Perceptions of mindful teaching are associated with longitudinal change in adolescents' mindfulness and compassion

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Keywords: Adolescent Development; High School; Teachers; Self-Determination; Mindfulness; Compassion

Acknowledgement: The authors would like to thank the district administration and all the participating teachers and students, as well as the research assistants who contributed to this project. We are grateful for your support and assistance.

Funding: This project was supported by the Institute of Education Sciences Grant R305B150033 to the first author at Penn State University. The views expressed in this article are the authors and do not necessarily represent views of the granting agency. This project was also supported in part by departmental funding to the second author, and the Edna Bennett Pierce endowed chair in Care and Compassion at Penn State University held by the last author.

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Full Citation: Colaianne, B. A., Galla, B. M., & Roeser, R. W. (2020). Perceptions of mindful teaching are associated with longitudinal change in adolescents' mindfulness and compassion. *International Journal of Behavioral Development*, *44*(1), 41-50. doi: https://doi.org/10.1177/0165025419870864

Abstract

The purpose of this study was to examine how student perceptions of mindful teaching are associated with changes in students' mindfulness, self-compassion, and compassion for others across a single high school year. We hypothesized two pathways of effect: a direct path whereby when high school students perceive their teachers as demonstrating mindful qualities, they are more likely to emulate these qualities; and an indirect path whereby mindful teaching affects student outcomes by providing an environment that fulfills the developmental needs of students. To test these hypotheses, a short-term longitudinal study of high school students ($N = 599$) was conducted in which student outcomes from the beginning to the end of the school year were regressed on perceptions of mindful teaching at the beginning of the year, and school need fulfillment during the midpoint of the school year. Results revealed support for the indirect path: student perceptions of mindful teaching predicted changes in student perceptions of school need fulfillment, which then predicted changes in students' own mindfulness, self-compassion, and compassion for others over time. Results are discussed in terms of how mindful teaching might represent a kind of social affordance for students, one in which the needs of students are seen and fulfilled, and, as a result, one in which the students may be more willing to emulate and internalize the qualities of their teachers.

Perceptions of Mindful Teaching and Longitudinal Change in High School Students' Mindfulness and Compassion

The factors that enable schools to become "caring communities of learning" have been explored in the educational literature for decades (e.g., Battistich, Solomon, Watson, & Schaps, 1997; Noddings, 2015). For instance, Bryk and Driscoll (1988) identified three core components of a caring school: a system of values which is shared among members of the organization, a common agenda of activities in which members participate, and an "ethic of caring," which includes school teachers and staff taking "a personal interest in students that reaches beyond the narrow confines of classroom performance" (p. 5). In this paper, we conceptualize mindful teachers as those who take a personal interest in the holistic growth and development of students and who interact with students in ways that address their basic psychological needs for belonging, autonomy, and competence in the school setting (Deci & Ryan, 2016). Furthermore, as Eccles and her colleagues (1993) have pointed out, adolescence is a time when young people may especially benefit from having both supportive non-parental role models like teachers who can address their developmental needs as they move into wider and wider social worlds. Much research has shown that when adolescent students experience school as a place that addresses their developmental needs, they are more engaged in learning, achieve more, and show greater well-being (see Eccles & Roeser, 2016).

Because of the critical role that teachers play in the school community, it is useful to consider what factors enable teachers to support adolescents' developmental needs, and thereby, help to advance caring school communities. While research is increasing on the role of mindfulness in education using intervention and prevention approaches (e.g., Schonert-Reichl & Roeser, 2016), few studies have examined how the natural variation of mindfulness and

compassion qualities among educators may impact the motivation, learning and development of students (e.g., Roeser & Eccles, 2015; Roeser, 2016). In this paper, we conducted a short-term longitudinal study of high school students to explore the idea that mindful teaching, by being calm, clear and kind in the interactions with students, may promote optimal adolescent development. Specifically, are teachers who students experience as more mindful and more compassionate also perceived as attending to their needs in school more? If so, is this how mindful teachers might impact student development? We hypothesize that student perception of mindful teaching enhances change in student perception of school need fulfillment, which then predicts students' own mindfulness, self-compassion, and compassion for others.

Theoretical Frameworks

Our hypotheses are grounded in Self-Determination Theory (Ryan & Deci, 2016), Stage-Environment Fit Theory (Eccles & Roeser, 2016), and research on teachers and mindfulness in education (e.g., Roeser, 2016a). Self-determination theory posits that the development of students' motivation, learning and wellbeing is shaped fundamentally by how well central life contexts, such as school, afford opportunities to meet three basic psychological needs: those for autonomy, competence, and belonging (Ryan & Deci, 2016). Autonomy involves the self-initiating and self-regulating of one's actions, competence refers to how effective one is within the environment, and belonging means having secure and satisfying relationships with others (Deci, Vallerand, Pelletier, & Ryan, 1991). When these needs are satisfied in a given social environment like school, the likelihood that care-givers' (e.g., teachers) embodied qualities and socialization efforts will be internalized and integrated into the person's developing identity is increased (e.g., Deci, Vallerand, Pelletier, & Ryan, 1991; Roeser, Eccles & Sameroff, 2000). For instance, in one longitudinal study of adolescents' in secondary school, Jang, Reeve and

colleagues (2009, 2012) found that teachers' support of student autonomy was associated with students' need fulfillment, and in turn, their engagement and learning in school. In addition, studies also show that perceptions of environmental support for student need fulfillment predicts students' academic motivation (Ricard & Pelletier, 2016) and their mindful awareness (Warren, Shubert, & Wray-Lake, 2020).

Other theorists have examined how such needs have particular importance in the second decade of life, when adolescents are moving from childhood to adult status and attempting to fulfill these needs in relation to adult roles and environments beyond the family (e.g., Erikson, 1968). Stage-Environment Fit Theory casts the needs perspective into a developmental framework to describe how the social environment impacts development throughout the life-course, highlighting the unique needs adolescents have during this time period (Eccles et al., 1993). Specifically, when adolescents' surroundings afford opportunities for them to exercise emotional, cognitive and behavioral autonomy; to develop their competencies in settings that do not emphasize competition and social comparison; and to feel a sense of relatedness and connection to non-parental role models; then they are more likely to feel engaged, to feel seen and accepted in their authenticity, and more likely to internalize the qualities and socializing messages of others. In short, such settings are hypothesized to provide a "developmental fit" with adolescents' changing needs that conduces towards motivation, learning, and well-being (Eccles et al., 1993). Conversely, issues like disengagement from school and psychological distress faced by many adolescents may be due, in part, to a developmental mismatch between adolescents' stage-specific needs and affordances in their families and schools (see Eccles & Roeser, 2016 for summary).

Research on adolescence and schooling has demonstrated that the ways teachers teach and relate to students can fulfill or undermine needs, and thereby shape student outcomes beyond academics like identity and social-emotional development (e.g., Roeser & Lau, 2002). Students who perceive their teachers as being supportive report liking school more and show increases in academic achievement (Roeser, Midgley, & Urdan, 1996). Supportive teachers also impact adolescents' school compliance, sense of school identification, and subjective value of learning (Wang & Eccles, 2012). Unfortunately, there is also evidence that as adolescents progress in school, opportunities for them to fulfill their needs in interactions with teachers become less frequent (Anderman, 2003; Eccles & Roeser, 2011).

Mindful Teaching

Recent research on teachers and mindfulness in education has begun to investigate the factors that affect how well teachers address adolescents' needs and thereby, foster their academic, identity and social-emotional development in school settings. Specifically, mindfulness and compassion have been identified as key aspects of one's ability to attend to and be attuned to the needs of others (e.g., Siegel, 2009) and have been hypothesized to support teachers' ability to create environments that meet students' needs (see Rickert et al., 2020; Roeser, Skinner, Beers & Jennings, 2012).

In an interdisciplinary dialogue sponsored by the Mind and Life Educational Research Network (MLERN; See Mind and Life Institute, 2009), Daniel Goleman described a *mindful person* as one who is "calm in body, clear in mind, and kind in heart." Rickert, Skinner and Roeser (2020) expanded on this idea to demonstrate that classroom teachers who exhibit these qualities of calm, clear and kind are in a more effective position to influence the needs of their students. These authors hypothesized that mindful teachers are calm, stable, resilient, and able to

regulate their emotions in the classroom; are clear insofar as they are present and focused, aware of their surroundings, and able to effectively communicate with their students; and are kind to the extent that they show care, empathy, compassion, and forgiveness toward their students, colleagues, and themselves at school. As such, this conceptualization of "mindful teaching" includes aspects of both mindfulness and compassion, which have been described in the literature as having complementary qualities and benefits, especially for those in human service professions (Raab, 2014). Collectively, these three qualities of calm, clear, and kind provide a description of mindful teaching that may be perceived by others.

Teachers who exhibit more mindful qualities may manage their classrooms differently, creating interactions with their students that allow for deeper connections and the fulfillment of student needs (Jennings & Greenberg, 2009; Roeser et al., 2012). For instance, because mindful teachers may cope with challenging emotions and stress in the classroom more effectively, teachers may be more available to their students in ways that may foster healthy teacher-student relationships and the internalization of the teachers' messages (Jennings & Greenberg, 2009). As such, mindful teachers, who are calm, clear, and kind, may be more likely to create engaging learning environments by being attuned to and meeting students' needs for autonomy, relatedness and competence compared to less mindful teachers (Roeser et al., 2012). Furthermore, when mindful teachers create an environment that matches students' needs, students may be more likely to emulate and internalize the calm, clear, and kind qualities demonstrated to them by these teachers. This internalization may appear as an increase in their own calmness and clarity (mindfulness), as well as the kindness they show to themselves (self-compassion) and to those around them (compassion for others).

In order to measure high school students' perceptions of their teachers and the nature of their school experience, we use student perception data rather than more "objective" measures of mindful teachers (e.g., Rickert et al., 2020) and school environments (e.g., Pianta & Hamre, 2009) in this study. A significant body of research has supported the idea that student perceptions, which reflect their personal meaning-making of their experiences in school, mediate between many so-called "objective" features of school and student outcomes (e.g., Wang & Holcombe, 2010; Wang & Eccles, 2013; Wentzel, 1997; Roeser & Galloway, 2002).

Research Questions and Hypotheses

To summarize, the current study uses longitudinal student self-report data collected from high school students across one school year to examine two main research questions. First, we examine: Are student perceptions of mindful teaching in their high school at the beginning of the school year related to changes in their own mindfulness, self-compassion, and compassion for others from the beginning to the end of the school year? This question, regarding the direct impacts of perceived mindful teaching on similar outcomes, addresses what we call our "role modeling hypothesis" - that mindful teaching has a direct impacts on students' mindfulness and compassion by serving as positive role models of qualities that students come to emulate over time.

Second, we examine: Are student perceptions of mindful teaching in their high school at the beginning of the school year related to subsequent changes in their perceptions of school need fulfillment in the middle of the school year, and does such change in need fulfillment impact changes in students' mindfulness, self-compassion, and compassion for others at the end of the school year? This question, on the indirect impact of perceptions of mindful teaching on outcomes, addresses what we call our "developmental fit hypothesis" - that mindful teaching

might be more effective at creating an environment that satisfies student needs of autonomy, competence, and relatedness, which in turn explains how and why mindful and caring teachers might contribute to the development of mindful and caring students through facilitating emulation and internalization of their own qualities (Ryan & Deci, 2016).

Method

Participants and Procedure

The sample included 599 high school students (M_{age} = 16.27 years, SD = 1.15) from a large suburban public high school in the Northeastern United States. Students were recruited through a random selection of teachers (and their students) from each grade level (grades 9-12). The analytic sample of 599 students represented about one third of the school population and included 19% freshmen, 24% sophomores, 28% juniors, and 29% seniors[1]. The sample self-identified as 49% female and 81% White, 12% two or more races, 2% Asian/Asian American, 2% Black/African American, and 2% Hispanic/Latino. The sample was representative of the school's population (88% White, 49% female; National Center for Education Statistics, 2018). According to NCES (2018), approximately 12% of the school population qualifies for free or reduced lunch.

Participants completed an online survey comprised of a variety of measures on mindfulness, compassion, empathy, and peer and teacher interactions. The survey was administered at three occasions during regular school hours throughout a single school year,

[1] Juniors and seniors were slightly over-sampled to permit a separate formative evaluation of a social psychology elective course in which students learned basic principles of mindfulness and compassion. In preliminary models, we included a dummy variable indicating enrollment in this elective course to test its influence on outcomes. Including this variable did not substantively alter any conclusions, and therefore, we did not include this variable in our analyses.

September (Time 1), January (Time 2), and April (Time 3). Approximately 66% (n = 395) of the participants took all three surveys, 27% (n = 163) took two surveys, and 7% (n = 41) took one survey. For more details on the procedure, see Abujaradeh, Colaianne, Roeser, Tsukayama, and Galla (2020).

Measures

Student perceptions of mindful teaching. Student perceptions of mindful teaching was measured using an 18-item measure developed by Rickert et al. (2020). Items assessed the three perceived teacher qualities of calm, clear, and kind (three items each), as well as their theoretical antitheses, reactive, distracted, critical (three items each). These qualities were assessed as a summary for all teachers that the students currently had in school (i.e., "Thinking about all the teachers you have right now…"). Students indicated their response to each item using a 5-point Likert scale (1 = "not at all true" to 5 = "very true"). Examples of items included, "Students can count on teachers in this school to be in a good mood" (calm/reactive), "Whether or not students can get away with something depends on how teachers are feeling that day" (clear/distracted), and "Teachers in this school go out of their way to help students" (kind/critical). The three subscales were positively correlated with each other at Time 1, r's = .68-.70. All 18 items were averaged in order to create a single omnibus perceived "Mindful Teaching" scale (Rickert et al., 2020; see Online Supplementary material for list of items). The Cronbach alpha coefficient at Time 1 was α = .89.

Student perceptions of need fulfillment in school. The Need Satisfaction Scale (La Guardia, Ryan, Couchman, & Deci, 2000) included nine items to capture how well adolescents perceived their school environment as meeting their basic needs for autonomy, competence, and relatedness. Students indicated their response to each item using a 7-point Likert scale (1 = "not

at all true" to 7 = "very true"). Examples of items include, "In this school, I feel controlled and pressured to behave in certain ways" (autonomy), and "In this school, I feel loved and cared about" (relatedness). Cronbach alpha coefficients for the composite scale at Time 1 and Time 2 were α_{T1} = .83 and α_{T2} = .85.

Student mindfulness. We used a 15-item short-form version of the Five Facet Mindfulness Questionnaire (Baer, Smith, Hopkins, & Krietemeyer, 2006). This short-form version (adapted from Tran, Glück, & Nader, 2013) included items from four mindfulness facets, act with awareness (four items), describe (three items), non-judgement (four items), and non-reactivity (four items), based on the results of a factor analysis of these items in this same sample (see Abujaradeh et al., 2020). Participants indicated their responses using a 5-point Likert scale (1 = "never or very rarely true" to 5 = "very often or always true"). Example statements include, "When I do things, my mind wanders off and I'm easily distracted" (act with awareness), "I have trouble thinking of the right words to express how I feel about things" (describe), "I tell myself I shouldn't be thinking the way I'm thinking" (non-judgement), and "I watch my feelings without getting lost in them" (non-reactivity). Cronbach alpha coefficients for the composite scale at Time 1 and Time 3 were α_{T1} = .82 and α_{T3} = .85.

Student self-compassion. The Self-Compassion Scale-Short Form is a 12-item scale used to measure six facets of self-compassion: self-kindness, self-judgement, common humanity, isolation, mindfulness, and over-identification (Raes, Pommier, Neff, & Van Gucht, 2011). For the purposes of this study, we used an omnibus indicator that included all items. Participants indicated their responses on a 6-point Likert scale (1= "strongly disagree" to 6 = "strongly agree"). Example statements include, "I try to see my failings as part of the human condition" (common humanity), and "I try to be understanding and patient towards those aspects of my

personality I don't like" (self-kindness). Cronbach alpha coefficients for the composite scale at Time 1 and Time 3 were α_{T1} = .86 and α_{T3} = .86.

Student compassion for others. Scholars have noted the need for better measures of compassion for others, including better self-report measures (e.g., Roeser & Eccles, 2015; Strauss et al., 2016). Thus, for purposes of this study, compassion for others was measured by combining items from three existing scales to cover components of compassion associated with awareness and sensitivity, motivation and engagement, and action (see Strauss et al., 2016). Eight items from the Compassionate Engagement and Action Scale (Gilbert et al., 2016) were used to assess individuals' sensitivity to and engagement with the suffering of others (e.g., extending compassion to others). Participants indicated their responses on a 10-point Likert scale (1= "never" to 10 = "always"). Example statements include, "When others are distressed or upset by things, I notice and am sensitive to distress in others when it arises" (engagement) and "When others are distressed or upset by things, I take the *actions* and *do the things* that will be helpful to others" (compassionate action). Three items were used from the Interpersonal Reactivity Index (Davis, 1980) to measure "empathic concern" – a key motivational feature of compassion (e.g., Strauss et al., 2016). Participants responded on a 5-point Likert scale (1 = "does not describe me well" to 5 = "describes me very well"). Example statements include, "I often have tender, concerned feelings for people less fortunate than me." and "When I see someone being taken advantage of, I feel kind of protective toward them." Finally, we used 4 items from the Adults' Prosocialness Scale (Caprara, Steca, Zelli, & Capanna, 2005) to measure prosocial action, another key feature of compassion (Strauss et al., 2016). Participants responded to a 5-point Likert scale (1 = "never/almost never true" to 5 = "almost always/always true"). Example statements include, "I help others even if it does not personally benefit me" and "I try to console

those who are sad." To create a composite scale, we derived a single factor from all items. This factor accounted for 49% of the variance in the items. Cronbach alpha coefficients for the composite scale at Time 1 and Time 3 were α_{T1} = .89 and α_{T3} = .91.

Student self-reported demographics. Because research has shown there are gender differences in self-compassion and prosocial behavior during adolescence (e.g., Bluth & Blanton, 2015; Van der Graaff, Carlo, Crocetti, Koot, & Branje, 2018), gender was included as a covariate in all statistical analyses in this study (coded 0 = *Male* and 1 = *Female*). In addition, because research findings on age-related changes in compassion during adolescence is equivocal (see Spinrad & Eisenberg, 2017), grade level in high school was included as a covariate in all analyses. This was measured as a continuous variable reflecting each students' grade level, 1 = *Grade* 9, 2 = *Grade 10*, 3 = *Grade 11*, 4 = *Grade 12*.

Data Analysis

All statistical analyses were completed using the *lavaan* package (Yves, 2012) and the *psych* package (Revelle, 2018) in RStudio. Missing data were handled using full-information maximum likelihood, which estimates the model based on all available information and is considered to be less biased and more efficient than other methods (Baraldi & Enders, 2010). We begin by examining univariate and bivariate statistics for all measures (see Tables 1-2). We then used multivariate regression and indirect effect analyses to examine our role model and developmental fit hypotheses, respectively.

Role model hypothesis analysis. A set of multiple regression analyses were conducted to test the hypothesis that student perceptions of mindful teaching predicts student mindfulness, self-compassion, and compassion for others over time after controlling for baseline levels, as well as student demographic characteristics.

Developmental fit hypothesis analysis. A set of indirect effect models were specified to test the hypothesis that the influence of student perceptions of mindful teaching on student outcomes is impacted by change in student perception of school need fulfillment, after controlling for baseline levels and demographic characteristics. A bootstrap estimation approach with 5,000 samples was employed, and bias-corrected 95% confidence intervals were estimated for each indirect effect (Preacher & Hayes, 2008).

Results

Descriptive and Bivariate Analyses

Table 1 presents the descriptive statistics and bivariate correlations for the student outcome and demographic variables. Overall, measures of student mindfulness, self-compassion and compassion for others were normally distributed around the mid-points of the scales and showed stability coefficients of between .68 and .71 over the course of one school year. Students' mindfulness was strongly, positively correlated with self-compassion at the beginning and end of the school year. In contrast, mindfulness and self-compassion only showed small, positive correlations with the combined compassion for others measure at the beginning and end of the school year. Females showed significantly lower self-compassion than males at the beginning of the school year ($p < .01$), and females showed significantly higher compassion for others at the beginning ($p < .001$) and end of the school year ($p < .001$). Grade level was significantly correlated with student mindfulness, such that underclassmen showed significantly higher mindfulness at the beginning of the school year ($p < .01$).

Table 2 shows the correlations between student outcomes and demographic characteristics and student perceptions of mindful teaching and student perceptions of school need fulfillment. All outcomes also showed small to large significant positive correlations, *r*s =

.20-.52, with perceptions of mindful teaching at baseline and school need fulfillment at midway through the year. Finally, though not presented in Table 2, results showed that student perceptions of mindful teaching were correlated with their perceptions of school need fulfillment at the beginning $r(597) = .33$, $p < .001$, and the middle of the school year, $r(597 = .32$, $p < .001$. These results also showed that, at the beginning of the school year, grade level was significantly associated with student perceptions of mindful teaching. There were no gender differences in student perceptions of mindful teaching or school need fulfillment.

Role Model Hypothesis Results

In order to test our first research question concerning role modeling, multiple regression analyses were used to examine the predictive relation of student perceptions of mindful teaching at the beginning of the school year on change in their mindfulness, self-compassion, and compassion for others from the beginning to the end of the school year. In these analyses, baseline measures of each outcome, student gender, student grade, and student perceptions of mindful teaching at baseline were used to predict outcomes at the end of the year. Results are presented in Table 3 and described below.

With regard to student mindfulness, results from regression analyses showed that student perceptions of mindful teaching at the beginning of the year did not predict change in student mindfulness from the beginning to the end of the year, $b = .07$, $SE = .04$, $p = .074$, after controlling for student mindfulness at baseline and demographic characteristics. Similarly, student perceptions of mindful teaching at the beginning of the year did not predict change in student self-compassion from the beginning to the end of the year, $b = .08$, $SE = .05$, $p = .080$, after controlling for baseline and demographic characteristics. However, perceptions' of mindful teaching at the beginning of the year did predict change in compassion for others from the

beginning to the end of the year, b = .15, SE = .06, p = .012, after controlling for baseline and demographic characteristics.

Developmental Fit Hypothesis Results

In order to test our second research question concerning the indirect effect of perceptions of need fulfilment in school, a series of indirect effect analyses were fit for each outcome to see if the predictive relation of student perceptions of mindful teaching at the beginning of the school year on change in their mindfulness, self-compassion, compassion for others from the beginning to the end of the school year was impacted through perceptions of school as a place where students' needs were fulfilled.

In all path analyses, predictors included student perception of mindful teaching at baseline, student perception of school need fulfillment at baseline, the outcome at baseline, student gender, and student grade level. These models were different from our Role Model Hypothesis models due to the addition of the school need fulfillment variables. In general, results favored an indirect path, such that mindful teaching significantly predicted change in student perceptions of school need fulfillment, which then significantly predicted change in student mindfulness, student self-compassion, and student compassion for others over time. Results are presented in Figures 1-3 and described below.

Change in student mindfulness. For the prediction of change in student mindfulness from the beginning to the end of the school year, results indicated that student perception of mindful teaching at the beginning of the school year was a significant predictor of change in student perception of school need fulfillment from the beginning to the middle of the year, b = .16, SE = .07, p = .025, and that change in school need fulfillment in the middle of the year, in turn, was a significant predictor of change in student mindfulness at the end of the school year, b

= .11, *SE* = .04, *p* = .001. Results showed that perceived mindful teaching was still not a significant predictor of student mindfulness at outcome after controlling for school need fulfillment, *b* = .04, *SE* = .04, *p* = .311. The bootstrap estimation confirmed that the indirect effect of perceived mindful teaching on change in student mindfulness was significant, *b* = .02, *SE* = .01, 95% CI [.001, .043].

Change in student self-compassion. For the prediction of student self-compassion from the beginning to the end of the school year, results showed that student perception of mindful teaching at the beginning of the school year was a significant predictor of change in student perception of school need fulfillment from the beginning to the middle of the year, *b* = .19, *SE* = .07, *p* = .006, and that change in school need fulfillment in the middle of the year was a significant predictor of change in student self-compassion at the end of the year, *b* = .17, *SE* = .04, *p* < .001. Perceived mindful teaching was still not a significant predictor of student self-compassion after controlling for school need fulfillment, *b* = .03, *SE* = .05, *p* = 0.574. The bootstrap estimation indicated that the indirect effect of perceived mindful teaching on change in student self-compassion was significant, *b* = .03, *SE* = .02, 95% CI [.009, .073].

Change in student compassion for others. For the prediction of student compassion for others from the beginning to the end of the year school, results showed that student perception of mindful teaching at the beginning of the school year was a significant predictor of change in student perception of school need fulfillment from the beginning to the middle of the year, *b* = .21, *SE* = .07, *p* = .004, and that change in school need fulfillment in the middle of the year was a significant predictor of change in student compassion for others at the end of the year, *b* = .18, *SE* = .06, *p* = .003. Perceived mindful teaching was not a significant predictor of student compassion for others after controlling for school need fulfillment, *b* = .12, *SE* = .07, *p* = .098.

The bootstrap estimation indicated that the indirect effect of perceived mindful teaching on change in student compassion for others was significant, $b = .04$, $SE = .02$, 95% CI [.010, .081].

Discussion

In this paper, we explored how student perceptions of their high school teachers as more or less mindful were related to their development of mindfulness, self-compassion and compassion for others across the course of a single school year. We hypothesized that student perceptions of mindful teaching would directly impact these outcomes through modeling, and indirectly through the impact of such interactions on fulfilling adolescents' developmental needs in school. To test these hypotheses, a short-term longitudinal student of high school students was conducted to assess cross-time relations between student perceptions of mindful teaching, school need fulfillment, and changes in students' mindfulness, self-compassion, and compassion for others from the beginning to the end of one year in high school. This is one of the first studies to examine how the natural variation in mindful teaching might impact similar outcomes in students at school.

With regard to our role modeling hypotheses, results showed only partial support. Perceptions of mindful teachers did not predict changes in students' mindfulness or self-compassion over time, but such perceptions did predict student compassion for others. It may be that seeing others be compassionate is easier, and therefore, this quality is both easier to model and easier to emulate than say, another's mindfulness or self-compassion. After all, compassion involves expressing feelings of support and taking actions that will be helpful to others (Gilbert et al., 2016), which implies that compassion for others has an interpersonal and visible quality compared to mindfulness and self-compassion, which have more intrapersonal and relatively invisible qualities. However, because these qualities were measured only in the assessment of

students, we cannot deconstruct the different behaviors of the teachers that preceded the student qualities.

In contrast, our correlational and indirect effect analyses results supported our hypotheses that mindful teaching might better meet student needs. We found support for our developmental fit hypothesis that mindful teaching influences student mindfulness, self-compassion, and compassion for others by way of students perceiving their needs being met. This indirect impact of mindful teaching on outcomes suggest that by meeting student needs, students may be more open to internalizing socialization qualities and messages. Thus, extending previous work, the results of this study suggest that supportive teachers may not only be associated with change in student need fulfillment at school, but they might also be associated with more mindful and caring students by facilitating the internalization of socialization messages.

How might such a sequence of relations look in the classroom? We imagine a few possible scenarios: 1) When teachers handle classroom situations calmly (mindful teaching), students may not feel controlled and pressured to behave in certain ways (autonomy), which gives students the ability to pause before immediately reacting against the teacher (student mindfulness); 2) When a teacher notices when students are confused and goes out of her/his way to help them (mindful teaching), students may now feel more competent and capable (competence), minimizing feelings of inadequacy when they struggle or fail at something (student self-compassion); and 3) When teachers notice when students are confused and go out of their way to help (mindful teaching), students feel cared about (relatedness), which may help students take the actions needed to care for others (student compassion for others).

More broadly, these results contribute to the work on the interpersonal impacts of mindfulness. Although often overlooked in the literature, mindfulness has been attributed to

improving relational qualities such as warmth, perspective-taking, empathy, and acceptance (Dekeyser, Raes, Leijssen, Leysen, & Dewulf, 2008; Burrows, 2011). One might imagine that, through modeling or need fulfillment, mindful people are a kind of social affordance for others - creating a more welcoming environment in which others are seen in their full humanity. This type of school environment, theory predicts, should be particularly impactful during the period of adolescence (Eccles & Roeser, 2016).

Practical Implications

The results of this study have implications for the everyday life of a teacher. Teachers' own social-emotional qualities have been said to create the "weather" in the classroom (Schonert-Reichl, 2017) in ways that impact program implementation and students (e.g., Jennings & Greenberg, 2009). Our results, based on student perceptions, suggest that this "weather" might impact non-academic aspect of students' development as well. The presence of a calm, clear, and kind teacher can support students' holistic growth, whether through modeling or need fulfillment. Broadly, studies have repeatedly found that student perceptions of teacher qualities impact student qualities, such as achievement expectation (Brattesani, Weinstein, & Marshall, 1984), purpose and goal direction (Bundick & Tirri, 2014) and growth mindset (Gutshall, 2016). This study contributes to this work by suggesting that perceptions of teacher qualities may also impact students' mindfulness and compassion. These results also call for future studies to explore whether the qualities of mindful teaching (calm, clear, and kind) are malleable, and if so, whether improving these qualities support student outcomes.

Strengths and Limitations

The strength of this study lies in the longitudinal approach of assessing naturalistic variation in students' mindfulness and compassion over time, as well as hypothesized

antecedents to change based on students' school experiences. Greater focus on naturalistic longitudinal studies is needed in the research based on mindfulness and compassion in human development (e.g., Roeser & Eccles, 2015).

Limitations also suggest avenues for future research. Future studies should test these hypotheses in additional schools that represent a wider range of socioeconomic communities and diverse teacher and student populations. When measuring the perception of mindful teaching, students were directed to consider their current teachers. However, because this was being asked at the beginning of the school year, students may have been thinking about past teachers when responding to the items. A more nuanced investigation of which teachers are being perceived as having mindful qualities would be useful for analyses. Although third-person observations of mindful teaching were not obtained here, there is prior evidence that observer ratings share modest, predictable relations with student perceptions of secondary school teachers' calmness, clarity and kindness in the classroom (see Rickert et al., 2020). Future research could include teacher self-reports and teacher observation measures to supplement student reports and improve reliability and validity of "mindful teaching" scales.

Conclusion

This study proposed that teachers who exhibit natural, mindful qualities of calmness, clarity, and kindness offer an affordance to their students' own social and emotional development. We found that students who perceive their teachers as more mindful at the beginning of the school year are more likely to show positive change over time in qualities of mindfulness, self-compassion, and compassion for others. We examined two different hypothesized pathways to such outcomes – a direct path (modeling) and an indirect path (developmental fit). We found evidence for a direct, modeling effect of perceptions of mindful

teaching and change in student compassion for others over time. We also found evidence for an indirect effect, such that perceptions of mindful teaching was associated with a change in students' sense that school was a place where their self-related needs were met, which was then associated with a change in student mindfulness, self-compassion, and compassion for others over time. By exploring the positive impacts of teachers' mindful qualities on students, we have provided initial evidence into perhaps an essential ingredient in transforming schools into more caring communities of learning.

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Table 1

Descriptive Statistics and Bivariate Correlations Among Student Outcome and Demographic Characteristics

Variable	1	2	3	4	5	6	7	8
1. Student Mindfulness (T1)	____							
2. Student Mindfulness (T3)	0.68***	____						
3. Student Self-Compassion (T1)	0.64***	0.54***	____					
4. Student Self-Compassion (T3)	0.52***	0.67***	0.69***	____				
5. Student Compassion for Others (T1)	0.12**	0.09	0.04	0.10*	____			
6. Student Compassion for Others (T3)	0.10*	0.13**	0.03	0.11*	0.71***	____		
7. Student Gender	-0.03	0.00	-0.13**	-0.05	0.32***	0.34***	____	
8. Student Grade Level	-0.14**	-0.09	-0.08	-0.04	0.05	0.02	-0.05	____
Mean	3.32	3.26	3.58	3.61	0.00	0.00	0.49	2.66
SD	0.57	0.59	0.82	0.81	1.00	1.00	0.50	1.09

Note. N = 599 (using full information maximum likelihood); *SD* = standard deviation; Gender is coded 0 = *Male*, 1 = *Female*; Grade level is coded 1 = *Grade 9*, 2 = *Grade 10*, 3 = *Grade 11*, 4 = *Grade 12*; T1 = *Time 1 (September)*, T3 = *Time 3 (April)*; *$p < .05$, **$p < .01$, ***$p < .001$

Table 2

Descriptive Statistics and Bivariate Correlations Between School Perceptions, Student Outcomes and Demographic Variables

	Students' School Perceptions	
Student Outcomes and Demographic Characteristics	Mindful Teaching (T1)	School Need Fulfillment (T2)
Student Mindfulness (T1)	0.40***	0.48***
Student Mindfulness (T3)	0.33***	0.49***
Student Self-Compassion (T1)	0.32***	0.46***
Student Self-Compassion (T3)	0.27***	0.52***
Student Compassion for Others (T1)	0.20***	0.19***
Student Compassion for Others (T3)	0.22***	0.28***
Student Gender	-0.03	0.06
Student Grade Level	-0.19***	-0.01
Mean	3.61	4.87
SD	0.61	1.02

Note. N = 599 (using full information maximum likelihood); *SD* = standard deviation; Gender is coded 0 = *Male*, 1 = *Female*; Grade level is coded 1 = *Grade 9*, 2 = *Grade 10*, 3 = *Grade 11*, 4 = *Grade 12*; T1 = *Time 1 (September)*, T2 = *Time 2 (January)*, T3 = *Time 3 (April)*; ***$p < .001$

Table 3

Direct Effects of Mindful Teaching on Change in Student Outcomes

	Student Outcomes (T3)					
	Student Mindfulness		Student Self-Compassion		Student Compassion for Others	
Variable (T1)	*Beta*	*SE*	*Beta*	*SE*	*Beta*	*SE*
Mindful Teaching	0.07	0.04	0.08	0.05	0.15**	0.06
Student Mindfulness	0.67***	0.04	____	____	____	____
Student Self-Compassion	____	____	0.66***	0.04	____	____
Student Compassion for Others	____	____	____	____	0.65***	0.04
Student Gender	0.01	0.04	0.05	0.06	0.24*	0.07
Student Grade Level	0.01	0.04	0.03	0.03	0.00	0.03
df	4, 594		4, 594		4, 594	
R^2	0.47		0.48		0.52	

Note. N = 599 (using full information maximum likelihood); *df* = degrees of freedom; Gender is coded 0 = *Male*, 1 = *Female*; Grade is coded 1 = *Grade 9*, 2 = *Grade 10*, 3 = *Grade 11*, 4 = *Grade 12*; T1 = *Time 1 (September)*, T3 = *Time 3 (April)*; *$p < .05$, **$p < .01$, ***$p < .001$

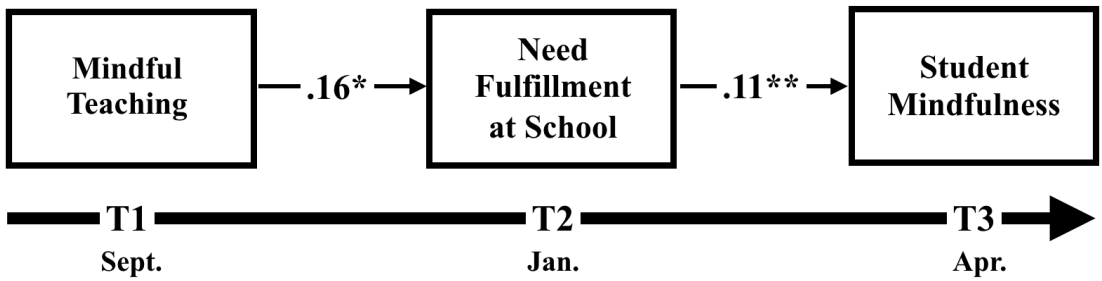

Figure 1. Indirect effects model for student mindfulness, controlling for student grade level, student gender, student mindfulness at T1, and school need fulfillment at T1.

Note. $N = 599$ (using full information maximum likelihood); T1 = *Time 1 (September)*, T2 = *Time 2 (January)*, T3 = *Time 3 (April)*; $*p < .05$, $**p < .01$

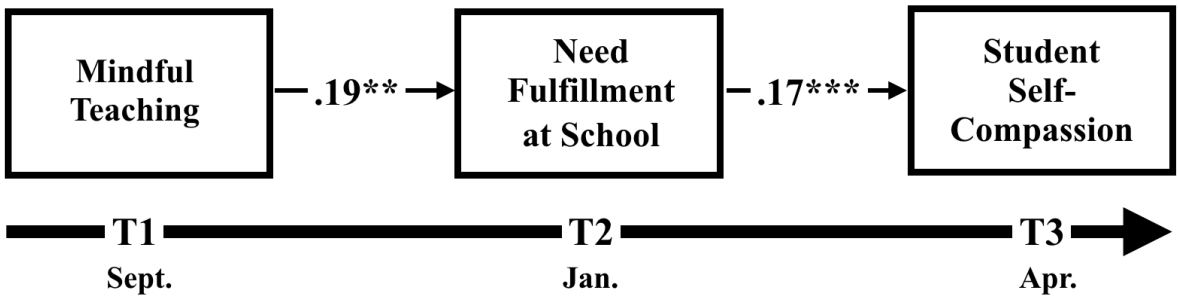

Figure 2. Indirect effects model for student self-compassion, controlling for student grade level, student gender, student self-compassion at T1, and school need fulfillment at T1.

Note. N = 599 (using full information maximum likelihood); T1 = *Time 1 (September)*, T2 = *Time 2 (January)*, T3 = *Time 3 (April)*; **p <.01, ***p < .001

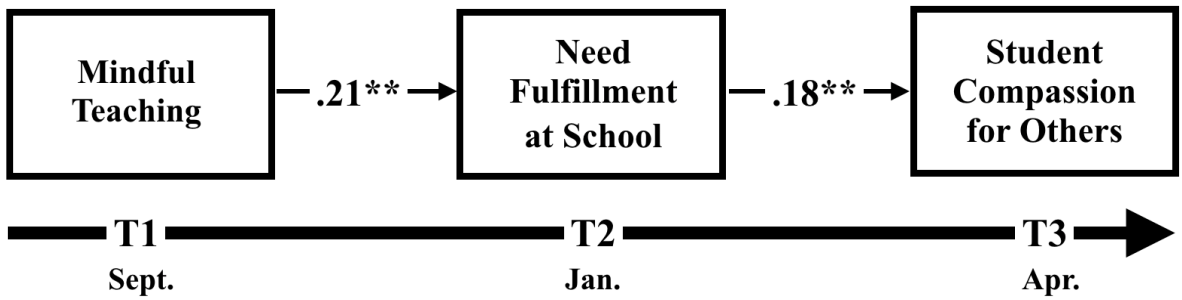

Figure 3. Indirect effects model for student compassion for others, controlling for student grade, student gender, student compassion for others at T1, and school need fulfillment at T1.

Note. N = 599 (using full information maximum likelihood); T1 = *Time 1 (September)*, T2 = *Time 2 (January)*, T3 = *Time 3 (April)*; **p <.01