Maximizing Mindful Learning: An Innovative Mindful Awareness Intervention Improves Elementary School Students' Quarterly Grades

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Abstract This paper discusses results from the first empirical study testing the feasibility and effectiveness of an audio-guided mindful awareness training program on quarterly grade performance in traditional United States public elementary schools. Structured as a quasi-experiment, the study demonstrates that a 10-minute-per-day, fully automated program significantly enhances students' quarterly grades in reading and science, compared to a control group, without disrupting teaching operations (N=191). The intervention utilized a series of guided mindful-based awareness and attention focusing practices as the method for students to engage with social and emotional learning (SEL) concepts, and can thus be called a "mindful-based social emotional learning" (MBSEL) program. The program is innovative because it requires neither expert trainers skilled in mindfulness nor changes to existing curriculum; thus it can be considered both teacher-independent and curriculum supportive. The goal of this exploratory study was to facilitate a consistent daily mindful awareness practice that generates improvements in student outcomes for resource- and time-constrained K–12 classrooms in the United States and elsewhere. The authors discuss limitations of this study and suggestions for further research on how to use mindful awareness programs to enhance academic performance both effectively and pragmatically.

Keywords Mindful-based social and emotional learning (MBSEL); Academic achievement; K–12 education; Mindfulness in education; Readiness to learn; MBSR

Introduction

There are more than 50 million children enrolled in approximately 98,706 public schools in the United States (National Center for Education Statistics 2010). Currently, student performance levels are less than optimal. Some experts argue that the situation is nearing a crisis (Fiester 2010), including the U.S. Secretary of Education, Arne Duncan, who said, "The truth—the brutal truth—is that we have thousands of schools where as few as 10 percent of students are reading or doing math at grade level, and where less than half are graduating" (Duncan 2013). These poor performance rates reduce United States competitiveness globally. In fact U.S. students are ranked 17th in the world in reading, 31st in math, and 23rd in science (Fleischman et al. 2010). Compared to other industrialized countries, the U.S. tops the list in per pupil spending yet delivers performance near the bottom (Organization for Economic Cooperation and Development 2013).

Despite these alarming statistics, our scientific understanding of what actually works in raising students' academic achievement is limited. Initiatives designed to enhance children's "readiness to learn" have recently gained momentum in the debate on how to improve student performance. Readiness to learn is conceptualized as the ability to regulate emotions and behaviors and to inhibit impulsivity (Diamond and Lee 2011). Readiness to learn is a critical ingredient of students' academic success, as several scholars in education, psychology, and neuroscience have linked self-regulation skills with academic outcomes (Beauchemin et al. 2008; Benson et al. 2000; Diamond and Lee 2011; Posner and Rothbart 2005). However, a child's self-regulation skills, and thus their readiness, are highly influenced by emotional arousal, including stress arousal, which impedes cognitive function (Zinns et al. 2004). For example, chronic or intense stress, which could be the result of several factors including test pressure, peer pressure, violence, bullying, and poverty, may cause a child to disregard what he or she knows intellectually, and resort instead to a habitual pattern of emotional reactivity.

Therefore, a child's ability to impede habitual responses while initiating attentional control is foundational for learning (McClelland et al. 2000; Payton et al. 2008; Pelco and Reed-Victor 2007; Posner and Rothbart 2005) and may play a bigger role in children's academic abilities than general intelligence (Blair and Razza 2007). Scientists are calling on educators to consider teaching attention skills as early as preschool, arguing that "[w]e should think of this work not just as remediation, but as a normal part of education" (Posner 2003, p. 58).

School-based interventions targeting students' readiness to learn focus on social and emotional skill development and are referred to as Social and Emotional Learning (SEL) programs. There are numerous programs included in this domain, all designed to enhance students' interpersonal and affect-based competencies, such as a child's ability to take turns, to listen and follow instructions, and to navigate conflict with peers (Collaborative for Academic, Social and Emotional Learning 2005). In particular, SEL programs based on mindfulness – defined as the capacity to pay attention to the present moment with curiosity and kindness (Kabat-Zinn 2003) – have been shown to positively impact children's self-regulation skills (Zoogman et al. 2014) and reduce the negative effects of stress (Biegel et al. 2009; Broderick and Metz 2009; Mendelson et al. 2010). Such interventions can be grouped under a new subcategory within the field of SEL: "mindful-based social emotional learning" (MBSEL). MBSEL practices are designed to enhance social and behavioral aptitude through attention practices, and are organized in a nonlinear and often organic fashion (Kaiser-Greenland 2010), where the teacher is guided by the collective experiences of the children. In this type of learning environment, the students may explore specific concepts, for example kindness, through a guided or silent contemplative period. Consistent contemplative practice fosters an increase in self-awareness and self-control, as well as the development and embodiment of core values, including kindness (Kabat-Zinn 1994).

Several prior research studies evaluating the effect of MBSEL programs for clinical populations of students, including those with learning disabilities, attention-deficit hyperactivity disorder (ADHD), and anxiety and depression disorders, have demonstrated benefits including higher levels of academic achievement (Beauchemin et al. 2008), reduced symptoms of anxiety, depression and somatic distress and improved attention, cognitive inhibition, subjective wellbeing and sleep quality (Biegel 2009; Raes et al. 2013; Semple et al. 2010; Zylowska et al. 2008). Yet there has been limited research in traditional classrooms with nonclinical students to measure the benefits of MBSEL interventions. Empirical evidence is scarce in examining age-appropriate mindful awareness interventions that include outcome measures stretching beyond self-reported and teacher-reported changes in student well-being (Greenberg and Harris 2012), in particular assessing academic performance data used by schools themselves, most notably term grades and standardized test scores. Eight empirical studies could be identified in the literature that document the salubrious effect of MBSEL interventions in traditional K–12 classrooms on student well-being, albeit none have reported results related to grades or standardized test scores due to several noted limitations related to program design and implementation (Broderick and Metz 2009; Flook et al. 2010; Huppert and

Johnson 2010; Mendelson et al. 2010; Napoli et al 2005; Raes et al. 2013; Schonert-Reichl and Lawlor 2010; van de Weijer-Bergsma et al. 2013). Scholars indicate that more extensive research and adoption of mindful- awareness programs within K–12 classrooms has been prohibited by the practical limitations of previously published MBSEL approaches (Burke 2010; Meiklejohn et al. 2012).

Two of these practical limitations, specifically the need for teachers to be trained in mindful awareness and for school curriculum to be changed, have been tackled in the present study. By way of illustration, in all eight of the above-mentioned empirical MBSEL studies, an outside trainer experienced in mindful awareness practice supported the teacher or taught the MBSEL program on behalf of the classroom teacher. These interventions were thus not teacher independent, meaning that they depended on additional teaching resources with prior experience or expertise in mindfulness. In addition, five of eight programs reported removing curriculum content to run the intervention and the other three required scheduling shifts to accommodate the training. The programs were hence not curriculum-supportive, in other words, the existing curriculum needed to be adjusted in order to accommodate the interventions. While these limitations are not unique to MBSEL programs, in that they exist in many other school-based initiatives, it seems that addressing them effectively may help accelerate the important task of facilitating sustainable improvements in education through mindful-based approaches, especially in non-private school settings, where resource constraints are particularly salient.

Hence this study follows the call of Davidson et al. (2012) for more empirical studies to understand how mindful awareness- programs can foster social and emotional competence – and ultimately academic achievement – in educational settings. Consequently, the first and forth authors designed an innovative MBSEL intervention for elementary school children and a quasi-experimental research program to test its impact on classroom performance. The three-fold research question was, what is the effect of the present MBSEL intervention on students' grades, on students' classroom behavior, and on day-to-day teaching operations.

Method

Participants

This study was constructed as a quasi-experimental design in two public elementary schools in the same town in a suburb of Chicago, Illinois, in early 2012. A total of 93 students (50 male, 43 female) in four third-grade classrooms, two from each school, were in the intervention group, and 98 students (51 male, 47 female) in four third-

grade classrooms, two from each school, were in the control group. Participating students remained grouped by classroom to determine if the program could be seamlessly delivered in traditional public school settings with existing classroom teachers, with all students, during regular class time.

Third-grade students were chosen to participate for two reasons. First, third-grade reading levels have been linked to high school graduation rates. If a child is not reading at grade level by the end of third grade, the child is four times less likely to graduate from high school (Fiester 2010). This demonstrates how important it is to bolster academic skills, including reading, in these early grades. Second, third grade represents the midpoint of elementary school. Hence it was deemed reasonable to test the program's effectiveness with this age group first, and subsequently to explore its effectiveness for younger (first- and second-grade) and older (fourth- and fifth-grade) students during later research phases.

Table 1 shows the gender distribution and percentage of Individual Education Plan (IEP) students in the intervention and control condition. There were 19% IEP students in the intervention condition, compared to 7% IEP students in the control condition. Additionally, participating students' socio economic status, operationally defined as their eligibility for free or reduced lunch through the National School Lunch Program (NSLP) were comparable to the state of Illinois averages: 23% of students in this study were enrolled in the NSLP, compared to 28% in all of Illinois.

Table 1 Gender and Individual Education Plan (IEP) student distribution

	Intervention			Control		
	School A	School B	Percent	School A	School B	Percent
Male	22	27	54%	21	30	52%
Female	23	21	46%	23	24	48%
Total	45	48	100%	44	54	100%
IEP-Total	9	9	19%	6	1	7%

Procedure

The protocol for inclusion in the study began with an email to all third-grade teachers from the principal of each target school, eight in total. The email introduced the program and asked for volunteers to participate in the study. The first two teachers in each school who volunteered were selected to be in the intervention condition. The remaining two teachers in each school were asked to be in the control condition.

All intervention teachers participated in a 60-minute training session the day before the program launch. The first 30 minutes of training included a review of the program content, structure, and classroom tools, as well as related research on mindful awareness, cognition, and social emotional learning. Control condition teachers joined the training for the last 30 minutes for a review of the research measures and informed consent agreement. Each teacher reviewed and signed the informed consent agreement, which followed the school district ethics policy. No parent or student consent or assent agreements were required as no child-specific information was collected. Aligned with the school district policy, all grades data was blinded to the researchers and behavior data was collected as an average daily total by classroom.

The 8-week study was conducted using a pre-recorded, 10-minute-per-day, audio-guided program that was based on the Mindfulness Based Stress Reduction (MBSR) protocol originally developed by Jon Kabat-Zinn and colleagues at the Center for Mindfulness at the University of Massachusetts Medical School. The program was created and recorded by two of the authors with over 25 years of combined experience practicing mindful awareness and 8 years as MBSR instructors. The pilot program included 35 unique MP3 audio tracks, each approximately 10 minutes in length. Each participating classroom received an MP3 player preloaded with the 35 MBSEL program tracks, a docking station with speakers, student notebooks for the journal integration exercises, and classroom tools for the teacher including a training/reference binder and a gazing rock, as well as tools for student demonstration such as a rain stick.

While the MBSEL program studied here was modeled on the MBSR protocol, the intervention used guided audio tracks to facilitate a daily formal mindful awareness practice.. With the MBSEL audio format, basic didactic information was included throughout the series, covering how to sit, why to practice, and what to expect from the practice. Consistent with MBSR, concepts including awareness of senses, thoughts, and emotions were integrated into the daily recordings, as well as periods of silence, relaxation, and breathing practices. Through the series, students were guided to practice both focused-awareness and open-awareness exercises. Focused-awareness

exercises included sequences on the five senses, relaxation, and body scan, as well as identifying and labeling thoughts and emotions. A mindful movement component was included in several tracks throughout the series, but all movements were done while students were seated. Open-awareness exercises included sequences on identifying and noticing how thoughts and emotions come into and then leave the field of awareness, and the subsequent flow of this process.

Consistent with both MBSR and SEL, self-awareness, self-control, and social awareness concepts were woven within the 35 tracks, as well as responsible decision making and core values including kindness and gratitude (Collaborative for Academic, Social and Emotional Learning 2005; Kabat-Zinn 2003). The program was designed to allow students to consistently explore what is happening inside themselves so they become familiar with their inner experiences. As an example, a student who has consistently experienced how it feels to be angry and has brought awareness to how the body and thought patterns respond to this emotion may be more likely to identify anger when it comes up, and choose productive ways to respond. The language and examples were developed specifically for children in this age group and pilot-tested through a series of trials conducted over the course of 3 months at a YMCA camp for students in grades 1–4.

During the last 2 minutes of each 10-minute recording, students were instructed, while still quiet, to take out their journals and write or draw about their experience with the practice that day in order to integrate any insights. This was done specifically to keep the overall time within the 10-minute target, in place of group sharing which forms part of the standard MBSR protocol. Teachers reported that a journaling time of 2 minutes was adequate on most days for students to complete the exercise. On the few occasions when students requested more time, the classroom teachers could decide if another minute or two could be accommodated given the curriculum schedule that day.

Teachers were instructed to play one audio track, in sequence 1–35, each school day. They were guided to select a normal transition time to run the program, for instance, after recess or lunch. They could pick what time of day to run the program, based on their schedule and classroom dynamics, but were encouraged to be consistent each day. For instance, one teacher in School A selected to run the program after recess at 10:05 am and the other teacher selected to run it between math and science at 1:20 pm. It was expected that giving teachers the flexibility to select what time to run the program would enhance their consistency with the daily protocol. Once all 35 tracks were played, they were instructed to repeat the sequence, beginning with track 1, until the end of the semester, normally

about 8 weeks. Because the program is fully automated, the teachers were encouraged to participate each day along with their students, by either closing their eyes along with the students or looking at the gazing rock during the program.

Measures

There were three dependent variables to examine the three-fold research question for this study: student quarterly grades, classroom behavior, and program impact on teaching operations. In the first two categories, the researchers collected data that was already being captured and reported by the two schools. Teachers reported student grades in each of six subject areas, including reading, science, math, writing, spelling, and social studies. Quarterly grades were reported on a scale of 0-100. Teachers were provided a spreadsheet that matched the districts' grading format, listing students by number on the top going across and listing each of six subjects down the side. At the beginning of the study, teachers were instructed to provide student grades for the third quarter, which had just ended, as the pre-condition. Teachers were given the same form to complete with students' fourth quarter grades at the conclusion of the study, as the post-condition. Teachers calculated quarterly term grades, in each subject, using a weighted formula to average grades for all tests, quizzes, projects, homework, and class participation throughout the entire term. Term grades were chosen as a comprehensive assessment of student academic performance because they include approximately 30 data points, in each subject, over an 8-week period, instead of standardized test scores which exclusively provide a one day snapshot of the student's performance and results can be skewed by any number of factors including a poor night's sleep prior to being examined. Table 2 presents student grade means and standard deviations before and after the intervention for both the intervention and control group.

Table 2 Means and Standard Deviations of Student Grades Per Subject for Intervention (I) and Control (C) Groups, Pre- and Post-Intervention

	Pre		Post	
	M	SD	M	SD
Reading I	84.84	8.64	87.89	8.73
Reading C	86.37	8.68	86.23	8.73
Science I	89.27	10.05	89.51	8.67
Science C	89.47	8.50	85.24	10.74
Math I	86.81	9.77	85.69	8.89
Math C	89.47	7.75	86.62	9.13
Writing I	84.14	10.60	84.75	8.85
Writing C	87.56	9.48	86.55	7.76
Spelling I	93.00	5.88	90.17	7.74
Spelling C	91.52	7.00	88.76	7.10
Social Studies I	89.22	11.14	91.48	8.82
Social Studies C	86.83	10.40	90.89	8.64

The second category of data, classroom behavior, was measured daily. All eight participating teachers completed a log each day documenting how many behavior events occurred. Behavior events were defined as principal visits, calls home, suspensions, and "red cards," which were given for consistent classroom disruptions. This data was not student-specific, but classroom-specific, as no information disclosing negative behaviors of individual students was collected for this study.

Finally, data was also gathered concerning the MBSEL program's impact on day-to-day teaching operations. This was to test the program's feasibility for consistent implementation and teachers' fidelity in being able to run the mindful awareness intervention alongside normal classroom activities. Each day teachers in the intervention condition recorded if they ran the program that day, if they participated along with the students, if they were able to get their planned curriculum accomplished, and if there were any issues associated with running the program. In addition, after the quasi-experiment ended, the teachers in the intervention condition completed a feedback survey where they provided open-ended comments about their experience with the program.

Data Analyses

A series of six hierarchical multiple regression analyses were performed to investigate the effect of the mindful awareness intervention on student quarterly grades. This method was chosen as the method of analysis because it was necessary to control for any baseline differences in the pre-intervention grades between the intervention and the control condition. One regression model was derived for the criterion of post-intervention grade, for each of the six subject areas – reading, science, math, writing, spelling, and social studies. The first block of each regression included the pre-intervention score for the subject area. The second block of each regression included the pre-intervention score as well as a dichotomous variable representing group assignment (intervention vs. control). The control subjects were coded as the reference group for the group assignment variable. In Block 1 of each regression model, any baseline differences between groups were examined. The Block 2 variables included both the pre-intervention grade and group assignment variables. In this way, it was possible to partition out the effects of the pre-intervention grades and specifically determine the effects of group assignment on the post-intervention grades.

Results

The data analyses showed that in every subject, pre-intervention grades were significant predictors of post-intervention grades; which essentially means that a student's quarterly grades before the intervention were highly correlated with his or her quarterly grades afterward. More pertinent to the research question, however, was that in two particular subjects, reading and science, being in the intervention group predicted a significant difference in post-grades. The Bonferroni procedure was used to control for Type I error across the six subjects ($\alpha' = .05/6 = .008$), p-values > .008 were deemed non-significant.

Specifically, the results of the regression analyses (Table 3) indicated that the combined Block 2 predictors of being in the intervention (as opposed to the control) condition, as well as the student's term grades before the intervention, explained a significant amount of variance in the post-intervention reading grades, namely 54% of the variance ($R^2 = .54$, $F[2, 188] = 108.68$, $p < .0005$). Being in the intervention group, n = 93, versus control, n = 98, significantly predicted changes in post-intervention reading grades (Beta = .15, p = .003), while controlling for differences in pre-intervention reading grades, and explained an additional 2% of the variance in the post-intervention reading grades (R^2 change = .02, F change [1,188] = 8.80, p = .008). As expected, pre-intervention reading grades also significantly predicted post-intervention grades (Beta = .73, $p < .0005$). By the same token, the

regression analyses showed that the two afore-mentioned predictors explained 52% of the variance in Block 2 of the hierarchical regression model for science (R^2 = .52, F[2, 188] = 100.45, p < .0005). In particular, being in the intervention group, n = 93, versus control, n = 98, significantly predicted a difference in post-intervention science grades (Beta = .22, p = .003) and explained an additional 5% of the variance in the post-intervention science grades (R^2 change = .05, F change [1,188] = 19.08, p < .0081, while controlling for differences in pre-intervention science grades, which was also a significant predictor (Beta = .69, p < .0005). Cohen's f^2 measure of effect size indicated a small effect for the additional amount of variance accounted for by the addition of the intervention into the model: .02 for reading, and ,05 for science grades (Cohen, 1988). For the remaining subjects (math, writing, spelling, and social studies), group assignment was not a significant predictor of post-intervention grades, while pre-intervention grades were. In other words, students' post-intervention grades were predicted by their pre-study grades in both intervention and control conditions for these subject areas, while the intervention did not generate a statistically significant difference. Thus the grade trajectory for these subjects essentially remained constant across the intervention period.

Table 3 Hierarchical multiple regression model results testing grades by subject post-intervention, with 'Pre-intervention grade' as the Block 1 predictor, and 'Pre-intervention grade' and 'Intervention vs. Control' as the Block 2 predictors.

Variable/Step	R^2	ΔR^2	B	SE B	Beta	p	Cohen's f^2
Reading							
Block 1	0.52						1.08
Pre-intervention grade			0.72	0.05	0.72	<.0005	
Block 2	0.54						1.17
		0.02					0.02
Pre-intervention grade			0.74	0.05	0.73	<.0005	
Intervention vs. Control			2.58	0.87	0.15	.003	
Science							
Block 1	0.47						0.89
Pre-intervention grade			0.74	0.06	0.68	<.0005	
Block 2	0.52						1.08
		0.05					0.05
Pre-intervention grade			0.74	0.06	0.69	<.0005	
Intervention vs. Control			4.42	1.01	0.22	<.0005	

Table 3 (cont'd)

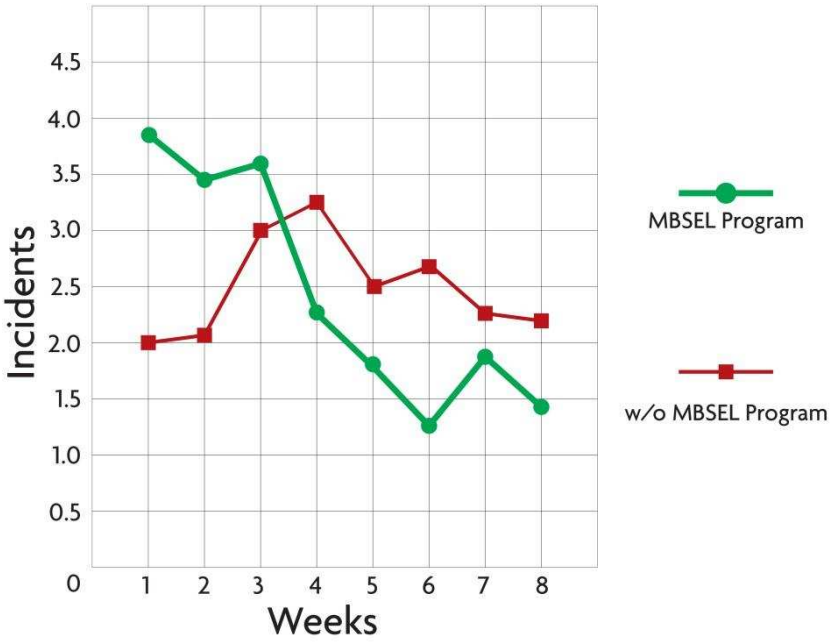
Variable/Step	R^2	ΔR^2	B	SE B	Beta	p	Cohen's f^2
Math							
Block 1	0.64						1.78
Pre-intervention grade			0.81	0.04	0.80	<.0005	
Block 2	0.64						1.78
		0.00					.00
Pre-intervention grade			0.82	0.05	0.81	<.0005	
Intervention vs. Control			1.25	0.79	0.07	.115	
Writing							
Block 1	0.61						1.56
Pre-intervention grade			0.64	0.04	0.78	<.0005	
Block 2	0.61						1.56
		0.00					.00
Pre-intervention grade			0.64	0.04	0.78	<.0005	
Intervention vs. Control			0.40	0.77	0.02	.605	
Spelling							
Block 1	0.48						0.92
Pre-intervention grade			.079	0.06	0.69	<.0005	
Block 2	0.48						0.92
		0.00					.00
Pre-intervention grade			0.80	0.06	0.69	<.0005	
Intervention vs. Control			-0.89	0.78	-0.06	.257	
Social Studies							
Block 1	0.25						0.33
Pre-intervention grade			0.41	0.05	0.50	<.0005	
Block 2	0.25						0.33
		0.00					.00
Pre-intervention grade			0.41	0.05	0.51	<.0005	
Intervention vs. Control			-0.38	1.10	-0.02	.732	

Note. Adjusted alpha value: .008; Cohen's f^2 reported for Block 1 and Block 2 effects.
Reference group for predictor of 'Intervention vs. Control' = Control.

The impact of mindful awareness practices on classroom behavior was analyzed by having teachers in intervention and control classrooms track behavioral incidents for 8 weeks. However, on days in which there was a field trip or school holiday, behavioral data was not collected. Therefore, weekly averages were tabulated for each classroom. The mean incidents of disruptive behavior fell by over 50% for the intervention group, from an average of about four incidents per day in week 1 to fewer than two per day in week 8, and rose by 15% for the control group over the 8 weeks, from two incidents per day in week 1 to an average of slightly more than two per day by the end of the intervention. In Figure 1 below, the trajectory of behavior incidents for both intervention and control classes is depicted graphically over the course of the MBSEL intervention.

Figure 1

Effect of MBSEL intervention on students' classroom behavior within treatment and Control classes.



There was little to no impact of the mindful awareness intervention on day-to-day teaching operations for participating classrooms. Out of an average of 38 school days that the intervention was run (the range was 34 to 39 days), participating teachers implemented the program 95% of available days, after 1 hour of preparatory training, which included 30 minutes to review the research protocol. On days the program was implemented, both teachers

and students had the opportunity to learn together, with students participating 100% of the time and teachers participating 99% of the time.

Of particular importance concerning the program's feasibility and fidelity was that all teachers reported no issues associated with the program. All of the teachers in the intervention group also indicated every day on the daily tracker that they had been able to accomplish their planned curriculum. These results suggest that the intervention had no adverse impact on day-to-day classroom activities whatsoever. Furthermore, the information provided by participating teachers in the feedback survey indicates that teachers were interested to start the MBSEL program at the beginning of the subsequent academic cycle and run it throughout the school year. The following comment from one of the participating teachers was representative of these teachers' sentiment about the intervention:

"I liked the consistency of the program . . . and how easy it was to implement."

Another teacher who participated in the program suggested that the intervention was not only beneficial to the students alone:

"They [the students] felt that overall our class seemed less distracted, more calm and more focused. They also told me that I seem less stressed and that it takes more to upset me *now."*

The latter comment above extends the potential salubrious effect of the MBSEL to teachers, and consequently their interaction with students in the classroom.

Discussion

This study focused on helping to find answers to the important question of what types of classroom interventions can help reverse the negative trend in U.S. public school academic performance in ways that are both effective and practically implementable. Specifically, its research goal was to test the effect of an innovative MBSEL intervention on classroom performance, by assessing students' quarterly grades, their classroom behavior, and day-to-day teaching operations. The present study extends the theory and practice debate around what kind of mindful awareness initiatives may both effectively and pragmatically benefit students' academic performance in key subject areas in at least three significant ways.

First, the study's results suggest that the brief, pre-recorded daily mindful awareness trainings discussed here significantly predict a difference in elementary students' term grades in science and reading, as well as notable improvements in classroom behavior. To the best of the authors' knowledge, this is the first empirical study documenting benefits of a mindful-based social and emotional learning program on elementary school students'

quarterly grades in a traditional classroom. The findings presented here link to an increasingly extensive knowledge base on knowledge retention in higher education settings (Raes et al. 2013).

Second, and of practical importance to a large target group of resource-constrained schools in the U.S. and elsewhere, the present approach may promote the desirable goal of a faster and more widespread rollout of mindful awareness programs in schools (Burke 2010; Meiklejohn et al. 2012). This is because the design of the present MBSEL intervention was kept purposely uncomplicated: Neither were experienced mindful awareness trainers required to conduct the intervention, nor did the existing curriculum need to be changed, nor students split into smaller groups or moved into different locations to participate in the trainings. Thus, the approach described in this paper can support the increased interest in MBSEL classroom interventions. The program may offer a simple method to facilitate a daily mindful awareness practice, in support of classroom teachers and dedicated mindful awareness trainers. The automated, audio-guided program outlined in this study is curriculum-supportive, in that it may be run during normal transition times without removing curriculum content, or making any physical classroom layout changes to accommodate the intervention. Through the use of technology, it is teacher independent, in that existing classroom teachers, and even substitute teachers, can facilitate the program without experience or knowledge in mindful awareness. They can participate in the program alongside students after pressing 'Play' on the sound device. This type of technology-based training is highly scalable, making it possible to implement such a program throughout entire schools and districts simultaneously.

Third, this pre-recorded format of audio-guided instruction is particularly aligned with insights from researchers who provide compelling data that repeated and consistent practice is critical to becoming skilled in a mindful approach (Napoli et al. 2005; Siegel 2007). The dosage of the MBSEL program discussed here can remain consistent throughout the school year because it can be run daily during short breaks between curriculum content or after recess or lunch, when students struggle to reengage in learning. Moreover, the brief, easy-to-use format may increase the likelihood that teachers run the program each day. This may be particularly effective as the amount of time students practice mindful awareness techniques is directly correlated with integrating learning and the subsequent benefits into their daily lives (Huppert and Johnson 2010; Saltzman and Goldin 2010). Delivering program content with fidelity and sustainably without spending too many resources on teacher training is an important concern in generating effective integration of MBSEL and SEL techniques into classrooms.

MBSEL research is still in its infancy. Follow-up research is needed to determine the longer-term effect of such MBSEL intervention on students' academic and socio-emotional functioning; this study was exploratory in nature and hence only ran over the course of one school quarter. In addition, several other limitations in this study should be explored further. First, students and classrooms were not randomly assigned to either the intervention or the control condition. Instead, classrooms were assigned non randomly, and all participating individuals remained nested within their given classroom setting. Second, students' grades were assessed by their teachers, hence the assessments may have contained bias. Follow-up research applying more rigorous research designs and using unbiased measures should address these limitations to eliminate any validity threats due to selection and measurement bias, and potential pre-existing differences among students, (albeit in this study, students in the intervention conditions had statistically significantly lower grades before the start of the study in the two subjects for which their grades were significantly different after the intervention).

Third, participating students' grade performance was not significantly affected across all individual subjects measured. Reading grades were significantly improved. Science grades remained virtually the same, while significantly decreasing for students in the control condition. None of the grade differences in the other subject areas reached significance after the intervention period. This finding needs to be explored further, including examinations of any particular factors concerning subject-specific effects of mindful-based approaches to improve students' grade performance, or relating to the time during the school day that a mindful awareness intervention may be more (or less) impactful. One possible explanation for this finding may be that mindful awareness training for elementary students may be more effective in raising performance in particular subject areas. An alternative reason for the difference in effectiveness observed in this study may be that the training has a transient effect on novice practitioners (Ie et al. 2014). While the authors did not collect such data during the study, it is conceivable that the subject areas in which students in the intervention group showed a significant effect, namely reading and science were taught immediately after the mindful awareness intervention. Only careful follow-up research using randomized control trials and employing more reliable outcome measures and more comprehensive analysis techniques, such as hierarchical linear modeling, will be able to disprove or corroborate these speculative explanatory arguments, and determine with more certainty the flow of causality involved in the present findings.

Fourth, the effect size of this intervention was small. Future research should investigate if variations in duration of MBSEL training are to produce larger effects. And finally, it would be illuminating to follow up the self-

reports from participating teachers in this study suggesting that they also benefited from listening to the MBSEL recordings. A more comprehensive understanding of teacher as well as student outcomes associated with bringing mindful awareness programs into school settings is both necessary and worthwhile (Meiklejohn et al. 2012; Napoli et al. 2005). Future research should explore to what extent mindful-based classroom interventions may influence both students and teachers to ultimately raise academic achievement in schools.

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