Improving Performance for Gifted Students in a Cluster Grouping Model

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Although experts in gifted education widely promote cluster grouping gifted students, little empirical evidence is available to attest to its effectiveness. This study is an example of comparative action research in the form of a quantitative case study that focused on the mandated cluster grouping practices for gifted students in an urban elementary school district. Some school administrators chose not to follow the model as designed, resulting in the emergence of two groups: gifted students in cluster-grouped classrooms and those in regular heterogeneous classrooms. This action research project analyzed achievement in mathematics for subgroups that included gender, grade levels, ethnicity, and English language learner status. Results indicate that the gifted students in gifted cluster classes demonstrated statistically significant and scientifically meaningful achievement growth, regardless of their demographic group.

Although experts in gifted education widely promote cluster grouping gifted students, little empirical evidence is available attesting to its effectiveness. This study is an example of comparative action research in the form of a quantitative case study that focused on the cluster grouping practices for gifted students in the Glendale Elementary School District (GESD). GESD is an intermediate-sized school district located in urban

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Journal for the Education of the Gifted. Vol. 34, No. 2, 2010, pp. 327–350.

Glendale, AZ. GESD aligned district curriculum and performance objectives with the Arizona State Academic Standards during the 2003–2004 school year and implemented them in the fall of 2004. Benchmark assessments (pre, quarter 1, quarter 2, quarter 3, and post) were also created to measure student academic growth.

In spite of the fact that GESD mandated cluster grouping for its gifted learners in the year 2000, with district administrators voicing support for cluster grouping as the sole model for providing gifted services in the district, site administrators of some schools, and teachers of some classes, chose not to follow the model as designed as recently as the 2006–2007 school year. As a result, two groups emerged: one group consisted of classes that clustered their gifted students ($n = 554$), and the other group consisted of those that did not ($n = 218$). Each group represented a different form of the "heterogeneous class." The district provided necessary resources and ongoing professional development for the gifted cluster teachers (e.g., cluster teacher meetings and district in-services). Teachers in the schools with classrooms that did not use cluster groups received professional development in differentiated instruction to a lesser degree than those who had.

This action research project analyzed achievement in mathematics for subgroups that included gender, grade levels, ethnicity, and English language learner (ELL) status. During the year of this project (2006–2007), a large percentage of gifted students (72%) received gifted services in the cluster-grouped classroom, while a smaller percentage did not receive gifted services (28%) in their regular heterogeneous classrooms. This circumstance provided a unique opportunity to conduct an analysis of the academic results of gifted students who were clustered and whose teachers received training in gifted education with a comparison group of gifted students who were not clustered and whose teachers received training in gifted education to a lesser degree.

Findings from this action research project indicate that gifted students in the gifted cluster classes with trained teachers experienced greater academic growth in mathematics than those who remained in regular heterogeneous classes with relatively untrained teachers (relative to gifted education, that is). It should be emphasized that the gifted students who were not clustered received no special educational services for gifted learners. When the data were disaggregated according to gender and ethnicity, gifted students in the cluster-grouped classrooms achieved at higher rates in mathematics than those students of similar ability in regular heterogeneous classes. Although the district benchmark assessments had a ceiling that may not reflect maximum growth, results indicate that the gifted students in gifted cluster classes demonstrated statistically significant and scientifically meaningful achievement growth regardless of their demographic (e.g., group, gender, ethnicity, ELL status, and grade level).

Background of the Study

Recent national and state legislation intended to raise the level of schools' accountability has inadvertently diverted educators' attention away from excellence, creativity, and exploration, in favor of teaching to proficiency levels of instruction. Public funds have followed this political vision (Brulles, 2005). Models for gifted programs, such as content-replacement, enrichment, and self-contained classrooms, once prevalent in school districts around the country, have suffered without appropriate and adequate funding and/or administrative attention or support. Many of these programs have even ceased to exist altogether (Rogers, 2002). The result has been the widespread application of inclusionary practices, which is characterized as "the heterogeneous classroom." Under present circumstances, some leaders in the field of educating gifted learners have advocated the use of cluster grouping along with curricula that are differentiated according to the needs of the students in the classroom (Gentry, 1999; Rogers, 1991; Winebrenner & Brulles, 2008b).

Cluster grouping represents an inclusion model that allows identified gifted students to receive services on a daily basis with few financial implications to the district. In a gifted cluster model, all identified gifted students receive services, regardless of their area(s) of identification, ability level, achievement, or English language proficiency level. Identified gifted students are clustered into classrooms with a teacher who has been designated as the gifted cluster teacher for that grade. The designated gifted cluster classroom also includes nongifted students (Gentry & MacDougall, 2008; Winebrenner & Brulles, 2008a). There is typically one classroom at each grade level in which the grade's identified gifted students are clustered, creating a gifted strand in each school that adhered to the district policy.

In the gifted cluster model, all students at a grade level are scheduled into classrooms in a way that balances ability and achievement levels throughout the grade level. In this structure, students are purposefully placed into classrooms with no classroom having both extremes of the learning continuum. The model slightly narrows the range of abilities in each classroom. This practice allows for a grade-level team approach and encourages grade-level planning and flexible grouping and facilitates more effective instruction. Careful balancing of the classes at each grade level and focused teacher training for the cluster teachers creates measurable differences in learning success. Teacher in-service training focuses on how to use differentiated teaching methods to be responsive to individual students' educational needs, a tactic that requires teacher preparation and the monitoring of student progress.

In this action research project, the researchers examined achievement levels of gifted students in an elementary school district that implemented a cluster model strongly supported with professional development. Professional development was provided through monthly gifted cluster teacher meetings at each school, quarterly gifted cluster teacher meetings at the district level, book studies, and university coursework in gifted education offered in the school district. Training for the cluster teachers emphasized the need to allow students to work at an accelerated pace or increased complexity when the students had demonstrated proficiency of the standard being taught.

Not all gifted students were placed in gifted cluster classes. Factors contributing to schools not clustering their gifted students included: lack of administrative support, gifted identification occurring after the start of the school year, and insufficient teacher buy-in. This scenario yielded two groups of gifted students whose academic achievement in mathematics could be compared.

The Glendale Elementary School District (GESD) serves approximately 14,000 students, kindergarten through eighth grade. The school district qualifies for Title I funds, with 83% of the student population receiving free and/or reduced-priced lunch. Glendale is a community rich in cultural and linguistic diversity (CLD). The majority population of the district is Hispanic, with approximately half of the student population identified as English language learners (ELL). The school district cluster model was in its sixth year of implementation at the time of the action research project.

This action research project incorporated data for two groups of gifted students in grades 2 through 8 during the 2006–2007 school year. The first group consisted of gifted students who received services in a gifted cluster class with teachers trained in gifted education, and the second group included gifted students who did not receive services in a gifted cluster class with teachers who had not received extensive training in gifted education. During this school year, principals of some schools elected not to follow the gifted cluster model that had been implemented in the district. In these schools, gifted students received no gifted education services. Schools that followed the model placed gifted students into gifted cluster classrooms.

Teachers of gifted cluster classes received professional development on a continual basis. Professional development included training in differentiated instruction, curriculum compacting, effective grouping using analysis of achievement data, and other methods to facilitate the learning of gifted students in the regular class. Teachers of gifted students in the classes that did not cluster group received some professional development on differentiated instruction as offered throughout the course of the school year by the school or district.

Review of Relevant Literature

The gifted cluster model creates a setting for providing differentiated instruction that is feasible for teachers and increases the likelihood that differentiation will take place resulting in greater academic achievement (Brulles, 2005; Gentry, 1999; Winebrenner & Brulles, 2008b). Despite the increasing use and possible benefits of cluster grouping, few empirical studies have detailed the effectiveness of the program model, the academic success rates of gifted students in clustered classes (Gentry, 1999), or other outcomes of the model. Differentiation of instruction lies at the heart of the gifted cluster model; therefore, evidence of the effectiveness of a cluster model must examine the achievement results of differentiated instruction occurring in the cluster classes.

A review of the literature confirms popular beliefs that assigning students to separate classes by ability, and then providing each group with the same curriculum, may have little effect on achievement, and has neutral effects for high, middle, and low achievers. Hollifield (1987) found that when students are ability-grouped into separate classes and given identical curriculum, there is no appreciable effect on achievement. However, Gentry and MacDougall (2008) found that "curricular differentiation is more efficient and likely to occur when a group of high-achieving students is placed with a teacher who has expertise, training, and a desire to differentiate curriculum than when these students are distributed among many teachers" (p. 12).

Curricular Adjustments

Regardless of the grouping approach a school decides to adopt, the research supports grouping programs that entail more substantial adjustment of curriculum to ability (Kulik, 1992). Pupils in those grouping programs outperform equivalent control students from mixed-ability classes (Kulik, 1992). Also, programs that include acceleration, which involves the greatest amount of curricular adjustment, have the largest effects on student learning (Kulik, 1992). Hollifield (1987) also found in his research that, when the curriculum is adjusted to correspond to ability level, student achievement is boosted, especially for high-ability students receiving an accelerated curriculum.

Teachers must vary the level and pace of instruction according to the students' levels of readiness and learning in ability-grouped classes (Slavin, 1987). When curricula are adjusted to correspond to ability levels, student achievement increases. This is especially evident for high-ability students receiving an accelerated curriculum (Saunders, 2005). Programs that include acceleration and involve curricular adjustments have the largest effects on learning for students at all ability levels (Kulik, 1992).

A 1993 U.S. Department of Education report, *National Excellence*, noted that the regular school curriculum fails to challenge gifted students, most who have already mastered up to half of the material before it is taught. When such students are forced to study material they already know, they become bored (Delisle & Galbraith, 2002) and angry (Cohn, 2003). Both boredom and anger are risk factors for academic problems, including loss of interest, lack of motivation, and underachievement (Delisle & Galbraith, 2002). These problems may occur if the curriculum is inappropriate for gifted students (Swiatek, 2001).

Haury and Milbourn (1999) argued that curriculum must be adjusted to meet the needs of the students, while also suggesting that high-achieving students would benefit by remaining in the heterogeneous class with learning opportunities that are differentiated according to students' ability levels. Gifted students must be involved in educational experiences that are challenging and appropriate to their needs and achievement levels (Archambault et al., 1993) and teachers must have the ability to adjust curriculum to the varied ability and achievement levels within the regular classroom (Winebrenner & Brulles, 2008b). Regardless of student placements, when teachers continue to teach one curriculum for all students regardless of their readiness, student learning suffers (Tieso, 2002).

In typical evaluation studies, talented students from accelerated classes outperform nonaccelerates of the same age and IQ by almost one full year on achievement tests (Kulik, 1992). The research of Farrar (2003) also found that high- and middle-ability students who were grouped by ability produced better quality work. The high achievers benefit from having to compete with one another, and the low achievers benefit from not having to compete with their more able peers (Kulik, 1992). This finding mitigates the concern that low-achieving students are harmed academically when grouped by ability. The research showed strong, consistent support for the academic effects of most forms of ability grouping for enrichment and acceleration (Rogers, 1991).

Study Design

Despite the district having implemented cluster grouping for the previous 6 years, not all schools and classes appropriately placed their gifted students into gifted cluster classes. This allowed the researchers to analyze test score data from two distinct groups, one group that received mathematics instruction in a gifted cluster class and another group that had received mathematics instruction in a heterogeneous class that did not cluster group gifted students. As such, this study can be considered action research as well as a district case study using quantitative data, where membership in different demographic groupings served as the basis of comparative analysis. The results of the action research project will function as baseline data for subsequent yearly evaluations that are already underway.

This project is an example of action research, which allows investigators to study phenomena in their actual settings. Because action research is field based, investigators do not have the prerogative to conduct true experimental studies that require randomized assignment to treatment and control groups. The findings from action research studies can only describe the group of subjects taking part in them; that is to say, the generalizability of findings is limited. Action research allows researchers to study actual practices in their field-based settings, albeit they do not provide unequivocal results. Nevertheless, the goal of action research is to improve real-life practices in their natural settings.

Method

Participants and Sources of Data

For research purposes, participants were separated into two categories: gifted students who received services in a gifted cluster class with teachers trained in gifted education, and gifted students who did not receive services in a gifted cluster class with teachers who had limited training in gifted education. A total number of 772 gifted students were included in this action research project. Of this total number, 554 gifted students (72%) received math instruction in the gifted cluster classes, while 218 gifted students (28%) received math instruction in classes that did not employ the gifted cluster. The analysis was restricted to include only students who had taken both the pre- and the postassessments.

The entire district qualifies for Title 1 funding, with 83% of the student body receiving free or reduced-priced lunch. Slightly less than half of the gifted students (46.4%) were identified as English language learners (ELL). All participants were identified as gifted based upon school district identification criteria of scoring at the 95th percentile rank or higher on either the Cognitive Abilities Test (CogAt) or the Naglieri Nonverbal Ability Test (NNAT). Demographics of the sample are located in Table 1.

For the purposes of this action research project, a quantitative design was employed that disaggregated results from district mathematics assessments, which aligned with the Arizona state standards. This approach allowed the researchers to determine whether or not significant differences in gifted students' tests scores resulted when the students received services in a gifted cluster class (with a teacher trained in gifted education) versus those who did not receive services in a gifted cluster class with a teacher relatively inexperienced regarding gifted education.

Intervention

At the time of the action research project, nearly all instruction in GESD occurred within the context of the heterogeneous

Table 1

Demographic Characteristics of Sample

	Overall	%	Cluster	%	Noncluster	%
Total	772	100.0	554	71.8	218	28.2
Gender						
Male	416	53.9	284	51.3	132	60.6
Female	356	46.1	270	48.7	86	39.4
Race/Ethnicity						
Caucasian	233	30.1	173	31.2	60	27.5
Hispanic	434	56.3	300	54.2	134	61.5
Asian	52	6.7	40	7.2	12	5.5
African American	39	5.1	32	5.8	7	3.2
American Indian	14	1.8	9	1.6	5	2.3
Language Status						
ELL	358	46.4	250	45.1	108	49.5
Non-ELL	414	53.6	304	54.9	110	50.5
Grade						
2nd	80	10.3	72	13.0	8	3.7
3rd	176	23.0	143	25.8	33	15.1
4th	140	18.1	102	18.4	38	17.4
5th	112	14.5	75	13.6	37	17.0
6th	94	12.2	60	10.8	34	15.6
7th	79	10.2	35	6.3	44	20.2
8th	91	11.7	67	12.1	24	11.0

classroom. Teachers were expected to provide differentiated learning opportunities for all students for whom this was needed in each class, including those belonging to special needs groups, such as ELL students, special education students, gifted students, and combinations of these groups. The district provided specific training for teachers working with these special populations.

To meet the learning needs of gifted students in each grade level, the district implemented a gifted cluster-grouping model. Within this structure, gifted students are clustered into designated gifted cluster classes at each grade level. Each gifted cluster teacher was expected to provide and document modifications to curriculum and pacing for the gifted students in the class. High-ability students had the opportunity to move beyond grade level in content area(s) in which their skills were highly developed. The gifted clusters contained approximately five to nine identified gifted students at each grade level. Classes with three or fewer gifted students were not considered "gifted cluster classes." There were no classes in the district that contained four gifted students.

Measures

The school district employed a national consultant, Jeannie Miyaska, Ph.D., to develop the benchmark assessments. A team of school district mathematics specialists created the tests by aligning test items to the Arizona state standards. The assessments were then field tested at two schools with diverse urban populations. Item analysis was then performed, and final revisions followed. The preassessment was administered in August of 2006, and the same instrument was used as a postassessment in May of 2007.

Data Analysis

A one-way analysis of covariance (ANCOVA) tests were run to examine differences between the cluster and noncluster students' postassessment scores controlling their initial differences using preassessment results.[1] Additional ANCOVA tests were run examining differences within demographic groups: gender, grade levels, ethnicity, and ELL status. Groups containing fewer than 15 students did not undergo ANCOVA analysis. Low *n*-values may misrepresent the statistical significance of the scores due to a low degree of freedom value (Green & Salkin, 2003). In addition,

[1] ANCOVA was used to determine the statistical significance of difference scores, as opposed to an Analysis of Variance using Repeated Measures. The two statistical techniques are somewhat similar. The ANOVA using Repeated Measures removes the entire pre-test score, whereas the ANCOVA removes only that part of the pre-test score necessary to create a "level playing field" at the pre-test administration (Cronbach & Furby, 1970). Accordingly, the authors determined that ANCOVA was more appropriate for this analysis.

follow-up tests were conducted to evaluate pair-wise differences among adjusted means. The Holm's sequential Bonferroni procedure was used to control for Type I error across the two pair-wise comparisons.

Results

Pre- and postassessment means for the cluster and noncluster groups are given on Table 2. Prior to conducting an ANCOVA, the researchers performed a test of the homogeneity-of-slopes assumption to determine the extent of the linearity. Based on analysis evaluating the homogeneity-of-slopes assumption, which indicated that the relationship between the covariate and the dependent variable differed significantly as a function of the independent variable, the researchers proceeded with the ANCOVA analysis. ANCOVA tests were used to evaluate whether the mean of the dependent variable (postassessment math score), adjusted for differences in the covariate (preassessment math score), differed between the clustered and nonclustered groups according to their various demographic categories (ELL vs. non-ELL, gender, ethnicity, and so forth). The results of these analyses are presented in Table 3.

Overall Student Performance

To evaluate student performance, a one-way analysis of covariance (ANCOVA) was conducted. The independent variable, grouping, included cluster and noncluster. The dependent variable was the postassessment and the covariate was the preassessment. The ANCOVA was significant, $F(1,769) = 350.01$, $p < .00$. The strength of the relationship between the grouping factor and the dependent variables was strong, as assessed by a partial η^2 of .31. The means of the postassessment adjusted for initial differences were ordered as expected across the cluster and noncluster groups. The cluster group had the largest adjusted mean ($M = 84.78$, $SD = 9.81$), and the noncluster group had the smallest adjusted mean

Table 2

Pre- and Postassessment Means and Standard Deviations

	Cluster					Noncluster				
	Preassessment			Postassessment		Preassessment			Postassessment	
	N	*M*	*SD*	*M*	*SD*	*N*	*M*	*SD*	*M*	*SD*
Overall	554	63.15	13.52	84.78	9.81	218	65.00	13.61	72.51	15.26
Gender										
Male	284	62.55	13.74	84.59	9.96	132	66.64	12.35	73.69	14.07
Female	270	63.79	13.27	84.99	9.67	86	82.49	15.08	70.71	16.87
Race/Ethnicity										
Caucasian	173	63.94	14.67	85.15	9.98	60	67.65	13.48	74.45	16.21
Hispanic	300	61.98	12.87	84.02	9.82	134	63.68	12.81	71.15	15.23
Asian	40	69.30	11.73	87.48	9.41	12	73.14	18.93	81.75	10.84
African American	32	64.06	12.17	86.06	9.11	7	60.43	9.96	70.43	10.31
American Indian	9	56.78	17.47	86.56	9.25	5	55.40	16.33	66.60	12.20
Language Status										
ELL	250	63.02	12.70	84.38	9.77	108	63.57	12.86	70.92	14.75
Non-ELL	304	63.26	14.18	85.12	9.85	110	66.40	14.23	74.08	15.67
Grade										
2nd	72	70.15	15.03	92.29	8.01	8	70.75	14.34	89.25	6.32
3rd	143	64.04	14.11	87.76	7.85	33	61.24	15.64	76.42	18.34
4th	102	59.48	12.76	83.63	9.42	38	63.32	12.57	68.63	14.75
5th	75	65.52	12.12	84.03	7.61	37	68.46	13.16	73.73	13.66
6th	60	63.50	11.43	83.07	9.53	34	69.56	13.25	73.47	16.50
7th	35	61.46	11.91	79.34	10.49	44	66.07	11.01	71.36	10.57
8th	61	57.25	11.69	77.33	10.42	24	57.17	13.75	66.58	17.02

Table 3

One-Way ANCOVA Conducted by Grouping

Dependent variable	*df*	*F*	*MSE*	*p*	Effect size (η_p^2)
Overall	1, 769	350.01	78.65	.00	.31
Gender	1, 767	0.07	78.81	.79	.00
Ethnicity	4, 761	1.34	78.65	.25	.01
Language	1, 767	0.50	78.61	.48	.00
Grade	6, 757	3.46	69.73	.00	.03

($M = 72.51$, $SD = 15.26$). There were significant differences in the adjusted means between groups (cluster and noncluster).

Gender

When analyzing assessment data based on grouping and gender, a one-way analysis of covariance (ANCOVA) was performed with the independent variables, grouping and gender, including cluster and noncluster/male and female. The dependent variable was the postassessment and the covariate was the preassessment. The ANCOVA was not significant, $F(1,767) = .07$, $p < .79$. There was shown to be no relationship between the grouping factor and the dependent variables, as assessed by a partial η^2 of .00. In the cluster classroom, there was great similarity between the postassessment scores of male and female students with a difference of 0.40, with female students scoring slightly higher than their male counterparts. There was a more distinct difference between the scores of male and female students in the noncluster classroom with a difference of 2.88, with male students scoring higher than their female counterparts. There were no significant differences in the adjusted means between both groups (cluster/noncluster and male/female).

Ethnicity

Achievement of gifted students by grouping and ethnicity was conducted utilizing a one-way analysis of covariance (ANCOVA). The independent variables, grouping and ethnicity, included cluster and noncluster/Caucasian, Hispanic, African American, Asian, and American Indian. The dependent variable was the postassessment, and the covariate was the preassessment. The ANCOVA was not significant, $F(4,761) = 1.34$, $p < .25$. The strength of the relationship between the grouping factor and the dependent variables was weak, as assessed by a partial η^2 of .01. In the gifted cluster classroom, Asian students had the greatest postassessment score. This is similar to the nongifted cluster, with Asian students scoring the highest postassessment scores of all five of the ethnic groups. Interestingly, there was a difference in the lowest postassessment scores, with Hispanic students scoring the lowest in the cluster classroom and American Indians performing at the lowest level in the noncluster classroom. There were no significant differences in the adjusted means between groups (cluster/noncluster and the differing ethnic groups).

Language (ELL vs. Non-ELL Status)

Examining achievement of grouping and language status, a one-way analysis of covariance (ANCOVA) was conducted with the independent variables, grouping and language, including cluster and noncluster/ELL and non-ELL. The dependent variable was the postassessment, and the covariate was the preassessment. The ANCOVA was not significant, $F(1,767) = .50$, $p < .48$. There was shown to be no relationship between the grouping factor and the dependent variables, as assessed by a partial η^2 of .00. In the cluster classroom, there was similarity between the postassessment scores of ELL and non-ELL students with a difference of 0.74, with non-ELL students scoring slightly higher than their ELL counterparts. There was a more distinct difference between the scores of ELL and non-ELL students in the noncluster classroom with a difference of 3.06, with non-ELL students scoring higher than their ELL counterparts. There were no significant differences in the adjusted means between groups (cluster/noncluster and ELL/non-ELL).

Grade Levels

When examining the achievement differences in grouping and by grade level, a one-way analysis of covariance (ANCOVA) was performed with the independent variables, grouping and grade levels, including cluster and noncluster/grades 2–8. The dependent variable was the postassessment, and the covariate was the preassessment. The ANCOVA was significant, $F(6,757) = 3.46$, $p < .00$. The strength of the relationship between the grouping factor and the dependent variables was weak, as assessed with a partial η^2 of .03.

In the gifted cluster classroom, there was a steady decrease in average postassessment scores from grades 2 through 8 (decrease of 14.96), with an exception appearing in grade 5 with a slight increase of 0.40. This trend is similar to students in the noncluster classrooms with a more pronounced difference in average postassessment scores from grade 2 to grade 8 (decrease of 22.67), with a more substantial increase in grade 5 of 5.10. Based on the above results, students in the gifted clustered classroom demonstrated a smaller range of difference between their average postassessment scores than their nonclustered counterparts. There were significant differences in the adjusted means between groups (cluster/noncluster and the differing grade levels).

Percentage Change

Student achievement data in this action research project was also analyzed utilizing a percentage of change. The postassessment score was subtracted from the preassessment score and the difference was divided by the preassessment score. The solution results in a decimal and by multiplying the solution by 100, this yields the percentage of change. The trend of the percentage change is displayed for each subgroup—ethnicity, gender, language status, and grade levels—in Figures 1–5. There

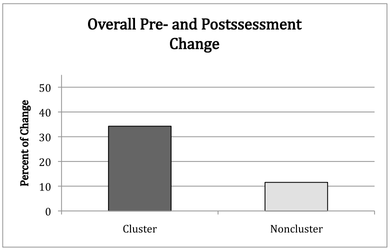

Figure 1. Percent of change by grouping, cluster and noncluster.

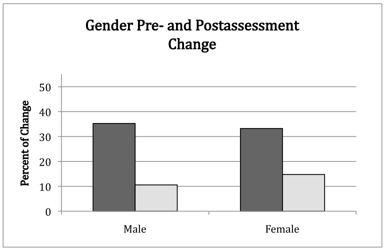

Figure 2. Percent of change by gender, cluster and noncluster.

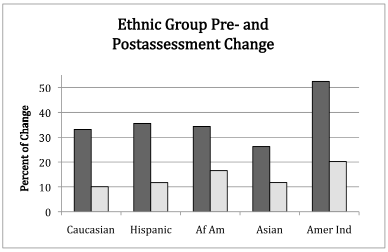

Figure 3. Percent of change by ethnicity, cluster and noncluster.

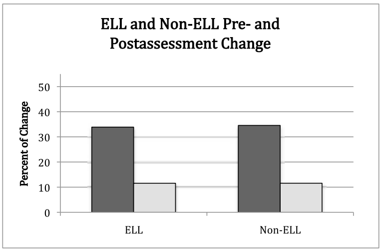

Figure 4. Percent of change by language, cluster and noncluster.

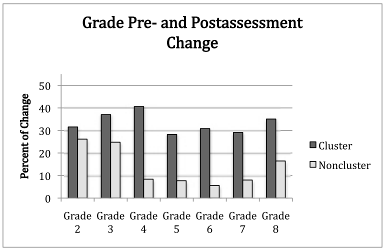

Figure 5. Percent of change by grade, cluster and noncluster.

is a similar pattern in all gifted subgroups in which the percentage of change in the gifted cluster classroom is higher than the gifted students being served in the noncluster classroom.

Discussion

Student learning was found to be at higher levels from the pre- to the post-assessment when gifted students received services in a gifted cluster class (with the teacher trained in gifted education). This action research project supports some researchers' claims that gifted students learn better when they are provided with differentiated curriculum by a teacher knowledgeable in the application of such methods and instruction with others of similar abilities. In 2001, research conducted by Swiatek showed that gifted students who were grouped with other gifted students in school learned more in a year than students who have classmates of more varied ability. In a meta-analysis, Goldring (1990) found that gifted students in like-ability classrooms achieved statistically significantly higher scores than their gifted counterparts in regular, heterogeneous classrooms. Results from this action research project support the work of Swiatek and Goldring. Although this project's findings are not generalizable, its results indicate that there may be educational advantages of cluster grouping gifted students when provided curriculum and instruction at levels commensurate with their ability (Brulles, 2005; Hollifield, 1987; Kulik, 1992; Robison, 1998; Saunders 2005; Winebrenner & Brulles, 2008b) by teachers who have knowledge concerning the application of differentiated learning strategies.

Differences between the gifted cluster and noncluster groups may be attributed to the complex and challenging curriculum as well as to receiving more teacher attention (from more knowledgeable teachers) and more attention to instruction at challenge levels in the gifted cluster classroom (Saunders, 2005).

Differences in the achievement gains between the cluster and noncluster classroom may be primarily attributed to cluster teachers' awareness and acceptance of the fact that students begin the school year at varying academic levels, along with the assumption that instruction must be directed toward those varying levels. A vast range in abilities among students in heterogeneous classrooms makes it virtually impossible to teach one curriculum to all students (Farrar, 2003; Robison, 1998; Winebrenner & Devlin, 2001). Some students grasp the curriculum at a rapid pace and are ready to move ahead, while other students in the classroom require additional assistance and practice on the concept being taught. Teachers trained in differentiated instruction for gifted students accept this as a premise from which to base instruction.

Cohn (1986) and Hollifield (1987) have argued for the creation of an optimal match between students and curriculum. Assigning students to classes by ability and then providing them with the same curriculum has limited effect on achievement; but when the curriculum is altered, clustering and ability grouping benefits students. Clustering promotes achievement among all groups and grade levels of students and no particular group of students misses out on the gain.

Analysis of the impacts of cluster grouping gifted students suggests that increases in academic achievement can be credited collectively to the more complex instruction by teachers knowledgeable in gifted education and challenging curriculum used in the gifted cluster classroom as compared to typical curriculum and instruction addressed in a regular classroom. Kulik (1992) reported that highly talented youngsters profit greatly from an enriched curriculum designed to broaden and deepen their learning. Cluster grouping not only narrows the range of student abilities in the classroom, while maintaining its heterogeneous character, but also increases the likelihood that teachers provide instruction at appropriate levels of difficulty (Gentry & MacDougall, 2008; Winebrenner & Brulles, 2008a).

Cluster grouping encourages the teacher to increase the pace of instruction and raise the level of instruction, while providing more individual attention, repetition, and review for low achievers (Gentry & MacDougall, 2008; Winebrenner & Brulles, 2008b). Farrar's (2003) findings supported this assertion when she found that grouping students by ability level allowed them to produce better quality work. Rogers' (1991) research also supported this claim; she found that students are more likely to take social and emotional risks when learning with students of like ability. For clustering to be successful for all groups, modifications and adjustments to curriculum based on the students' ability level and developed skills should represent standard instructional practice. The ability to provide consistent differentiated curriculum and instruction to all subgroups is essential to student achievement in the gifted cluster classroom. The evidence of differences in achievement levels demonstrated by the gifted students in the two settings reported here supports these claims.

Conclusions

The findings of this action research project support assertions that the gifted cluster model, which includes effective teacher training, serves as a useful approach to providing gifted education services within a school or district. In addition to administrative support, teacher training remains a critical component to the success of the cluster program model. Requisite training should include learning differentiated instruction; compacting curriculum; understanding behaviors, characteristics, and social and emotional needs of gifted students; and learning how to monitor academic achievement through assessments.

The student most neglected in heterogeneous classes, in terms of reaching his or her full potential, is the gifted student of mathematics (Robison, 1998). In 1992, Kulik summarized the research on ability grouping by stating that the damage would be truly profound if schools eliminated accelerated classes for their brightest learners. Kulik went on to state that the achievement level of such students would fall dramatically if they were required to move at the common pace. Effects of cluster grouping, one form of ability grouping, albeit within the heterogeneous classroom, reveal that students benefit when provided differentiated, highly challenging learning opportunities (Brulles, 2005; Gentry 1999; Winebrenner & Brulles, 2008b) by trained teachers.

Limitations

Variables that could influence achievement of gifted students in a cluster model include curricula, teacher experience, teacher training in differentiating instruction for gifted students, and methods of instruction. Students in this action research project are mostly members of low-socioeconomic status families. Findings could differ for school districts that serve students from higher socioeconomic status families. Future studies of achievement in a gifted cluster grouping model conducted in a controlled setting and that go beyond the scope of action research in methodological rigor are recommended.

Implications

The findings of this action research project describe the "what"—that students demonstrated increased academic achievement in mathematics when receiving services from trained teachers within a gifted cluster model. Possible reasons for the achievement gains have been inferred, however further study might seek answers to the "why." Other questions that might be addressed include:

- Do students in a cluster-grouping model experience increased achievement because of higher expectations from the teachers?
- Do students in a cluster-grouping model experience increased achievement because of attention directed at the students' ability levels and skills development (made possible by the narrowed range of abilities in the model)?
- How do students who are not identified as gifted perform in both gifted cluster classrooms and regular heterogeneous classrooms?

This action research project has provided a baseline for further evaluation of students in a cluster-grouping model with improved assessment tools and continually refined methods of differentiating learning. The findings serve several additional purposes for practitioners. First, the action research project revealed significant increases in mathematic achievement for all gifted students when provided services in a gifted cluster model. Consequently, it provides a credible case for cluster grouping gifted students in a heterogeneous setting. Second, the action research project suggests that differentiated curriculum and instruction address the academic needs of gifted students. Thus, accelerated and enriched curriculum appears to provide a strong base for effective instruction of gifted students in this setting.

Finally, the action research project suggests that training teachers in differentiation and clustering has a positive impact on student achievement in a gifted cluster model.

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