

Does Ability Grouping REALLY Harm Self- Concept?

Carol L. Tieso, Ph.D.
The College of William and Mary
cties@wm.edu

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Purpose of the Study

- The purpose of the study was to investigate the effects over time of flexible and temporary ability grouping, combined with appropriate curricular adjustments, on students' self-efficacy and self-concept for mathematics.

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Background of the Study

- Schunk (1996) defined *self-concept* as "one's collective self-perceptions that are formed through experiences with, and interpretations of, the environment, and that are heavily influenced by reinforcements and evaluations by significant other persons" (p. 448).
- Bandura (1994) defined *self-efficacy* as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (p. 71).
- Kulik and Kulik (1982) found in 15 controlled studies of between-class ability grouping and self-concept that the average effect size was $-.06$, a negligible effect.

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Background of the Study

- Academically gifted students may possess higher academic self-concepts (Chapman & Boersma, 1984; Hoge & Renzulli, 1993, McCoach & Siegle, 2003) and higher academic self-efficacy (Zimmerman & Martinez-Pons, 1990) than non-gifted students, especially when they are placed in mixed ability or heterogeneously grouped classes and/or schools (Marsh, Chessor, Craven, & Roche, 1995).

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Research Hypotheses

- Intermediate math students placed in different ability group settings would have similar levels of self-efficacy for mathematics;
- Intermediate math students placed in different ability group settings would have similar levels of self-concept for mathematics;

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Research Hypotheses

- All students would gain in self-efficacy and self-concept for math over time; and
- The relationship between student achievement and self-concept and self-efficacy for mathematics will be positive and moderate.

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Method

- Sample
 - The sample consisted of 34 teachers and their students (N = 420), randomly assigned to one of three treatment levels (below, on, or above grade level) based on their pretest scores on a curriculum-based assessment (CBA). The sample is further subdivided into students who were exposed to three curricular practices: textbook, enhanced, and differentiated and two grouping practices: whole group and flexible temporary small groups.

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Method

- Instrumentation
 - Curriculum-Based Assessment (alpha = .78), developed for this study.
 - Student Mathematics Self-Efficacy Survey (SMSES) (alpha = .91) (adapted from Siegle, 1995).
 - Student Self-Concept for Math Scale (SSCMS) (alpha = .78) (adapted from Marsh, 1990).
- Treatment
 - Three-week experimental math unit on Data Representation and Analysis.

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Data Analysis

- Descriptives
 - Treatment Level
 - Curricular Type
 - Grouping Type
- Repeated Measures Analysis of Variance (RM-ANOVA)
 - Pre/Post CBA
 - Pre/Post SMSES
 - Pre/Post SSCMS

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Results

- Self-Efficacy for Math
 - Results from the RM-ANOVA indicated significant gains for all treatment levels on the SMSES over time, $F(1, 226) = 95.79, p < .001$, and a significant interaction between time and treatment levels, $F(3, 226) = 3.00, p = .05$.
 - Students who were working above grade level in mathematics made greater gains in self-efficacy for math over time than students working below or on grade level.
 - Students assigned to the Differentiated curriculum treatment made the greatest gains in self-efficacy for math over time than students assigned to the Textbook or Enhanced curriculum treatments.

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Table 1
Means and Standard Deviations for Student Mathematics Self-Efficacy Survey by Treatment Level

Treatment Level	N of Students	Pretest M	Pretest SD	Posttest M	Posttest SD	d
Below Grade Level	38	88.24	23.18	103.24	13.80	.81
On Grade Level	96	86.52	19.61	107.01	18.86	1.06
Above Grade Level	94	87.54	18.78	110.64	19.86	1.20
Total	228	87.23	19.84	107.88	19.91	1.04

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Table 2
Means and Standard Deviations for Student Mathematics Self-Efficacy Survey by Curriculum Type

Curriculum Treatment	N of Students	Pretest M	Pretest SD	Posttest M	Posttest SD	d
Textbook	24	84.42	14.57	101.54	18.68	1.03
Enhanced	44	84.70	17.53	102.68	20.47	.95 (.06)
Differentiated	160	88.34	21.07	110.26	19.47	1.08 (.47)
Total	228	87.23	19.84	107.88	19.91	1.04

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Table 3
Means and Standard Deviations for Student Mathematics Self-Efficacy Survey by Grouping Type

Grouping Type	N of Students	Pretest M	Pretest SD	Posttest M	Posttest SD	d
Whole Class	68	84.60	16.43	102.28	19.72	.98
Flexible Groups	160	88.34	21.07	110.26	19.57	1.08 (.40)
Total	228	87.23	19.84	107.88	19.91	1.04

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Results

- **Self-Concept for Math**
 - Results from the Repeated Measures Analysis of Variance (RM-ANOVA) indicated significant differences over time for students in all treatment levels $F(1, 420) = 136.83$, $p < .001$, but no significant interaction between time and treatment levels, curricular, or grouping practices on the SSCMS.
 - Results from the descriptive analyses indicated that students in all treatment groups had *significantly lower* scores for self-concept for math over time.

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Table 4
Means and Standard Deviations for Student Mathematics Self-Concept Survey by Treatment Level

Treatment Level	N of Students	Pretest M	Pretest SD	Posttest M	Posttest SD	d
Below Grade Level	113	33.22	6.60	29.48	5.75	-.61
On Grade Level	160	34.09	7.88	30.41	6.77	-.50
Above Grade Level	147	34.86	7.09	30.69	6.71	-.60
Total	420	34.13	7.29	30.26	6.49	-.56

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Table 5
Means and Standard Deviations for Student Mathematics Self-Concept Survey by Curriculum Type

Curriculum Type	N of Students	Pretest M	Pretest SD	Posttest M	Posttest SD	d
Textbook	44	36.89	7.53	32.48	7.64	-.58
Enhanced	130	35.55	6.99	30.98	6.77	-.66 (-.60)
Differentiated	246	32.88	7.15	29.48	5.99	-.52 (-.45)
Total	420	34.13	7.29	30.26	6.49	-.56

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Table 6
Means and Standard Deviations for Student Mathematics Self-Concept Survey by Grouping Type

Grouping Type	N of Students	Pretest M	Pretest SD	Posttest M	Posttest SD	d
Whole Class	174	35.89	7.13	31.36	7.01	-.63
Flexible Groups	246	32.88	7.15	29.48	5.99	-.52 (-.49)
Total	420	34.13	7.29	30.26	6.49	-.56

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Results

- **Relationship between CBA and Affective Measures**
 - Positive, significant relationship between posttest CBA and self-efficacy ($r = .115$, $p < .05$).
 - Non-significant, negative relationship between pretest scores on the CBA and self-concept ($r = -.075$).
 - Positive, non-significant ($r = .042$) relationship between posttest scores on the CBA and self-concept.
 - Positive, significant relationship between CBA and Differentiation ($r = .103$, $p < .05$).
 - Positive, significant relationship between CBA and flexible grouping ($r = .124$, $p < .05$).

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Table 7
Intercorrelations for Achievement, Self-Efficacy, Self-Concept, and Treatment Variables

Measure	1	2	3	4	5	6	7	8
1. Pretest (CBA)	-							
2. Posttest (CBA)	.636**	-						
3. Pre Math SC	-.040	-.075	-					
4. Post Math SC	-.005	.042	.622**	-				
5. Pre Math SE	-.010	-.045	-.076	-.049	-			
6. Post Math SE	.151**	.115*	-.061	.021	.459**	-		
7. Treatment Level	.693**	.397*	.084	.068	-.010	.077	-	
8. Curriculum Type	.070*	.097**	-.194**	-.161**	.022	.103*	-.112**	-
9. Grouping Type	.032	.005	-.200**	-.149**	.047	.124*	-.072*	.917**

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Discussion and Implications

• Self-Efficacy for Math

- Students at all treatment levels had similar levels of self-efficacy.
- Students at all treatment levels made significant gains over time in self-efficacy.
- These results support the hypothesis that students at all treatment levels (below, on, or above grade level) would have similar levels of self-efficacy for mathematics.
- These results also support hypothesis 3 that students in all treatment conditions (treatment levels, curricular practices, grouping practices) would demonstrate gains in self-efficacy for mathematics over time.

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Discussion and Implications

• Self-Concept for Math

- These data support the hypothesis that students at all treatment levels (below, on, or above grade level) would have similar levels of self-concept for mathematics.
- These data do not support the hypothesis that students in all treatment conditions (treatment levels, curricular practices, or grouping practices) would have gains in self-concept for math over time.
- Students working on grade level had the smallest drop in Math SC.

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Discussion and Implications

• Self-Concept for Math

- Students working below and above grade level in math had the greatest loss in math self-concept over time. These data are consistent with previous “Big Fish, Little Pond” research that indicates a drop in self-concept for a specific academic area as gifted or high ability students encounter other students as bright as they (Marsh, Chessor, Craven, & Roche, 1995).
- These results also support the contention that students who are struggling in math **may not** be helped by the presence of high ability students in their group/class.

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Limitations

- Sample sizes for the various treatment conditions were small and diverse.
- The CBA created for this unit was based on mathematics objectives designed for students in grades 4-8 and was too difficult for most students.
- Instrumentation
- There is evidence that a short educational intervention may bring about substantial gains that may not be sustainable over time (Kulik, 1992).

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Conclusions

- Math students in grades 4 and 5 can be assigned to temporary and flexible ability groups and challenged without losing a positive sense of self-efficacy or self-concept.

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Conclusions

- Since there were no significant differences in self-efficacy or self-concept for students with different levels of prior knowledge or in different grouping arrangements, educators may no longer need to base flexible grouping decisions on the fear that students' self-concept may be harmed.

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Conclusions

- In these days of heightened anxiety over improving achievement and making *adequate yearly progress*, the results of this study may help educators make better decisions about what should be taught (and what eliminated) and how the classroom might be organized and managed based on students' prior levels of knowledge and unique learning needs.

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