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The *Responsive Classroom* Approach and Fifth Grade Students' Math and Science Anxiety and Self-Efficacy

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Self-efficacy forecasts student persistence and achievement in challenging subjects. Thus, it is important to understand factors that contribute to students' self-efficacy, a key factor in their success in math and science. The current cross-sectional study examined the contribution of students' gender and math and science anxiety as well as schools' use of Social and Emotional Learning (SEL) practices to students' math and science self-efficacy. Fifth graders (n = 1,561) completed questionnaires regarding their feelings about math and science. Approximately half of the students attended schools implementing the *Responsive Classroom®* (*RC*) approach, an SEL intervention, as part of a randomized controlled trial. Results suggested no difference in math and science self-efficacy between boys and girls. Students who self-reported higher math and science anxiety also reported less self-efficacy toward these subjects. However, the negative association between students' anxiety and self-efficacy was attenuated in schools using more *RC* practices compared with those using fewer *RC* practices. *RC* practices were associated with higher science self-efficacy. Results highlight anxiety as contributing to poor self-efficacy in math and science and suggest that *RC* practices create classroom conditions in which students' anxiety is less strongly associated with negative beliefs about their ability to be successful in math and science.

Keywords: anxiety, math, science, self-efficacy, *Responsive Classroom* approach

Students' math and science achievement declines around the transition to middle school (Gonzales et al., 2008), a period when such achievement is considered integral to students' future curricular and career choices (Singh, Granville, & Dika, 2002). The decline creates the need to understand factors that may promote student success in math and science, such as students' self-efficacy beliefs. Evidence has indicated that students who feel more efficacious in math and science demonstrate higher achievement in these subjects (Borman & Overman, 2004; Britner & Pajares, 2001, 2006; Lau & Roeser, 2002; Pajares & Graham, 1999). Theory suggests that such students may not experience academic declines because strong self-efficacy fuels student persistence, even as tasks become more difficult (Bandura, 1997). Understanding child attributes and school conditions that foster elementary students' math and science self-efficacy may help school psychologists better understand ways schools can promote students' self-efficacy and support their achievement.

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The elementary school years represent a formative period for the development of self-efficacy (Bandura, 1997). However, there is little known about child and school factors that contribute to self-efficacy in math and science during this developmental period. Existing work implicates students' academic anxiety (Britner & Pajares, 2006; Lopez & Lent, 1992) and gender (i.e., being a girl; Fast et al., 2010; Lau & Roeser, 2002) as child attributes likely associated with having lower math and science efficacy. Children's experiences at school appear to play a role, as well (Bandura, 1997; Fast et al., 2010; Patrick, Ryan, & Kaplan, 2007). Social and Emotional Learning (SEL) approaches to instruction have the goal of enhancing students' self-efficacy (Zins & Elias, 2006) through a focus on creating caring, emotionally supportive learning environments in which teachers encourage positive peer interactions (Collaborative for Academic, Social, & Emotional Learning, 2003). However, associations between SEL practices and math and science self-efficacy during the elementary years remain understudied.

The present study bridged two areas of inquiry—one that describes links among student anxiety, gender, and self-efficacy in math and science (Britner & Pajares, 2006; Joët, Usher, & Bressoux, 2011; Lau & Roeser, 2002; Lent, Lopez, Brown, & Gore, 1996) and the other that considers the role of SEL practices in shaping students' self-perceptions (Linares et al., 2005; Solomon, Battistich, Watson, Schaps, & Lewis, 2000). Some existing work has described classroom characteristics that predict increased student math self-efficacy (Fast et al., 2010; Patrick et al., 2007), but the work does not consider the role of interventions in those associations. Existing studies also have examined the contribution of SEL practices to students' sense of self (Linares et al., 2005; Solomon et al., 2000), but they have not addressed students' self-perceptions pertinent to math or science. The present study extended existing work by considering anxiety and self-efficacy in math and science and by examining the role of an SEL (i.e., *Responsive Classroom*® [*RC*]; Northeast Foundation for Children, 2007a, 2007b, 2010) intervention in shaping associations between these student feelings and beliefs.

Anxiety and Self-Efficacy in Math and Science

Students' anxiety in academic settings contributes to poor self-efficacy (Usher & Pajares, 2008), theoretically because they interpret anxious feelings as evidence they will be unsuccessful (Bandura, 1997). Anxiety specific to math and science emerges as early as midelementary school (Chiarelott & Czerniak, 1985; Gierl & Bisanz, 1995), but few studies have examined whether anxiety relates to self-efficacy in elementary samples. Research on French elementary students indicated no associations between students' math anxiety and self-efficacy (Joët et al., 2011). By contrast, studies of U.S. middle and high school students suggested that those experiencing greater math anxiety believe themselves to be less efficacious toward solving math problems (Lent et al., 1996; Lopez & Lent, 1992; Lopez, Lent, Brown, & Gore, 1997; Pajares & Urdan, 1996). Likewise, U.S. upper grade students with greater science anxiety have reported less self-efficacy toward earning high science grades (Britner, 2008; Britner & Pajares, 2006). Given the importance of self-efficacy for promoting math and science achievement (Lau & Roeser, 2002; Pajares & Graham, 1999), the present study examined the extent to which anxiety is associated with poorer math and science self-efficacy among U.S. fifth graders.

Gender and Self-Efficacy in Math and Science

Students' gender has implications for their self-efficacy, an issue that begs attention in efforts to create equal access to math and science for boys and girls. Focus on this issue is fueled by findings suggesting that low math performance among undergraduate women is largely attributable to low self-efficacy (Pajares & Miller, 1994). Boys exhibited higher efficacy toward math than girls in studies involving U.S. and French students in grades 3–7 (Fast et al., 2010; Friedel, Cortina, Turner, & Midgley, 2010; Joët et al., 2011). Two explanations are most plausible. First, actual gender differences in math performance exist—boys gradually outperform girls over the elementary school years, with differences reaching their maximum in fifth grade (Robinson & Lubienski, 2011).

Second, links between gender and self-efficacy may be rooted in gender stereotypes. Stereotypical beliefs that boys are more competent in math than girls emerge during elementary school (Cvencek, Meltzoff, & Greenwald, 2011), which may help explain why boys believe themselves more efficacious than girls. To date, researchers have yet to examine gender differences in science self-efficacy among elementary school students. Whereas in one previous study high school girls reported less science self-efficacy than boys (Lau & Roeser, 2002), more recent studies have suggested the opposite pattern (Britner, 2008; Britner & Pajares, 2001, 2006). Together, findings underscore the importance of determining whether elementary girls believe themselves to be less efficacious in math and science than boys to intervene early and support their persistence in these subjects.

RC Practices and Students' Self-Efficacy in Math and Science

There is increasing national interest in schools implementing SEL programming (Collaborative for Academic, Social, & Emotional Learning, 2013). This trend underscores the importance of examining the extent to which SEL practices predict student psychological states such as their self-efficacy beliefs. One study that addressed this question involves a quasi-experimental investigation of the Unique Minds School Program. Results suggested links between being in an elementary school implementing this program and increased student-reported academic self-efficacy over time (Linares et al., 2005). The present study focused on a different SEL intervention, the *RC* approach. The *RC* approach is designed to help teachers create safe, supportive classroom climates conducive to academic learning (Northeast Foundation for Children, 2010). The *RC* approach consists of seven principles about teaching and 10 practices that emanate from those principles (see Table 1). Teachers use a Morning Meeting in which teachers and students gather together daily to engage in greetings, activities, and preparation for the day. In theory, daily use of the Morning Meeting provides opportunities for children to practice prosocial skills and develop a sense of community. Teachers learn Teacher Language that considers children's feelings, reflects teachers' abilities to see issues from the child's perspective, offers encouragement, and supports

Table 1
RC Principles and Practices

Principles	
• The social curriculum is as important as the academic curriculum	
• How children learn is as important as what they learn	
• The greatest cognitive growth occurs through social interaction	
• To be successful academically and socially, children need a set of social skills	
• As teachers, knowing the children is as important as knowing the content	
• As teachers, knowing and partnering with children's families is essential	
• How adults at school work together is critical	
Practices	
Morning Meeting	Structured class meetings where teachers and students greet each other, share news, and engage students in the learning ahead
Guided Discovery	Procedure for introducing classroom materials to students in a way that promotes interest and understanding
Interactive Modeling	Techniques for modeling classroom expectations for students
Academic Choice	Procedure where teachers allow students choices regarding their learning
Rule Creation	Process where teachers and students collaborate to generate classroom rules
Collaborative Problem-Solving	Procedures for resolving conflicts with students in peaceful ways
Classroom Organization	Techniques for arranging the physical classroom space to promote student collaboration
Positive Teacher Language	Techniques where teachers use words that convey warmth and caring and support learning
Logical Consequences	Procedures for addressing student misbehavior in a thoughtful, caring way
Working with Families	Procedures for teachers to collaborate with students' families

Note. Northeast Foundation for Children, 2010.

students' mastery orientations by emphasizing the process of learning and not only performance. Students in *RC* classrooms engage in Rule Creation, and teachers use Logical Consequences to proactively establish rules, include students in the process of creating rules, support students' development of autonomy, and respond to misbehavior in ways that demonstrate respect for students. Teachers use Interactive Modeling to teach behavior and the skills necessary for group work among peers. The practices of Guided Discovery and Academic Choice orient students to learning materials and allow them academic freedoms in ways that theoretically build confidence and mastery. Lastly, teachers use Classroom Organization to create a physical space that supports positive peer interactions and group work, and they use Collaborative Problem-Solving to help students maintain positive working relationships with one another.

Taken together, *RC* practices are intended to improve classroom social environments and facilitate more positive and instructionally productive interactions among teachers and peers, an association recently described (Abry, Rimm-Kaufman, Larsen, & Brewer, 2013). Germane to the present study, the changes in practice intended and produced by the *RC* approach resemble the types of practices linked to children reporting greater self-efficacy in mathematics. For instance, upper elementary students who perceived their teachers to be more mastery-oriented and emotionally supportive also reported having higher math self-efficacy (Fast et al., 2010; Patrick et al., 2007). Specifically, students reported higher math self-efficacy when they perceived that their teachers emphasized effort and understanding (analogous to the *RC* principle of emphasizing the process of learning and not just the product; Fast et al., 2010) and encouraged students to discuss academic material with one another (Patrick et al., 2007). Similar findings occur among middle school samples. Students who reported that their teachers promote mutual respect and positive peer interactions also self-reported increased math self-efficacy from seventh to eighth grade (Ryan & Patrick, 2001). There also is evidence that teachers' modeling of a mastery orientation influences students to adopt similar orientations, which in turn relates to greater math self-efficacy in middle school (Friedel, Cortina, Turner, & Midgley, 2007). Such work combined with findings linking *RC* practices to improved teacher-student interactions in third and fourth grade (Abry et al., 2013) establishes a rationale for examining the extent to which implementation of *RC* practices relates to elementary students' math self-efficacy. There is an equivalent need to assess associations between such classroom practices and students' science-related beliefs during the elementary years.

In theory, *RC* practices may support self-efficacy for students' with high math and science anxiety. Anxiety is thought to inhibit self-efficacy because students interpret anxious feelings to mean they will not perform well (Bandura, 1997). Theory suggests that teachers' use of emotional support and emphasis on students' efforts (instead of stress and undue pressure around achievement) may help counteract students' anxiety-driven negative interpretations of their abilities in math and science. In turn, anxiety may be less associated with students having poor self-efficacy when exposed to emotionally supportive classroom practices such as those represented in the *RC* approach.

Current Study

The present exploratory study addressed three research questions. First, to what extent do student attributes (anxiety about math and science; gender) contribute to students' self-efficacy toward math and science? We hypothesized that students who were more anxious about math and science would report less efficacy toward these subjects. Further, we expected greater math and science self-efficacy among boys than girls.

Second, do students attending schools implementing more *RC* practices report greater self-efficacy in math and science? The present study examined the association between *RC* practices and self-efficacy in math and science in a subset of schools enrolled in a randomized controlled trial of the *RC* approach. Given the overlap between *RC* practices and classroom practices (e.g., emotional sensitivity, language that promotes mastery orientation) demonstrated to be important for student self-efficacy, we hypothesized that exposure to *RC* practices would be associated positively with math and science self-efficacy beyond the influence of students' gender and anxiety.

Third, are there reduced links between students' high anxiety and low self-efficacy in the presence of *RC* practices? We expected that greater student exposure to *RC* practices would attenuate the negative association between anxiety and self-efficacy in math and science.

Method

Participants

Twenty-four elementary schools were enrolled in a 3-year randomized controlled trial of the *RC* approach, the Responsive Classroom Efficacy Study (RCES; described in greater detail in Rimm-Kaufman et al., 2013) in 2007. The 24 schools were in a large ethnically and socioeconomically diverse school district located in a mid-Atlantic state. In 2010, corresponding to the third year of RCES, study schools were invited to participate in a more intensive child-level data collection of fifth grade students. Twenty schools (12 intervention, 8 control) enrolled. The 20 schools had between 2 and 7 fifth grade classrooms (M = 3.80, SD = 1.28).

Fifth grade math teachers at these 20 schools were invited to participate, resulting in a sample of 62 math teachers (34 intervention, 28 control) teaching 76 math classrooms (40 intervention, 36 control). The response rate for teachers exceeded 95%. Students in these classrooms were invited to complete questionnaires as part of the normal educational practice at the school, resulting in a sample of 1,561 fifth graders (797 intervention, 764 control).

Intervention and control schools did not differ in percentage of students eligible for free and reduced price lunch (FRPL) or holding English Language Learner (ELL) status. Further, the 20 schools participating in the child-level data collection did not differ on FRPL and ELL percentages from the 4 schools that did not enroll.

Procedure

Study procedures were approved by internal review boards for the university and participating school district. All fifth grade teachers in the *RC* condition participated in two week-long institutes taken during two consecutive summers (*RC 1* in 2009 and *RC 2* in 2010) led by certified *RC* trainers. In 2010–2011, *RC* consultants provided in-school coaching involving three consultation sessions plus individualized, on-demand, follow-up with teachers. Teachers received manuals, *RC* books, and access to online and print *RC* materials.

Comparison schools used "business as usual" approaches to social and emotional learning and classroom management. Principals in the control schools reported using an amalgamation of programs varying in intensity, often delivered by school guidance counselors. Programs included antibullying efforts, character education curricula, and school-wide programs, which often utilize reward systems geared toward improved social skills and behavior—programs not adopted by intervention schools.

Data were gathered in 2010–2011 via three sources. In the spring of 2011, data were provided by the school district regarding student demographic characteristics. Also in the spring, survey data were gathered to measure teachers' use of *RC* practices. Finally, in the fall of 2010, student-report data were gathered to measure student self-efficacy, anxiety, gender, and age. Teachers administered student-report measures at the beginning of math class on a single day after specific instructions. Teacher administration was used to optimize student comfort and minimize instructional interruptions. Students independently completed measures in less than 10 minutes.

Measures

Student feelings and beliefs about math and science. The *Self-Efficacy and Anxiety Questionnaire* is a 20-item survey adapted from existing measures to be specific to math and science (e.g., "my math class" instead of "this class"). Original response scales were modified to a uniform 4-point scale (1 = *almost never*, 2 = *sometimes*, 3 = *most of the time*, 4 = *almost all of the time*).

Self-efficacy. Students responded to 10 items on self-efficacy: 5 related to math and 5 related to science. Example items include "I know I can learn the skills taught in math this year" and "I can learn science, even if the work is hard". Items from the Academic Efficacy subscale of the Patterns of Adaptive Learning Scales (PALS; Midgley et al., 2000), a widely used measure of student perceptions, were adapted to apply to math and science. The original PALS self-efficacy subscale demonstrated reliability among fifth graders ($\alpha = .78$; Midgley et al., 2000). Scores were averaged to create one math and one science self-efficacy score for each student ($\alpha = .82$ and $\alpha = .84$ in the current sample, respectively).

Anxiety. Students completed 10 items, 5 assessing their anxiety toward math and 5 toward science. Example items include "I feel nervous when I do math because I think it's too hard" and "I'm usually calm during science tests [reverse scored]", which were adapted (as described above) from the Math Anxiety subscale of the Student Beliefs about Mathematics survey (Owens et al., 2007; original $\alpha = .89$). Scores were averaged to create a mean math ($\alpha = .61$) and mean science ($\alpha = .62$) anxiety score. Reliability estimates for the present sample were low by conventional standards, but they correspond to estimates for self-report data on elementary-aged children (Guhn et al., 2012; McMahon, Parnes, Keys, & Viola, 2008).

***RC* practices.** As part of RCES, teachers reported on their fidelity of implementation to *RC* practices using two methods, each with established reliability and validity (Abry et al., 2013). Because *RC* practices share features of commonly used classroom practices, the presence of *RC* practices in control schools could be expected. Please see Rimm-Kaufman, Curby, Abry, and Thomas (2013) for a description of this issue. Both measures omitted *RC* terminology to enable data collection in *RC* and control conditions. However, because the measures were custom-designed to assess use of *RC* practices, this terminology is used throughout. The present study used students' math teachers' reports of use of *RC* practices. The *Classroom Practices Teacher Survey* (CPTS; Nathanson, Sawyer, & Rimm-Kaufman, 2007b) is a 46-item teacher report of their adherence to *RC* practices rated on a 5-point scale (*not at all characteristic* to *extremely characteristic*). The CPTS demonstrated reliability among fifth grade teachers ($\alpha = .91$). Using the 11-item *Classroom Practices Frequency Survey* (CPFS; Nathanson, Sawyer, & Rimm-Kaufman, 2007a), teachers rated the frequency of their use of *RC* practices on an 8-point scale (*almost never* to *more than once per day*). The CPFS demonstrated reliability among fifth grade teachers ($\alpha = .84$). Teachers' reports of use of *RC* practices (using CPTS and CPFS) correlated with reliable, empirically validated observations of teachers' use of *RC* practices in their math classes using the *Classroom Practices Observation Measure* (CPOM; Abry, Brewer, Nathanson, Sawyer, & Rimm-Kaufman, 2010) at $p < .001$ ($r = .77$ and $r = .76$, respectively).

Although math teachers' reports were used in the current study, the CPTS and CPFS assessed each teacher's use of *RC* practices across all of their classes. Because many students in the current district change classes during the day, the current measure of *RC* practices reflects teachers' use of (and thus, students' exposure to) *RC* practices throughout the day. Teachers' CPTS and CPFS scores were averaged and aggregated at the school level to further capture students' exposure to *RC* practices across teachers. Teacher-reported use of *RC* practices was significantly higher in *RC* schools ($M = 3.13$, $SD = .24$) relative to comparison schools ($M = 2.37$, $SD = .26$; $t(18) = -6.65$, $p < .001$), supporting the ability of the current measures to differentiate between schools implementing the *RC* approach and control schools. Differences between *RC* and control schools in teacher-reported use of *RC* practices were large ($d = 3.04$).

Student demographic characteristics. Students reported their gender (1 = female) and date of birth (converted to months) when completing the *Self-Efficacy and Anxiety Questionnaire*. The school-level percent FRPL and ELL variables were garnered from records compiled by districts.

Analytic Approach

Preliminary analyses indicated mild ceiling effects for self-efficacy and floor effects for anxiety (i.e., students reported overall high self-efficacy and low anxiety). However, skewness values were within the acceptable range of ± 2 (Lewis-Beck, Bryman, & Liao, 2004); thus, original values were maintained in all analyses. Hierarchical Linear Modeling (HLM; Raudenbush & Bryk, 2002) conducted in HLM 6.06 software (Raudenbush, Bryk, & Congdon, 2004) was used for all primary analyses to account for the nested data structure (i.e., students within classrooms within schools) and any dependence in outcomes associated with such nesting. We calculated intraclass correlations

(ICCs) using unconditional models to ascertain the proportion of variance existing at each level. For math, ICCs were .08 for Level 1 (child), .92 for Level 2 (classroom), and .00 for Level 3 (school). For science, ICCs were .08 for Level 1, .89 for Level 2, and .03 for Level 3.

To examine the first research question, two three-level HLM models were analyzed (one for math and one for science). For brevity, we describe the math models here (science models were identical). Students' self-efficacy served as the dependent variable. Students' gender and math anxiety were each entered at Level 1 to assess their predictive value for students' math self-efficacy. Students' age was entered as a covariate at Level 1. The classroom mean for student math anxiety was entered at Level 2 to control for varying classroom levels of anxiety (Paccagnella, 2006). Covariates representing school-level percentage FRPL and ELL were entered at Level 3. Continuous Level 1 predictors were group-mean centered and continuous Level 2 and 3 predictors were grand-mean centered (Enders & Tofighi, 2007). For models addressing the second research question, the level of *RC* practices present among schools was added as a main effect at Level 3. Given that four of the schools originally randomized in RCES did not participate in the intensive child-level data collection, we used the level of *RC* practices present at each school as a predictor instead of treatment assignment. To test the third hypothesis regarding cross-level interactions between *RC* practices and student math anxiety, we entered *RC* practices at Level 3 as a predictor of the slope of the association between anxiety and self-efficacy. Significant interactions were probed according to Aiken and West (1991). Given the potentially curvilinear relationship between anxiety and self-efficacy (Usher & Pajares, 2006a, 2006b), a quadratic term for anxiety was tested at Level 1 in all models; however, this addition resulted in less than a 1% increase in the variance explained; thus, the term was excluded from final models. Missing student-level data occurred when students omitted items; however, these missing data were minimal, never exceeding 6% of the sample for any variable. Full maximum likelihood estimation in HLM was utilized.

As an estimate of effect size, we computed the percentage of variance explained from the unconditional model (containing no predictors) to the new model (after including the independent variables of interest).

Final model:

Level-1: $Y_{ij} = \pi_0 + \pi_1(\text{gender}) + \pi_2(\text{age}) + \pi_3(\text{math anxiety}) + e_{ij}$

Level-2: $\pi_0 = \beta_{00} + \beta_{01}(\text{classroom math anxiety}) + r_0$

$\pi_1 = \beta_{10}$

$\pi_2 = \beta_{20}$

$\pi_3 = \beta_{30}$

Level-3: $\beta_{00} = \gamma_{000} + \gamma_{001}(RC\text{ practices}) + \gamma_{002}(\text{FRPL}) + \gamma_{003}(\text{ELL}) + u_{00}$

$\beta_{01} = \gamma_{010}$

$\beta_{10} = \gamma_{100}$

$\beta_{20} = \gamma_{200}$

$\beta_{30} = \gamma_{300} + \gamma_{301}(RC\text{ practices})$

Results

Preliminary Analyses

Correlations and descriptive statistics are presented in Table 2. Boys and girls reported similar math self-efficacy, $t(1440) = 1.34$, $p = .18$ ($M = 3.31$, $SD = .58$ and $M = 3.26$, $SD = .59$, respectively). Boys reported greater self-efficacy toward science ($M = 3.35$, $SD = .58$) than girls ($M = 3.28$, $SD = .61$), $t(1450) = 2.28$, $p < .05$, although this difference was small ($d = .12$). Boys also reported less math ($M = 1.69$, $SD = .55$) and science ($M = 1.65$, $SD = .54$) anxiety than girls ($M = 1.79$, $SD = .58$ and $M = 1.80$, $SD = .59$, respectively), $t(1437) = -3.37$, $p = .001$ and $t(1447) = -5.07$, $p < .001$, respectively. Differences were small for math ($d = -.18$) and science ($d = -.27$). Bivariate correlations indicated that students in schools with higher percentages of FRPL and ELL reported greater anxiety and lower self-efficacy toward math and science (see Table 2).

Model 1: Anxiety and Gender as Predictors of Math and Science Self-Efficacy

Findings suggested no gender differences in math or science self-efficacy when students' anxiety was controlled, contrary to our hypothesis. In math and science, greater anxiety predicted less self-efficacy when controlling for students' gender and other covariates (see Tables 3 and 4).

Table 2
Correlations and Descriptive Statistics for Study Variables

Variable	1	2	3	4	5	6	7	8	9
Student-level									
1. Gender (1 = girl)	—								
2. Age (in months)	−0.14***	—							
3. Math anxiety	0.09**	0.02	—						
4. Science anxiety	0.13***	−0.06*	0.50***	—					
5. Math self-efficacy	−0.04	−0.04	−0.46***	−0.22***	—				
6. Science self-efficacy	−0.06*	0.00	−0.22***	−0.51***	0.53***	—			
School-level									
7. FRPL (percent)	0.05†	0.04	0.13***	0.19***	−0.07**	−0.14***	—		
8. ELL (percent)	0.06*	0.06*	0.12***	0.17***	−0.06*	−0.14***	0.91***	—	
9. *RC* practices	0.05*	−0.01	0.05*	0.10***	−0.02	−0.05*	0.36	0.41	—
N	1,467	1,517	1,528	1,539	1,531	1,543	20[a]	20[a]	20[a]
M	0.50	136.87	1.74	1.73	3.28	3.30	33.36	30.82	2.82
SD	0.50	4.95	0.57	0.57	0.59	0.60	25.01	18.62	0.45
Min	0	117	1.00	1.00	1.20	1.00	2.14	6.22	1.83
Max	1	190	4.00	4.00	4.00	4.00	83.09	74.02	3.57

[a] Indicates a school-level sample size.
† $p = .05$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Model 2: Use of RC Practices and Students' Math and Science Self-Efficacy

Contrary to our hypothesis, there was no main effect of *RC* practices on math self-efficacy (see Table 3). However, there was a significant main effect for *RC* practices with regard to science such that *RC* practices were associated with greater science self-efficacy when controlling for students' gender, anxiety, and other covariates (see Table 4).

Model 3: RC Practices Moderate Associations Between Anxiety and Self-Efficacy in Math and Science

Findings revealed significant *RC* × anxiety interactions in predicting self-efficacy for

Table 3
Predictors of Math Self-Efficacy

Fixed Effects	Model 1 Coeff(*SE*)	Model 1 *p*	Model 2 Coeff(*SE*)	Model 2 *p*	Model 3 Coeff(*SE*)	Model 3 *p*
Level 1						
Intercept	3.26 (.02)	<.001	3.26 (.02)	<.001	3.26 (.02)	<.001
Age (mo)	−0.01 (.00)	0.099	−0.01 (.00)	0.104	−0.01 (.00)	0.109
Gender (1 = girl)	0.02 (.03)	0.532	0.02 (.03)	0.545	0.02 (.03)	0.502
Math anxiety[a]	−0.44 (.03)	<.001	−0.44 (.03)	<.001	−0.44 (03)	<.001
Level 2						
Classroom math anxiety	−0.81 (.09)	<.001	−0.81 (.09)	<.001	−0.81 (.09)	<.001
Level 3						
FRPL (%)	0.00 (.00)	0.686	0.00 (.00)	0.629	0.00 (.00)	0.630
ELL (%)	0.00 (.00)	1.000	0.00 (.00)	0.845	0.00 (.00)	0.844
RC practices	—	—	0.04 (.04)	0.392	0.04 (.04)	0.392
RC practices × math anxiety	—	—	—	—	0.15 (.06)	0.012
Variance explained from unconditional model						
Level 1	18.69%		18.70%		19.11%	
Level 2	75.33%		75.93%		75.52%	
Level 3	100%		100%		100%	

[a] Group mean centered.

Table 4
Predictors of Science Self-Efficacy

	Model 1		Model 2		Model 3	
Fixed effects	Coeff(*SE*)	*p*	Coeff(*SE*)	*p*	Coeff(*SE*)	*p*
Level 1						
Intercept	3.29 (.02)	<.001	3.29 (.02)	<.001	3.29 (.02)	<.001
Age (mo)	0.00 (.00)	0.625	0.00 (.00)	0.661	0.00 (.00)	0.660
Gender (1 = girl)	0.02 (.03)	0.385	0.02 (.03)	0.415	0.02 (.03)	0.413
Science anxiety[a]	−0.48 (.03)	<.001	−0.48 (.03)	<.001	−0.49 (.03)	<.001
Level 2						
Classroom science anxiety	−0.97 (.09)	<.001	−1.00 (.09)	<.001	−1.00 (.09)	<.001
Level 3						
FRPL (%)	0.00 (.00)	0.431	0.00 (.00)	0.278	0.00 (.00)	0.279
ELL (%)	0.00 (.00)	0.741	0.00 (.00)	0.385	0.00 (.00)	0.386
RC practices	—	—	0.10 (.04)	0.026	0.10 (.04)	0.026
RC practices × science anxiety	—	—	—	—	0.16 (.06)	0.005
Variance explained from unconditional model						
Level 1	23.29%		23.27%		23.73%	
Level 2	72.45%		77.67%		77.40%	
Level 3	98.72%		99.91%		99.91%	

[a] Group mean centered.

math and science (see Tables 3 and 4). Negative associations between anxiety and self-efficacy were attenuated when students were in schools implementing more teacher-reported *RC* practices ($\beta = -.68$, $p < .001$ for math and $\beta = -.76$, $p < .001$ for science) relative to fewer *RC* practices ($\beta = -.79$, $p < .001$ for math and $\beta = -.88$, $p < .001$ for science; see Figure 1). For students high in math anxiety (1 *SD* above the mean), those in schools exhibiting more *RC* practices are predicted to have self-efficacy scores of 3.06. These students' predicted self-efficacy when in schools exhibiting fewer *RC* practices is 2.95. The predicted self-efficacy score for students 1 *SD* above the mean of science anxiety would be 3.10 when in a school exhibiting more *RC* practices. These students would be estimated to have, on average, self-efficacy scores equal to 2.93 when in classrooms demonstrating fewer *RC* practices. Both differences equate to roughly one quar-

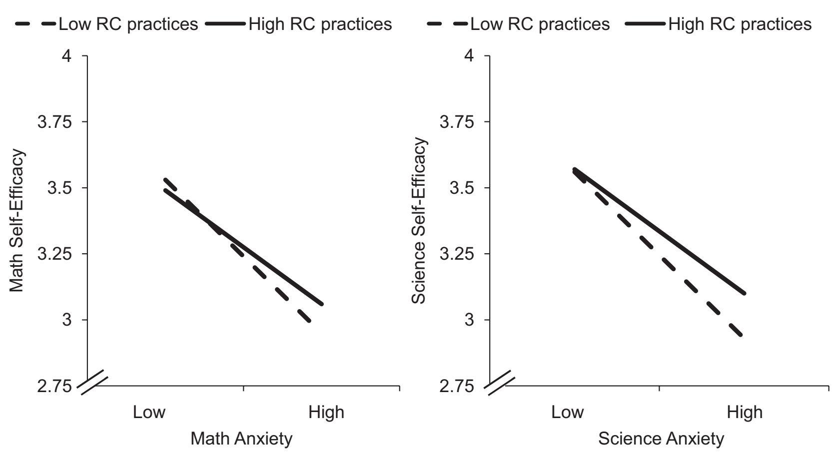

Figure 1. RC practices attenuate associations between anxiety and self-efficacy in math and science.

ter of a standard deviation in student self-efficacy.

Follow-Up Analyses

We reconducted Models 2 and 3 using dichotomous assignment to *RC* condition ($0 =$ control; $1 =$ *RC*) instead of continuous *RC* practices. Findings were consistent in significance, magnitude, and direction with the exception of the interaction involving *RC* $\times$ math anxiety predicting math self-efficacy, which dipped just below the traditional cutoff for statistical significance ($p = .056$).

Discussion

Strong self-efficacy beliefs promote students' achievement in math and science (Lau & Roeser, 2002; Pajares & Graham, 1999). There is currently a dearth of research examining child and school factors that contribute to these critical self-perceptions in math and science, subjects in which student achievement often declines upon transitioning to middle school (Gonzales et al., 2008). The purpose of the current study was to examine the contributions of student gender and anxiety in math and science as well as the *RC* approach, an SEL intervention, to math and science self-efficacy among fifth graders. Results suggested that students who reported feeling more anxious about math and science also reported less efficacy toward these subjects. Results also indicated that boys and girls report similar levels of self-efficacy in math and science. Students in schools implementing more *RC* practices reported greater self-efficacy in science. Further, exposure to *RC* practices was associated with an attenuated negative correlation between student anxiety and self-efficacy in math and science. In the present study, students experiencing greater math and science anxiety were less likely to experience poor self-efficacy when they were exposed to more *RC* practices.

Current findings reflected no differences between boys and girls in their self-efficacy toward math or science (in analyses controlling for anxiety). Findings are inconsistent with recent studies suggesting that elementary school girls have lower math self-efficacy than elementary school boys (Fast et al., 2010; Joët et al., 2011). One explanation for the discrepancy between past and present work is that the present study controlled for children's levels of math and science anxiety, which is frequently greater among girls than boys (Britner & Pajares, 2001, 2006; Hyde, Fennema, Ryan, Frost, & Hopp, 1990). Thus, once anxiety is controlled, boys and girls may believe themselves similarly efficacious toward math and science. Another plausible explanation is that gender differences in math and science self-efficacy are better established after the elementary years (Gierl & Bisanz, 1995; Pajares, 2005).

Present findings also add to literature linking SEL practices, such as teachers' provision of emotional support and emphasis on mastery in learning, to students' self-efficacy (Fast et al., 2010; Patrick et al., 2007). Specifically, current results provide evidence that exposure to *RC* practices is associated with greater self-efficacy in science, but not math. One plausible mechanism for the positive science finding is that *RC* practices foster a caring classroom environment, thus resulting in teacher-student and peer interactions that enhance self-efficacy. Another possibility involves the *RC* principle that encourages teachers to focus on the process of learning, not just the product. By focusing on the process, it is possible that teachers help children observe their incremental progress, perhaps explaining enhanced self-efficacy. Teachers may have an easier time applying *RC* practices (such as Academic Choice) to science than math content because in fifth grade, science content lends itself to more individualized inquiry in specific areas of interest than math. This may be one explanation for the lack of association between *RC* practices and math self-efficacy. Alternatively, there may be other predictors of math self-efficacy requiring further study. For instance, students' experiences of mastering academic content represent another well-established source of academic self-efficacy (Usher & Pajares, 2008).

Findings indicated that *RC* practices were associated with reduced relation between anxiety and low math and science self-efficacy for students experiencing high anxiety in these subjects. *RC* teachers are trained to understand and be sensitive to children's individual needs and to create well-organized classroom environments in which children feel safe taking academic risks. Although causal associations cannot be inferred, exposure to *RC* practices (or practices that offer comparable support) may be useful for children with initial unease about math and science.

To date, most research involving self-efficacy and anxiety pertains to math. In the current study, the presence of *RC* practices was associated with attenuated links between high anxiety and poor self-efficacy in math and science. Findings underscore the importance of considering teaching practices as important for promoting students' self-efficacy toward science, an area previously underexplored in the existing literature.

Implications for School Psychologists

Findings have two key implications for school psychologists. First, practitioners may consider that students who are highly anxious about math and science may also believe themselves to be less efficacious (perhaps unnecessarily) toward these subjects. Second, although the study design does not permit prescriptive recommendations about the *RC* approach, school psychologists may consider the potential benefit of schools' use of *RC* practices or similar classroom practices, particularly for students who may be experiencing high math and science anxiety.

Strengths and Limitations

Several strengths require mention. This study utilized a large, sociodemographically diverse sample, which enhances generalizability of the findings. Results also shed light on student beliefs during middle childhood, a critical developmental period for fostering emotional well-being (Schonert-Riechl, 2007). In addition, this study advances knowledge pertaining to students' feelings and beliefs toward science, an area that is relatively underexplored, especially as compared with math. Limitations also exist. Students completed questionnaires on a single day, in the presence of classroom teachers and peers, and during math but not science—all factors challenging the validity and reliability of our findings. Given that students were nested within their math classrooms, analyses used math teachers' reports of *RC* practices. Although steps were taken to account for this (i.e., aggregating *RC* practices to the school level), and although most math teachers also taught science, we cannot be completely certain of the level of *RC* practices exhibited in science classrooms. Also, the reliability of the student-reported anxiety scale was somewhat low by conventional standards. Lastly, the analyses using *RC* practices as a predictor rather than intervention assignment requires cautious interpretation in that we cannot infer causality.

Future Directions

Future work could examine whether mitigated associations between anxiety and self-efficacy relate to higher math and science achievement. It also will be important to consider other child attributes (e.g., classroom engagement) that may influence math and science self-efficacy. Researchers also could consider how teachers' own math anxiety might negatively affect their efficacy toward teaching math and science (Bursal & Paznokas, 2006; Gresham, 2008), and in turn, the extent to which these negative feelings are transferred to students. The *RC* approach does not directly address teachers' anxiety, but previous studies suggest that it predicts improved teacher self-efficacy (Rimm-Kaufman & Sawyer, 2004). Future work could explore whether teachers' implementation of the *RC* approach attenuates a link between their anxiety about teaching math and/or science and their self-efficacy toward teaching these subjects.

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