As a philosophy, inclusive education has become prevalent in many parts of the world (VanderHoff, 2008).

Failing to incorporate students with disabilities into inclusive classrooms may result in school dropouts and increased unemployment rates due to lack of conceptual understanding in core subjects. According to the Twenty Fourth Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act (2003), graduation rates for students with disabilities, although increasing, continue to be significantly lower than graduation rates of students without disabilities in traditional public schools. The report indicates that 62% of students with learning disabilities graduated with a diploma and 79% of students without disabilities graduated with a diploma. In other reports (Wagner, 1991), 28% of students with learning disabilities dropped out of high school before their fourth year. The dropout rate of students with learning disabilities are connected with factors such as lack of comprehension in core subjects (Dunn, Chambers, & Rabren, 2004; Kortering & Braziel, 2002). In addition, research shows that although employment rates for students with disabilities are increasing (45%), they continue to lag behind the rates of students without disabilities (63%) (Wagner, 2005).

Research findings suggest different results about the effects of inclusive education on both students with and without disabilities. In their research, Wild and Trundle (2010) conducted research to investigate the conceptual change of middle school students with visual impairments about seasonal change. Students were divided into two groups including one inquiry and one comparison group. The inquiry group received instruction that included process skills of observing, measuring, classifying, inferring, hypothesizing, engaging in controlled investigation, predicting, explaining, and communicating. The comparison group received traditional instruction. The results showed that students with disabilities in the inquiry-based group tended to have a more scientifically accurate conceptual understanding of seasonal change after they participated in inquiry-based instruction in comparison to the control group.

Aydeniz, Cihak, Graham, and Retinger (2012) conducted research to examine the impact of inquiry-based science instruction on the conceptual change of students with learning disabilities. The participants included five elementary school students with learning disabilities. They received a six week intervention on a series of inquiry-based activities targeting conceptual and application-based understanding of simple electric circuits. After the intervention, the results showed that they improved solving problems targeting electric circuits. In another research, Mastropieri et al. (2002) examined the outcomes associated with class-wide peer tutoring using differentiated hands-on activities vs. teacher-centered instruction for students with mild disabilities in an inclusive classroom at a middle school. The participants had a 12-week randomized field trial design in which the experimental group received differentiated, peer-mediated, and hands-on learning activities, while the control group received traditional science instruction. Researchers found that both students with special needs and their non-disabled peers engaged and comprehended better in inclusive classrooms than those in non-inclusive classrooms.

Jimenez, Browder, Spooner and Dibiase (2012) examined the impact of inquiry lessons on the academic skills of students with moderate intellectual disabilities in a sixth grade inclusive science classroom. Participants included six students without disabilities and five students with moderate intellectual disabilities. Participants implemented three inquiry science activities including vocabulary words, pictures, word and picture match, and concept statement. Findings suggested that inclusion provided positive outcomes for all students (Lynch et al., 2007). McDuffie, Mastropieri, and Scruggs (2009) investigated the effects of inclusive science education on students with disabilities and students without disabilities. The participants were students and teachers from two middle schools from two school districts. The science lesson included differentiated science curriculum materials for teaching genetics and life science containing a review of major concepts and vocabulary covered in the units. Findings of the study suggested that inclusive science education was beneficial for all students' science understanding and peer interaction (Palincsar, Magnusson, Collins, & Cutter, 2001).

In formulation of a theoretical perspective for studying the conceptual understanding of students without disabilities in inclusive classrooms, social learning theory (Bandura, 1989) provides a useful framework. The theory claims that people learn from one another through observation, modeling, and imitation (Morris & Higgins, 2010). This theory requires human memory, motivation, and attention in learning activities (Bandura, 2001). Social learning theory has been used in many areas of education considering the sources and techniques of learning (Bandura, 2001; Mischel, 1969). In addition, the theory has been applied to a wide range of social and pathological attitudes and conceptual competitiveness (Bandura & Walters, 1963; Mischel, 1969; Rotter, 1954; Staats, 1975). By applying social learning theory to this study, the cognitive and environmental determinants of continuous human interactions will be explained according to the interactions among students (with and without disabilities) in an inclusive setting which can have a positive effect on these students' cognitive development resulting in higher conceptual understanding. As a result, the following statement represents the underlying logic for designing and conducting this scholarly research: If students with disabilities are included with students without disabilities in a middle school science classroom, then students without disabilities will attain higher conceptual understanding and demonstrate positive social attitudes.

Researchers have examined the effects of inclusive education on students with disabilities, but the effects of inclusive education on the population of students without disabilities have been lacking in public schools (Imberman, 2011; Moores-Abdool, 2010; Smoot, 2011; VanderHoff, 2008). A few studies conducted on the population of students without disabilities in traditional public schools have mixed results about the effects of inclusive education (Salend & Duhaney, 1999). Even though research findings are inconclusive about the effect of inclusive education on general education population in public schools, research also fails to confirm this on the general education population particularly in middle schools (Wolf, 2011). Therefore, this study was designed to fill the gap in literature for middle school students without disabilities.

Methodology

Research Goal

This quantitative study was designed as a quasi-experimental model to examine the effects of inclusive science education on the conceptual understandings of middle school students. The study is a quasi-experimental one rather than the experimental one due to fact that the participants were selected through non-random selection instead of random selection. The study sought to answer the following research question: How does inclusive education affect the scientific conceptual understanding of general education students in 6th, 7th, and 8th grade classrooms?

Sample and Data Collection

This study was conducted in a middle school in a large urban school district in the Midwestern US in 2013-2014 school year. The public school was composed of 479 students. The school was listed as 83% economically disadvantaged school and 63% of its population included Hispanic students. Approximately 4% of students in the school were receiving special education services. The participants of this study included 20 students without disabilities in each classroom with a total number of 120 students from a total of six different middle school classrooms. The study included two classrooms (one inclusive and one non-inclusive) for each grade level (6, 7, and 8). Each inclusive classroom also included two students with no disabilities.

The researcher used the *Density Assessment* before science lesson 1 as a pre-test and then as a post-test after science lesson 2, and last as a post-post-test one week after science lesson 2 to measure the conceptual change of students without disabilities in inclusive science classrooms in comparison to students without disabilities in non-inclusive classrooms. The length of each science lesson was one week, and each lesson was delivered in each classroom 50 minutes every day. As a result, the researcher spent five hours in a total of six classrooms each day. The answers of the students were not discussed after each assessment. Between each conceptual change measurement, the researcher delivered a different lesson on density. After each test, students' scores were recorded. The conceptual change of students without disabilities was measured using the *Density Assessment*, which was developed by Smith et al. (1992) and also used by Holveck (2012) in her dissertation about seventh-grade students' conceptual change on density. Students without disabilities and those with learning disabilities in inclusive science classrooms, and students without disabilities in non-inclusive science classrooms were assessed with this instrument. Students' conceptual understanding on density was examined through 20 multiple-choice questions.

Analyzing of Data

Data first were entered onto the answer sheets by each participant and then were scanned by the researcher at each data collection point. Upon the completion of data collection, the data set was imported into the SPSS software for further analysis. The researcher conducted several analyses in SPSS to answer this research question. First, the researcher conducted a paired samples (dependent) *t*-test to examine significant differences on conceptual change (pre-test to post-test, post-test to post-post-test, and pre-test to post-post-test) within inclusive classrooms and independently for non-inclusive classrooms. Second, a multivariate group analysis test was conducted to investigate significant differences in conceptual change (pre-test, post-test, and post-post-test) of students between inclusive and non-inclusive classrooms.

Findings

In the study, first, two students with disabilities were assigned to the inclusive science classrooms as a treatment to measure the conceptual understanding of students without disabilities. Second, a pre-test on density was conducted on each classroom before implementing science lessons for two weeks. Third, after science lessons a post-test was conducted. Lastly, one week after post-test, a post-post-test was conducted on each classroom. Students scored 5 points for each correct answer on the twenty-item density assessment. The possible range is 0-100. The mean scores for students in the 6th grade inclusive science classroom were 33.00 (*SD = 9.23)* on the pre-test, 39.30 (*SD* = 8.60) on the post-test, and 38.85 (*SD* = 9.27) on the post-post-test. Students in the 6th grade non-inclusive classroom had a lower mean score of 29.50 (*SD = 10.87*) on pre-test, but a higher mean scores of 53.25 (*SD = 12.28*) on post-test and 50.25 (*SD = 9.24*) on post-post-test compared to students in the 6th grade inclusive classroom. Students in the 7th grade inclusive science classroom had a mean score of 37.50 (*SD = 8.96*) on the pre-test, 48.25 (*SD = 9.36*) on the post-test, and 47.75 (*SD = 11.52*) on the post-post-test. Students in the 7th grade non-inclusive classroom had higher mean scores of 43.25 (*SD = 8.47*) on pre-test, 62.25 (*SD = 14.64*) on post-test, and 66.25 (*SD = 13.17*) on post-post-test compared to students in the 7th grade inclusive classroom. Students in the 8th grade inclusive science classroom had a mean score of 35.75 (*SD = 10.30*) on pre-test, 46.50 (*SD =10.53*) on the post-test, and 42.25 (*SD = 11.86*) on the post-post-test. Students in the 8th

grade non-inclusive classroom had higher mean scores of 37.75 (*SD = 9.24*) on the pre-test and 47.75 (*SD = 12.51*) on the post-post-test, but a lower mean score of 45.00 (*SD = 11.35*) on the post-test compared to students in the 8th grade inclusive classroom. Table 1 provides the summary of ranges, means, and standard deviations on the pre-test, post-test, and post-post-test measures for the density assessment.

Table 1. Summary of Ranges, Means, and Standard Deviations for DA Scores

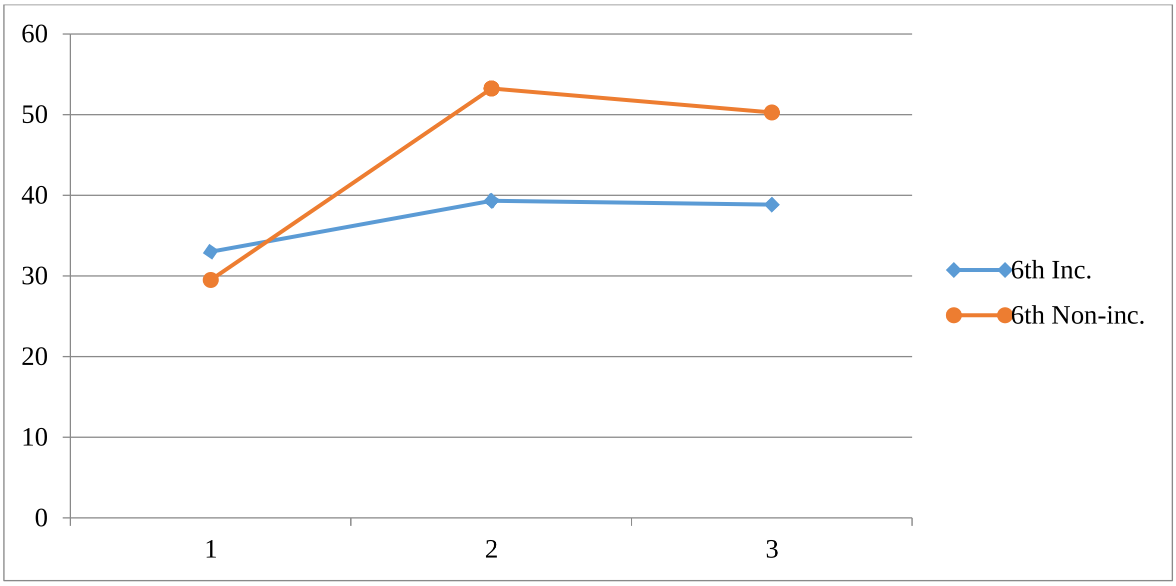
		Pre		Post		Post-Post	
Group	*n*	Min-Max	*M (SD)*	Min-Max	*M (SD)*	Min-Max	*M (SD)*
6th Inc.	20	10-50	33.00 (9.23)	25-60	39.30 (8.60)	20-55	38.85 (9.27)
6th Non-inc.	20	10-45	29.50 (10.87)	35-80	53.25 (12.28)	40-75	50.25 (9.24)
7th Inc.	20	20-50	37.50 (8.96)	35-70	48.25 (9.36)	30-70	47.75 (11.52)
7th Non-inc.	20	25-55	43.25 (8.47)	25-85	62.25 (14.64)	50-85	66.25 (13.17)
8th Inc.	20	20-60	35.75 (10.30)	35-85	46.50 (10.53)	25-65	42.25 (11.86)
8th Non-inc.	20	20-50	37.75 (9.24)	30-65	45.00 (11.35)	30-70	47.75 (12.51)

Note. DA = Density Assessment. This construct consisted of 20 multiple choice items with a possible score of 0-100. Inc. = Inclusive, Non-inc. = Non-inclusive.

6th Grade Inclusive and Non-Inclusive Science Classrooms

A paired samples *t* test was conducted to examine significant differences of mean scores on conceptual change (pre-test to post-test, post-test to post-post-test and pre-test to post-post-test) within the inclusive 6th grade science classroom. There was a significant difference in the scores for pre-test (M = 33.00, $SD = 9.23$) and post-test (M = 39.30, $SD = 8.60$) conditions, $t(19) = -7.73$, $p < .001$. There was not a significant difference in the scores for post-test and post-post-test (M = 38.85, $SD = 9.27$) conditions, $t(19) = 0.71$, $p = .48$). However, there was a significant difference in the scores for pre-test and post-post-test conditions, $t(19) = -7.01$, $p < .001$.

A paired samples *t* test was also conducted to examine significant differences in mean scores on conceptual change (pre-test to post-test, post-test to post-post-test and pre-test to post-post-test) within the non-inclusive 6th grade science classroom. There was a significant difference in the scores for pre-test (M = 29.50, $SD = 10.87$) and post-test (M = 53.25, $SD = 12.28$) conditions, $t(19) = -7.62$, $p < .001$. There was not a significant difference in the scores for post-test and post-post-test (M = 50.25, $SD = 9.24$) conditions, $t(19) = 0.99$, $p = .34$. However, there was a significant difference in the scores for pre-test and post-post-test conditions, $t(19) = -6.73$, $p < .001$. Figure 1 shows a graphical comparison in mean scores between students in the 6th grade inclusive classroom and the 6th grade non-inclusive classroom on the density assessments.



Note: 1 = Pre-test Density Assessment, 2 = Post-test Density Assessment, 3 = Post-post-test Density Assessment, Inc. = Inclusive, Non-inc. = Non-inclusive.

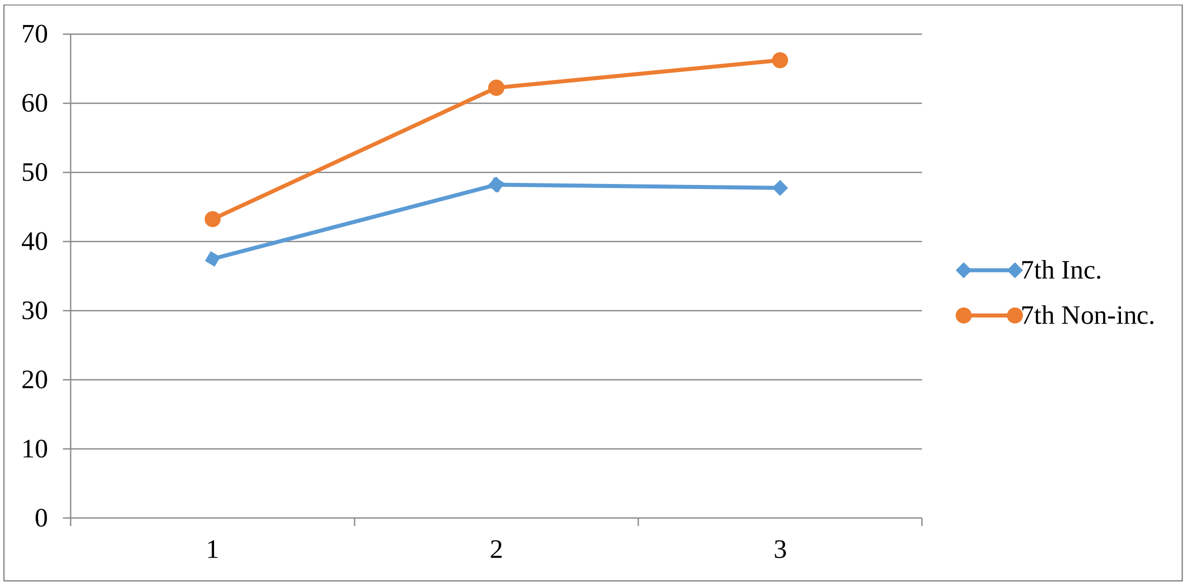
Figure 1. Comparison in Mean Scores between Students in 6th Grade Inclusion and 6th Grade Non-Inclusion on Density Assessments

The researcher conducted a multivariate group analysis test to examine significant differences on conceptual change (pre-test, post-test, and post-post-test) of 6th grade students between inclusive and non-inclusive classrooms. After running paired samples t tests within the 6th grade inclusive and 6th grade non-inclusive classroom, the multivariate group analysis test results showed the differences in mean scores on conceptual change (pre-test, post-test, and post-post-test) of students between inclusive and non-inclusive classrooms. The results with observed power of .19 showed that there was no significant difference on conceptual change between 6th grade students in inclusive and non-inclusive science classrooms on the pre-test density assessment $F(1, 38) = 1.20$, $M\Delta = 3.50$, $p = .28$, $\eta^2 = .03$. However, there was a significant difference on conceptual change between students in inclusive and non-inclusive classrooms on the post-test density assessment $F(1, 38) = 17.32$, $M\Delta = 13.95$, $p < .001$, $\eta^2 = .31$ with observed power of .19, and post-post-test density assessment $F(1, 38) = 15.17$, $M\Delta = 11.40$, $p < .001$, $\eta^2 = .28$ with observed power of .97. The possible effects of the treatment period based on the effect size show that having students with learning disabilities in inclusive 6th grade classroom have very small effect on pre-test, huge effect on post-test, and huge effect on post-post-test results. Based on the findings, one may conclude that students with learning disabilities had negative effects on the conceptual understanding of students with no disabilities in inclusive 6th grade classroom as they scored lower on the tests.

7th Grade Inclusive and Non-Inclusive Science Classrooms

The researcher then conducted a paired samples t test to examine significant differences on conceptual change (pre-test to post-test, post-test to post-post-test and pre-test to post-post-test) within inclusive 7th grade science classrooms and independently for non-inclusive 7th grade classrooms. The paired samples t test that was conducted for 7th students in inclusive science classrooms showed that there was a significant difference in the scores for pre-test (M = 37.50, $SD = 8.96$) and post-test (M = 48.25, $SD = 9.36$) conditions, $t(19) = -4.40$, $p < .001$. There was not a significant difference in the scores for post-test and post-post-test (M = 47.75, $SD = 11.52$) conditions, $t(19) = .62$, $p = .54$. However, there was a significant difference in the scores for pre-test and post-post-test conditions, $t(19) = -3.69$, $p = 0.002$.

A paired samples t test was conducted to measure the conceptual understanding of 7th grade students in a non-inclusive science classroom. The results indicated that there was a significant difference in the scores for pre-test (M = 43.25, $SD = 8.47$) and post-test (M = 62.25, $SD = 14.64$) conditions, $t(19) = -11.54$, $p < .001$. There was a significant difference in the scores for post-test and post-post-test (M = 66.25, $SD = 13.17$) conditions, $t(19) = -2.22$, $p = .04$. In addition, there was a significant difference in the scores for pre-test and post-post-test conditions, $t(19) = -15.20$, $p < .001$. Figure 2 shows the comparison in mean scores between students in 7th grade inclusion and 7th grade non-inclusion on density assessments.



Note. 1 = Pre-test Density Assessment, 2 = Post-test Density Assessment, 3 = Post-post-test Density Assessment, Inc. = Inclusive, Non-inc. = Non-inclusive.

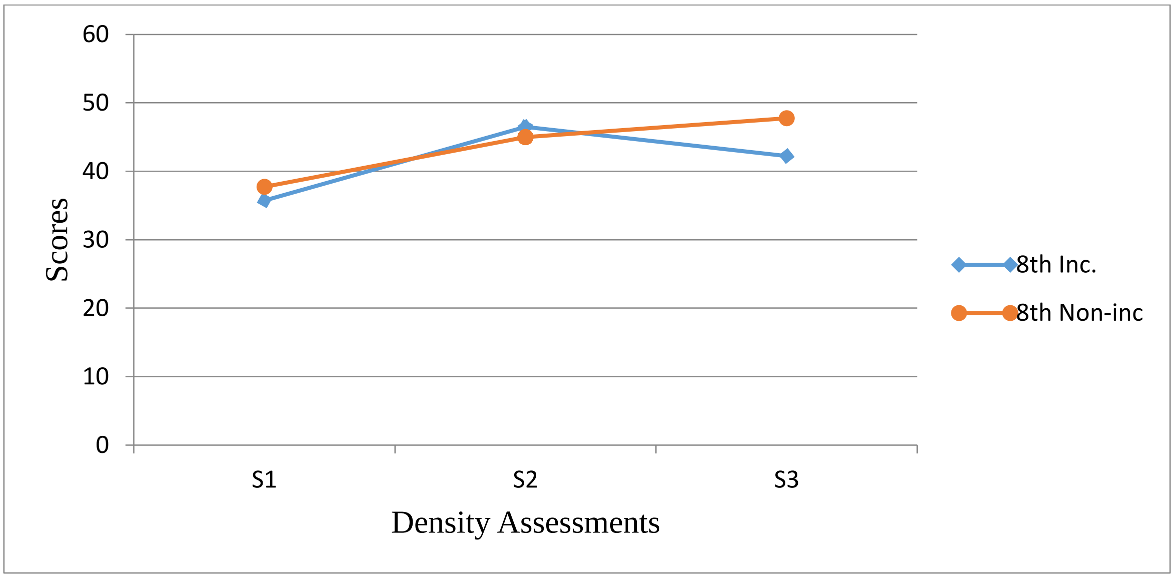
Figure 2. Comparison in Mean Scores between Students in 7th Grade Inclusion and 7th Grade Non-Inclusion on Density Assessments

The multivariate group analysis tests were conducted to investigate significant differences on conceptual change (pre-test, post-test, and post-post-test) of 7th grade students between inclusive and non-inclusive classrooms. The test results showed that there was a significant difference on conceptual change on pre-test density assessment $F(1, 38) = 4.349$, $M\Delta = 5.75$, $p = .04$, $\eta^2 = .10$ with observed power of .53, post-test density assessment $F(1, 38) = 12.98$, $M\Delta = 14.00$, $p < .001$, $\eta^2 = .25$) with observed power of .94, and post-post-test density assessment $F(1, 38) = 12.98$, $M\Delta = 22.36$, $p < .001$, $\eta^2 = .37$ with observed of .99 between students in 7th grade inclusive science classroom and those in non-inclusive science classroom. The possible effects of the treatment period based on the effect size show that having students with learning disabilities in inclusive 7th grade classroom have small effect on pre-test, huge effect on post-test, and huge effect on post-post-test results. These results show that having students with learning disabilities in inclusion may have a diverse effect on learning of students with no disabilities. Because the differences on all tests between 7th grade inclusive and non-inclusive classrooms were significant, teachers and school leaders need to find effective solutions to close the achievement gap between two groups of students.

8th Grade Inclusive and Non-Inclusive Science Classrooms

The researcher then conducted a paired samples t test to examine significant differences on conceptual change (pre-test to post-test, post-test to post-post-test and pre-test to post-post-test) within inclusive 8th grade science classrooms and independently for non-inclusive 8th grade classrooms. The paired samples t test that was conducted for 8th students in inclusive science classrooms showed that there was a significant difference in the scores for pre-test ($M = 35.75$, $SD = 10.30$) and post-test ($M = 46.50$, $SD = 10.53$) conditions, $t(19) = -8.83$, $p < .001$. There was a significant difference in the scores for post-test and post-post-test ($M = 42.25$, $SD = 11.86$) conditions, $t(19) = 2.74$, $p = .01$. In addition, there was a significant difference in the scores for pre-test and post-post-test conditions, $t(19) = -7.93$, $p < .001$.

The researcher conducted a paired samples t test to examine the conceptual understanding of 8th grade students in a non-inclusive science classroom. There was a significant difference in the scores for pre-test ($M = 37.75$, $SD = 9.24$) and post-test ($M = 45.00$, $SD = 11.35$) conditions, $t(19) = -6.17$, $p < .001$. There was a significant difference in the scores for post-test and post-post-test ($M = 47.75$, $SD = 12.51$) conditions, $t(19) = -2.46$, $p = .02$. In addition, there was a significant difference in the scores for pre-test and post-post-test conditions, $t(19) = -10.42$, $p < .001$. Figure 3 shows the comparison in mean scores between students in 8th grade inclusion and 8th grade non-inclusion on density assessments.



Note. S1 = Pre-test Density Assessment, S2 = Post-test Density Assessment, S3 = Post-post-test Density Assessment, Inc. = Inclusive, Non-inc. = Non-inclusive.

Figure 3. Comparison in Mean Scores between Students in 8th Grade Inclusion and 8th Grade Non-Inclusion on Density Assessments

The significant differences on conceptual change (pre-test, post-test, and post-post-test) of 8th grade students between inclusive and non-inclusive classrooms were examined using multivariate group analysis tests. The test results suggested that that there was no significant conceptual change on pre-test density assessment $F(1, 38) = .42$, $M\Delta = 2.00$, $p = .52$, $\eta^2 = .01$ with observed power of .10, post-test density assessment $F(1, 38) = .19$, $M\Delta = 1.50$, $p = .67$, $\eta^2 = .00$ with observed power of .07, and post-post-test density assessment $F(1, 38) = 2.03$, $M\Delta = 5.50$, $p = .16$, $\eta^2 = .05$ with observed power of .28 between students in 8th grade inclusive science classroom and those in non-inclusive science classroom. The possible effects of the treatment period based on the effect size show that having students with learning disabilities in inclusive 8th grade classroom have almost no effects on pre-test, post-test, and post-post-test results. According to the findings, 8th grade students in inclusion and those in non-inclusion had similar results on all tests as there were no significant differences between the both groups. Such results are worthy of consideration as students in lower grades (e.g. Grade 6 and 7) had significant differences on test scores, but those in upper grades (e.g. Grade 8) had similar test scores. Instructional leaders need to examine differences on academic achievement between those students in order to determine whether the differences are due to the existence of students with learning disabilities in the classrooms or it is due to social competence of students in inclusive classrooms.

Social competence is defined as cognitive, social, and emotional skills that individuals need for social adaptation. In this study it may be suggested that students' cognitive developments in upper grades seem to be similar as their test scores did not significantly vary. However it is hard to suggest same conclusions for students in lower grade levels as their test scores varied from one another.

Discussion and Conclusion

In response to the research question, the researcher examined the scores on conceptual understanding between pre-test density assessment and post-test density assessment after a-two-week science lesson for students without disabilities in inclusive science classrooms and students without disabilities in non-inclusive science classrooms at 6th grade, 7th grade, and 8th grade levels. The researcher also emphasized the importance of the existence and the needs of students with learning disabilities in schools and how their needs should be addressed and attract the attention of instructional leaders on such crucial topic. Findings of this study may provide insights for instructional leaders on whether the existence of students with learning disabilities in inclusive settings has any effects in terms of learning and understanding of their peers with no disabilities. Depending on these effects, instructional leaders may take certain measures to help all students to benefit from learning activities.

The overall range of mean scores on conceptual change for all students in both inclusive science classrooms and those in non-inclusive science classrooms was 29.50 – 43.25 (out of 100) for the pre-test density assessment and 39.30 – 62.25 (out of 100) for the post-test density assessment. These low scores may exist because these students find the subject of density too abstract to understand. Hitt (2005) supports this finding in his study. He found that the concept of density is confusing because it is derived from two other concepts: mass and volume. Even though middle school students have some understanding of mass and volume, they do not develop a conceptual understanding of density. This is because students relate density mainly to the concentration and particles of mass, but they do not connect volume with density.

With respect to conceptual understanding, 6th grade students without disabilities in inclusive science classroom and those in non-inclusive science classroom had a significant increase ($p < .001$) between pre-test density assessment and post-test density assessment. This result showed that there was a significantly positive relationship between the effect of inclusive science education and the understanding of science concepts in students without disabilities in inclusive science classroom. This study supports findings from previous studies that students without disabilities improved their conceptual understanding over the intervention period regardless of classroom setting (Hitt, 2005; Smith, Snir, & Grosslight, 1987). The researcher found that students participated in a two-week science lesson and right after the science lessons while their knowledge was still fresh; they scored higher on the post-test density assessment resulting in higher conceptual understanding. This supports findings from Hewson and Hewson (1983). They found that when a unit was designed to promote conceptual change through experimentation and demonstrations on density on continuous days, students improved their conceptual understanding.

An interesting finding from these data was that 6th grade students in non-inclusive science classroom had a higher conceptual understanding ($p < .001$) on the post-test density assessment compared to 6th grade students in the inclusive science classroom. The researcher found that students with disabilities demanded more of the teacher's time and effort. Past research shows that students with learning disabilities demand more remediation from the teacher in the inclusive classrooms (Agne, 1999). The researcher found that this situation caused students without disabilities becoming bored, and exhibiting behavioral issues and disengagement in the inclusive setting. Agne (1999) supports these findings on her study on inclusive education. She found that teachers paying more attention to the accommodations of students with disabilities in the inclusive classrooms created a less focused and less engaged classroom environment.

Students without disabilities in the 7th grade inclusive science classroom and those in the non-inclusive science classroom had a greater increase on conceptual understanding ($p < .001$) between pre-test density assessment and post-test density assessment. This result showed that there was a significantly positive relationship between the effect of inclusive science education and the understanding of science concepts in students without disabilities in inclusive science classroom. The researcher found that after learning a particular science concept, practicing on the same science concepts constantly can result in higher learning. This finding follows the study of Hewson and Hewson (1983). They found that practicing science learning through hands-on lab activities may result in improved conceptual understanding regardless of learning environment. It is also important to indicate that with respect to conceptual understanding, 7th grade students without disabilities in non-inclusive classroom scored significantly higher on pre-test density assessment ($p = .04$) than those in inclusive science classroom. In addition, the researcher found that compared to all other classes in the study, this classroom was the most motivated, focused, and engaged in all science learning activities regardless of the amount of support from the science teacher. This finding follows the study of Wehmeyer et al. (2003). They found that students requiring the least amount of support from the teacher were engaged in all learning activities.

It is important to point out that 7th grade students in non-inclusive science classroom had a higher conceptual understanding ($p < .001$) on the post-test density assessment compared to 7th grade students in the inclusive science classroom. The researcher found that the existence of students with learning disabilities within the inclusive classroom may have caused the science teacher to spend most of his time and effort on these students. This issue may have caused students without disabilities to become bored and disengaged from science learning. This finding supports the study of Agne (1999). She suggested that when teachers provide more help and individual attention to students with learning disabilities, it may create a less engaged learning environment.

Analyzing the conceptual understanding, both 8th grade students without disabilities in inclusive science classroom and those in non-inclusive science classroom had a greater increase ($p < .001$) between pre-test density assessment and post-test density assessment. This result showed that there was a significantly positive relationship between the effect of inclusive science education and the understanding of science concepts in students without disabilities in inclusive science classroom. The two-week science lesson helped both 8th grade students without disabilities in the inclusive classroom and those in non-inclusive classroom to increase their conceptual understanding on the post-test density assessment. These findings support the studies of Hitt (2005) and Smith et al. (1987). They found that regardless of classroom settings, all students increased their conceptual understanding over the intervention period. The researcher found that students without disabilities in inclusive classroom and those in non-inclusive classroom grasped a better understanding of the concept of density after the science lessons due to continuous hands-on learning and demonstrations. This result supports the findings of Hewson and Hewson (1983). They indicated that all students obtain higher conceptual understanding after they receive constant feedback from the teacher through experiments and scientific demonstrations during the intervention period.

It was interesting that 8th grade students in the inclusive science classroom had a slightly higher conceptual understanding (p = .67) on the post-test density assessment compared to 8th grade students in the non-inclusive science classroom. This result supports the findings of Baker et al. (1994). They found that students without disabilities in inclusive settings established better conceptual understanding than comparable students in non-inclusive settings. The researcher found that the reciprocal interaction between students without disabilities and those with learning disabilities in the inclusive classroom established an acceptance of one another resulting in engagement and increased conceptual understanding of the concept of density. This result supports the findings of Bandura (1989). He suggested that the reciprocal interaction between students with different backgrounds (students with disabilities and students without disabilities) can show an increase in cognitive student achievement within the same environmental setting. Another explanation for the aforementioned findings may be that the researcher found that the social interactions between all students in the inclusive classroom dictated peer support. This resulted in less time and effort of the teacher on students with learning disabilities creating more teaching and more effective classroom management. These findings support the study of Mastropieri et al. (2006) on curriculum enhancement in inclusive middle school science classrooms. Their results indicated that social interactions between students without disabilities and students with learning disabilities in the inclusive classrooms resulted in peer-support, engagement, and better comprehension of science concepts.

Lack of random sampling, limited number of students with disabilities in the inclusive classrooms, and the small size were some of limitations of this study. The overall findings of the study indicated that the effect of inclusive education mainly includes meaningful results on the conceptual understanding of students without disabilities in inclusive science classrooms. Furthermore, the study findings suggested that inclusive science education had a significantly negative effect on the conceptual understanding of students without disabilities in inclusive 6th grade and 7th grade classrooms, and no effects on those in inclusive 8th grade classrooms. The test scores of students had different variations depending on their grade levels. It is important to emphasis that such variations may not only be related to the existence of students with disabilities in inclusive classrooms, but it may also be related to students' cognitive competence, social adaptation, and social maturity. Having said that it is viable to suggest that least restrictive learning environments have positive impacts on all students' learning. Creating such environments may depend on how effectively school leaders run their schools. In conclusion, school administrators need to communicate school's educational mission, manage curriculum and instruction, promote a positive learning atmosphere, supervise teaching, and monitor all students' progress in order to make inclusion more beneficial for all students and effectively run their schools (Bateman & Bateman, 2001).

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