Ability Grouping and Self-Efficacy: Enhancing Competence in Middle Grades Mathematics

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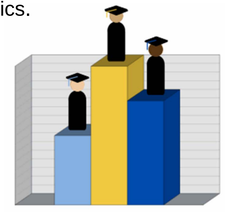
Abstract

Ability grouping has been prevalent in American schools for over a century (Burris & Welner, 2005; Slavin, 1990). Although ability grouping has been studied in terms of student performance, little research has examined the relationship between this practice and student motivation. The purpose of this study was to examine middle school students' (*N* = 1,880) mathematics self-efficacy and its sources in ability-grouped mathematics courses. Students responded to Likert scaled items assessing self-efficacy and its four sources (Bandura, 1997). Tests of mean differences in self-efficacy and its sources revealed that students in above-level courses reported significantly higher levels of self-efficacy than students in on- and below-level courses. Regression analysis revealed that mastery experiences, social persuasions, and negative physiological state predicted self-efficacy for above- and on-level students. Only mastery experiences and vicarious experiences predicted mathematics self-efficacy for below-level students. Results imply that teachers who work with students who are struggling in mathematics may find it beneficial to provide ample opportunity to expose students to models in mathematics.

Background and Purpose



- Ability grouping is characterized by grouping students of similar academic background together in separate classrooms or tracks (Mantle, 2013).
- Self-efficacy, the belief in one's ability to complete a given task, could potentially be affected by ability grouping practices within middle school math classrooms.
- The purpose of this study was to examine math self-efficacy and its development among middle school students in below-, on-, and above-level math courses.

Method

- Participants were students (*N* = 1,880) in Grades 6-8 who attended four middle schools in the Southeastern U.S. (49% female, 51% male; 53% White; 31% African American; 9% Hispanic, 4% Other, 3% Asian; and 53% qualified for free or reduced-price lunch).
- Students completed measures of general math self-efficacy, skills self-efficacy, and the four sources of self-efficacy in Fall 2011 and measures of general math self-efficacy and skills self-efficacy in Spring 2012.

Table 1
Ability Grouping Information by Student Grade Level and Course Name

Grade Level	Below-Level (*n* = 311)	On-Level (*n* = 1,367)	Above-Level (*n* = 601)
6		Mathematics 6	Pre-Algebra
7	Mathematics 7	Pre-Algebra	Algebra I
8	Mathematics 8 Pre-Algebra	Algebra I	Advanced Geometry

Note. School administrators stated that there were no below-level mathematics courses for sixth-grade students.

Analyses and Results

- One-way analysis of variance was conducted to examine self-efficacy ratings among students (see Table 2).
  - Above-level students reported higher levels of general math and skills self-efficacy than students in on- and below-level courses.
  - Below-level students had the lowest self-efficacy ratings.
- Multivariate analysis of variance was conducted to test for mean differences in the four sources of self-efficacy among students in each ability group (see Table 3).
  - Below-level students relied more on vicarious experiences than on-level or above-level students.
  - Above-level students reported higher levels of mastery experience and social persuasions.
- Both measures of self-efficacy were regressed on the four sources of self-efficacy for each ability group (see Table 4).
  - The four sources of self-efficacy explained 41% of the variance of students' general self-efficacy and 25% of students' skills self-efficacy in mathematics

Table 2
Mean Differences in General Mathematics Self-Efficacy and Skills Self-Efficacy

	df	*F*	*p*	η^2	Below-Level *M* (*SD*)	On-Level *M* (*SD*)	Above-Level *M* (*SD*)
General Self-Efficacy	2, 2057	8.52	<.001	.008	**4.56$_a$** (1.09)	**4.70$_b$** (1.09)	**4.87$_c$** (0.97)
Skills Self-Efficacy	2,2056	28.91	<.001	.027	**4.91$_a$** (0.94)	**5.06$_b$** (0.84)	**5.32$_c$** (0.66)

Note. Group means for a dependent variable (row) that are bold and followed by different letters are statistically different.

Table 3
Mean Differences in the Sources of Self-Efficacy

	df	*F*	*p*	η^2	Below-Level *M* (*SD*)	On-Level *M* (*SD*)	Above-Level *M* (*SD*)
Mastery Experience	2, 2097	16.902	<.001	.016	**4.12$_a$** (1.15)	4.24$_a$ (1.18)	**4.53$_b$** (1.06)
Vicarious Experience	2, 2097	5.802	.003	.006	3.99$_a$ (0.97)	**3.89$_a$** (0.99)	**4.05$_b$** (0.93)
Social Persuasion	2, 2097	17.186	<.001	.016	**3.88$_{ab}$** (1.23)	**3.82$_{ab}$** (1.29)	**4.19$_b$** (1.24)
Physiological State	2, 2097	1.116	.328	.001	2.62$_a$ (1.22)	2.60$_a$ (1.25)	2.52$_a$ (1.25)

Note. Group means for a dependent variable (row) that are bold and followed by different letters are statistically different.

Table 4
Multiple Linear Regression Results for the Prediction of Mathematics General Self-Efficacy and Skills Self-Efficacy

	General Self-Efficacy			Skills Self-Efficacy		
Variable	Below-Level	On-Level	Above-Level	Below-Level	On-Level	Above-Level
SES (β)	-.03	-.04	-.02	-.06	**-.05***	**-.15****
Mastery Experience (β)	**.48****	**.37****	**.31****	**.31****	**.24****	**.15***
Vicarious Experience (β)	**.23****	.06	.08	**.17***	**.10***	**.10***
Social Persuasion (β)	.07	**.16****	**.16***	.09	**.09***	**.17***
Physiological State (β)	-.04	**-.14****	**-.15***	-.08	**-.17****	-.07
F	52.41	155.96	58.40	21.02	77.84	25.03
Model	.52**	.41**	.36**	.29**	.26**	.19**

Note. *p < .05 **p < .001

Conclusions

- As previous studies have found, students in above-level courses believed themselves to be more capable than those students in on-level tracks and reported higher efficacy experiences in math than did their on-level or below-level peers (Usher & Pajares, 2009).
- By understanding the different sources students use to form their efficacy beliefs and incorporating these types of experiences into the curriculum, teachers and educators alike can enrich the experiences of students at all academic levels.
- Teachers who work with students who might be behind or struggling in mathematics may find it beneficial to provide ample opportunity to expose students to models in mathematics.
- Results may be helpful to researchers who study classroom operation and structure, because both of these things can expose learners to different sources of self-efficacy.
- To determine whether ability grouping and self-efficacy are causally related, future research could investigate the self-efficacy ratings of students who are randomly assigned to ability-grouped classrooms.

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