



Published in final edited form as:

Child Dev. 2015 May ; 86(3): 945–954. doi:10.1111/cdev.12344.

Depressive Symptoms in 3rd Grade Teachers: Relations to Classroom Quality and Student Achievement

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Abstract

This study investigated associations among third grade teachers' ($n = 27$) symptoms of depression, quality of the classroom-learning environment (CLE), and students' ($n = 523$, mean age 8.6 years) math and literacy performance. Teachers' depressive symptoms in the winter negatively predicted students' spring mathematics achievement. This depended on students' fall mathematics scores; students who began the year with weaker math skills and were in classrooms where teachers reported more depressive symptoms achieved smaller gains than did peers whose teachers reported fewer symptoms. Teachers' depressive symptoms were negatively associated with quality of CLE, and quality of CLE mediated the association between depressive symptoms and student achievement. Findings point to the importance of teachers' mental health, with implications for policy and practice.

Keywords

teacher characteristics; classroom quality; depression; mathematics; literacy

The purpose of this study is to explore the extent to which teachers' depressive symptoms affect the quality of the classroom-learning environment (CLE) and students' academic achievement in third-grade. Third grade is a critical juncture in young children's academic development and in many states in the US is the first year that students' achievement will be tested using high stakes assessments. Schools and teachers are judged based on third graders' academic performance with reputation, funding, and jobs at stake. Moreover, and perhaps more importantly, students who are not reading well by the end of third grade are less likely to experience long term academic and life success (Reynolds & Ou, 2004; Spira, Bracken, & Fischel, 2005).

Following dynamic systems theories (Yoshikawa & Hsueh, 2001), specifically the bio-ecological model of development (Bronfenbrenner & Morris, 2006), we conceptualize the classroom as a complex microsystem that includes key sources of influence that impact students' development. According to Bronfenbrenner & Morris (2006, pg. 796) "growing hecticness, instability and chaos in the principle settings in which human competence and character are shaped are considered harmful to development." Thus, we conjecture that a

teachers' expression of depressive symptoms within the CLE might contribute to its instability, leading to negative implications for students' developmental processes.

A significant innovation of this study is its conceptualization of depression as an ongoing constellation of symptoms. Related research has examined individual correlates of depression, such as stress or career burnout (Chang, 2009; Hamre et al., 2008; Roeser, Skinner et al., 2012); however few have studied such symptoms concurrently as a constellation of symptoms. We conjecture that teachers with diagnosable clinical depression, i.e. teachers who experience multiple symptoms, are different from those who are temporarily suffering from individual symptoms, such as stress. Although the use of clinical diagnosis is beyond the scope of this study, our assessment of depression *risk* based on comprehensive symptomatology is a valuable first step towards more clearly defined research in this area. An additional innovation is the consideration of the quality of the CLE and student *academic* outcomes whereas others focus on teacher performance and belief outcomes.

Foundational Research in Clinical Depression

Clinical depression is recognized by the DSM V as a mental disorder and is characterized by ongoing negative mood, low self-esteem, and a loss of interest or pleasure in enjoyable activities (American Psychiatric Association, 2013). Diagnosis is based on self-reporting and evaluation by a clinician; a certain number of symptoms must be present for an ongoing amount of time in order to qualify diagnosis. Clinical depression is the leading cause of disability in U.S. citizens between the ages of 15 and 44, and affects approximately 6.7% of the population. The median onset age of depression is 32, and it has been found to be more prevalent in women (NIH, 2013).

The adverse effects of maternal depression on child development have been well documented. Children of depressed mothers exhibit poorer academic and social competence and more behavioral problems (Murray & Cooper 1997; Supplee et. al 2004). High quality mother-child relationships have been found to buffer against the effects of developmental risk factors that lead to lower academic achievement (NICHD: ECCRN, 2002). Because depressed mothers are at risk for developing low-quality relationships with their children, these protective effects may not be available. Interestingly, O'Connor & McCartney (2007) found that a positive teacher-child relationship buffered against the effects of insecure mother/child attachment, pointing to the importance of teachers' emotional stability in the classroom. We anticipate that, because teachers are viewed to act 'in loco parentis' within the school, the effects of depression in the mother/child relationship will be mirrored with teachers and their students.

Teacher Depression in the Classroom

Teacher practices and the quality of the CLE are important contributors to children's development (Hamre & Pianta 2007; Ponitz et al. 2009). Because teachers are responsible for the implementation of many important classroom factors, they play a crucial role in defining the learning context in which students participate (Eccles & Roeser, 1999). Although past studies have focused on the effectiveness of CLEs, instructional techniques

employed by teachers, and teacher-student interactions (Connor et al. 2010; Hamre & Pianta 2005), fewer have investigated contributions of teachers' psychological health, even in light of growing concern about the effects of teachers' chronic stress on educational quality (Alliance for Excellent Education, 2005).

Individual depressive symptoms, such as stress and poor emotional regulation, have been found to affect teachers' contribution to the CLE. An optimal classroom climate has been described to have "low levels of conflict and disruptive behavior, smooth transitions from one type of activity to another, appropriate expressions of emotion, respectful communication and problem solving, strong interest and focus on tasks, and supportiveness and responsiveness to individual differences and students' needs" (La Paro & Pianta, 2003). Teachers' negative psychological characteristics may influence this climate. For example, personal stress in teachers has been associated with lower-quality classroom interactions, and teachers who have stronger emotion regulation are more likely to reinforce positive student behavior and respond supportively to students' negative emotions (Li Grining et al., 2010; Swartz & McElwain 2012). Mashburn, Hamre, Downer and Pianta (2006) found that teachers who exhibited more maladaptive psychological characteristics were more likely to rate their relationships with students as hostile. Additionally, Hamre et al. (2008) found that classroom emotional climate and teacher stress level were predictive of teachers' reports of conflict, over and above students' diagnosed behavior problems.

While these studies strongly support the notion that teachers' everyday interactions with students, classroom management, reactions to student behavior and ability to implement curriculum are impacted by the presence of depressive symptoms, few conceptualize 'depression' as a whole construct comprised of multiple symptoms, while those that do have found mixed results; Hamre & Pianta (2004) found that non-familial caregivers with more depressive symptoms showed less engagement and sensitivity and more withdrawal in their interactions with children. However, Pianta et al. (2005) found that a similar relation between caregivers' depression and the classroom climate became non-significant when other teacher characteristics were added as predictors of child-care quality outcomes. We seek to build on and extend these studies by expanding the focus from specific correlates to a comprehensive constellation of characteristics that indicate depression risk, and by introducing potential mediating factors into the relations between primary variables of interest.

Research Questions and Hypotheses

In order to explore the associations among teachers' depressive symptoms, quality of the CLE, and student academic achievement, we pose the following research questions: Firstly, what is the relation between risk for depression in teachers and the quality of the CLE? Secondly, do students of teachers who exhibit higher depression risk display lower levels of academic achievement compared to their peers who have lower-risk teachers? And finally, does the quality of the CLE mediate the association between teachers' depression risk and students' academic achievement?

We predict that as teachers' depression risk increases, levels of observed CLE quality will decrease (RQ 1). Further, we anticipate that as risk for depression increases in teachers, student academic achievement will decrease (RQ 2). We also hypothesize that the impact of teachers' depression risk on student outcomes will operate through the quality of the CLE (RQ 3).

METHOD

Participants

The data for this study were collected during the 2010–2011 year as part of an ongoing parent study investigating classroom instruction in early education (Connor et al., 2013), which began in 2005. Five hundred and twenty three third-grade students in 27 classrooms across 8 schools in North Florida comprise the sample for the present study. School percentages of students qualifying for Free and Reduced Lunch ranged from 92% (low-SES) to 4% (high-SES). All teachers met state certification requirements and had at least a bachelor's degree related to education. Teachers' years of experience ranged from 0 to 31 years, with a mean of 10.9. Forty-six percent of students were male, 82% were Caucasian, 7% were African American, 5% were Hispanic, and 6% were Asian or mixed-race. Age of students ranged from 7 to 11 years, with a mean of 8.6. Teachers participated in interventions as part of the parent study, which focused on individualized instruction in either reading or mathematics. These interventions were not focused on teachers' psychological characteristics, and exploratory analyses revealed no significant differences in levels of depression, nor in the rated quality of the CLE, between the intervention groups.

Measures

Teacher Risk for Depression—Teachers completed an adapted version of the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff 1977; $\alpha = .85$). This scale includes 20 questions that ask subjects to report the frequency of their depressive symptoms. Scores range from 0 to 60 with 16 or higher indicating possible clinical depression. The adapted measure added 18 of the 20 questions to a larger self-efficacy survey to alleviate concerns about teachers' sensitivity to a formal measure of depression. The Likert-scale was increased from 3 to 5 points in order to capture more nuanced levels of depressive symptoms, with a score of '1' indicating complete absence of a symptom and a '5' indicating constant presence of a symptom. Depression risk questions were scored separately from self-efficacy questions to determine each teacher's level of self-reported symptomatology. Scores on this measure ranged from 22 to 62 with a mean score of 36. Although few teachers reported high levels of depressive symptoms, there was enough variability among teachers to continue with analyses. The adapted measure displayed acceptable reliability at $\alpha = .75$. Teachers involved in this study were not professionally assessed for clinical depression nor did the questionnaire ask about any diagnosis of depression. We consider our measure an assessment of general *risk* for depression based on the presence of self-reported symptoms. It was beyond the scope of the study to base evaluation of depression on actual diagnosis.

Classroom Quality—Quality of the CLE was assessed using the Classroom Learning Environment Rubric (Connor et al., 2011; 2014), an observational measure used within the parent study, which is available upon request. This scale assesses classrooms across three dimensions: implementation of individualized instruction, organization/planning, and teacher warmth/responsiveness. Scores on each dimension range from 1 to 6, with a score of 6 indicating exemplary practice on the part of the teacher and a score of 1 indicating weaker practice. This rubric is conceptualized to represent classroom quality, as opposed to teacher quality, as it takes into account students' and teachers' reciprocal interactions during instruction as well as the developmental appropriateness of the context of the educational environment. An exemplary rating (scored '6') on the 'organization/planning' dimension would indicate a classroom that is "well organized in its physical systems and instruction, with evident classroom routines and efficient transitions". An exemplary rating on the 'teacher warmth/responsiveness' dimension would indicate a classroom that "consistently offers a positive learning environment with clear expectations for students' behavior as a member of the learning community". Finally, an exemplary score in 'implementation of individualized instruction' would refer to a classroom in which "the content of literacy/math instruction is differentiated" and "the entire language arts/math block is spent in meaningful literacy/math activities."

CLE was assessed in the winter using classroom video observations that lasted approximately 60 minutes. Raters demonstrated adequate levels of inter-rater reliability (Cohen's Kappa = 0.73; Landis and Koch, 1977) upon initial assessment, and this level of reliability was maintained after recoding a randomly selected 10% of the videos. In other studies, this measure has predicted students' achievement outcomes (e.g., Connor et al., 2014), providing evidence for its validity (Ochs, 1979). The three dimensions of the CLE rubric were moderately to highly correlated with each other (correlations ranged from .33 to .58, $p < .001$).

Student Academic Measures—Student academic skills were assessed using the Woodcock-Johnson 3 Tests of Achievement (Woodcock et al., 2001) and the Gates-MacGinitie literacy tests (GM; MacGinitie et al., 2000). Tests were administered in the fall and spring following normed testing protocols.

Letter-Word Identification (WJ-3). Students read increasingly difficult words. Alpha = .94.

Picture Vocabulary (WJ-3). Students verbally identify increasingly difficult pictures. Alpha = .81.

Passage Comprehension (WJ-3). Students fill in missing words from passages. Alpha = .88.

Gates-Macginitie Reading Test. Two separate portions of this test measure reading comprehension and vocabulary. Alpha = .91 for vocabulary and .92 for comprehension.

Math Fluency (WJ-3). Students perform increasingly difficult foundational math functions. Alpha = .90.

Applied Problems (WJ-3). Word problems of increasing difficulty. Alpha = .93.

Principal Components Analysis

Principal components analysis was used to create separate factor scores for the student math and literacy outcome variables using standard scores (which adjust for age) for the WJ-3 and ESS scores (not age-adjusted) on the Gates and for ratings of the CLE. This technique provided a more manageable number of variables without substantial loss of information. The WJ-3 literacy variables and the Gates-MacGinitie vocabulary and comprehension variables (for fall and spring, separately) loaded onto the fall and spring literacy factors, and the WJ-3 fall and spring math variables loaded onto the fall and spring math factors (Table 1). The CLE factor was comprised of total scores on each of the subscales being loaded onto one factor (Table 2). All variables loaded strongly onto their intended factors.

RESULTS

All teachers filled out and returned the teacher depression survey and all classrooms were assessed for quality using the CLE scale. In the fall, 18 and, in spring, 64 of the 523 student participants did not complete the battery of academic achievement measures. Students' missing data in this study were determined to be negligible and missing at random; no significant demographic differences were among students who did not complete testing. These students were absent on testing days due to sickness or family vacations, or had permanently left the school district by the end of the year. Maximum likelihood estimations were used in analyses where appropriate. Students entered third grade with generally age-appropriate skills and made expected gains by spring (Table 3) that were deemed to be at grade-level based on standard scores (mean = 100, SD = 15).

We conducted zero-order correlations to examine the associations between teacher depression and quality of the CLE ("Q-CLE"; RQ 1). We found a moderately sized negative correlation ($r = -.406, p < .001$), which supports our initial hypothesis that as teachers' depressive symptoms increase, the quality of the CLE decreases. We then used hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002), which accounts for the nested structure of the data (students within classrooms) to answer our second and third research questions. Students' spring literacy and math factor scores were each examined separately as a function of teacher's depressive symptoms and students' fall achievement. These models revealed an interaction effect such that teacher's depressive symptoms and students' fall mathematics scores interacted to affect students spring math scores (Table 4 and Figure 1). This interaction indicated that students who began the year with weaker mathematics scores and were in a classroom with a teacher who reported more depressive symptoms showed weaker achievement gains across the school year than did their peers whose teachers reported no or fewer symptoms.

We investigated the third research question by examining mediation effects (Baron and Kenny, 1986) of Q-CLE on the relation between teacher depression and student math outcomes (Table 5). When Q-CLE was added to the model, teacher's depressive symptoms no longer predicted student math achievement. Q-CLE fully mediated the effect of teacher depression on student mathematics outcomes. There was also a fall math X Q-CLE interaction effect such that students with weaker fall math scores demonstrated stronger

math gains when they were in higher quality CLEs compared to peers in lower quality CLEs.

DISCUSSION

This study revealed that teachers reporting more depressive symptoms were less likely to maintain high-quality CLEs. Additionally, students whose teachers reported more depressive symptoms demonstrated weaker math achievement, especially if they began the school year with weaker math skills, compared to students whose teachers reported fewer depressive symptoms. This relation between teacher depressive symptoms and student math achievement was mediated by the quality of the classroom-learning environment. The importance of CLE quality was further underscored by the finding that students with weaker math achievement made greater gains when they were in higher-quality CLEs. These findings support our conceptualization of student learning whereby distal sources of influence (teachers' depressive symptoms) operate within the microsystem of the classroom to impact student learning.

Our hypothesis regarding achievement was supported for math but not for reading. This pattern of results is reflected within the larger parent study, which found that students in reading intervention classrooms made greater gains in reading than did students in mathematics intervention classrooms, and there was no effect of the mathematics intervention on student achievement. These differential effects between reading and mathematics observed in the parent study could have carried over into the present study, and there are multiple reasons this may have happened. In 2010, the district introduced a new core mathematics curriculum, *Everyday Math*. The previous curriculum, *Saxon Math*, had been used for at least the previous three years and was more skill-focused than the conceptually-focused *Everyday Math*. Hence, there was the additional burden of learning a new way of teaching mathematics, which was not the case for reading. This coupled with the fact that early elementary teachers are generally less comfortable teaching mathematics compared to reading (Beilock, Gunderson, Ramirez, & Levine, 2010, Vinson, 2001), may have made their mathematics teaching more vulnerable to sources of influence such as depression. Further, teachers in Florida have received extensive training in reading instruction since 2002 under Reading First and other state programs, therefore reading instruction might be more robust than math instruction in this particular population.

Theoretical and Practical Implications

Dynamic systems theories hold biological and ecological processes at their core as they attempt to model the interaction of biology and environment across time as influences on development. Within this study, the bio-ecological model is used to examine the microsystems (i.e., CLE) to which children are exposed, and how perturbations to these microsystems (teachers' depression) influence change in their participants (students). A strong focus on *reciprocity* is held here, as the bio-ecological model holds that developmental processes are not unidirectional. Thusly, teachers' depression and negative student math outcomes potentially form a loop, wherein teachers become more depressed, leading to more maladaptive CLEs and poorer student outcomes, leading to more

vulnerability to depression for teachers, and so on. Here, the importance of *identifying* this reciprocal process and *interrupting* the cycle to restore the classroom microsystem to a positive state becomes clear. This study is an important first step in this identification, as it provides evidence that complex associations among teachers' psychological health, the CLE, and student achievement exist. Further, we conjecture that an 'interruption' of this process might come in the form of mental health support systems implemented within schools, coupled with professional development to improve teacher and classroom quality, that together strive to help teachers achieve and sustain psychological well-being, build effective classroom learning environments, and improve students' outcomes.

Pioneering studies have examined the effectiveness of such mental health interventions on teachers' classroom performance. Jennings, Snowberg, Coccia & Greenberg (2011) successfully implemented a program based on their Prosocial Classroom theoretical model (Jennings & Greenberg 2008) designed to reduce stress and improve performance in teachers, with positive results for teachers in high-stress settings. Additionally, Raver and colleagues (2008) found that preschool teachers were better able to foster positive classroom climates, had higher sensitivity to students' needs, and were more successful at managing behavior when they participated in an intervention that included weekly "coaching" by mental health consultants. Whereas these studies provide promising evidence that such programs have strong potential for positive change, most current models of professional development do not address issues surrounding psychological health (Roeser, Skinner et al., 2012).

Teaching is one of the most stressful occupations in America (International Labour Office, 1993; Johnson et al., 2005), with emotional stress and poor emotion management being consistently identified as the primary reasons teachers leave their profession (Darling-Hammond, 2001; Montgomery & Rupp, 2005). Managing students with behavior problems, working with difficult parents, and high-stakes performance evaluations are all examples of situations regularly faced by teachers that have strong potential to produce chronic stress that may leave teachers more vulnerable to depression. Additionally, the nature of the teaching profession leaves practitioners with very few opportunities for emotional self-regulation. Professionals in other areas can take a break when stressed, but a teacher must stay in the classroom with her students and continue teaching (Carson, Templin, & Weiss, 2006; Sutton, 2004), a less-than-optimal solution for both the teacher and her students. Conditions such as this may result in an occupational environment that contributes to teachers' vulnerability to clinical ailments such as depression. In fact, Whitaker et al. (2013) found that reports of poor mental health were more prevalent amongst female head start teachers compared to US women with similar sociodemographic characteristics in other professions.

This study provides foundational evidence for the high-risk nature of teaching as an occupation in relation to practitioners' emotional well being. When these considerations are paired with strong evidence that teachers' psychological health is an important source of influence on a wide range of contributors to student development, such as classroom experience (Hamre & Pianta 2004), behavior patterns (Jeon, Buettner & Snyder 2014) and cognitive/self-regulatory development (Ursache, Blair & Raver 2012), it becomes clear that

mental health should be a higher priority within today's education system. This study provides an important first step towards elucidating the roles that teachers' psychological characteristics play in shaping the learning context that impacts student development. Whereas much has been done examining the effects of maternal depression on child development, the impact of teachers' depression in the context of the classroom has yet to be fully defined. Related projects in the field examine depressive symptoms individually rather than as ongoing constellations of symptoms that indicate a larger problem. This project may be used as a guide for future research that investigates rates of depression among teachers compared with the general population, utilizes different student age groups, examines the roles of teacher support and professional development, and bases assessment of teachers' depression on clinical diagnosis.

Limitations

It is possible that the interventions applied in the longitudinal study could have played a role in our findings. Additionally, the small teacher sample limits this study's ability to detect effects, as well as its generalizability to the overall population. The fact that effects were indeed detected even given this small teacher sample is encouraging, however, and begs future research using more participants. Further, due to concerns about teachers' sensitivity to filling out a formal clinical assessment, depression risk was based on self-reporting. The wording of some questions was changed and questions were mixed into a larger self-efficacy survey, which could have compromised the integrity of the target questions or primed participants to answer differently than they otherwise might have. The use of a self-report measure was seen as an exploratory first step in this promising line of research, in lieu of diagnosis. We wanted to first establish whether there were meaningful associations among teachers' depressive symptoms, CLE and student outcomes before progressing to the more involved steps of asking teachers about their status of clinical diagnosis. We plan to build on this methodology in future studies that incorporate formal diagnosis.

Conclusions

It is important to acknowledge the highly sensitive nature of this topic, especially considering the degree of scrutiny to which today's teachers are exposed through policy and evaluation, particularly in third grade settings when high stakes testing begins. It is in the spirit of understanding and support, not judgment or blame that we hope to continue this line of research. Our long-term goal is to promote evidence-based recognition of the importance of teachers' mental health within schools. Knowledge gained in this area could not only inspire depressed teachers to seek the help they need, but could set in motion movement towards large-scale implementation of psychological support systems for America's educational practitioners. Such systems would provide benefits to those directly supported, as well as improve the educational experiences of students whose success is greatly influenced by the well being of their teachers.

Acknowledgments

Authors would like to acknowledge Dr. Angela Barrus, Dr. Nicole Sparapani, Dr. Stephanie Day, Sarah Ingebrand, and Julie Fellows for their contributions to the editing and revising of this report and Dr. Elizabeth Crowe and Dr. Andrea Carlisle for assistance with data collection and questionnaire design. We would also like to thank the

participating schools, teachers, students, and families of student participants, without whose cooperation this research would not be possible. Funding for this project was provided by the U.S. Department of Education Institute of Education Sciences (R305H04013 and R305B070074) and the National Institute of Child Health and Human Development (R01HD48539, R21HD062834, and P50HD052120).

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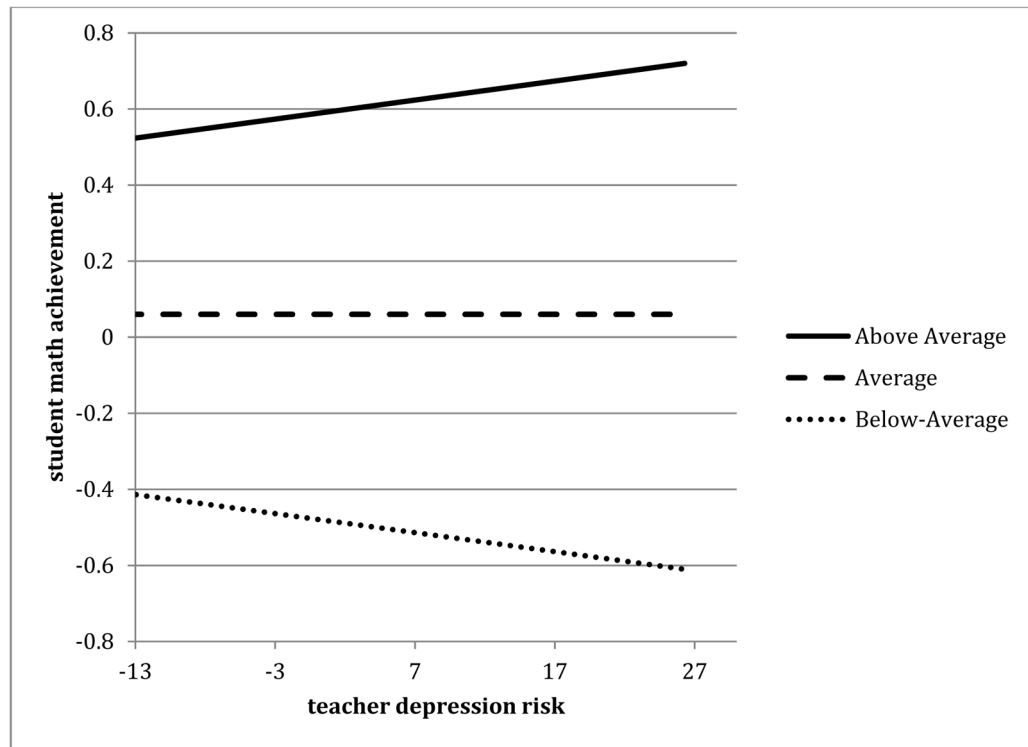


Figure 1. Teacher Depressive Symptoms X Fall Math Score interaction effects on Student Spring Math Scores (mean = 0; SD = 1).

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Table 1

Factor Loadings for Fall and Spring Student Mathematics and Literacy Achievement

	Fall Literacy	Spring Literacy
Gates MacGinitie Vocabulary	.90	.88
Gates MacGinitie Comprehension	.84	.82
Letter-Word ID	.86	.83
Picture Vocabulary	.72	.77
Passage Comprehension	.88	.86
	Fall Math	Spring Math
Math Fluency	.89	.88
Applied Problems	.89	.88

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Table 2

Factor Loadings for Q-CLE, Comprised of Each Rubric Subscale

	<u>Q-CLE Component</u>
Orientation/Organization	.83
Implementation of Instruction	.77
Warmth/Control	.68

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Table 3
 Mean Achievement Scores for Students (Presented in Estimated Scaled Scores, ESS, and Standard Scores, SS as Indicated)

	Fall	SD	Winter	SD	Spring	SD
G.M. Vocabulary ESS	474	37.3			497.44	37.84
G.M. Comprehension ESS	471.99	40.31			487.22	42.67
Letter-Word Identification SS	107.01	10.62	106.77	10.66	107.61	10.93
Picture Vocabulary SS	103.08	9.68	103.57	9.7	103.71	9.77
Passage Comprehension SS	97.8	9.72	98.03	9.3	98.52	9.237
Math Fluency SS	100.25	12.63	101.21	13.27	102.03	12.72
Math Applied Problems SS	102.04	12.92	102.59	12.55	105.74	11.83

Table 4
Teacher Depression Predicting Spring Math Factor Scores, Controlling for Fall Math Scores

Fixed Effect	Coefficient	Standard error	t-ratio	d.f.	p-value
Student Spring Math Score (fitted mean)	0.016	0.033	0.497	23	0.624
Teacher Depression effect	-0.0005	0.004	-0.132	23	0.896
Student Fall Math effect	0.813	0.033	24.738	287	<0.001
Fall Math X Teacher Depression interaction effect	0.009	0.004	2.180	287	0.030
Random Effect	Standard Deviation	Variance Component	d.f.	χ^2	p-value
INTRCPT1, u0	0.053	0.003	23	26.391	0.282
level-1, r	0.542	0.294			

Note: factor scores centered at 0 with a SD of 1. All other scores grand mean centered. Teacher Depressive Symptoms score mean = 36.

Table 5
Effects of Teacher Depressive Symptoms on Spring Math are Mediated by Q-CLE

Fixed Effect	Coefficient	Standard error	t-ratio	d.f.	p-value
Student Spring Math Score (fitted mean)	0.011	0.029	0.390	22	0.700
Teacher Depression effect	0.002	0.003	0.667	22	0.512
Q-CLE effect	0.058	0.019	2.988	22	0.007
Student Fall Math effect	0.820	0.037	22.107	286	<0.001
Fall Math X Teacher Depression interaction effect	0.006	0.005	1.325	286	0.186
Fall Math X Q-CLE	-0.057	0.022	-2.548	286	0.011
Random Effect	Standard Deviation	Variance Component	d.f.	χ^2	p-value
INTRCPT1, u0	0.044	0.002	22	24.581	0.317
level-1, r	0.541	0.292			

Note: Factor scores centered at mean = 0 with a SD of 1. All other scores grand mean centered. Teacher Depressive Symptoms score mean = 36.