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ABSTRACT

The practice of student grouping from the perspective of critical school district involvement in the proposed program is examined in this report, with a focus on the relationship between grouping program outcomes and the degree of district support. Four school districts in Texas participated in two substudies: the first examined the performance of 176 high-ability third- through fifth-graders in a magnet school, a continuous progress district, and traditional schools, and the second examined the mathematics performance of 223 lower general ability fifth-graders in a continuous progress district, nongraded school, Chapter 1 school, and cluster-grouped program. Pre- and post-tests were administered to the children in each study. Continuous program students consistently ranked at the top in areas of mathematics, computational skills, and conceptual skills mastery, suggesting that district commitment is crucial for student achievement despite the grouping practice utilized. Seven tables are included. (11 references) (LMI)

Grouping and Achievement: A Systems Approach

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While studies of the effects on achievement of grouping students to attain greater cognitive homogeneity, based on ability and/or achievement, have abound, conclusions about the benefits of grouping have been far from concordant. In attempts to integrate the often conflicting results obtained from study to study, several researchers have performed meta-analytical reviews. Their efforts have examined grouping studies relating to special populations, such as the gifted (Kulik & Kulik, 1984), as well as to comprehensive ability grouping plans (Slavin, 1987). The overall findings suggest that, with respect to the latter, self-contained ability-grouped classes produce no significant achievement in children so grouped. However, children grouped within classrooms for mathematics instruction do evidence higher math achievement than those not grouped at all. Furthermore, certain cross-grade grouping techniques have been associated with superior performance.

While not a meta-analytical study, Jeannie Oakes' indictment (1986) of the practice of grouping centers on the negative effects on lower tracked students who, it appears, are not given access even to the same curriculum as higher tracked students. It is as though these students are a priori labeled incapable and as such denied a quality education.

The rationale for grouping is that such a procedure facilitates a more individualized instructional environment and so should lead to higher achievement, be it through flexibility in the pace at which materials are presented and/or through qualitatively different instruction (Gamoran, 1986; Hiebert, 1987). This implies that the grouping pattern effects greater homogeneity with respect to the underlying variable requiring differential educational strategies; thus, students may be grouped on the basis of general or specific domain ability (Good & Marshall, 1984). Additionally, the development of a curriculum that has been defined to meet the specific needs of the various groups, and that can be implemented and continually evaluated without undue burden to the teacher (Slavin, 1987), may be necessitated. With such instructional and assessment tools, teachers trained in their use (Brophy and Good, 1987) can become more effective in the classroom.

While previous researchers have aptly identified these factors, a larger underlying issue may be in operation, for such a level of curricular development and assessment as well as of teacher mastery and accountability may require significant financial assistance, and so necessitate the involvement of the larger

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school district system. School district fiscal and social policies regarding expenditures for curricular development, identification of student ability levels (particularly in districts with large minority or culturally disadvantaged school populations), and financial support for continuing teacher education can significantly constrain or enhance the effectiveness of a grouping program, or, for that matter, of most educational programs.

Perhaps this issue of district input has been neglected by past studies for a number of reasons. Studies are often conducted in only one or two school districts, thus limiting the potential for differences at the districtwide level to emerge. And too, even though the differences may be there, it is often in the best interest of key district personnel to refrain from calling attention to certain aspects of district involvement or lack of it (Borich and Jemelka, 1982). Additionally, if the emphasis in the experimental design is on randomization, the researcher may overlook the critical fact that important administrative assistance is not random; without it, there may be no program development to support the grouping practice.

Examining instructional innovation in higher education, Kozma (1985) developed a grounded theory to explain how instructional change occurs in higher education. In doing so, he identified several key factors that have a negative impact on the likelihood of innovation adoption:

(1) the degree to which faculty autonomy overrides group involvement, thus potentially making the innovation a highly personalized and biased program;
(2) the loose coupling of teaching and accountablility;
(3) lack of participation in the innovation by the department chairman;
(4) lack of a center for instructional imporvement, where potential users of the innovative program can receive assistance and clarification concerning the program.

These characteristics reflect the need for a position of power to back the program (the department chairman), continuing education for teachers (instructional center), a cooperative effort to the program (not too personal), and a means of evaluating and ensuring the success of the educational program (teaching and accountability link). Kozma noted that while instructional innovation often requires substantial financial assistance from the outside to fund curriculum development and facilities, funding from inside the system motivates members to work with one another to make the program a cooperative effort, thus increasing its chances for success.

Extending this to school systems in general, successful instructional innovation (implied in the decision to group children) needs real, not just verbal support from those in positions of power, often including financial power, to define the program adequately and to develop an effective curriculum. It also requires ongoing education for the teachers in that program and a means of linking the implementation of the educational strategies with the outcomes. The latter two components also imply a strong financial base.

The current study sought to re-examine the practice of grouping from the vantage point of critical school district involvement in the implied program. The link between the achievements of the grouping program and the degree of district support and commitment may enhance our understanding of what constitutes effective school practices concerning this issue.

Method

Subjects: This study encompassed two substudies. One investigated the performance, on several measures, of children of high ability, in three programs where the grouping practices in each program reflected increasing concentrations of students of high ability. The other examined the math performance of children of lower general ability levels, in four types of grouping programs.

Study 1: Subjects for this study were 176 third to fifth grade students in central Texas, including 53 children from a magnet school for math and science, 77 children from schools in a continuous progress school district, where children were grouped across classrooms of a given grade, by subject, for math and for language arts-reading instruction only, and 46 children in traditional heterogeneously-mixed classrooms in a third school district. Children were selected for the study if (1) they had an IQ of 120 or higher and (2) they were in the 90th percentile or higher on the ITBS math achievement composite or on a quantitative aptitude test. Approximately 75% of the children in the magnet school, 10% to 60% of the students in a given math class in the continuous progress district, and an average of 10% of the students in a given traditional classroom met these criteria. Thus, the magnet school setting represented the greatest concentration of high ability students and for the longest period of time (all day),the traditional classrooms, the least. Final inclusion in the study required parental consent. Additionally, 16 children in a 'nongraded' school, where children were grouped across grades for math instruction, were administered the math achievement test. The final sample of students represented 8 classrooms in the magnet school, 14 classrooms in the continuous progress district, and 18 classrooms in the traditional schools.

Study 2: Subjects were included in this study if their IQ scores were below 120. The resulting sample of 223 fifth grade students consisted of 59 children from 4 classrooms in the continuous progress school district, 41 children from 4 classrooms in the nongraded school, 57 children from 3 classrooms in the Chapter I school, where the children had been divided in the middle of the school year into three groups within the grade, but with no group differentiated instruction intended, and 66 children from 4 classrooms in the cluster-grouped program, where four essentially inflexible groups had been formed, with a clear attempt to accelerate the higher ability students.

Totally, four districts participated in the study. While the traditional,the nongraded, and the Chapter I schools were from the same district, the other three programs were housed in three separate districts. Further, only participation in the magnet program was optional.

Instruments:

Study 1: All children were administered pre and post tests, in October and March respectively, using the CTBS/4 math achievement test, up a grade level from their current grade in school, the SAGES Reasoning Abilities Test, and the SAGES Divergent Production Test.

Study 2: The children were administered the on-grade-level CTBS/4 math achievement test, pre and post.

Children in both studies were administered affective measures, the results of which are presented elsewhere (Keller and Hays, 1991; Keller, 1991). Because of the focus of this paper, they will not be discussed here.

Since these studies could not employ a random assignment methodology, information on variables known to affect math achievement was collected and systematically incorporated into the analyses. These variables included IQ, gender, paternal and maternal level of education, and parental occupational level (as defined by the Hodge-Siegel Occupational Prestige Code). However, no SES data collection was permitted in the cluster-grouped school district. The levels of education ranged from 1 (professional, graduate degree) to 7 (under 7 years of school).

Results

To determine the influence of the various potentially mediating variables, groups were first tested for significant differences in the level of each variable. Where there were significant differences between groups, the mediating variable was then regressed on the various outcome variables, controlling for pretest levels, to determine ongoing effects on achievement. If these effects were significant ($p<.05$), then this variable was tested by program to assess its continuing influence on achievement in each program. If it was a significant factor in more than one program, it was incorporated into the analysis of program effects.

Study 1: Table 1 contains the mean levels of each of the mediating variables. Only one variable, maternal level of education, differed significantly from one group to another in overall level and in effect upon posttest scores, pretest scores covaried ($F=4.52$, $p<.02$). Regression of this variable on each of the outcome variables indicated that maternal level of education exerted an ongoing effect on math concepts only($F=4.53, p<.035$). However, subsequent analysis showed this effect to be significant only for the students in the traditional classrooms program (Table 2). Thus, none of the potential covariates were incorporated into the analysis of program effects.

Table 3 contains the mean scores on the various measures used in study 1, as well as the adjusted posttest means. Tests of homogeneity of the regression line of pretest on posttest scores indicated that, across programs, the effects of the pretests on achievement were uniform on all measures except divergent production skills, where the traditional and continuous progress students' scores evidenced greater sensitivity to starting values . The integrity of these differential environmental effects of pretest values was maintained in subsequent analyses of divergent production skill levels. All program effects on outcome measures were tested, using analyses of covariance, pretest scores covaried. These effects are given in Table 4. Because a continuous progress program and a magnet school for math and science both emphasize an accelerated pace for bright students, the achievement of these two groups, taken together, in math computations as well as in math concepts, was measured against that of the traditional classroom gifted students. Since a magnet school is further designed to advance higher level thinking skills as well as creative thinking, tests of reasoning and divergent production skills compared the continuous progress and traditional students, as a group, with the magnet school students. Significant program effects occurred for math computations, ($F=6.51, p<.011$), with the magnet school and continuous progress students, taken as a unit, scoring significantly higher than students in the traditional heterogeneously mixed schools. A further test of rank order, with continuous progress students highest, magnet school students second, and traditional students third, also proved significant ($B=-1.31$, $F=6.21$, $p<.014$). Introducing the performance of students in the nongraded school into the analysis resulted in no differences significant at the 5% level, though a trend, significant at the 10% level, was seen, with students in the continuous progress and nongraded programs ranking highest, followed by students in the magnet school program, with the traditional class students lowest ($F=2.04$, $p<.091$). However, because of the small sample size in the nongraded school, the results should be interpreted with caution. There were no program effects on progress in math concepts ($F=.168$, $p<.68$) or in reasoning skills ($F=3.36$, $p<.07$). Continuous progress and traditional class students together scored significantly higher than magnet school students on their increase in divergent production skills ($F=21.80$, $p<.0001$).

Study 2: Again, various potentially mediating variables (gender, maternal and paternal levels of education, parental occupational level, and IQ) were tested for differences in overall group levels and continuing effects upon achievement. The group means are given in table 5. Results indicated that only parental occupational level both significantly differed among groups($F=12.31$, $p<.001$) and affected math computational achievement ($F=8.21$,$p<.005$), but it was a significant effect only in the continuous progress school district (Table 7). Thus, subsequent analyses (See Table 7) did not incorporate any potential covariates. Mean socores on achievement are given in Table 6. Students in the continuous progress and Chapter I schools scored significantly higher in math computations ($F=6.29$,$p<.001$), with the cluster-grouped students scoring the lowest. While no program effects on math concepts were significant at the 5% level, a trend, significant at the 10% level, was noted, with the continuous progress students scoring the highest, the traditional and nongraded students next, and the cluster-grouped students lowest ($F=2.51$,$p<.0595$).

Discussion

It was seen that, where significant differences or trends were found, the continuous progress students consistently ranked at the top, sometimes alone, and sometimes along with another program. In the study of children of high ability, the continuous progress students ranked highest in math computational skills mastery, along with the magnet school students, and highest in divergent production skill level, along with the traditional classroom students. In the study of children of less than exceptional ability, the continuous progress students, as well as the Chapter I students, ranked highest in computational skills. There was also a trend to indicate the superior achievement by continuous progress students in conceptual skills mastery. This small (student population less than 10,000), centrally controlled school district has formally identified itself as a continuous progress district, with a fully developed K-8 math scope and sequence, accompanying teaching strategies, availability of textbooks of any grade level, as needed, regardless of the student's physical grade level, a test bank to assess mastery, a computerized system to facilitate that assessment, and frequent meetings of personnel to review test results for the re-grouping of students and the re-planning of instruction. The district administration has developed informal guidelines for what constitutes adequate progress for a given group and oversees its attainment. The math curriculum in the grades under study is heavily oriented toward computational skills.

The Chapter I students also evidenced some significant mastery, though not as comprehensive as the continuous progress students. The teachers in the Chapter I school received intensive training in math concepts and in the use of math manipulatives from a local university; the district paid for substitutes while classroom teachers spent nine days throughout the year to receive this training. This school is housed in a heavily site-based managed school district, of approximately 20,000 students, with virtually no formal direction from central administration. However, central office administrators are knowledgeable and dedicated professionals, who seem to work well with the individual school personnel.

The magnet school has no differentiated curriculum, though there exists an undercurrent of acceleration to the 'program'. It appears that the students are given excessive amounts of 'busy work.' Because this is a district with a high minority population, district officials, until recently, have not considered ability level, whether general or by area, in admissions decisions. Previous admissions decisions have used a cutoff score consisting of the 80th percentile on the composite ITBS as its sole objective measure. So, while 75% of the students evidence high ability, IQ scores of the others go as low as 90. It is difficult for teachers to be effective with such a peculiar mix of ability levels, so it is not surprising that the magnet school students did not perform better. This district is also site-based managed, though there is an independent magnet school coordinator who has been vested with significant control over the magnet schools.

Teachers in the cluster-grouped program are allowed to accelerate students, but they do not formally use lower grade level textbooks for remedial students. This district has traditionally enjoyed a wealthier community of residents on the average than have other districts in this study, with impressive scores on national achievement tests. The emphasis has been on furthering those with higher potential. Since this study investigated the performance of students in this district who would not generally be classified as possessing exceptional ability, the lower degree of progress in these students is understandable.

The nongraded school, which was in its second year at the time of the study, lies in the same district as the Chapter I school. The principal of the nongraded school has sought the services of a local institute for gifted education to establish a program to meet the needs of the more capable students. These higher ability students performed well in the present study, while the other children, whose needs were not given a special focus, did not evidence outstanding progress when compared with other groups in this study. But again, the small number of high ability students from the nongraded school participating in this study renders conclusions about their relative performance questionnable at best.

Previous research efforts have identified several variables that may affect achievement, besides the manner of grouping, variables such as teacher-student interaction patterns, differentiated classroom practices (pace and level of instruction), and flexibility of group assignments. The present study has suggested the need to develop a grounded theory of grouping and achievement which will also encompass issues and policies at the school district administrative level, issues that may include:

1. adequate funding for curriculum development and for the ongoing assessment of student progress,
2. appropriate group identification procedures that may be driven by district socio-political policies,
3. district policies regarding use of out-of-level textbooks, both above and below the students physical grade level to ensure the progress of all students in the program,
4. effective means of ensuring teacher accountability for the progress of all students, means that do not also engender fear,
5. district financial support of continuing teacher education when needed, and
6. the effect on all these of site-based versus centrally-controlled governance.

This impact of the larger school district system on program implementation must be considered if the effectiveness of various grouping strategies is to be understood, for the degree of commitment and systematic support from the district system may be the driving force behind the achievement of students, regardless of the grouping practice employed.

Table 1

Covariate	Magnet	Continuous Progress	Traditional
IQ	129.42 (6.83)	125.25 (4.92)	128.52 (7.04)
Gender			
Boys, Girls	35,17	51, 26	31, 15
Grade			
3,4,5	18,16,19	23,21,33	18, 11, 17
Mother's Education	2.33 (1.15)	2.91 (.79)	2.78 (1.11)
Father's Education	1.72 (1.03)	2.48 (.88)	2.23 (.92)
Parental Occupation	55.89 (14.74)	51.30 (11.44)	52.45 (10.00)

Table 2

Program	Estimate	T	P
Traditional	-2.00	-3.01	.003
Continuous Progress	-1.33	-1.68	.095
Magnet	.39	.59	.557

Table 3

Outcome Measure	Magnet		Continuous Progress		Traditional		Nongraded	
	pre	post	pre	post	pre	post	pre	post
Math Computations	25.83 (6.46)	33.28 (6.43)	22.35 (6.52)	32.13 (6.72)	23.31 (6.61)	29.89 (6.09)	28.63 (5.78)	35.56 (6.67)
Math Concepts	32.30 (8.24)	38.45 (7.21)	30.72 (8.45)	38.23 (6.28)	31.18 (6.93)	38.78 (5.23)	37.75 (6.85)	42.50 (5.61)
Reasoning	21.48 (5.14)	24.60 (6.04)	23.11 (5.25)	27.52 (5.33)	25.81 (6.03)	27.56 (5.92)		
Divergent Production	19.85 (6.12)	23.77 (7.67)	19.25 (5.13)	26.00 (7.71)	21.44 (5.43)	27.96 (8.80)		

Table 4

Math Computations

Source	SS	df	MS	F	P
Program	204.48	1	204.48	6.51	.011
Error	5119.65	164	31.22		

Adjusted Posttest Means:
Magnet & Continuous Progress: 32.43 Traditional: 31.23

Math Computations: Rank Order

Source	SS	df	MS	F	P
Program	195.32	1	195.32	6.21	.014
Error	5128.80	163	31.47		

Solution:
Posttest= 22.23 - 1.31(Program) + .51(Pretest) + E

Math Computations (Nongraded School Included)

Source	SS	df	MS	F	P
Program	232.69	3	77.56	2.51	.061
Error	5473.32	177	30.92		

Adjusted Posttest Means: Continuous Progress 33.01 Nongraded 33.17
Magnet 32.34 Traditional 30.27

Math Concepts

Source	SS	df	MS	F	P
Program	4.07	1	4.07	.168	.683
Error	3471.54	143	24.28		

Math Concepts (Nongraded Included)

Source	SS	df	MS	F	P
Program	29.86	3	9.95	.41	.750
Error	4269.15	177	24.12		

Reasoning Skills

Source	SS	df	MS	F	P
Program	79.81	1	79.81	3.36	.069
Error	3822.45	161	23.74		

Divergent Production Skills

Source	SS	df	MS	F	P
Interaction	606.02	1	606.02	10.93	.001
Program	1208.55	1	1208.55	21.80	.001
Error	9090.85	164	55.43		

Adjusted Posttest Means:
Magnet: 23.87 Continuous Progress & Traditional: 26.73

Table 5

Covariate	Continuous Progress	Nongraded	Traditional	Cluster Grouped
IQ	100.95 (11.69)	104.14 (8.66)	100.54 (11.10)	102.57 (14.45)
Father's Education	2.66 (1.01)	3.04 (.84)	4.00 (1.48)	
Mother's Education	3.30 (1.12)	3.50 (.88)	4.07 (1.48)	
Parental Occupation	46.80 (10.43)	43.90 (9.94)	36.87 (10.63)	
Gender Boys, Girls	22,37	18, 23	29, 28	36, 30

Table 6

Outcome Measure	Continuous Progress		Cluster Grouped		Nongraded		Chapter I	
	pre	post	pre	post	pre	post	pre	post
Math Computations	19.19 (6.61)	29.56 (8.49)	28.06 (6.31)	31.78 (8.00)	25.51 (7.61)	31.90 (5.68)	23.98 (7.49)	32.26 (7.12)
Math Concepts	23.88 (8.41)	31.03 (8.75)	28.70 (8.19)	32.17 (8.94)	29.32 (6.63)	34.29 (7.21)	25.21 (8.65)	31.19 (8.99)

Table 7
Effect of Parental Occupational Level on Math Computational Achievement

Environment	Estimate	T	P
Continuous Progress	.003	3.637	.001
Nongraded Program	.001	.591	.556
Traditional Program	.000	.045	.968

Math Computations

Source	SS	df	MS	F	P
Program	681.04	3	227.01	6.29	.001
Error	7868.23	218	36.09		

Adjusted Posttest Means: Continuous Progress 32.53
Traditional: 32.44 Nongraded 31.61 Cluster-Grouped 28.29

Math Concepts

Source	SS	df	MS	F	P
Program	236.95	3	78.98	2.51	.06
Error	6850.94	218	31.43		

Adjusted Posttest Means: Continuous Progress 33.26
Traditional: 32.35 Nongraded 32.14 Cluster-Grouped 30.51

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