PROMOTING WELLNESS THROUGH MINDFULNESS-BASED ACTIVITIES

By

MAŁGORZATA POWIETRZYŃSKA

A dissertation submitted to the Graduate Faculty in Urban Education
in partial fulfillment of the requirements for the degree of Doctor of Philosophy,
The City University of New York
2014

© 2014

MAŁGORZATA POWIETRZYŃSKA

All Rights Reserved

This manuscript has been read and accepted for the Graduate Faculty in Urban Education in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy

Dr. Kenneth Tobin

_____ _____
Date Chair of Examining Committee

Dr. Anthony D. Picciano

_____ _____
Date Executive Officer

Dr. Kenneth Tobin

Dr. Konstantinos Alexakos

Dr. Gillian Bayne

Dr. Gene Fellner

Supervisory Committee

THE CITY UNIVERSITY OF NEW YORK

ABSTRACT

PROMOTING WELLNESS THROUGH MINDFULNESS-BASED ACTIVITIES

by

MAŁGORZATA POWIETRZYŃSKA

Advisor: Professor Kenneth Tobin

The central idea of this dissertation is mindfulness framed as a sociocultural, secular, and multidimensional construct involving attention that is purposeful, in the present moment, and non-judgmental. Mindfulness represents a unification of century-old contemplative Eastern traditions (including Buddhism) and the recent developments of modern, Western science. Hence, supported by the emerging scientific evidence, I argue that mindfulness practices have a potential to offer a wide range of benefits related to wellness. In particular, I report on our hermeneutic-phenomenological studies investigating the centrality of emotions in teaching and learning. Our findings confirm that when adopted in education, mindfulness may mediate positive socio-emotional and cognitive changes stretching beyond the immediate school environments and their narrowly defined outcomes. In my discussion of methods and methodologies used in our research, I highlight theory and practical applications of mindfulness-based interventions. I specifically address two such interventions–breathing meditation and reflexivity-boosting heuristics–that were developed and enacted in our studies. Considered in ontological terms, the interventions are meant to afford shifts towards enactments saturated with focus, open awareness, and the ability to detach from thoughts and emotions. Axiological

considerations point to compassion towards all sentient beings and the non-animate world as a highly valued component of a mindful disposition. The principles of authentic inquiry we practice stipulate that research participants benefit from the study. Accordingly, my engagement in this research afforded ontological changes towards more mindful ways of being. In addition, I was able to witness and contribute to similar transformations in people occupying different fields of my social life. When viewed through an epistemological lens, wellness-mediating mindful enactments constitute knowledge that is profoundly desirable and distinct from a canonical tradition that continues to be privileged in education. As a researcher, I consider it an ethical obligation to persist in mindfulness-promoting activism towards achievement of ontological, educative, catalytic, and tactical authenticity. The relationships with like-minded scholars that emerged in the course of my research open up new possibilities for the collaborative work to continue.

ACKNOWLEDGEMENTS

This dissertation is a product of a collaborative work of countless minds and bodies who have contributed to its genesis and completion. As such, a list of people to whom I am indebted is fairly extensive making it impossible to name everyone in this important section of giving thanks.

I am grateful to Kenneth Tobin for taking a risk by including me in the circle of his advisees when he barely knew my scholarly work. From day one of our mutual journey, however, Ken, who is a rare combination of brilliant scholar and relentless humanitarian, has been an invaluable mentor. He is a humble embodiment of the theories and practices he teaches. At the same time, he is courageous in speaking out and acting against injustice and hegemony. As such, he is a sanctuary for those who may not quite fit the prescribed academic mold. I appreciate Ken's encouragement and trust in allowing me to find my own way and to grow as a mindful scholar.

Gene Fellner has been a dear friend ever since we met in one of the early courses of the doctoral program at the CUNY Graduate Center. He was the very first person who recognized and convinced me that I could become a scholar. His love of pondering over ideas and his willingness to engage me in the process has been an inspiration to push forward. An articulate intellectual with an artistic sensibility and an unshakable sense of ethics, Gene has always been ready to lend a helping hand. And whenever he did, he did it with utmost thoroughness and care. I was thrilled to have Gene on my advisory committee.

I am thankful to Konstantinos Alexakos for welcoming my participation in the Brooklyn College Study, which has become a powerful springboard for my trajectory as an interpretive researcher. I appreciate Konstantinos for often pushing back on ideas and thus giving me the

reason to pause and consider an alternative. An avid advocate of his students, Konstantinos exemplifies a (com)passionate educator.

I am grateful to Gillian Bayne for serving on my second exam and the dissertation advisory committee. Gillian's unique perspective and astute comments were a much-needed component of my doctoral experience. She was a great support to me during the dissertation process.

I thank Anthony Picciano for providing consistent guidance towards progression in my doctoral work and Christine Saieh for always being prepared to help me navigate the academic bureaucracy when its workings overwhelmed me.

A big thank you goes out to Natasha Dachos who has been a most gentle teacher of mindful ways of being. To my adopted sisters, Aimee Tabrizi and Aga Pierwola, whose stories and powerful quotes are featured in my manuscripts. To the members of the Research Squad collective: Andre, Dorota, Glauco, Hiro, Karim, Olga, Peter, Rafael, and Rey for being my family away from home and for providing their loving support and encouragement. To my best friend, Bozena, for always believing in me, for cheering me on, and for lending her "technical" expertise in conducting statistical analyses. To my family across the big pond for their unconditional love and patience in listening to my endless "field reports." To my son for his stoical and levelheaded support. To Alex for being understanding and for enduring my persistent unavailability for social occasions. Notably, I must acknowledge Piotr's courage in allowing me to share our mutual and deeply personal story. And finally, I am grateful to the students who patiently participated in my research and shared their inner thoughts and emotions with me.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

FOREWORD

FRAMING THIS DISSERTATION

> [I]n the helter-skelter of contemporary academic life, I never found the time to sit down and write the book through end-to-end. Instead, I took advantage of invitations to give a paper here or attend a conference there and composed them one at the time. The essays have, therefore, gradually been scattered about in various journals and edited collections. (Sewell, 2005, p. x)

William Sewell wrote the above words in the "Preface" to his seminal book *Logics of History: Social Theory and Social Transformation*. My introduction to Sewell and his work occurred in the Fall of 2011 during what was the very last course of my doctoral program in Urban Education. Labeled "Qualitative Research Methods," the course happened to be taught by one of the front-line faculty, Kenneth Tobin, of whom, at the time, I knew close to nothing. Quite unexpectedly and within a relatively brief time, however, Tobin and his work (along with that of Sewell's) became a desperately needed "growth hormone" and a major transformative influence in my scholarly trajectory. It was under Tobin's tutelage of the past two and a half years that I developed a passion for interpretive research under the umbrella of sociocultural frameworks. This dissertation is one of the products of a collaborative work I engaged in as a member of Tobin's research squad collective. Similar to Sewell's book, my dissertation consists of pieces I wrote in response to invitations to contribute to various publication outlets. Therefore, each of these manuscripts (here chapters) may be read independently from one another. What unifies these essays is the theme of mindfulness and its place/role in teaching and learning understood as happening not only within the confines of a traditional classroom but also occurring informally in other fields of social life. I organized the chapters chronologically, i.e., from the earliest

(Chapter 1) to the most recently written one (Chapter 6). My rationale for doing so rests in my belief that the progression of chapters represents my scholarly growth. Hence, before I delve into introducing each chapter, I would like to provide the context in which they were born. I will focus on what I find salient to this formative period of my identity as a researcher. To that end, I will dial the clock back two and a half years and share the confessional tale (Van Maanen, 2011) of my epistemological, ontological, and axiological journey.

Beginning at the End

> One of the hallmarks of contemporary qualitative research is its transparency, with researchers making visible their engagement in the inquiry process (…). Because qualitative research produces deeply contextualized (rather than universal) knowledge, detailed description of context is crucial (Taylor, 2013, p. 1).

I stumbled across Tobin through what he and Joe Kincheloe (2006) refer to as *the complexity of the educational cosmos* or what back then I considered "an act of fate." Today I would frame that occasion as part and parcel of the emergent nature of social life. Emergence and contingence always resonated with me on an intuitive level. Resembling the proverbial "life is like a box of chocolate, you never know what you're gonna get," I never believed in making long-term plans. Whenever I was pressured by my best friend to commit to a course of action in the future, I used to jokingly say that I was waiting for "a sign from heaven" to guide me. Indeed, it appears that things have always had a way of "falling into place" for me. Such was the case with Tobin and me crossing paths at what proved to be the most opportune moment. The resultant immersion in the sociocultural frameworks afforded me with the theoretical grounding to identifying, articulating, and applying emergent principles to not only my life but to study designs and execution. As I illustrate in the chapters of this dissertation, emergence, which is a function of

"the complexity of the lived world with its maze of uncontrollable variables, irrationality, non-linearity, and unpredictable interaction of whole and parts" (Kincheloe & Tobin, 2006, p. 6), has become my preferred lens for making sense of the world.

From: Malgorzata Powietrzynska
Sent: Fri 8/26/11 10:16 PM
To: Gene Fellner

I'm in Tobin's class. I hear you'll be taking the lead in two weeks.

I remember sitting in my first class with Tobin wide-eyed and overwhelmed by the terminology he was using. I felt bombarded with unknown–words like ontology, axiology, interpretive research, phenomenology, hermeneutics, dialectic, polysemic, polyphonic, and radical subjectivity, and many others. I remember thinking to myself, "Here I am at the end of my coursework and feeling downright inadequate." Fortunately, for the first time during my doctoral journey, I decided to take a leap of faith and share my unsettling state of mind with one of my fellow doctoral students, Gene Fellner. Gene, who at the time was getting ready for his defense, was among Tobin's advisees. He also happened to be an invited guest speaker in one of Tobin's classes I was attending. Gene had been among very few students in the program I had interacted with outside class time. Typically for Gene, when he recognized my distress, he caringly engaged me in scholarly exchanges that assisted in interpretation of the constructs I was struggling with. In the process, I began to experience a change in my habitus and in my position in the field of the doctoral program. Up until that time, I was "going it alone" since I believed education was meant to be an individual endeavor. As a result, I felt quite isolated and disconnected from other doctoral students. In addition, I did not develop a sense of an epistemologically-driven connectedness with any of the faculty members in the program even

though I kept on being told that I would eventually "click" with a professor who would then become my advisor and mentor. Unfortunately, as time marched on, I did not appear to be "clicking" with anyone. It was through dialoging with Gene and attendance in Tobin's class that I began developing an ontological understanding that, similar to other fields of social life, "to be in the [academic] world is to be in relationship" (Kincheloe & Tobin, 2006, p. 6). Applying what I was learning in Tobin's course, I began recognizing the importance of the dialectic relationship between individual and collective and of learning from being in with others. To that end, I eagerly accepted Tobin's offer to join his research squad and his invitation to participate in the monthly Urban Science Education Research Seminars. For the first time since I started the program, I felt connected to a community of practice which I hoped would "provide scaffolding associated with how to do and learn from research, what to read, and how to present what you learn from research" and would make possible "participation in various forms of peer review and dissemination" (Kincheloe & Tobin, 2006, p. 12). As I note later, I would not be disappointed.

From: Gene Fellner
Sent: Mon 10/17/11 9:51 PM
To: Malgorzata Powietrzynska

There are often a number of graduates who come to squad-- it's a way of giving back to the idea of collaborative thinking and I think Ken likes us there.

On Oct 17, 2011, at 6:12 PM, Malgorzata Powietrzynska wrote:

We will? If you're done with you dissertation, what would you be doing in the squad? Not that I do not welcome the idea. I read the article while on my way to work in the car and got dizzy. Need to reread while not in motion...

On Oct 17, 2011, at 4:09 PM, Gene Fellner wrote:

Thanks for your long letter. I realized that, next semester, we'll be in squad together.

Most notably, I recognized that, intrigued by Tobin's school of thought, I was rapidly developing a strong attraction towards sociocultural theory and interpretive forms of inquiry. Heavens were clearly sending me the sign. Therefore, upon consultation with Gene, I decided to follow what felt right. To that end I bid farewell to the macro-level quantitative research I had previously been engaged in with an eye to it becoming the basis of my dissertation. Instead, after Gene put in a good word for me, I welcomed an opportunity to embark on a new journey as Tobin's freshly minted advisee. As it turned out what was to be the end of a fairly mundane doctoral coursework was indeed a beginning of a profoundly enriching and refreshingly exciting academic experience that is culminating with the pages of this dissertation.

From: Gene Fellner
Sent: Fri 10/21/11 1:14 AM
To: Malgorzata Powietrzynska

I'm really excited about you working with Ken, loved listening to your excitement on the phone, and am looking forward to read your papers.

Meanwhile, it's 1 AM and I'm going to bed. I'm struggling again with this last chapter. I fear I'm making it worse rather than better and taking the poetry out of it.

It'll be great to see you on Saturday. Welcome to USER-S!

From "a Sign from Heaven" to a Baptism by Fire

> Scholarship, which may seem a lonely occupation to those who do not pursue it, is in fact profoundly social. Our ideas are produced in within the socially constructed network of puzzles, problems, and observations that are the stuff of intellectual communities, and they are advanced by endless discussion and argument. (Sewell, 2005, p. x)

There was no wasting time with Tobin. Even before the conclusion of the same semester, on December 6, he arranged for my Second Exam with a group of scholars (Gene included) who

would also serve as my dissertation committee. Among them was Konstantinos Alexakos–Tobin's close collaborator and a creator and director of a graduate Science Teacher Education program at our sister institution, Brooklyn College. It so happened that, at the time, Tobin and Alexakos were in the planning stages of a complex research project investigating the centrality of emotions in education; the study to be conducted the following semester in a course taught by Alexakos. Along with a group of doctoral students in Tobin's research squad collective, I jumped at the opportunity to join what came to be known as the *Brooklyn College Study*. Even though I was not certain what would come out of my involvement, I thought it would be beneficial to gain experience conducting participant observation in the field. At a minimum, I expected that my engagement in the study would afford testing in practice theories I recently acquired in Tobin's class. In preparation, prompted by what I understood as good scholarship, I familiarized myself with the study proposal and participated in the pre-launch research squad meetings. Furthermore, I began immersing myself in the theories of Jonathan Turner, Paul Ekman, and Randall Collins who argue the primacy of emotions in social life. As I would soon discover, however, nothing could prepare me for what "working in the field" truly meant.

When I entered the research site shortly before the beginning of the first class of the study, I witnessed what appeared a fair amount of controlled commotion. While Alexakos was busy setting up camcorders and microphones, Rey Llena (a fellow doctoral candidate who had previously collaborated on research with Tobin) was preparing clickers that students would use to register their sense of the emotional climate in the classroom. At the same time, Tobin, assisted by Soyoung Choi (a visiting doctoral student from Seoul), was working on establishing a Bluetooth connection between a laptop and an oximeter (a device capturing participant physiological measures including pulse rate and strength, and the percentage of oxygen in the

blood). Later during the class, I noticed Natasha Dachos and Parvathy Premkumar (both former students in Alexakos' program and research team members) busily scribing field notes. I also observed them approach and interact with the student-participants during group work and breaks. It was a lot to take in and, yet again, a sense of inadequacy washed over me. I remember being there, feeling slightly intimidated by all the action around me and unsure of my role in it. Fortunately, it did not take much time to recognize that, as remarked by Sewell in the above quote, research is "profoundly social." As such, the Brooklyn College research was a collaborative effort. The previously theoretical notion of the individual | collective dialectic began to make sense; I was there to learn at the elbow of another and by being in with others. Indeed, the study became a training ground where I could learn by first observing and then by doing. Gradually, as the study progressed, I was becoming proficient and eventually developed confidence with the application of various research methodologies and their associated methods. As I remark in the final chapter of this dissertation, I was on my way to recognizing how they could contribute to phenomenological descriptions and to hermeneutic accounts of what was being learned.

The principle of beneficence and authentic inquiry, which dictate that the study participants directly benefit from research, places high on my axiological ladder. At Brooklyn College we embarked on an investigation of ways of creating and maintaining positively valenced emotional climates. To that end, we sought to develop interventions that would mediate mindful environments in the classrooms. As I would learn, the methods and methodologies we utilized were not merely the means to collecting and interpreting data; they were to serve as interventions affording the desirable (mindful in nature) changes. Unbeknownst to me at the time, in a contingent and emergent manner, mindfulness-based interventions would gain

prominence in my work and in my reporting. Hence, every manuscript I wrote (and included in this dissertation) spotlights heuristics and breathing meditation as two interventions we developed and enacted in our studies. At the beginning of the Brooklyn College Study my knowledge of mindfulness, heuristics, and meditation was highly limited. Luckily, once again, I had others to learn from. Among them, Natasha, who was a seasoned practitioner of mindfulness and meditation, became a treasured resource of the relevant theoretical and practical know-how for our research collective. She was also instrumental in the development and deployment of a study-specific intervention based in a breathing meditation practice. As I describe in Chapters 1 and 2, Tobin entrusted me with taking the lead on generating another mindfulness intervention protocol grounded in heuristic methodologies. In the process, principles of hermeneutics began to take hold as I along with others walked down the path of coming to know and making sense of the heuristic construct.

Onto The Challenging Art of Reporting

> By telling our stories (…), we are admitting to those we trust that our goals are not necessarily fixed, that we are never free of doubt and ambiguity, that our strategic choices in fieldwork are often accidental (guided more by inchoate lore than by a technical logic), that our data to be meaningful require development over time, and that we are far more dependent on the people we study than we can know or say (Van Maanem, 2011, p. 120).

The first three chapters of this dissertation draw directly on my work associated with the Brooklyn College Study. Upon a conclusion of the project, we planned to generate an edited volume focusing on the methodologies used to enact the study. Accordingly, in Chapter 1, which was meant to be a contribution to the volume, I focus on the *how* and *why* of *what* we did towards rolling out mindfulness and mindfulness-based interventions in the teacher education

setting. In other words, I provide a phenomenological account of what happened and its theoretical rationale. Central to the discussion is the role of a heuristic as a mindfulness raising intervention. I also theorize other uses of the mindfulness heuristic as enacted in this study. Evident in this chapter is my heavy reliance on Tobin for conceptualizing the heuristic construct. The commitment to polyphonia (multiple voices) and polysemia (multiple meanings) is represented through the extensive use of voices of student-participants and researchers. I argue that the interventions we enacted appear to have mediated more mindful states among student participants. At the same time, I try to represent contradictions that necessarily emerged by reporting on divergent ways students responded to the mindfulness heuristic and how they did or did not apply mindfulness to their classroom practice. Since in this multilayered study, a number of interventions contributed to raising the levels of mindfulness, the intersections among those interventions (i.e., the use of the oximeter-based methodology) emerge in the chapter.

In Chapter 2, I argue that mindfulness may be a powerful tool in raising awareness of and ameliorating intense emotions that often accompany teaching and learning. Since heuristics afford changes in practice by mediating reflexivity, they may assist in introducing mindfulness into the classroom. In this chapter, I describe our hermeneutic approach to the development of a mindfulness heuristic. Included is the story behind the three iterations of the heuristic. I provide a detailed and extensive account of how they came into being and evolved. I emphasize the flexibility and adaptability of heuristics, which make them easily applicable to various contexts. Drawing on the Brooklyn College Study, I illustrate how heuristics may be used towards different purposes.

Chapter 3 is intended for inclusion in a logics handbook focused on conducting educational research. I describe the logics we apply to our mindfulness-focused research work

against the backdrop of the current state of the field in the educational setting. I address the ongoing debate over which methodological paradigms are appropriate for conducting studies involving contemplative states. Development and enactment of interventions is presented as vital to conducting authentic inquiry. I discuss in depth mindfulness-based interventions and present a case study to illustrate their practical application. Ethical issues that may arise in mindfulness-based research are also considered.

Chapter 4 is an entry to the *Encyclopedia of Science Education*. It builds on, synthesizes and condenses the work presented in the previous three chapters. It also bridges and is a precursor to a more comprehensive discussion (in the following chapter) of the need to shift the goals of science education towards inclusion of issues of wellness and sustainability. I begin framing mindfulness as a process skill and briefly outline mindfulness heuristics and breathing meditation as examples of mindfulness-based interventions aiming at affording desirable outcomes in people's lifeworlds. Notably, connections between mindfulness practices and wellbeing are established. I argue the salience of emotions as relating to a cognitive focus in the teaching | learning environment and advocate the desirability of emotion regulation through mindfulness practices.

Originally written for inclusion in the *Special Issue of Cultural Studies of Science Education on Ecological Mindfulness and Cross-Hybrid Learning*, Chapter 5 addresses the nature of mindfulness and its salience to education generally and to science education specifically. In a context of the historical embeddedness of mindfulness in Buddhism, I discuss research in social neuroscience, presenting evidence for neuronal plasticity of the brain and six *Emotional Styles* (Davidson & Begley, 2012), which are not biologically predetermined but are responsive to adaptation through life experiences. I raise questions about the role of science

education in mediating the structure and function of the brain. Also, I discuss interventions to increase *Mindfulness in Education*, including meditation and heuristics. These interventions act as reflexive objects to heighten awareness of characteristics of mindfulness and increase the likelihood of changes in the conduct of social life thereby advancing mindfulness. I present mindfulness and the development of a toolkit for ameliorating emotions when and as necessary as a component of a science curriculum that orientates toward wellness and sustainability. I advocate for changes in the nature of science education to reflect the priorities of the 21st century that relate to sustainability of the living and nonliving universe and wellness of sentient beings.

Salient to Chapter 5 is my collaborative mindfulness-focused work with Karim Gangji, a physics educator, a doctoral candidate in my program, and a member of Tobin's collective. Conducted at Queens College, this research was quite distinct from the Brooklyn College Study. At Brooklyn College the number of student-participants was relatively small affording frequent, face-to-face interactions with the researchers over an extended period of time (often stretching beyond class time and space). In the process, many study participants (students and researchers) were able to develop close bonds with one another. I was fortunate to maintain a special scholarly friendship with two likeminded women, Aga and Aimee, with whom I collaborated in many capacities and who I feature in chapters of this dissertation. At Queens College classes were large (often consisting of more than eighty students) and the nature of our study did not require my presence at the research site. Karim and I amassed large amounts of numerical data obtained through responses to mindfulness heuristics provided on-line by undergraduate students whom I never met face-to-face. Since I find it valuable to connect with study participants, it was fairly unsettling for me not to be able to do so in this research. Taking a cue from Tricia Kress (in press) I needed to find a way to "shorten the distance between us [me] and our [Karim's]

students and research participants" because "[t]he further we are from each other, the more our students or research participants will appear to be a faceless mass." As long as I was merely statistically analyzing their numerical responses, Gangji's students epitomized a faceless mass. It wasn't until I started exploring some of their "open-ended" answers in connection with their first names that they became men and women with hearts and souls. Peter Taylor (2013) warns, "we learn nothing about the 'small dots' (especially the outliers) that make up the big statistical picture of ANOVAs, regression equations, or mean scores and standard deviations" (p. 6). Additionally, I noticed that what Taylor refers to as the large 'grain-size' (macro-level) of statistical data is often misaligned with what emerges at the 'small dot' level. The realization that statistical analyses of numerical responses to heuristics provided by Karim's students did not necessarily reflect what I found in their "qualitative" comments was similar to what I learned during our previous work towards the development of mindfulness heuristics (as I comment in Chapter 2). While *the statistical* has its value (which, as I illustrate in the chapter, includes assisting with generating landscape studies), to my way of thinking, *the individual* often trumps *the global* because "stories are not made from common and routine occurrences"; (…) "we learn more from the exceptional than from the topical" (Van Maanen, 2011, p. 108).

For those of us working in the sociocultural tradition it is unreasonable to make a distinction between the researcher and the researched since conducting authentic inquiry necessitates doing research *with* others rather than *on* others. As Taylor (2013) accurately remarks and as I have experienced in the field, "The observer and observed are intimately interconnected in a dialectical relationship, with one affecting the other, and vice versa" (p. 3). In the same vein, and consistent with the idea of porousness of boundaries among social fields, I find that there can be no demarcation line between research and other spheres of social life that

may not, at the time, be under formal investigation. Research necessarily seeps into our daily lives on a very personal level. In addition, since, as remarked by Tobin (2012), "theory illuminates experience, affording participants making sense of their social life" (p. 2), certain elements of experience become salient when one applies a theoretical lens to them. For example, after I learned about the research around *email apnea* (defined as "shallow breathing or breath holding while doing email, or while working or playing in front of a screen" (Stone, 2012)), I started monitoring my breathing patterns when typing away on my MacBook. As I was developing proficiency with reporting research findings, I also began infusing personal narratives into my writing. In chapter 3, it took a form of an opening self-vignette illustrating what mindfulness (or lack of thereof) might be like. In chapter 5, inspired by Heesoon Bai's (2013) manuscript, I ventured into a more expansive description of experiences in my childhood and youth that mediated my adopting sustainability-driven axiological and ontological inclinations as well as my openness to alternative (non-Western) epistemologies. The final chapter (6) is very special to me since it is situated in a familial experience involving my ex-husband (Piotr). I tell an impressionistic tale of how two of my identities came together and how what I learned through mindfulness research informed our (Piotr's and my) efforts towards improvement of Piotr's emotional wellbeing. Since it touched me on a very deep level, the story has become the most compelling evidence of how mindfulness practices can mediate wellness. In this powerful first-hand experience, Piotr and I appear to be successful in putting to the test Davidson's theory that mental exercise may assist in altering our Emotional Styles. It also afforded Piotr and me learning about self. Central to this story is the meaning of compassion and its enactment. I conclude the chapter by advocating the need for conducting research by educators as a means to reflecting on and mediating their practice.

How Others View My Research

I subscribe to polysemia and polyphonia which I consider crucial to the interpretive framework I have adopted in my research. Therefore, I would be remiss if I did not attempt to represent my dissertation trajectory through the voices of others. To that end, I briefly report positions taken by five people who occupy varied fields of my lifeworld. These constitute reflections on my mindfulness-focused work and how it mediated (or failed to mediate) ontological changes in me and in others. Selection of these vignettes is grounded in a Sewellian framing of social life as characterized by thin coherence and contradictions. My intention is not to explain away the differences but to give them meaning by applying a multi-level lens to them. I situate each person in relationship to my identity as a daughter, a friend, an employee, and a researcher.

My Family

Among people who participated in my research journey were members of my family living back home (in Poland). Whether they liked it or not, they had to live and breathe my research along with me. In particular, the weekly Sunday Skype conversations with my mom became my scholarly confessional. Often elatedly, I reported on what I was learning through research and how I was progressing with my writing. Pretty quickly the phrase "Piszę papier" (which is a word-for-word, yet inadequate, translation of "I'm writing a paper") became our inside joke. My annual visits home were also occasions for sharing my enthusiasm for mindfulness and related neuroscientific findings. Hence, I had mindfulness-driven conversations with members of my family both individually and collectively, in their kitchens and living rooms, at cafés and at the airports. While the majority of our talks occurred informally, often in response to witnessed or recounted less-than-mindful enactments, I remember one instance of videotaping my sister and me pondering over the characteristics in one of the versions of mindfulness heuristic while

lounging in my makeshift bedroom on a hot summer day. Knowing that my family was plagued with a number of issues, I intended to offer what I knew as one possible way to mediating some of them. For example, when my sister or my niece was complaining of being in a stressful situation (sadly, at times, with one another), I would encourage them to breathe deeply and try to let go of the negative emotions. Since I continued to witness similar patterns being reproduced among my family, I often felt a sense of "mindfulness mission unaccomplished." I was therefore pleasantly surprised when I read my mom's contribution to this dissertation.

Mom

My mom just turned 74. Recently, she and I often engage in discussions around aging and the associated gradual decline in my mom's health. Knowing my mom, I am convinced that some of her nagging afflictions stem from or are exacerbated by stress. Even though she has been retired for close to a decade, she continues to worry unnecessarily over the smallest and seemingly inconsequential matters. For example, at the epicenter of her universe are my sister's two kids (age 13 and 18!) making my mom an overprotective *helicopter grandma*. Her biggest concern appears to always be whether the kids have been fed "properly" (notwithstanding the fact that my sister and I survived on canteen food when we were growing up and mom was a busy bank executive) and if they are keeping up with their schoolwork. This controlling disposition is often a source of frustration for those around my mom. When they push back, my mom feels unappreciated and unfulfilled. I thought a dose of mindfulness could be a much needed remedy for all involved. Even though my mom has been an attentive listener, I knew she was skeptical about mindfulness and its application to her life. At one point, when I suggested that she and dad find a meditation center so that they can learn the practice, my mom (whose Catholic practices

have strengthened as she grew older) got alarmed and asked if I was certain I did not belong to some sort of cult. Gradually, however, my mom warmed up to the idea as she testifies below:

> *Uważność to słowo, którego wcześniej nie znałam. Ideę uważności przybliżyła naszej rodzinie córka, nie wzbudziła jednak mojego zainteresowania. Nie byłam skłonna zawracać sobie tym głowy–nie wierzyłam, że można coś zmienić bez niczyjej pomocy. Kolejne rozmowy z Małgorzatą pogłębiły moje pojmowanie sensu uważności w codziennym życiu. Jej podpowiedzi dotyczące zmiany zachowań w konkretnych sytuacjach spowodowały, że nauczyłam się zatrzymywać–zatrzymywać świadomie. I to jest moim wielkim osiągnięciem w rozpędzonej karuzeli codzienności.*
>
> Mindfulness is a word that I was not familiar with. When the idea of mindfulness was introduced to our family by my daughter, it did not catch my attention. I was not willing to be bothered with it–I did not believe that one might change something without someone else's help. The ongoing conversations with Małgorzata deepened my understanding of the essence of mindfulness in everyday life. Her cues regarding changes in conduct in specific situations mediated my learning to pause–to pause consciously. And I consider it my big accomplishment in the speeding merry-go-round of everyday living. (Mom, Opole, Poland, April 10, 2014)

Dad

Even though I do not talk to my dad as often as I do with my mom, he and I share a special bond. Without having to verbalize it, we understand how much we care for each other. They say I am a lot like my dad. I suppose that may be so on some level. For example, he and I are slight hypochondriacs, which, according to Davidson (Davidson & Begley, 2012), may indicate hypersensitive Self-Awareness. Unlike me, however, my dad has always loved doing

sports and kept himself physically active. Now, in his 70s, he continues to engage daily in some combination of jogging, hiking, biking, Nordic-walking, swimming, skiing, and working out. Alarmingly, my dad's "sound body" appears to be a home to an increasingly shaky mind. With passing time, my dad is becoming more and more forgetful and not always fully present. I worry that these may be signs of an onset of some neurogenerative condition. During one of my visits home my dad complained that he was having trouble sleeping. As my mom reports below, after I explained possible benefits of deep breathing to my dad, he adopted the practice as a way of addressing undesirable sleeping patterns. In light of emerging research evidence to support the application of meditation techniques to help improve cognition and memory in patients with neurodegenerative diseases (Newberg et al, 2014), it is my hope that the benefits he reaps from the practice will be more global.

Zupełnie inaczej potraktował uważność mój mąż. Myślałam, że jego zainteresowanie bierze się bardziej z chęci sprawienia przyjemności Małgorzacie niż próby faktycznego przyjrzenia się kwestii uważności. Bo po co uważność mojemu mężowi? W odróżnieniu ode mnie jest oazą spokoju, opanowania, stanowczości i zdyscyplinowania zwłaszcza w systematycznym uprawianiu różnych dyscyplin sportowych. Jednak to Małgorzata wdrożyła ojcu lekcje oddychania, aby poradził sobie z niechcianymi przerwami we śnie. Skuteczność dobrze odrabianych lekcji jest wysoka.

Mindfulness was received quite differently by my husband. Initially I thought his interest stemmed more from wanting to please Małgorzata than from the actual attempt to examine the mindfulness construct. Because what would my husband need mindfulness for? Unlike me, he is an oasis of calmness, composure, determination, resoluteness, and self-discipline, particularly when it comes to engaging in a variety of sport disciplines.

However, it was Malgorzata who taught breathing lessons to her dad so that he could manage undesirable breaks in sleep. The homework well done appears to be highly effective. (Mom, Opole, Poland, April 11, 2014)

My College Friend

During the grueling undergrad years back in communist Poland, four female students and I formed an envied, close-knit support group. Even though today we are scattered across the globe, we have stayed in touch and continue to come together occasionally. Irena, who teaches English to high schoolers in Germany, has always been a methodical and curious scholar. About two years ago, after I had asked her to complete a mindfulness heuristic, she developed an interest in the topic. To that end, she immersed herself in the mindfulness-related literature and completed Kabat-Zinn's Mindfulness Based Stress Reduction (MBSR) program. When I recently inquired whether she kept up with contemplative practices, she responded:

Medytacje oczywiście kontynuuję, raz mniej raz więcej. Staram się tez regularnie ćwiczyć yogę. Jestem ci stokrotnie wdzięczna, że naprowadziłaś mnie na mindfulness, bo jest to coś, co naprawdę daje mi siłę w radzeniu sobie z dołkami i często dostarcza szczęśliwych momentów. Od razu przy pierwszym wczytywaniu się w tę materię, wiedziałam że jestem uratowana.

I certainly continue meditation–sometimes less, sometimes more. I also try to do yoga regularly. I am incredibly indebted to you for leading me to mindfulness because it is something that truly gives me strength in dealing with the lows and often brings happy moments. Immediately after I got immersed in the relevant material, I knew I was saved. (Irena, Dortmund, Germany, March 19, 2014)

My Best Friend

Bożena and I have been friends for over 30 years. We met when we were undergraduate students preparing to become English language teachers in our hometown college. Slightly older and much more experienced at the time, Bożena was instrumental in creating the support group of the 5 women I mention above. Over the years, she and I have developed a very strong bond and we have supported one another throughout our adult lives. We have always been there to lend an ear to each other and a shoulder to cry on. We each know that we can depend on the other no matter the circumstance. Having earned her Ph.D. in social psychology, Bożena has cheered me on throughout my years at the Graduate Center. She also has been pleased to witness how I was changing in the course of my mindfulness-grounded research. The following note, which Bożena caringly wrote about me as a contribution to my dissertation, is saturated with mindful meanings: being present and compassionate, alleviating stress, and not getting stuck with emotions. It is a powerful testament to how well she knows me. I could have not asked for a better (more mindful!) friend:

> I think the change permeated all aspects of your life. You have gained some distance in how you react to things that used to stress you to no end–work, health, school. I remember that problems at work would consume you and create chronic stress for days. Now you are talking about them but I can see that you are able to put them in perspective and switch them off while attending to other parts of your life. You are able to enjoy your life despite them. I also remember when getting a B+ on a paper in your grad school was a source of disappointment producing a sense of failure and stress. Now I am asking about your Ph.D. defense (clearly a much bigger event) and you are relaxed and confident that everything will be alright. The interesting thing is that while gaining perspective on

> and some distance toward the usual sources of stress, at the same time, you seem to be more present in all the areas of your life. Maybe because the stress does not consume you, you seem to see more clearly, with more understanding, and definitely more empathy. You were always a very helpful and generous person to those that mattered to you. I knew I could count on you completely and so did all your close people. But recently, the way you give has gained a new quality–you give more freely, with warmth that comes from you being at ease with your giving. Hard to describe, really, but I can clearly feel this new quality in the help you extended to Piotr or the empathy and love you sent my way around my mom's passing. (Bożena, Vancouver, Canada, April 15, 2014)

Director at My Workplace

In a recent conversation with the Director of the institution I work for, she asked whether I thought my research had any "impact" on the organization. Even though I am well aware of how my workplace might benefit from exposure to mindfulness, I consider it not particularly conducive to entertaining such an "unorthodox" idea. Sadly, my 15 years of experience in that place taught me that people (particularly those in key positions), some of whom are pervasively content with a copy-and-paste modus operandi, would not be open to new ideas. Thus, they would be reluctant to embrace tenets of mindfulness particularly if those originated from what they consider a non-expert source (me). Hence I was treading carefully when sharing what I was learning through my research with select co-workers. They were the few people with whom I developed mutual trust and respect, people in the we-have-each-other's-back category–my workplace brethren. When contemplating how to respond to my Director's inquiry, I was well aware that I couldn't claim any "large-scale impact" of my research on students or employees in

our school. Hence, I ventured a suggestion that since learning about mindfulness mediated my reactions to emotionally charged workforce situations and made me more resilient, it had an indirect "impact" on the colleagues with whom I interacted. I was quite astonished to hear my Director respond that she did not register a change in my conduct and that she continued to consider me a highly emotional (understood in negative terms) employee.

As I reflect on this conversation and contrast it with Bożena's "testimonial," I can't help but think that how people perceive others may have a lot to do with the grain size of their relationship. If one knows the other superficially, at a macro level, the way my Director appears to know me, he or she is less likely to observe incremental changes in the other. Clearly, the grain size may have little to do with the amount of time one spends with the other; it may be more about the quality of the mutual interactions. Perhaps when perceiving others at a macro level, we are more prone to reproducing the structures rather than to work towards producing new ones (including adjusting how we perceive others). As my Mentor (Tobin) reminds me, another sociocultural idea to consider is that frameworks illuminate while obscuring. Accordingly, the frameworks my Director applies to me leave me as an unchanged individual while obscuring the things that I have changed. Thus my Director appears to be stuck in her assessment of who I am. Needless to say, my workplace "brethren," those who appear to know me at what I would call a meso level and perhaps subscribe to frameworks more aligned with mine, often comment about the noticeable mindfulness-driven evolution I have undergone. In that respect they are in agreement with Bożena and my family who know me intimately as if at the micro-level.

I, for one, am incredibly grateful for the opportunity created through my research to look inside myself and to explore the possibilities of new ways of being in the world. I consider my

journey into mindfulness an exceptionally enriching experience. I hope that my contribution to the collective work reflected in the pages of this dissertation will become an inspiration for others to give mindfulness a chance. As I remark in Chapter 5, embracing mindful ways is part of our ethical obligation as educators, as parents, as daughters, as politicians, as dwellers of this planet.

CHAPTER 1

SOWING THE SEEDS OF MINDFULNESS WITH SCIENCE EDUCATORS–APPLICATION OF A HEURISTIC

> You could see the emotions come out early on and I was thinking to myself: this is going to be an interesting class because you have to get your emotions in check as far as presenting information and how you're going to receive things that your classmates are going to say to you. (Sarah, Week 1)

Sarah was one of the participants in our study conducted in the graduate level science education course. The above quote was in response to a spirited class discussion of a poem that investigates the role of science and science education in the context of the atrocities of the Holocaust (see Appendix 1). In it, Sarah recognizes that the course, filled with controversial topics such as race and gender, evolution, eugenics, and ethics, would evoke intense, emotionally charged responses. Sarah's statement was music to our ears. As researchers, our interest was in engaging students in co-exploring emotions that, while often unrecognized or ignored in the classroom, tend to accompany teaching and learning. Moreover, we were aiming at working with these pre-service and in-service science teachers towards co-developing strategies that would assist with (in Sarah's words) "getting their [and our] emotions in check." We believed that *mindfulness* might become a powerful tool in not only raising awareness of emotions but also in ameliorating them in the context of science education and, by extension, in other fields of social life.

The study was conducted with the class of 19 pre-service and in-service science teachers who met weekly for 3.5 hours over a 15 week long semester. Our research agenda was very ambitious and may have been perceived as intrusive. Thus, we recognized the need to introduce its different elements gradually and in manageable doses to avoid overwhelming the students and

to minimize a possibility of the research interfering with the official curriculum of this course in *Historical, Philosophical, and Social Foundations of Education and Science*.

This study reflects a continued interest in the centrality of emotions in teaching, learning, and doing science by its principal investigators: Kenneth Tobin and Konstantinos Alexakos (the class instructor). Tobin and Alexakos are among likeminded researchers who recognize the significance of emotions in education. A growing body of scholarly literature on this topic includes the edited volume, *Advances in Teacher Emotion Research: The Impact on Teachers' Lives,* in which Paul Schutz and Michalinos Zembylas (2009) present current research into a role of emotions in teachers' professional lives and work. Similarly, mindfulness-related work has been rapidly gaining traction in the field of education. Of concern is that both students and teachers in today's schools experience tremendous pressures that can negatively impact their health and school performance. A potential problem is that strong emotions, especially negative emotions, can disrupt science learning and, in the long term, catalyze disease. Accordingly, interventions to monitor and control the connections between the way one enacts social life and emotions have the potential to mediate learning and health. We consider introduction of mindful practices a promising intervention.

In this chapter, I discuss how we (the researchers on this study) introduced the concept of mindfulness to the study participants and how it mediated their practices. Particular attention is devoted to the role of mindfulness heuristics as developed and applied in this study. I provide examples of potential applications of a heuristic including its use as a low-grade intervention, and as a tool assisting in lesson planning, in undertaking interpretive analyses, and in conducting landscape studies. In an effort to nuance this phenomenological-hermeneutic account, I weave in voices of the study participants including those of the researchers. In my reporting, I rely on

multiple data resources including video and sound files and field notes of class meetings, pre and post class cogenerative dialogue sessions, research squad meetings, as well as formal and informal conversations with study participants, email communications, and written responses to the heuristics.

Cultivating the Soil–Rolling Out Mindfulness

Week 2–Plowing

We think of mindfulness as an overarching theme tying our research on emotions in education in this multimethod study conducted at our sister institution, Brooklyn College. As advocated by Tobin (2006), it was of great importance to us that students in this study be active participants/co-researchers. Following Egon Guba and Yvonna Lincoln's (1989) principles of authenticity criteria, such engagement in the research project carries a promise of translating into benefits to the study participants. Accordingly, we consistently discussed our progress with the students and encouraged them to contribute their ideas. To that end, in week two, after briefly discussing how *we* envisioned "the road ahead," both principal investigators requested that the students discuss in groups what *they* would like to "get out" of the research. As a way of introduction, Tobin spoke of mindfulness as an important idea that was relatively new in education. He signaled that we considered it essential to work towards increasing mindfulness in science classes through making people aware of what mindfulness was and how it related to teaching and learning. He added that we were in the early stages of developing "a questionnaire" that would address the important aspects of mindfulness.

Based on student comments following their brief small-group discussions, it was evident that a number of them were intrigued by and curious about many aspects of the research. They wondered how their participation in the study would contribute to a raised awareness about

emotions and about their physiological manifestations. They seemed curious to discover ways to regulate emotions. Aga, a female student, commented:

> It's really interesting, using your brain … it's like your mind and body actually can work together. I don't think we're used to that at all especially in the Western world where there is this dichotomy. (Aga, Week 2)

Awareness of the mind-body connection is an essential element of mindfulness. Supported by recent research findings in the field of neuroscience, Richard Davidson with Sharon Begley (2012) argue that in bidirectional communication the state of the mind influences the body and the body influences the mind. To Davidson, human emotions may be the most powerful influence on our physical health. In turn "practices that emphasize the body, such as hatha yoga, have the potential to modulate emotion" (p. 136). Since these and similar findings have powerful implications for science educators and their students, we placed the mind-body connection at the center of our study. For example, we used oximeters to increase the participants' awareness of the in-the-moment emotions and their physiological manifestation. In turn, the mindfulness-increasing practice of breathing meditation was a way of using our bodies and physiology to calm our minds. The mind-body connection is in alignment with our epistemological stance that rejects dichotomies in favor of dialectical (Tobin, 2012) or, as argued by Gene Fellner (2012), multilectical relationships in social fields where constructs, such as mind | body, individual | collective, agency | passivity, macro | meso | micro are constituents of a whole and do not exist independently.

In the context of this study we considered it essential to make a connection between mindfulness, science, and science education. Tobin was theorizing that mindfulness would become a new inquiry skill and, as such, it would be one of the key elements of the science

program in the future. Accordingly, we believed it highly beneficial for science teachers to know about mindfulness and to be able to determine how to enact mindfulness practices in their classrooms so that, through studying science, other individuals could become more mindful in social life.

Week 3–Harrowing the Land

Encouraged by the promising initial reactions to our ideas from the students, we were ready to plunge into mindfulness in week 3 of the course. Given the unorthodox nature of the construct, we felt compelled to unwrap mindfulness in a way that would not follow a traditional paradigm. To that end, we refrained from assigning mindfulness-related readings and from conducting formal lectures devoted to the topic. Rather than trying to explain what mindfulness was, we planned to cogenerate a tool, a mindfulness heuristic, which we hoped would do the job. We theorized that if students become aware of the mindfulness construct in this way, they would not only grasp its meaning but they would also adopt its characteristics and make some of them part of their practice. This assumption was guided by the principles of "a reflexive methodology in which participants become aware of forms of conduct and thereby create possibilities for discussing what happens, identifying possibilities for change, and introducing changes in the conduct of science education specifically and social life generally" (Tobin & Richie, 2012, p. 121).

The opening activity of week three was devoted to a closer exploration of multidimensionality of the construct of mindfulness. When we asked the study participants what meanings they associated with mindfulness, Emily suggested, "It's like being aware" and Aimee added, "Awareness of how your actions and words can impact others. And how you're impacted by things that are around you." Indeed, the state of awareness of the present moment is crucial to

mindfulness. Kirk Brown and Richard Ryan (2003) define mindfulness as "the state of being attentive to and aware of what is taking place in the present" (p. 822). In addition, Aimee's response appears to allude to the dialectical relationship between self and other and indirectly to compassion as a quality of mindfulness. According to the mindfulness veteran scholar, Jon Kabat-Zinn (2003) mindfulness does include "an affectionate, compassionate quality within the attending, a sense of openhearted, friendly presence and interest" (p. 145). At this early stage of the study, however, compassion was not yet part of how we were framing mindfulness. Instead, we focused on seven facets of mindfulness: *observing, describing, acting with awareness, non-judging, non-reactivity, de-centering*, and *curiosity*. We drew on the work of Ruth Baer, Gregory Smith, Jaclyn Hopkins, Jennifer Krietemeyer, and Leslie Toney (2006) as well as that of Karen Davis, Mark Lau, and David Cairns (2009). Situated in the field of psychology, these researchers developed and validated surveys to measure degrees of mindfulness in participants of their studies. The Five Facet Mindfulness Questionnaire (FFMQ) (Baer et al., 2006) and the Toronto Mindfulness Scale (Davis, Lau, & Cairns, 2009) were two sources we used to generate an initial pool of mindfulness items organized by facets they described. Hence in week 3, we presented the items to our research participants and asked them to collectively review them. The idea was for the students to identify items that best represented the meaning of each facet (as interpreted by the students) and to use those items as a basis for the development of our own mindfulness heuristic. This way the students were not only getting their first taste of features of mindfulness, they were also beginning to coparticipate in a hermeneutic (i.e., meaning making) process towards developing the mindfulness heuristic.

By the end of this class we noticed that students were incorporating the concept of mindfulness into their vocabulary. For example, the word was used by Christa during a

discussion of Dewey's philosophy. At one point, when the instructor admitted to "not being in the moment" the students playfully teased him for not being mindful. Alexakos later revealed that through this conduct he was aiming at creating an opportunity for students to recognize how lack of mindfulness might manifest itself.

Tool Preparation–A Heuristic Prototype

Using the students' choices of the mindfulness items, we generated what we initially referred to as a "mindfulness scale." The tool was divided into three sections: 1) 35 mindfulness-related facet items (adopted from FFMQ and TMS) each accompanied by a 5-point Likert scale, 2) an open-ended segment consisting of questions relating to spirituality, meditation, and emotions, and 3) a section that provided space for students to offer comments regarding their experience with the scale including the time it took them to complete it (see Appendix 2). We decided to use SurveyMonkey.com® as a vehicle through which we made the instrument available to the students. To that end, Alexakos wrote an email to his students requesting that they complete the online survey. He encouraged his students to view the survey as an invitation to reflect on mindfulness, particularly as it relates to teaching and learning environments as well as a heuristic to continue and expand on the conversation in class. The email was also an opportunity to reinforce confidentiality issues: Alexakos reminded his students that their responses would remain anonymous and that as the class instructor he would not know the authorship of the responses.

Upon completing the first version of the mindfulness survey, the students provided a fair amount of comments regarding its structure and content. The feedback came in the form of emails, answers to the open-ended questions, as well as remarks made in class and during informal conversations (see Figure 1.1 for some examples). Based on what we were hearing from

the students and others (including us) who at the time were involved in the process of development of the mindfulness heuristic (see Chapter 2), there was a sense of collective desire to make major improvements to what we were proposing.

Most of the statements are negative statements, which makes it slightly more difficult to read and understand. Instead of saying, "I tend not to judge..." say, "I tend to judge."	Christa on poor phrasing of the items
I am uncomfortable with the terms "never" and "always" and so I didn't check any of the bubbles under those categories.	Nashia on Likert scale
It was meaningful and touched a variety of areas that speak to the balance in the persons' inner voice.	Andrew giving positive feedback
I am home, and I have been doing other things in the same time [while completing the scale] such as taking care of family.	Edward admitting to not being mindful
After taking a closer look at many of these items it seems to me that a few could be a little contradictory. For example, statements such as "when I do things my mind wanders off and I'm easily distracted" and "I am curious to see what my mind is up to from moment to moment." (…) Perhaps seemingly contradictory items could be solved by being a little more specific? For example, "When reading a book or engaging in conversation my mind wanders off and I'm easily distracted."	Aga suggesting contextualization of items
I think that was a general consensus, we were suffering through them ["the surveys"]. Me and Christa had a conversation and I was, like, "What's wrong with these surveys? I don't think this is what I signed up for." (…) The surveys were, they were interesting. The first one was just a pain. It was, like, a disaster. It took me, like, an hour to do it. I didn't want to do it.	Brad expressing frustration over the first "survey"
I think by basically doing the open-ended questions, it kind of widened my whole thinking as to what mindfulness is really about and meditation because it kind of ties in to what we're doing now. And I was seeing it as a spiritual thing. And what Parvathy is talking about – the yoga thing and deep breathing. All that kind of tie in because it's more of your own inner personality coming out, your own beliefs and stuff like that. So it may be good for research to answer these questions because I was like, okay this is not ... I was thinking just religiously but then it goes further out.	Laura on developing new understandings of mindfulness

Figure 1.1. Student comments regarding the mindfulness scale.

Alexakos played a critical role assisting his students in navigating the research environment. To that end, in his dual role as the course instructor and principal investigator, he

actively participated in all aspects of the study including completion of the initial survey. In the following quote, he emphasizes shared experience and solidarity with the students:

> I took the [mindfulness] survey as well so I had similar reactions to what a lot of you had just by looking at it at the end. Yeah, it's not intended to show one way or another, whether you're spiritual or not, whether you're religious or not or whether it's right or wrong. (…). We're really interested in using this heuristic as a way to start a conversation about mindfulness in a classroom, for example. (Alexakos, Week 4)

Heuristic as Mindfulness Tool

In this study, a heuristic is understood as "a model used to flesh out a social construct to reveal some of its characteristics and thereby to afford the validity process of coming to know the construct in ways that facilitate reflection and changes that relate to salient aspects of social life" (Tobin, personal communication, May 4, 2012). The mindfulness heuristic we developed looked very much like a survey. It contained short statements serving the purpose of bringing particular characteristics to the awareness of those who read them. It also included a Likert scale that required participants to connect each characteristic to their perceptions of frequency of its occurrence in a selected field such as a science classroom.

Since one of the study goals was to produce, enact, adapt and validate interventions, it was essential to make explicit the distinction between a survey and a heuristic as a potential tool to be adopted into lives of the study participants and subsequently into lives of their students. As illustrated by the exchange at the beginning of class in week 5, we actively sought to include students in our theorizing the concept of a heuristic:

Malgorzata: We've mentioned the term heuristic a couple of times and we were wondering if you understood what we mean by that. Why do we call it a heuristic and not a survey or a questionnaire? (Silence from the class)

Alexakos: You all know surveys. What are surveys meant to do?

Zachareeya: Assessment?

Sarah: A survey, you kind of have in your mind what you want the outcome to be.

Malgorzata: Surveys are sort of there to measure things. I don't think we are trying to measure anything. What we have in mind is to develop low-grade interventions. So you just spoke about assessment system that's going on in schools and Zachareeya said there was a lot of stress that's associated with it. We look at mindfulness as something that can alleviate some of those negative emotions that may be going on in the classrooms these days not just with the teachers but also with the students. We look at the heuristic as an intervention, as something that will make students and teachers think about what it means to be mindful, what mindfulness translates into, what it looks like. So it's about how people think about the construct more so than trying to measure anything related to it.

Alexakos: Going back to what Sarah said. Do you see the difference between the two? No? Yes? Ken?

Tobin: Sometimes when I'm thinking about it I think about the blueprint which is something that's got it right, it's static and it's correct and you follow it to the letter whereas heuristic is shifting shape; it's your best bet at the time.

And based on what you learn, you change the heuristic. And if the heuristic is better suited in different words to a different context, it can change with the context whereas the blueprint is the blueprint and never changes. So we have this idea that you would use the heuristic in your own schools you would change it a bit and you would get the idea of what it is about by looking at the items in the heuristic but they wouldn't be set in stone. They would always be there as a way to think about it but not the only way to think about it.

Alexakos: I will probably go back to what Sarah said (collective laughter). Because, in addition to what you [Ken] said, what Malgorzata said, I think the survey is pretty much determined, I think, just by the way the surveys are done. That's why … what revision are we up to now?

Malgorzata: Sixteenth, nineteenth … I'm not sure.

Alexakos: Even though you [the students] did the first one, and you helped shape it, we are up to sixteen or eighteen and probably by the time it's done it's going to be a few numbers higher, because we see it as a way to intervene and to explore and to find out things rather than to say this is what it tells us, this is what it is.

At first, students and some of the research squad members, including me, appeared to struggle with grasping the difference between a survey and a heuristic. Indeed, the students often referred to the instrument as a survey. Interestingly, they also referred to the characteristics in the heuristic as "questions" (as though they were part of a "*question*naire") even though the characteristics have always been phrased as declarative statements. However, by the time we

completed the study, there was evidence that the term heuristic and its applications had been internalized by at least some of the study participants. For example, in an informal meeting following the conclusion of the semester, Brad shared his interpretation of the heuristic. He pointed to the heuristic as a tool that raises awareness, has a potential to transform conduct, and may require repeated administrations:

> A lot of these things [referring to characteristics of mindfulness], you don't think, you don't realize until you actually take the thing, the heuristic, and you realize all of it. And that's something that I do remember and I do try to do. I mean, it's hard also because it's only been a couple of weeks since we've taken this thing [heuristic] and you can't change your behavior that quickly, overnight, it doesn't happen like that. But, I think, repeated, awareness of it, I think, it would be something that I would, maybe, realize that, ok, well something bad did happen but nothing out of control happened because of it. (Brad, post-semester informal meeting, June 6, 2012)

In his comment Brad considers mindfulness a practice rather than something one reads about theoretically. To that end, the heuristic was a way to facilitate the mindfulness practice in which awareness and reflexivity are first steps.

An important aspect of a heuristic is its malleability and adaptability to different contexts. As noted by Tobin during the classroom exchange above, a heuristic is not meant to be a "blueprint" but rather it is expected to evolve and change. Accordingly, we use a metaphor of "shape shifter" to convey the idea that a heuristic can change its shape for contexts of interest (Tobin, 2013). Unlike in a survey, we try not to be repetitive, but instead ensure that characteristics that are "the essence" of a construct are included. Not surprisingly, in the course of this study, we generated multiple versions of the mindfulness heuristic. Hence, the original

"35-item survey" which was derived from validated mindfulness scales, gradually lost its psychometric features and became a "17-characterisitc heuristic" (see Appendix 3). The emergence of a slimmed-down heuristic was consistent with the contingent design of our study. It was also reflective of our changing epistemologies (what we knew), ontologies (the way we were experiencing social life) and axiologies (what and who we valued) as we, researcher-participants, were building a more mature understanding of what mindfulness was and adopting its features into our lives. Consistent with the idea of multilectical relationship between cultural production, reproduction and transformation, as we were learning from the study, the knowledge we valued and our way of being in the world were changing. For example, in the subsequent versions of the heuristic, we incorporated characteristics that reflected what we practiced in the study including monitoring one's heart rate and breathing patterns. Accordingly, the heuristic was not only an intervention in its own right; it complemented and reinforced other interventions such as oximeter readings and breathing meditation.

Heuristics may serve different purposes one of them being a low-grade intervention. The theory that supports low-grade intervention is reflexive inquiry (Bourdieu & Wacquant, 1992) where reflexivity is understood as becoming aware of the unaware. Tobin (2012) remarks "because so much of what happens in social life happens without conscious awareness, reflexivity is important for actors, such as science teachers and their students, so that they can identify aspects of their practice and their supporting rationale, changing them as desirable to benefit the collective" (p. 4). Thus, we ask the participants to complete the heuristic, thereby making them aware of the characteristics and their relative occurrence. We theorize (and find supporting empirical evidence) that becoming aware in this way facilitates reflection and catalyzes changes in practices. Another use of heuristics is in planning. Individuals involved in

an activity, such as coteaching, may use the characteristics and plan accordingly so that the relative occurrence of those characteristics could be targeted to reach desirable levels (as determined by the coteachers). Heuristic may also serve as a framework for interpretive inquiry concerning what happens in a social field. When used as a survey (statistically analyzing the numerals used by participants to show the relative frequency of each of the characteristics), heuristics assist in conducting landscape studies. I will devote the following sections to discussing the manner in which each of these uses was enacted in our study.

Planting Mindfulness Seeds–Heuristic as an Intervention

Low-grade interventions involve using research data to heighten awareness about what is learned, thereby allowing participants to decide whether changes are desirable (Tobin, 2013). In the course of this research study we discovered that students recognized mindfulness characteristics in a heuristic as beneficial to their practices. For example, consider the following exchange between Christa and Tobin in a pre-class meeting in week 15. It is an excerpt of a longer discussion regarding characteristic: *I feel compassion for people even if I don't know them:*

Tobin: But whether you give them [panhandlers] money or not, do you feel the compassion, feel their pain?

Christa: I don't really think about it, actually.

Tobin: Oh, okay.

Christa: Now, I will. I'll think about it. Do I feel compassion for that person? Yeah, yes. What if that were me? It would be terrible.

This exchange is an example of the in-the-moment self-reflection by Christa. While considering the compassion feature of mindfulness, she pauses and decides that adopting this characteristic,

i.e., being compassionate towards people she may not know, may be a desirable shift in her habitus. A similar occurrence happens when Brad reflects on two related characteristics: *I'm compassionate to myself when things go wrong for me;* and *I quickly recover when things go wrong for me.*

Brad: I can't recover quickly or I can't recover maybe at all because I'm too worried about other things that could, kind of, have, like, a domino effect because of that when something goes wrong for me.

Malgorzata: Would you like to recover quicker?

Brad: I think, yeah, I would. (…) I think that's the kind of mentality that I need to have. Cause nothing really bad has ever happened to me really, honestly, that has been devastating. So I can't wonder when these things happen, something bad will happen. But, no, I would like to actually. Pretty much so.

How quickly one recovers from adversity refers to the Resilience Dimension of Emotional Style (Davidson & Begley, 2012) and to an aspect of mindfulness (being able to get unstuck). Even though there is no perfect spot on the continua for Emotional Styles, if an area (in this case low Resilience) is causing distress or limitations (as in Brad's case), one needs to first recognize it (become aware of it) and, knowing that it is possible to change, make a decision whether or not adjustments are desirable. In this instance, Brad appears quite certain about the suitability of adopting a different "kind of mentality."

Over the first nine weeks of the course, the students participated in discussions focusing on being aware of emotions that arise in the classroom, on the possible impact of emotions on teaching and learning, and on ways to regulate the emotional states of teachers and students. By

now (week 10) the students appeared accustomed to using clicker devices to measure the emotional climate in 5-minute intervals. Indeed, some students indicated a liking for the "clicker routine" saying that it allowed them to be more aware (more mindful) of their in-the-moment emotions. In addition, the students appeared to appreciate an opportunity to wear an oximeter when making class presentations. Through monitoring their physiology (heart rate and oxygen level), many recognized that they tended to teach with high pulse rates, which, if sustained over long periods of time, may have negative implications for their physical health. Since in week 7 the class was introduced to a deep abdominal breathing exercise, students were now equipped with an intervention that has been shown to help regulate emotional states. Our plan for the last five weeks of the semester (weeks 10 through 15) was to enact two of our interventions (breathing meditation and mindfulness heuristic) prior the beginning of each class session.

The Heuristic Routine

At the beginning of the class in week 10, Tobin briefly discussed the concepts of the authenticity criteria, low-grade and high-grade interventions, as well as a heuristic. He said that while we believed that the interventions had a potential to make a profound impact on the way the students taught, if we found that the interventions were not working, we would involve the students in making the decision whether to discontinue them. Alexakos, who provided further clarifications, encouraged the students' participation by reassuring them that it took him less than a minute to complete the new iteration of the heuristic.

Immediately following the breathing meditation, the paper-and-pencil version of the mindfulness heuristic was distributed to the class. The directions read: *For each characteristic circle the numeral that best reflects your current state of mindfulness. As necessary, provide contextual information that applies to your rating.* Each of the 17 mindfulness characteristics

was accompanied by a 5-point Likert scale and a space for reflective thoughts. It took between 3 and 7 minutes for individual students to complete the heuristic. By combining the two interventions, we were aiming at facilitating the process of making the body-mind connection. Thus, when the heuristic was administered directly after the breathing meditation, the students immediately were able to reflexively consider relevant mindfulness characteristics such as: *When I am emotional, I notice changes in my breathing* and *When I am emotional, I notice changes in my heart rate.*

Student Feedback Following the Intervention

Upon completion of the heuristic, a group of students commented on it: "It is better, shorter, nicer. You don't have to re-read the characteristics to answer them." They liked the conciseness and non-repetitiveness of this new version. They also appreciated that the negative statements they struggled with in the earlier version were eliminated. Since compassion was now part of the heuristic, students were curious about the meaning of the relevant characteristic: *I am* compassion*ate to myself when things go wrong for me*. They asked, "Does that mean not to beat myself up?" A brief discussion about how we tend to be "meanest" to ourselves followed.

We discovered that only five students chose to write additional comments to some characteristics in the spaces provided in the heuristic for reflective thoughts. We wondered if the students were getting the full benefit of the intervention when "rushing" through what was meant to be a reflexive act. We were encouraged, however, when later the same evening students engaged in a discussion about how they were incorporating mindful practices into their personal and professional lives. Some of the comments included:

Andrew: I was trying to do this whole mindful stuff and focus with the kids [his middle-school age students]. This thing [breathing meditation] went really, really well for 5 minutes.

Vania: I was concentrating on bringing my pulse rate down; I was being conscientious of it.

Louise: This [breathing meditation] allows for a "me" time during a stressful day.

Aimee: I was having a stressful day and I realized I could not breathe standing up. So I sat down and tried breathing meditation.

Among these favorable comments, there was a voice that challenged the applicability of mindfulness to his students' life experiences. Robert, who says he "likes things quiet," remarked that to his question, "Do you like it when it's quiet?" some of his high school students replied that they felt a lot more comfortable "when it's loud" and they preferred "when a lot is going on." Andrew agreed that "quietness is scary for the children" and Natasha added that these days being quiet might be considered "a radical way of being." As was often the case, Tobin chimed in. After noting that what people prefer and what they are comfortable with may be quite different from what is "good for them," he pointed to Richard Davidson's research that found evidence that breathing meditation changes neuropathways in the brain thus increasing problem-solving efficiency and the percentage of antibodies in our blood. These and similar findings by scientists involved in affective neuroscience research have clear implications for education and wellness.

All in all, we were learning that the mindfulness interventions were actually mediating social practices of some study participants. Furthermore, ripple effects were being created as these teachers took the practices into their classrooms and shared them with those they taught. In

a multilayered study like ours, we do not endeavor to make claims about transformative power of any one intervention in isolation. In their multilectic relationship with other interventions, breathing meditation and a heuristic, worked in tandem, one possibly reinforcing the other.

Students as Sowers–Heuristic Used for Planning

In our study, a group of three student-participants considered mindfulness characteristics when preparing for a presentation on teaching evolution. Having come from a strong biology background, all three presenters, Aimee, Aga and Edward, signed up for the presentation because they were passionate about the theory of evolution and they hoped to share that passion with the rest of the class. Aga and Edward were immigrants from Poland and Haiti respectively; Aimee was a native New Yorker. While Edward was a practicing teacher, Aga and Aimee had no teaching experience.

As the class instructor and the director of the program, Alexakos expected many of the students in this course to be conflicted about the theory of evolution (Alexakos & Pierwola, 2013). He considered it important that the presentation is not an attempt at converting the "evolution non-believers." To that end, he worked with the presenters on incorporating mindfulness practices into their presentation. Hence, Aga, Aimee and Edward developed a set of guidelines for their presentation. They were planning to 1) Create a safe and respectful atmosphere; 2) Respect religious beliefs of students and teachers; 3) Consider difference between scientific and religious way of knowing (how they don't have to interfere with each other, how scientific way of knowing is not necessarily "better"); 4) Keep in mind a quote by a biology teacher in the assigned reading by Amy Harmon (2008, p. A1): "I don't expect you to 'believe' the scientific explanation of evolution (…). But I do (…) expect you to understand it." The following disclaimers served as an opening to the presentation:

> Before we get started we would like to make clear that it's important for all of us to be respectful as there is a wide variety of viewpoints and we want to make sure that we keep the emotional climate healthy for everybody so keep that in mind through the whole presentation. (Aimee, Evolution presentation)
>
> I came to this presentation with sort of my mind made up of how I thought it was going to be and it completely changed my view of how to teach evolution and how to even think about evolution. And we are not trying to impose any dogmas or views on anyone, we just want to share what we learned and perhaps create a sort of discussion. (Aga, Evolution presentation)

Titled *Mindful Future* the culminating slide was devoted to exploration of teaching evolution in a mindful manner. The class presentation generated relatively few contributions from the class. Many of the usually vocal students appeared reluctant to actively participate. Nevertheless, there was evidence that the class made an impact on them. According to Tobin (2012) passivity can be thought of as receptivity to learn from others. Thus, being-in-with-others is a sufficient condition for learning as science is enacted in the social field. Consider Louise. A self-proclaimed "very spiritual person and a Christian," she remained quiet (yet, apparently very attentive) throughout the entire class on evolution until, at the end, prompted by Alexakos' request for feedback on the presentation, she stated:

> I liked it because when I was reading the articles [assigned class readings], especially the geology stuff, I was really skeptical about teaching it to my students because, as a Christian, I wouldn't want anybody to be against God. I like the tips that they [the presenters] gave as a teacher on how you can approach it, how you can teach it to your

> students without having them not believe in God. I think they did a good job. (Louise, Week 12)

It is of significance to note that Louise's comment was one of two student voices that offered verbal feedback on the presentation immediately following its conclusion. Students were much more vocal in their journal entries (Alexakos & Pierwola, 2013). In addition, Louise exercised her agency when she chose to sign up for an elective course on teaching evolution. She was also one of few students who volunteered to participate in a summer session led by the research team. In it, we focused on rating the emotional climate of the evolution class. In turn, Louise became an inspiration for Aga's ontological, axiological and epistemological shift. Reflecting on Louise's trajectory, Aga commented:

> I learned a lot from people like her in the class because her being there makes us all a little more mindful. So with me, that's what was happening. Perhaps she is not changing her religious beliefs because it is so important to her and God is so central in her life and religion. But she is very willing to be mindful of other people and her students and their opinions and perhaps their views. And, as a teacher, she is willing to explore that. I feel like we are all benefiting from it. What I have found is that a lot of scientists, a lot of people who, take evolution as scientific truth and fact tend to look down at people who do not and tend to exclude them and basically assign them to back waters of America and call them ignorant and so forth. And Louise is such a proof that this is not true. And I think that's what makes her so precious for people like me who came from biased scientific standpoint. In having to interact with people like her, I have learned, and hopefully am still learning, how to be mindful when teaching subjects like evolution. And I think she is doing the same thing as I am doing. It's like two people coming from two

> different ends and trying to meet in the middle and perhaps have a dialogue and figure some things out. (Aga, Summer research squad meeting)

In this quote Aga recognizes Louise's right to be herself and not to be changed. She also notes that scientism may be a problem when it comes to evolution since people who disagree with science are largely seen to be ignorant rather than as having a different truth system. That Louise decided to enroll in a course on evolution should be considered a hermeneutic (or meaning making) activity. Her purpose was to understand evolution and be able to teach about evolution and not a matter of her getting to know the truth.

In a slightly different way, for Aimee, embracing mindfulness characteristics during the planning process afforded changes in her habitus. In an informal gathering following the conclusion of the class, she reflected:

> One of the most essential things I got from this experience was the awareness that was brought to the individuals involved. One of the primary methods of coteaching successfully is awareness, mindfulness. (…) For example, when we were at the restaurant [during one of the class planning meetings], I was talking to Edward and I was disagreeing with him. I was doing the things that I have always done when I get argumentative, but it was the first time I was able to think of it as an outsider and look at myself reacting to Edward as opposed to just purely reacting to him. So it made it easier for me to come back down and talk a little more rationally. Trying to get out of the emotional realm and into the rational mindset. That for me was a goal. Cos I just get so overemotional. Aga and I were definitely relating in terms of how to respond to disagreements. (Aimee, informal meeting, May 29, 2012)

Guided by mindfulness-focused strategies, preparation, subsequent execution, and reflection on the evolution class are examples of a heuristic working as a planning tool and, indirectly, as an intervention. Worth noting are also contradictions that arose. For example, the anxiety surrounding the presentation catalyzed a great deal of emotional distress for Aga and Aimee. In Aga's case, the level of apprehension reached its peak right before the presentation began. To calm herself down she decided to step out of the classroom "to be by herself." Therefore, she did not participate in the collective deep abdominal breathing exercise and she also opted out of completing the mindfulness heuristic. Thus, Aga chose to resort to her own way of ameliorating stress forgoing the interventions we were offering. Since mindfulness takes practice, internalizing mindfulness-based practices may be a necessary condition for our ability to apply them in extreme situations when they may be most needed.

Surveying the Field–Heuristic Used for Interpretive Inquiry

The heuristic may be used as a framework for interpretive inquiry. For example, a mindfulness heuristic may shine the light on what is happening in the science classroom in terms of the characteristics contained in the heuristic. Hence, a heuristic may serve as a "mind jogger" for researchers engaging in interpretive inquiry, especially from a hermeneutic phenomenological perspective

Let's consider two related mindfulness characteristics: *When I am emotional, I notice changes in my breathing* and *When I am emotional, I notice changes in my heart rate.* Because the two characteristics relate to the physiological manifestations of emotions (the body-mind connection), they may serve as a lens to zoom in on the impact of emotions on actors in the classroom. Coteaching was a critical part in this course. Accordingly, each student was expected to partner up with one or more classmates and make two presentations (each time with a different

partner/s) on course-related topics. Based on the responses to the open-ended question in the early version of the heuristic (*In what ways and to what extent are you emotional in teaching/learning contexts?*), we knew that emotions played a prominent role in the students' lives. Many participants were shocked to learn how elevated was the level of their heart rate when they were presenting. Of particular concern were extreme cases that exceeded 130 beats per minute (bpm) occasionally rising to as high as 150 and 170 bpm. *Self-Awareness* is one of the six Dimensions of Emotional Styles (Davidson & Begley, 2012). Davidson warns that to be "blissfully unaware" is a misnomer. He explains that since the level of Self-Awareness is a function of activation in insula, it may be regulated through mindfulness meditation. Indeed, when participants in our study applied mindfulness practices, we recorded markedly lower heart rates. Such was the case with Vania who commented:

> This experience also … like you said, teaching us how to present well and, um, just to see how we were the first … how I was [in] the first presentation versus the last presentation is completely different. You can even just see how our students can feed off of the energy and know, see our energy, our level of energy, our level of calmness or our level of stress up there and our level of confidence. (…) You guys are talking about mindfulness and just being aware of how we present ourselves was a good exercise. To really see how I was [in] the first presentation, really, really nervous, high pulse rate and then I was able to control my breathing in a second presentation two weeks ago. And my pulse, I got, like, 101/103 that's like 40 beats different. So this was good. (Vania, Week 14)

Interestingly, in this quote, Vania points to the benefit of emotion regulation not only to the teacher/presenter, but also to her students who "feed off of " the levels of calmness or stress. Here, of importance is the ever-present dialectical relationship between individual and collective

as characteristic of the field (in the Bourdieusian sense) of a classroom and its impact on such structures as emotional climate (EC).

Reflective of the principle of coherence and contradictions in social life, not all students in the study were teaching with high heart rates. Among those who appeared to have control over their emotions was Robert whose heart rate of 60 bpm was one of the lowest. Robert revealed that years of being in sports and singing in the church choir gave him the necessary skills to regulate emotions and calm himself. Robert did not participate in the collective breathing meditation in the classroom. He told us that whenever he wore the oximeter, he consciously sought to slow his heart rate by focusing on doing so–calming his body and using breathing as he learned from sports and singing. Similarly, another male student, David, whose heart rate was relatively low, commented:

> I work out so my heart rate never goes up too high. When I present, when I'm in front of people, I get nervous. But then I think that it does not help to be nervous so I try to calm myself down. (David during the post-presentation debriefing in week 10)

Despite seemingly being in control of their emotions, both David and Robert experienced spikes in heart rate during their respective presentations. Similar to David, Robert knew that he "spiked" right at the beginning of the presentation because he was "a little nervous" but, as he stated, he worked quickly to bring it down. Robert and David attributed their control over emotions to particular practices that placed them at the high end of the Self-Awareness spectrum of Emotional Style.

As we were approaching the conclusion of the course and learning from the study, we inevitably reached a point when we needed to contextualize the heuristic to the science classroom environment. Hence the *Mindfulness in Education Heuristic* was born (see Appendix

4). In it, some of the physiology-related characteristics became more reflective of agency involved in mindful practices, e.g., *During this classroom, I use breathing to manage my pulse rate* and *During this class, I use breathing to manage my emotions.* The characteristics of this "revamped" heuristic may prove particularly applicable to interpretive inquiry in science classrooms.

Counting the Mindfulness Kernels–Heuristics Used for Conducting Landscape Studies

Heuristics may assist in conducting landscape studies. After we administered the 17-charateristic heuristic in weeks 10, 11 and 12, we were curious to see if there was any statistically significant change between the three administrations. We employed repeated measures analysis of variance (ANOVA) to analyze the trends in mindfulness across weeks 10 through 12. The within subjects factor in the analysis was occasion of measurement (week 10, week 11, week 12). The dependent variables were Mindfulness scores obtained by summing the rating for each characteristic to obtain a total score for each occasion of measurement. Table 1.1 shows the variation in the mean and standard deviation for Mindfulness over the 3 occasions of measurement. Reliability of the Mindfulness data for the three administrations of the heuristic were 0.70, 0.64, and 0.75 respectively. Although these reliability coefficients were only moderate in size, we did not expect them to be high because the design of the heuristic intentionally involved selections of characteristics that differed from one another, though each involved an aspect of mindfulness, which is a very diverse construct. Given the moderate magnitude of the reliability coefficients, we proceeded with the analyses, realizing that the statistical tests would be conservative (i.e., increasing the likelihood of type II errors).

Table 1.1
Variation in the Mean and Standard Deviation for Mindfulness Over the Three Occasions of Measurement

General Mindfulness Heuristic	Week 10		Week 11		Week 12	
Characteristics	Mean	SD	Mean	SD	Mean	SD
I am curious about my feelings as they occur.	3.9	0.8	3.8	0.6	3.8	0.6
I easily find words to describe my feelings.	3.7	0.9	3.7	0.7	3.7	0.7
I observe my thoughts without being caught up in them.	3.2	0.8	3.1	0.7	3.5	0.7
I perceive my emotions without having to react to them.	3.5	0.7	3.1	0.9	3.7	0.6
I am compassionate to myself when things go wrong for me.	3.1	0.8	3.1	0.8	3.3	0.7
I quickly recover when things go wrong for me.	3.3	0.8	3.1	0.7	3.2	0.7
I pay attention to sensations, such as the wind in my hair or sun on my face.	4.1	0.9	3.8	0.7	4.4	0.7
When I am emotional, I notice how my breathing changes.	3.5	1.1	3.5	0.8	3.9	0.6
When I am emotional, I notice changes in my heart beat.	3.7	0.8	3.7	0.8	4.2	0.7
I maintain a positive outlook on life.	3.7	0.9	3.8	0.7	4.1	0.8
I can tell when something is bothering another person just by looking at him/her.	4.1	0.7	4.0	0.5	4.2	0.7
The extent to which I show my emotions depends on where I am.	3.9	0.9	4.1	0.7	4.1	0.7
The extent to which I show my emotions depends on whom I am with.	3.9	0.9	4.2	0.5	4.2	0.7
If I decide to focus my attention on a particular task, I can keep it there.	3.9	0.6	3.8	0.9	3.9	0.7
I am kind to others.	4.3	0.5	4.2	0.7	4.4	0.5
I feel compassion for people even if I do not know them.	4.3	0.7	4.1	0.8	4.0	0.8
When I produce strong emotions, I can easily let them go.	2.9	0.9	2.9	0.8	3.2	0.8
Mindfulness (general scale)	63.0	5.7	62.0	4.8	65.7	5.3
Reliability (coefficient α)	0.70		0.64		0.75	

The repeated measures analysis of variance supported an assertion that there were significant contrasts in the means for mindfulness on the three different occasions of administration ($F(2,15)=12.9$, $p<0.001$). We hypothesized that the mean for week 11 would be higher than the mean for week 10 and the mean for week 12 would be higher than the mean for

week 11. The latter contrast, between weeks 11 and 12, was statistically significant ($F=23.4$, $p<0.001$). The difference in the means obtained for weeks 10 and 11 was not statistically significant ($F=1.1$, $p=0.32$). Based on this result, some might argue that mindfulness among the students increased between the two latter administrations.

Another procedure we employed was cluster analysis. The cluster analysis spread out the students across three groups based on the way they completed all three mindfulness heuristics. We selected one person from each of the three groups to explore why they completed the heuristic in the way they did. Guided by Guba and Lincoln (1989), in our effort to look for and make sense of contradictions, we selected our participants intentionally, serially and contingently. What this principle involves is making sure that the individuals are as different from one another as possible not only in the way they are making sense of the construct of mindfulness (as evidenced in their answers to the heuristic) but also in terms of their gender, ethnicity, extent of teaching experience, etc. We picked Brad and Christa since they were at the opposite ends of the cluster spectrum. Sarah, who "clustered" with the vast majority of the students, was interesting to us due to her engagement and thoughtful comments made in class. Through a conversation with each of the three students, we were able to gain insights into their thinking around the different characteristics of mindfulness which further informed our study. For example, eyeballing the results in Table 1.1, we noticed that while students were compassionate to others, they were generally hard on themselves. So we asked Christa, Brad, and Sarah about their opinion on that.

> I think that's probably the biggest quality [compassion] you have to have to be a teacher – to be in tune with others. It's probably, I'm gonna say, it's probably the most social job out there. You're responsible for 25 other people so you have to be compassionate. How

> effective would you be if you were a terrible, mean teacher? You wouldn't get anything done; that would be, like, the worst class ever. I think that's the biggest quality to have – compassion and being a people's person as far as teaching goes. If you're not, you're in the wrong field; you should pick something else. (Brad, informal meeting, June 6, 2012)

Brad and Sarah, who moved to New York from other parts of the US, both emphasized that their compassion for others was a result of their upbringing. Christa's response to: *I feel compassion for people even if I do not know them* was more indiscriminate:

> It depends. I was going to say, "not really" which sounds terrible, so I don't want to say it but, I mean, um, if there is something out of their control that's affecting them then yes, I feel compassion for them, why not. But if it's something they're doing to themselves, like drug abuse or something or like that, I don't really feel compassion for them. (Christa, Week 15 pre-class meeting)

Compassion can be strengthened through mindful practices, particularly through compassion meditation. A seasoned mediator, scientist, science educator, and co-researcher on this project, Natasha Dachos (2012), explains that compassion, or being aware of the suffering of another combined with a desire to relieve it, is an integral aspect of mindfulness. It starts with compassion to oneself and moves out to people we love and ultimately to all beings. We consider it important to cultivate compassion, empathy and kindness in students and teachers. Many of the contemporary ills prevalent in today's schools such as bullying, which coincidently became subject of a discussion in week 5 of the study, could be alleviated through compassion. Sarah agreed. Responding to the video on bullying she appeared to embrace mindfulness as a remedy for dealing with bullying. Sarah stated:

> I don't see how as a teacher you are not aware of what's going on in the classroom. I think, you know when someone is being bullied; you can, kind of pick up on that, you know that. So I think that teachers need to be more mindful.

Frederick Erickson (1998) advises that when reporting results of "qualitative" studies, researchers should include relative frequency of occurrence of data. So how many lives has our study touched? Of the 19 participants, about two-thirds explicitly expressed their enthusiasm for mindfulness practices and for their transformative potential. On different occasions, a total of about 10 students joined us in exploring, analyzing and presenting the unfolding study results during pre- and post-class cogens, in our research squad meetings and in Urban Science Education Research Seminars devoted to mindfulness. The study had an impact on many members of the research squad (including me). Virtually all of us infused mindfulness, including meditation, into our daily lives and professional practices and the lives of those around us–our friends, families, students, co-workers, bosses, and others. The seeds of mindfulness have been planted and we hope for abundant crops.

Converting the Field of Education into Mindfulness-Fertile Ground

One of the major goals of this study was to use results of research to produce, enact, and adapt interventions and use research to validate them. One such intervention was the mindfulness heuristic. Equally important was meeting authenticity criteria as postulated and practiced by Tobin (2006). For research to be authentic, the study must instantly benefit those who are involved in it (teachers, students, and researchers). Hence, we not only consistently informed participants about what we were learning from the study but we also witnessed ontological changes that catalyzed improvements. In other words, through infusing mindfulness into the classroom, we witnessed ripple effects of the research in the form of enhanced practices. Our

study was unique in the sense that the interventions we enacted were woven into the "official curriculum" as opposed to being the curriculum (as is often the case with mindfulness-based programs).

The mindfulness-raising interventions presented in this chapter are meant to be adoptable in order to fit any context. Thus, it is our strong conviction that our research and its results may be readily implemented in any (science) classroom. We consider it incredibly important that mindful practices are introduced in schools throughout the United States and in other parts of the world. We are confident that, in Tobin's words, "enduring transformation, for the better, might be sustained if fresh theoretical and empirical lenses are acquired for making sense of teaching and learning and the ways in which participants successfully interact to produce learning" (2006, p. 26). We invite (science) educators to join us in this effort.

CHAPTER 2

HEURISTICS FOR MINDFULNESS IN EDUCATION AND BEYOND

"Teaching Should Not Make You Sick"

In our research conducted in a graduate science education course, we discovered that often when students cotaught classes, their heart rates and oxygenation of the blood reached dangerous levels (Alexakos & Tobin, 2014, forthcoming). We considered these physiological markers as manifestations of heightened emotional states associated with teaching. Many of the study participants were unaware of the impact of emotions on their physiology and expressed a profound surprise when faced with this realization. Jonathan Turner (2002) and Randall Collins (2004), who argue the primacy of emotions in human interaction, confirm that much of what happens in social life happens without conscious awareness. We are often unaware and inattentive to the moment-to-moment emotional states that accompany our experiences. If sustained and not regulated for extended periods of time, negative emotions may inevitably lead to poor health. Richard Davidson, a leading scholar of affective neuroscience, provides evidence that human emotions may be the most powerful influence on our physical health (Davidson & Begley, 2012). In the field of education, a potential result is a well-documented high teacher turnover as reported by Richard Ingersoll and David Perda (2010) as well as absenteeism among students such as that described in the study by Kenneth Tobin, Gale Seiler, and Edward Walls (1999).

Since we believe that teaching should not put in jeopardy the health of teachers or students, we undertook research promoting self-awareness of emotional states. Our research was conducted with 19 pre-service and in-service science teachers of diverse cultural, ethnic, and racial backgrounds at a large, urban, public college in the Northeast. I was among the group of

Ph.D. students invited to collaborate on this project by the principal investigators Kenneth Tobin (my advisor) and Konstantinos Alexakos (the class instructor). Our aim was to develop interventions that would allow teachers (and students) to monitor their emotions, to counteract their negative impact and to maintain wellbeing. We are among a growing number of educators who believe that mindfulness, through raising awareness, may be a powerful tool in shaping our emotional states. We decided to introduce mindfulness into the class through the use of a *heuristic*, which we refer to as a *low-grade intervention*. A low-grade intervention relates to a construct illustrated in the heuristic by a set of characteristics, which are salient to the contexts in which the construct is applicable. In this chapter, I discuss our approach to theorizing, developing and applying a mindfulness heuristic. The roles of reflexivity, contingency, and interpretive inquiry, all essential to our methodology, are emphasized.

Introducing Mindfulness Reflexively

A multi-faceted, subtle and somewhat elusive construct, mindfulness may be challenging to explain. One analogy to how our minds work is that of a DVD player. We often find ourselves in a fast-forward (thinking about the future) or rewind (focusing on the past) mode rather than being in the moment. In other words, we experience what is often referred to as *mind wandering*. Amishi Jha (2012) points out that while mind wandering may have some benefits, it is associated with difficulties performing current tasks. The trick is to be able to focus our mind on the present experience and that is where mindfulness may be of assistance. Jon Kabat-Zinn (1994), a leading mindfulness scholar, defines mindfulness as paying attention in a particular way: on purpose, in the present moment, and non-judgmentally. Since there is growing interest in secular applications of mindfulness, Scott Bishop and his colleagues (2004) convened a panel of researchers who reached consensus on the various components of the construct and developed its

operational definition. The focus was on providing greater precision and specificity of the construct and on facilitating its measurement development and hypothesis testing. The panel proposed a two-component model of mindfulness. The first component involves self-regulation of attention so that it is maintained on immediate experience, thereby allowing for increased recognition of mental events in the present movement. The second component involves adopting a particular orientation toward one's experiences in the present moment, an orientation characterized by curiosity, openness, and acceptance. Kabat-Zinn (2003) refers to this second component as "an affectionate, compassionate quality within the attending, a sense of openhearted friendly presence and interest" (p. 145). To Gordon Marlatt and Jean Kristeller (1999), mindfulness involves observing one's experiences "with an attitude of acceptance and loving kindness" (p. 70). According to Sue Kraus and Sharon Sears (2008), "one metaphor for mindfulness is a bird, with one wing of awareness and the other wing of compassion" (p. 170). Unless awareness and compassion are in balance, the bird of mindfulness cannot fly.

Awareness and acceptance rather than avoidance and suppression may prove effective in alleviating negative emotions. For example, Turner (2002) finds that defense mechanisms to mitigate the effects of negative emotions such as repression, defensive attribution, projection, and displacement are counterproductive to the smooth flow of an interaction. Instead, says Turner, "if individuals are successful in overcoming their pain, they will typically experience pride that can work to tear down the defense regime" (p. 91). We maintain that one way to overcome pain is through being mindful of one's emotions. Through mindfulness meditation, one may practice observing thoughts, feelings, and sensations moment by moment and nonjudgmentally, viewing them simply as they are: thoughts, feelings, sensations, nothing more and nothing less.

A relationship between emotions and conduct is a big part of mindfulness. Although it may be difficult to do, the idea is to recognize emotions as they present themselves, name them, and let them go. If emotions are stuck to conduct then agency may be used to separate them. Usually examples are given concerning anger in its low-grade forms that express frustration. Consider Rey Llena, a teacher-researcher in many of Tobin's studies on emotions and author of the opening quote to this chapter. In Rey Llena's case the strident anger he exhibited as he taught continued to be expressed hours, days, and weeks later (Tobin & Llena, 2012). It was like the social resonance that occurs when structures similar to those associated with the initial expression of anger reappear. Structures that serve as sites for resonance might include the same person or persons associated with the initial event in which the emotions were generated, a friend of that person or those persons, a similar prosodic pattern, and even the same classroom (Tobin, personal communication, February 19, 2012). Rey's sustained inability or perhaps his unwillingness to regulate his emotional states had serious negative implications for his physical health.

The Hermeneutics of Mindfulness

A major feature of our mindfulness heuristic was reflexivity, or becoming aware of the unaware (Bourdieu & Wacquant, 1992). We theorized that once research participants (or students in the classroom) became aware of the different characteristics in the heuristic, we would witness evidence of awareness about mindfulness in their language and practices. We believed that encouraging greater mindfulness among teachers and students would assist them in regulating emotions that accompany teaching and learning. The respondents commented that the heuristic made them think and internalize their feelings; it made them stop and think more and be more reflective than they usually were; it made them think of things they never thought about; and it

made them think about themselves. Thus, it was evident that the heuristic successfully mediated reflexivity since it actually worked as an enhancer of self-awareness.

There was a history to our use of heuristics. Over a decade earlier, during his close collaboration with Wolff-Michael Roth, Tobin developed and used heuristics as pedagogical tools with pre-service teachers in the Teacher Education Program at the University of Pennsylvania and with inner city school students in Philadelphia. Examples of heuristics that he developed at the time include *Heuristics for Productive Coteaching* and *Heuristics for Productive Cogenerative Dialogue* (Roth & Tobin, 2002). The heuristics were generated by closely examining videotapes of coteaching involving new teachers, supervisors, and researchers. The heuristic characteristics were meant to capture practices that occurred during effective coteaching (such as *willingness to step back* and *tolerance of others' actions*) and could be used for planning and enacting such practices.

The development of a heuristic for mindfulness built on Tobin's earlier work. Tobin would also play a pivotal role in our efforts of theorizing the construct. To make the heuristic meaningful, our approach to developing the heuristic was collaborative, polysemic (involving multiple-meanings) and polyphonic (multiple-voiced). The major contributors to the development of the heuristic were the pre-service and in-service teachers who participated in our study at the time. We also extended an invitation to collaborate on the mindfulness project to scholars who worked at universities in the US and in different parts of the world. From the very onset of our study, we envisioned it to have a global reach and to become an international study that examined mindfulness in a variety of different contexts related to science education. Hence, we foresaw working with colleagues to develop contextually relevant heuristics. Many of the colleagues embraced the idea as evidenced in the following comment:

> I find your work on mindfulness most interesting and it relates well to some of my own reading of the crucial role of emotion in maintaining attention – a necessary prerequisite for any learning. Mindfulness, then, relates to awareness of emotions and focusing on it could be useful for students and classroom teachers in 'accessing' emotions of their own and their students to facilitate learning. (Colette Murphy, Associate Professor, School of Education, Trinity College, Dublin, March 3, 2012)

Because yoga practitioners deal with mindfulness much of the time, we considered it important for our study to involve people in our professional and personal networks who practiced yoga. Also, because these individuals understand mindfulness in ways that are probably deeper than those of other people, they might be able to provide input that would broaden the construct.

In order to engage these different voices in the conversation about mindfulness and heuristics, we utilized on-line resources including the SurveyMonkey® and email communication. We also discussed the heuristic in the graduate classes where we conducted our study as well as during research squad meetings and larger gatherings such as monthly Urban Science Education Research Seminar (USER-S) forums. Established by Tobin in 2004, USER-S provided an ideal platform for exchange of ideas in the research community.

First Iteration of the Heuristic

Since Tobin asked me to take the lead on the development of the heuristic, my first instinct was to review the extant literature. Knowing that in its format our heuristic would resemble a survey, I identified several mindfulness-related scales whose reliability and validity evidence appeared to have been well established through multiple studies. In my search for the broadest construct possible as a starting point, I chose to focus on two surveys: the Five-Facet Mindfulness

Questionnaire or FFMQ (developed by Ruth Baer, Gregory Smith, Jaclyn Hopkins, Jennifer Krietemeyer, and Leslie Toney (2006)) and the two-factor trait version of the Toronto Mindfulness Scale or TMS (as proposed by Karen Davis, Mark Lau, and David Cairns (2009)). When combined, the two scales offered seven facets of mindfulness: observing, describing, acting with awareness, non-judging, non-reacting, curiosity and de-centering (see Table 2.1 for definitions of the seven facets as offered by Ruth Baer, Erin Walsh, and Emily Lykins (2009)).

Typically, in contemplative-related psychology literature, scales, questionnaires or surveys are developed, validated and utilized to provide self-reported measurement of mindfulness pre- and post-intervention. The idea is to empirically demonstrate the effectiveness of the treatment in raising levels of mindfulness. For example, James Carmody and Ruth Baer (2008) demonstrated significant increases of scores as measured by the FFMQ administered to individuals before and after they completed MBSR (Mindfulness-Based Stress Reduction) program. In light that our heuristic was meant to act as an intervention in its own right, our major concern was not with using it to document the pre/post-treatment difference. Establishing causality (the direct effect of the intervention) was not central to our hermeneutically driven research and we were not focused on measuring the levels of mindfulness or on developing an all-encompassing definition of it. Instead we saw our heuristic as generative in the sense that once a person read the characteristics and responded to them, the characteristics became objects for reflection and changes in practice. In other words, completing the heuristic would provide a context for reflexive changes.

Having selected 5 characteristics for each mindfulness facet, we generated a 35-characterisic multidimensional instrument complete with a 5-point Likert scale (see Appendix 2). We were interested not only in the relationship between how people rated themselves vis-à-vis

mindfulness but also in their concepts of spirituality, meditation and emotions. Additionally, in our hermeneutic approach, it was essential to allow for comments regarding the experience with the heuristic. Consequently, relevant open-ended questions were added.

Table 2.1
Meanings of Seven Facets of Mindfulness

Mindfulness Facet	Relevant Scale	Meaning of the Facet	Example of a Characteristic as Used in our Heuristic
Observing	FFMQ	Includes noticing or attending to internal and external stimuli, such as sensations, emotions, cognitions, smells, sounds, and sights.	12. I pay attention to sensations, such as the wind in my hair or sun on my face.
Describing	FFMQ	Refers to labeling observed experiences with words.	2. I'm good at finding words to describe my feelings.
Acting with awareness	FFMQ	Includes attending to the activities of the moment and can be contrasted with automatic pilot, or behaving mechanically, without awareness of one's actions.	3. When I do things, my mind wanders off and I'm easily distracted.
Non-judging of inner experience	FFMQ	Refers to taking a non-evaluative stance toward cognitions and emotions.	4. I criticize myself for having irrational or inappropriate emotions.
Non-reactivity to inner experience	FFMQ	Is the tendency to allow thoughts and feelings to come and go, without getting carried away by them or caught up in them.	5. I perceive my feelings and emotions without having to react to them.
Curiosity	TMS	Reflects interest and curiosity about inner experiences.	7. I am curious to see what my mind is up to from moment to moment.
De-centering	TMS	Emphasizes awareness of experiences without identifying with them or being carried away by them.	33. I am aware of my thoughts and feelings without over identifying with them.

Even though the resultant instrument looked like a survey, its different purpose made it something radically distinct. The inclusion of a rating scale with each characteristic is meant to

assist in creating a personal bond between each individual and a particular mindfulness characteristic. A respondent thinks briefly about each characteristic in relation to his/her own conduct and chooses a point on the rating scale to represent the extent to which he/she enacts that characteristic. It may be of little significance whether the selected point is an accurate reflection of how the person actually conducts social life. As long as the description of the characteristics and the associated rating scale assists in creating a personal bond, the objective has been met. As a person subsequently enacts social life, it is possible that this characteristic frames what is happening. In other words, associated interactions that are salient to this characteristic might be undertaken with greater awareness of the phenomenological *what happens* and the hermeneutic *why it happens*. We are not arguing that this occurs in a deterministic way but rather that heightened awareness about (in this case) the construct of mindfulness in terms of a diverse set of characteristics is an affordance for making sense of social life through mindfulness (Tobin, personal communication, October 23, 2012).

Emerging Patterns

Along with our collaborators, we quickly identified areas where the heuristic needed improvements. Many respondents were distracted by what seemed like repetition. This was particularly true for characteristics sharing the same stem as in #11, 29, 30 and 35 all beginning with a clause: *When I have distressing thoughts or images*. Understandably, even though it was not our intention, the respondents often assumed that the repetitive/redundant structure was done on purpose in order to increase validity and to strengthen internal consistency. While these are important objectives for surveys, they tend not to be for heuristics.

Wordiness and excessive length as well as lack of clarity of some characteristics emerged as problematic. Accordingly, the respondents commented that some characteristics were too

long, too wordy, too whimsical, too esoteric, difficult to respond to, unclear, confusing and not easily identifiable with other characteristics. One such case was characteristic #6: *I experience my thoughts more as events in my mind than as a necessarily accurate reflection of the way things 'really' are*.

Another challenge in the heuristic was that as many as ten characteristics were categorized as *reverse scored*. Therefore, they were negative characteristics as far as mindfulness is concerned. For example, characteristic #3: *When I do things, my mind wanders off and I'm easily distracted* refers to a mind wandering and inability to focus which is typical of non-mindful conduct. Similarly, characteristic #4: *I criticize myself for having irrational or inappropriate emotions* does not agree with mindfulness, which is characterized by acceptance of all emotional states and an effort to refrain from judging oneself. We felt that the reverse-scored characteristics did not align well with the reflection-invoking function of a heuristic. Reflecting on what mindfulness is rather than what it is not made more sense. We thought that alignment with the mindfulness construct was what should set our tool apart from a survey that adheres to certain psychometric features.

A further limitation of this version of a heuristic was that some characteristics combined distinct concepts such as 1) *feelings* and *emotions* as in #5, 2) *thoughts* and *feelings* as in #33, or 3) *thoughts* or *images* as in #11, 29, 30 and 35. We agreed with the collaborators who noted that some words whose meanings were close to each other appeared as if they were interchangeable. Characteristic #8 (*I can easily put my <u>beliefs, opinions and expectations</u> into words*) may be representative of this issue. We decided that for clarity purposes each of the distinct ideas needed to be teased apart and included in separate characteristics.

Finally, we received a fair number of comments regarding the rating scale. Some respondents were uncomfortable with *never* and *always* being part of the scale. In addition, a suggestion was made to remove the word *true* from the scale and just retain frequency words. This comment aligned well with our stance that rejects ontological realism in favor of polyphonia. We accepted the suggestion that the scale should be reversed, starting with "positive" and ending with "negative," i.e., from *very often* to *very rarely*. The flexibility of a heuristic includes changing the nature of the rating scale and even forgoing the rating scale if a person does not want to use it. Indeed, a heuristic could be delivered as a narrative or a story that might be appealing to different audiences including young children or senior citizens.

Ever-Present Contradictions

While the majority of our colleagues enthusiastically embraced the process of the heuristic development, at least one of them challenged our seemingly "unmindful" and "scientific" approach to discussing mindfulness. At that stage we were fully aware that our efforts to make mindfulness concrete by identifying facets of mindfulness might be perceived as incomplete and reductive. Furthermore, identifying 35 characteristics for those facets was even more reductive. We did not want to take an essentialist stance that we had fully described mindfulness in terms of seven facets and associated characteristics. On the contrary, we began with the idea of transcendence and the benefit of offering insights by providing descriptions of what mindfulness was and was not even though this could never be determined fully by categories and lists. Like any other concept, once a person starts to build up a repertoire of what belongs to it and what does not belong, there is a growing hermeneutic awareness that begins to define the construct in ways that are fluid and dynamic (Tobin, personal communication, February 19, 2012).

Another contradiction came from one of the avid yoga practitioners who felt that the instrument fell short of meeting its goal. While others pointed to the extensive length of the heuristic, he found it to be short in terms of getting an accurate assessment of people's "true mindfulness." He advocated that a more meaningful heuristic would be possible if more questions were to be put forth in different ways. This comment resonated with us and, ultimately, we expanded the heuristic to include dimensions of mindfulness (such as loving kindness and compassion) that were missing from its early iterations.

Consistent with the emergent design of our interpretive research (Erickson, 1998), we expected and were open to making evolutionary adjustments to the mindfulness heuristic. This approach is grounded in our axiological stance that values difference and complexity as a resource for learning (Tobin, 2010).

Second Iteration of the Heuristic

In addition to gathering and analyzing the comments made by our respondents, we decided to take advantage of the quantitative data obtained through the use of the rating scale. We were curious to see if analyzing underlying statistical structures might assist us further in refining the heuristic. Using SPSS, we performed factor analysis of 37 responses to the heuristic and arrived at a 6-factor solution. At this stage, we thought it was useful to retain all six of these factors and to sharpen the characteristics accordingly. In addition, the factors could be used as a basis for selecting characteristics to provide a shorter version of the mindfulness heuristic. Because of the way they were selected, these characteristics could be used heuristically to think about mindfulness but we did not expect them to load on a single factor and nor did we expect them to aggregate together to form a measure of mindfulness. In other words, psychometrically it made more sense to consider a construct that was multidimensional in nature. It would not be

appropriate to sum the scores provided on the heuristic to obtain a single measure of mindfulness. Instead there was at least an empirical rationale for producing separate scores for each construct.

Following Frederick Erickson's (1998) recommendation, we were now armed with a variety of kinds, sources and amounts of evidence and ready to proceed with transforming the heuristic. Statistical analyses were not laid out as evidence for any particular stance but instead they were meant to be used to show patterns and contradictions that provided alternative insights into the construct of mindfulness. It was never our intention to present any of the analyses as truths and we did not search for coherence among the different analytical tools we used. Once again, our stance was part of an axiology that is neither monosemic nor monophonic but radically polysemic and polyphonic.

Upon closer inspection, we discovered that our statistical outcomes were not in alignment with the respondent comments. In many cases, characteristics that loaded most heavily on a particular factor were "flagged" as problematic by our collaborators. It was becoming more and more clear that the heuristic was in need of a major overhaul and it made little sense to try to "rescue" any particular characteristics drawn from the original pool. To that end, it was time to finally bid farewell to the psychometric characteristics in our tool, starting with the elimination of characteristic redundancy as well as removal or re-wording of the reverse-scored characteristics.

A feature of a heuristic that makes it different from a survey is that characteristics are selected to cover the field of the construct, making sure that characteristics positioned around the boundaries as well as those in the center are included. That is, a heuristic pays attention to difference as well as central tendency. Making sure that characteristics are coherent, in the way

that the items that define a survey should be coherent, is not a goal. Instead care is given to make sure that characteristics that are "the essence" of a construct are represented in the heuristic.

As we were breaking ties with anything that might suggest our heuristic having any psychometric aspirations, a few of us participated in the Annual Conference organized by the Mindfulness in Education Network. There we came in contact with the work of Sharon Solloway, the author of the Solloway Mindfulness Survey (SMS). Similar to us, Solloway conducted studies with students in a pre-service teacher education program (though in her case the participants were in an undergraduate program). She argued that mindfulness practice is measurable, teachable and learnable, and may be an object of experimental research. Additionally, like us, she and her collaborator developed the scale through a hermeneutic integration of qualitative (drawing on students' journal entries) and quantitative (using Rash model) processes (Solloway & Fisher, 2007). Solloway claims that this approach allowed her to translate the cumulative voices of her students into a scale that corroborated their journal entries retaining the individuality of experience just as the journal entries did. When we reviewed her scale, we were drawn to the idea that for some of the SMS items, the respondents were asked to describe in their own words what the item meant and to write an example from their life. Since we were deeply concerned with creating opportunities for reflective pauses, we decided that we would provide space for free-flowing reflections over each of the characteristics in our heuristic. Such an approach would allow for making even deeper connections with each mindfulness trait.

A strong influence on reshaping the heuristic came from Richard Davidson's seminal work in *affective neuroscience* (the study of the brain basis of human emotions). In his 2012 co-authored book, that was released as we were engaged in our research, Davidson identified unique neural signatures for *Emotional Styles* that underlie human personalities and traits. Davidson

demonstrates the power of neuroplasticity (the brain's ability to change its structure and function) in altering Emotional Styles through contemplative practices such as mindfulness. For example, *Resilience* is a measure of how quickly one recovers from adversity. Davidson's experiments show that strengthening and increasing the connections between the left prefrontal cortex and the amygdala through mindfulness practices can increase Resilience.

This idea that our Emotional Styles can be transformed through practices that modify our brains has very important implications for education. For example, a teacher's (or a student's) low *Outlook* (inability to maintain a positive emotion) or poor *Attention* skills (how sharp and clear one's focus is) may have devastating consequences for school performance. Both Outlook and Attention may be improved through mindfulness meditation, which fosters concentration, promotes compassion and kindness, and consequently may create a happy and optimistic classroom in schools. Davidson's findings resonated with us in light of our work on emotions in education and our interest in self-regulating emotional states. Raising *Self-Awareness* (how well one can perceive bodily feelings that reflect emotions) aligned well with our efforts to assist teachers in making a connection between emotions and their physiological markers such as heart rate and breathing pattern. We were also interested in increasing levels of *Resilience* (ability to recover from adversity or not getting stuck with a particular emotion as was often the case with Rey Llena). We concurred with Davidson that being mindful about areas of potential brain activity could be associated with gaining some control over them. For this reason, we thought it important to develop one or two characteristics for each of the six dimensions of Emotional Style and weave them into the heuristic (see Table 2.2 for examples of the new characteristics).

We found it intriguing that Paul Ekman, whose best-known work is on the universal elements in emotion, was proclaiming a strong interest in how each individual's emotional

experience is unique. What Davidson labels Emotional Style dimensions, Ekman (2003) appears to refer to as "emotional profiles" (p. 238). Similar to scholars with interests in contemplative practices, Ekman acknowledges that emotional behavior awareness and impulse awareness may be accomplished through mindfulness meditation.

Table 2.2
Emotional Style Dimensions as Represented in the Mindfulness Heuristic

Emotional Style Dimension	Meaning	Related Mindfulness Characteristic
Resilience	How quickly you recover from adversity.	6. I quickly recover when things go wrong for me.
Outlook	How long you are able to sustain positive emotion.	10. I maintain a positive outlook on life.
Social Intuition	How adept you are at picking up social signals from the people around you.	11. I can tell when something is bothering another person just by looking at him/her.
Self-Awareness	How well you perceive bodily feelings that reflect emotions.	9. When I am emotional, I notice changes in my heartbeat.
Sensitivity to Context	How good you are at regulating your emotional responses to take into account of the context you find yourself in.	13. The extent to which I show my emotions depends on where I am.
Attention	How sharp and clear your focus is.	14. If I decide to focus my attention on a particular task, I can keep it there.

Finally, we felt that our heuristic would not be complete without the other wing of mindfulness–loving kindness and compassion. Therefore, we added a few characteristics relating to loving kindness as in #15: *I am kind to* others, as well as to compassion to self as in #5: *I am compassionate to myself when things go wrong for me* and to others as in #16: *I feel compassion for people even if I do not know them.* Compassion was somewhat related to a non-judgment

factor (taking a non-evaluative stance toward cognitions and emotions) in the earlier version of the heuristic. We discovered an interesting pattern among teachers in our study–in their responses to the heuristic they indicated that while they were compassionate to others they were often "hard" on themselves. In follow-up conversations, we were told that raising compassion to self and increasing resilience levels were among desirable outcomes for the study participants not only in the teaching/learning context but also in other fields of social life.

After adding the loving-kindness and compassion characteristics, the second iteration of our heuristic was complete (see Appendix 3). Now consisting of seventeen characteristics, the heuristic reflected ten dimensions of what Tobin (personal communication, April 1, 2012) refers to as *mindful action* (see Figure 2.1).

• Being aware of surroundings, emotions and what you are doing	• Maintaining a positive outlook
• Maintaining focus	• Being socially intuitive
• Being kind	• Adapting actions to context
• Acting with compassion	• Separating emotions from other actions
• Recovering from adversity	• Suspending judgments about emotions

Figure 2.1. Ten dimensions of mindful action.

Third Iteration of the Heuristic–Mindfulness in Education

Since our interest is in education in general and in science education in particular, the next and natural progression was to contextualize the heuristic to teaching and learning. Our collaborating colleagues liked the idea of "making educational contexts more reflexive places." They considered mindfulness "not only important but necessary for holistic development, which constitutes science education also." Therefore, early on, contextualizing the heuristic appeared to be a preference of our collaborators. What we did with characteristic #14 may be an example of

adapting it to educational contexts. A generic statement: *If I decide to focus my attention on a particular task, I can keep it there* became a specific characteristic: *I can focus my attention on learning*. Similarly, an earlier characteristic referring to *social intuition*: *I can tell when something is bothering another person* was replaced by two related characteristics: *I can tell when something is bothering the teacher* and *I can tell when something is bothering other students*. Conversely, a somewhat specific earlier characteristic: *I pay attention to sensations, such as the wind in my hair or sun on my face* became more reflective of a windless and sunless classroom setting in *I pay attention to my moment-to-moment sensory experiences*.

What we were hermeneutically learning from the study with the pre-service and in-service science teachers constituted another impetus for implementing modifications to the heuristic. The characteristics of a heuristic are expected to constantly change to fit the contexts of research including the axiologies (what is valued), ontologies (how life is experienced), and epistemologies (what constitutes knowledge) of participants. Thus, what an individual would be mindful about would depend on the circumstances being considered and would be included in the heuristic. Often we use the metaphor of "shape shifter" to convey the idea that a heuristic can change its shape even though a construct, such as mindfulness, might remain the same from one context to another. Because our study focused on raising awareness of emotions, their physiological manifestations, as well as ways of regulating emotional states, a pool of relevant characteristics was expanded and gained prominence in the new version of our heuristic. Thus, informed by Tobin's earlier studies on prosody and proxemics and the work of Ekman (2003), Turner (2002) and Collins (2004), we included characteristics referring to the awareness of the expression of emotions in voice, face, and body movements in addition to body temperature, breathing patterns and pulse rates. Furthermore, we added three characteristics referring to a

high-grade intervention involving the management of emotions through breathing meditation that we developed and enacted as part of the study. Awareness of the emotional climate in the classroom was yet another ingredient of our study and necessarily found its reflection in the heuristic (*I am aware of emotional climate and my role in it*). Finally, we considered it essential to incorporate characteristics that would be reflective of the individual | collective dialectic (the vertical line indicates a dialectical relationship) that is typical of teaching/learning environments. Dialectical relationships refer to constructs in social fields that are a constituent of a whole and do not exist independently – existence of one presupposes the other. An example of a pair reflective of such a relationship is a "collective" characteristic #20: *I recognize <u>others' emotions</u> by looking at <u>their faces</u>* and its "individual" counterpart #21: *I am aware of <u>my emotions</u> as they are reflected in <u>my face</u>.* Even though the number of characteristics in the new heuristic nearly doubled as compared to the previous version, they all reflected salient aspects of our study without redundancy (see Appendix 4). This transformation made it easier for the study participants to identify with each of the mindfulness characteristics included in the heuristic.

Uses of Heuristics

A heuristic is meant to be a malleable tool fitting any context. Its flexibility also lies in its multiple uses. The first use is as a low-grade intervention. As noted earlier, the theory that supports low-grade interventions is reflexive inquiry where we ask participants to complete the heuristic thereby making them aware of the characteristics and their relative occurrences. We theorized that becoming aware in this way would catalyze changes in practices. During our study, we found evidence suggesting that this is exactly what happens. A second use of the heuristic may be for planning where individuals involved in an activity, such as coteaching, use the characteristics and plan accordingly so that the relative occurrence of those characteristics

could be targeted to reach desirable levels. Third is the use of the heuristic as a framework for interpretive inquiry concerning what happens in a social field. Hence, mindfulness heuristics may be used to describe what is happening in the science classroom from a hermeneutic phenomenological perspective. A fourth use is in undertaking landscape studies. The presence of the rating scale allows a heuristic to be used to portray landscapes (descriptions of the amount of mindfulness that crops up) for individuals and/or collectives. For each characteristic, a time series plot could be made for an individual to show how conduct in relation to the characteristic changes with time. Similarly, measures of central tendency and dispersion could be obtained for each characteristic for a collective as an illustration of patterns and contradictions. The calculation of parameters such as mean, mode, median along with appropriate measures of dispersion such as minimum, maximum, range, standard deviation, variance is a typical feature of a landscape study. It needs to be emphasized that the purpose of a landscape study is not to generalize to a population of which either the participants or the characteristics are a random selection. In the type of research in which we engage the participants are carefully selected and so are the characteristics for a social construct such as mindfulness.

In order to illustrate these four uses of heuristics, let us consider week 12 in our 15-week long study with the graduate students of a science-education program. The topic of the class was evolution. The instructor, his students and the research team anticipated this controversial topic (like many others covered in this course) to invoke high emotional states. The three students who volunteered to coteach that week (Aga, Aimee and Edward) decided to consider mindfulness characteristics when preparing for, executing and reflecting on their presentation. I worked closely with the group and we videotaped and analyzed our prep meetings, the class itself and the post-class discussions. At the forefront of all these activities was the pervasive awareness of,

sensitivity to and respect for the ontological, axiological and epistemological standpoints of both the presenters (all very passionate about the theory of evolution) and other class participants (representing a wide spectrum of attitudes towards the theory in its entirety or its parts). Of the three presenters, Aga and Aimee, who became actively involved in our research, often commented on how considering mindfulness assisted them in preparing and coteaching the class. They also attributed their personal transformations to their participation in the research and being exposed to the enacted interventions, including mindfulness heuristics. In Aga's case, it was reconsidering the value of scientism with its dismissive attitude towards alternative ways of knowing. The manuscript Aga co-authored with the class instructor provides a more complete account of her experience (Alexakos & Pierwola, 2013). For Aimee, who considers herself "overemotional," mindfulness was a way of learning how to replace *reacting* with *responding*. As evident in the following quote, awareness development was the first important step for her:

> I'm trying to bring mindfulness into my life generally. The other day at work I was having a conversation with one of my bosses and I noticed I was raising my voice; I was getting defensive. One of my other managers had to step in. He said, "You know, Aimee, you're getting too aggressive; he is your supervisor." And I was like, "Oh, God, if I really can't contain myself even with my boss what am I going to do in the future if I'm talking to the principal."

As I noted earlier, the next step associated with a low-grade intervention may be making a decision whether a change in one's habitus is desirable. Coming to and enacting such a decision (as in Aimee's case a move "to put a lid on" emotions) may prove challenging:

I'm actually kind of stuck here because part of me doesn't want to change myself, I think it's like giving in if I say I have to put, like, a lid on it. But, at the same time, I have to, like, get by, right? Like, control my display.

In this course, heuristics were one of the methods used to bring mindfulness characteristics to the awareness of the participants. Week 12 is an example of how heuristics were used as a planning tool (by assisting in enacting a mindful presentation) and, simultaneously, perhaps dialectically, as an intervention that ignited a reflection over one's way of being in the world. When heuristics are applied in these ways, they contribute to meeting authenticity criteria that guide our research. The idea behind authenticity criteria is for the research participants to benefit from research. The benefits may translate into improved practices and wellbeing.

In applying the heuristic as a framework for interpretive study, one might focus on certain mindfulness characteristics. For example, let us consider two characteristics that link emotions with their physiological markers: breathing patterns and heart rate. In our study, through the use of oximeters worn by the students during coteaching activities, we were able to record participants' heart rate and oxygenation level in their blood. Both Aga and Aimee were extreme cases of what may happen when individuals are involved in teaching. While Aga's oxygen level dropped considerably, Aimee's heart rate soared to the level unmatched by any other student in the class. Of note was the fact that, like many others in their class (and possibly in classes across our educational system), Aga and Aimee were not aware of what was happening to them. As the course progressed, however, we witnessed heightening of awareness of the connection between in-the-moment emotions and physiology as well as an increased ability to rein in strong emotions. In addition, students reported that their newly acquired practices seeped

into other fields of their daily lives. Reporting findings from the perspective of the research participants is a linchpin of doing interpretive research. As part of the course requirement, each student was responsible for coteaching twice during the semester. We were able to record the drop of heart rate level between the early and late instance of many student presentations. In the case of Aga and Aimee, the increased awareness associated with relevant mindfulness characteristics may also be illustrated through how they responded to the heuristic. We administered the 17-characteristic heuristic at the beginning of each class starting with week 10 and ending in week 12. In this instance, in addition to its other functions, a heuristic became a tool for undertaking a landscape study. Aga's rating for the awareness of changes in her breathing associated with being emotional (characteristic #8) was the highest in week 12. For Aimee, her awareness of heart rate (characteristic #9) increased in week 11 and stayed at that level through week 12. Thus both Aga and Aimee exercised agency in gaining control over their wellbeing. When we analyzed change over time among 17 students who participated in the three administrations of the heuristic, increase in the mean score between weeks 10 and 12 and between weeks 11 and 12 were statistically significant ($p<0.05$) for characteristic #9 (see Table 2.3). Other characteristics that displayed increase in the mean scores included #4 (separating emotions from other actions), #7 (self-awareness), #10 (maintaining a positive outlook), #13 (being socially intuitive) and #16 (acting with compassion). The change in ratings may indicate that these characteristics may have been salient to students in our study. Thus, we might argue that the class became more mindful in respect to these characteristics. Indeed, we found that the difference in the means of the combined characteristics obtained for weeks 11 and 12 was also statistically significant ($F=23.4$, $p<0.001$).

Table 2.3
Change in Means of Characteristic #9 Over Three Administrations of the Mindfulness Heuristic

(I) Time		Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Week 10	Week 11	0.000	.243	1.000	-.514	.514
	Week 12	-.471*	.194	.027	-.882	-.059
Week 11	Week 10	0.000	.243	1.000	-.514	.514
	Week 12	-.471*	.174	.016	-.839	-.102
Week 12	Week 10	.471*	.194	.027	.059	.882
	Week 11	.471*	.174	.016	.102	.839

Notes: Based on estimated marginal means
*. The mean difference is significant at the .05 level.
b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

The "So What?"

With its calming effect, mindfulness has clear implications for the field of education where it is slowly gaining traction. It may help to ameliorate stressful thoughts and emotions and quiet down racing hearts of teachers like those in our study. In turn, mindful teachers may be able to assist their students in adopting mindful conduct. This chapter presented one approach to developing a reflective tool, a heuristic, that may be used by educators interested in raising mindfulness in their classrooms. We hope that through the use of the heuristic, students and teachers will become aware of what mindfulness is and will take steps to becoming more mindful. We hope that like many of the novice teachers in our study, they will experience breakthroughs of making a connection between learning and teaching and mindfulness. We invite our colleagues to adopt and/or redesign any of the three versions of the mindfulness heuristic to fit their particular contexts and needs. We hope that our research will create ripple effects of transformations within and beyond the field of education. We also believe that this research will contribute to an emerging science of teaching and learning, which we regard as a

central constituent of teacher education. Included in this chapter is a list of mindfulness-related resources we offer to those whose interest in the topic is inspired by our work (see Appendix 5).

CHAPTER 3

TO YOUR HEALTH! HEURISTICS AND DEEP BREATHING AS MINDFULNESS PROMOTING INTERVENTIONS IN EDUCATIONAL CONTEXT

"Feel this Moment"

I am sitting in a spacious, attractive, modern room on the 40th floor of the newly re-erected 7 World Trade Center which is the home for the New York Academy of Sciences (NYAS). Behind me a wall of floor-to-ceiling windows reveals a panorama of downtown Manhattan glittering with lights on this cold, crispy, and crystal clear February evening. I am here awaiting the beginning of a sold out event. As the audience members slowly fill the rows of seats, I can hear buzz of their muffled voices. With seemingly nothing else to do (I came alone and, unusually for me, I arrived quite early), I catch myself drifting with my thoughts. I think of another event I attended in the morning at yet another freshly minted building of John Jay College. I remember the speeches by the Chancellor of the Department of Education and the Chancellor of the City University of New York highlighting collaborative efforts between the City's educational giants. I think of the speakers' lack of genuineness when glossing over the many problems that continue to plague public schooling in the city. Then, I remember the reason for being where I am. I close my eyes and try to bring myself back; I try to be present; I try to be in the moment. I focus on my breath. "Breathe in, breathe out, in, out…" Someone is taking a seat next to me. I open my eyes and catch myself scrutinizing and judging the stranger. I notice the way he smells as the scent bothers me. I think to myself, "Oh, why did he have to sit next to me? Oh, how I wish they would start already." My thoughts take over again! I close my eyes and return to my breath… Moments later the speakers emerge and take seats on the podium at the front of the room. They are neuroscientists Richard Davidson and Amishi Jha and a clinical mindfulness expert Jon

Kabat-Zinn. Their talk tonight, Becoming Conscious: The Science of Mindfulness, is the last in the series titled The Emerging Science of Consciousness: Mind, Brain and the Human Experience. As advertised on the NYAS's website, the speakers are here "to explore the role of consciousness in mental and physical health, how we can train the mind to become more flexible and adaptable, and what cutting-edge neuroscience is revealing about the transformation of consciousness through mindfulness and contemplative practice."

A mushrooming of similar events is a testament that mindfulness, as a special case of contemplative practice, has entered mainstream science. Labs in a number of distinguished colleges and universities across the United States have opened their doors to research involving meditative states. Curious scientists collaborate on projects that provide an insight into how in the fast-paced, technology-driven world of information overload our brains and lives may be impacted by a radical idea of pausing and being in the moment; in other words – being mindful. Often perceived as incongruent traditions, Western and Eastern thought finally come together in the hope of providing relief to human beings many of whom are victims of chronic stress. The ultimate teacher and relentless student of contemplative practice, the Dalai Lama, routinely meets with scientists in an unprecedented exchange of Eastern and Western epistemologies. Modern methodologies meet centuries old traditions when Tibetan monks perform their meditation practice in fMRI tubes providing invaluable data of what is happening in their mindfulness-trained brains (Davidson & Begley, 2012). The data are revealing the effects of *neuroplasticity*–our brain's ability to modify its structure and functioning. It turns out that when we engage in contemplative practice (such as mindfulness meditation), we are in effect exercising our minds. An analogy may be drawn between exercising the mind and exercising the body: meditation has an analogous strengthening effect on our brain as doing physical exercises

has on our muscles. Moreover, just like physical exercise promotes health, the same is true for effects of exercising the mind. Healthier brains translate into improvements in overall wellbeing including decreased levels of stress and depression. Commenting on his understanding of meditation, a participant in one of our studies noted:

> I think meditation is a process of concentration in order to clear the mind from unwanted thoughts. It is also a way to exercise our brain and mind. I practice meditation sometimes, and it always helps. Meditation increases mindfulness. (Edward, in-service science teacher, February 26, 2012, Week 4 of the study)

The explosion in acceptance of mindfulness in scientific circles is relatively new. In the words of Arthur Zajonc (2009), for many years the mindfulness pioneers "felt alone in their stubborn conjunction of the scientific and the contemplative" (Personal Practice and Finding Fellowship, para.1). Richard Davidson often admits spending years of his early career as a "closeted meditator" while being feverishly discouraged by his academic colleagues from his interest in what is now known as contemplative neuroscience. A son of a painter and a biomedical scientist, Jon Kabat-Zinn links the pursuit of contemplative practice with his search for the unifying factor of the different ways of knowing (artistic and scientific). As a young professor at the University of Pennsylvania, Amishi Jha admits to being shocked when she first heard the word meditation uttered by Davidson in a scientific setting. Soon after, having experienced benefits of incorporating meditation practice into her busy life of an academic, she made mindfulness a focal point of her research program. Despite the skepticism of their peers and working against the grain of the privileged scientific paradigms, all these scholars have turned their passion into fruitful careers whose unifying theme is that of beneficence. They are among the pioneers whose work continues to provide a mounting evidence for the many benefits

associated with contemplative practices. As a result there has been notable proliferation of applications of meditative practices in the most unexpected fields of social life ranging from the US military to pop-culture. In a recent film, a Danish director, Phie Ambo, documents a study conducted by Davidson and his research team that found positive effects of meditation and yoga on the returning war veterans suffering from the post-traumatic stress disorder (Dyekjaer & Ambo, 2012). In its relentless search for a happier and thus more efficient workforce, corporate America (notwithstanding its often less than altruistic motivation) has jumped on the mindfulness bandwagon. David Gelles (2012) of the Financial Times reports how large companies such as Google, General Mills, and Green Mountain Coffee incorporate mindfulness training into their corporate practices. Politicians join in promoting mindfulness as a cure for the collective ills. In his book, "A Mindful Nation" congressman Tim Ryan (2012) explains "How a Simple Practice Can Help Us Reduce Stress, Improve Performance, and Recapture the American Spirit." In popular culture, the rapper Pitbull and a singer-songwriter Christina Aguilera encourage their young fans to "feel this moment" through their high-energy song about stopping to appreciate life. So how might we as individuals and collectives reap the benefits of contemplative practices? As an educator and a researcher, I join a growing number of enthusiasts who believe in the desirability of incorporating the practices into our educational system. In this chapter, I describe the logics we apply to our mindfulness-focused research work against the backdrop of the current state of the field in the educational settings. By "we," I refer to the research squad led by Kenneth Tobin. The members of this collective are students and doctoral candidates of the Ph.D. program in Urban Education at the City University of New York. Many of the ideas presented here have their genesis in Tobin's continually evolving research

philosophy and practice. I also weave in my voice as well as the voices of other squad members and research participants.

Mindfulness-Based Interventions in Education and in Educational Research

> (…) social research is something much too serious and too difficult for us to allow ourselves to mistake scientific *rigidity,* which is the nemesis of intelligence and invention, for scientific *rigor,* and thus to deprive ourselves of this or that resource available in the full panoply of intellectual traditions of our discipline and of the sister disciplines of anthropology, economics, history, etc. In such matters, I would be tempted to say that only one rule applies: "it is forbidden to forbid," or watch out for methodological watchdogs. (Bourdieu & Wacquant, 1992, p. 227)

Consisting of contemplatives and contemplative scholars; neuroscientists; cognitive, developmental and educational scientists; and educational activists, the Mind and Life Education Research Network (MLERN, 2012) frames *contemplative practices* in modern scientific terms as "forms of mental and behavioral training that are intended to produce alterations in basic cognitive and emotional processes, such as attention and the regulation of certain forms of negative affect, and to enhance particular character traits that are considered virtuous, such as honesty and kindness" (p. 146). To the group, applying contemplative practices to cultivate these shifts in cognitive skills and socio-emotional dispositions is central to the aims of education in the 21st century. In their recent review of research into K-12 mindfulness training programs, John Meiklejohn and his colleagues (2012) agree that both teachers and students can benefit significantly from enhancing attentional and emotional self-regulation and from promotion of flexibility. Indeed, an earlier report by the Garrison Institute (2005) found many commonalities among contemplative programs for K-12th grade students. Consistent with the MLERN

description, the programs appear to train and refine attention, promote emotional balance, and help students develop a capacity for self-regulation. They also share a common set of "short-term" outcomes consistent with those of mainstream education which include enhancing students' learning and academic performance, improving the school's social climate as well as promoting emotional balance and pro-social behaviors. Among the "long-term" outcomes identified by the report are the development of noble qualities such as peacefulness, internal calm, compassion, empathy, forgiveness, patience, generosity and love. Looking beyond K-12, Shauna Shapiro, Kirk Warren Brown, and John Astin (2008) document similar findings: when applied to higher education, meditation can contribute to enhancement of cognitive and academic performance, management of academic-related stress, and development of the "whole person."

Investigating Mindfulness–The Question of Paradigm

While the extant literature points to the proliferation of mindfulness-based programs across the educational spectrum, there is agreement that research in this newly emerging field is in its infancy. One concern is that while there is support for the feasibility and acceptability of mindfulness-based interventions in educational settings, more "scientific" evidence of their effectiveness is needed (Meiklejohn et al., 2012). For example, Christine Burke (2009) notes that the existing studies conducted with children and adolescents are characterized by "weak" methodologies and designs. She concludes that there is a need for "a more rigorous course of gathering empirically-sound evidence of the efficacy of these interventions" (p. 143). Scientific rigor is often associated with following a positivistic paradigm that focuses on establishing causality through quantitative methodologies with the "gold standard" of randomized controlled trials. In an opening quote to this section, Bourdieu equates such reliance on a single paradigm with scientific rigidity which may be ill-suited for research in social sciences. Indeed, Shapiro

and her colleagues (2008) note that due to their subtlety and complexity, meditation experiences may not easily lend themselves to quantification by existing measures. Therefore, they recommend that some research "may include qualitative reports of phenomenological changes" (p. 32). Members of the MLERN group (2012) appear to try to find a happy paradigmatic medium by pointing out that the field of mindfulness-based interventions would benefit from research drawing on quantitative data resources and experimental methods as well as "careful qualitative analyses documenting processes of change in a deep and rich way" (p. 151). Instead of dichotomizing research into qualitative and quantitative, Tobin (2012) recommends thinking of research "in terms of the logics used in arriving at conclusions and the manner in which conclusions are framed and nuanced" (p. 9). That Buddhist scholars and monks rub elbows with prominent cognitive scientists and psychologists in interrogating contemplative practices may in itself be a testament to the viability of suspension of dichotomies in favor of dialectical relationships and wholeness.

When considering suitable paradigms for researching the effects of mindfulness training on teachers and students, Robert Roeser and his colleagues (2012) advocate applying multi-method, multi-trait, and multi-informant measures to establish the empirical and practical significance of these programs. Methodological multiplicity is a lynchpin of studies conducted by Tobin and his research squad. More precisely, in our interpretive research (inspired by Frederick Erickson, 1998) we employ multi-level, multi-method, and multi-theoretical approaches which we maintain are well-suited to examining multilectic (as opposed to one-dimensional) life experiences of our research participants (Tobin, 2012). To that end, for example, we embrace and try to illuminate multiple voices (polyphonia) representing multiple meanings (polysemia) ascribed by study participants who may occupy different positions in

social life. Gene Fellner (in press) advances a compelling argument for applying the concept of multiplicity to the way of being in the world including the way we conduct research. In order to capture the multiple ways of being, we generate phenomenological accounts of what is happening in the classrooms and we develop their hermeneutic interpretations. In the process we strive to stimulate transformative shifts where such shifts appear desirable. Based on the research findings we generate a theory which is then available to others. We adopt Margaret Eisenhart's stance on theoretical generalizability (Eisenhart, 2009). Accordingly, the decision whether the research is generalized depends on its user and not on the individuals who do the empirical or theoretical scholarship.

Getting my Feet Wet in the Pool of Mindfulness-Based Research

Tobin's interest in the benefits of contemplative practices has its genesis in his work on the intersection of emotions, teaching and learning (Tobin & Richie, 2012). Motivated by his conviction that there is desperate need for generating transformative shifts such as regulation of certain forms of negative affect, Tobin initiated a series of mindfulness-centered studies. One of the research projects was conducted with pre-service and in-service teachers in a graduate-level science teacher education program. This was my very first encounter with conducting an empirical study. It was a unique opportunity to learn from and with Tobin and Konstantinos Alexakos who, in his dual role of a principal investigator | instructor, welcomed us into his classroom. A follower of the interpretive research paradigm, Alexakos had previously undertaken studies in his classroom with his students who often assumed roles of co-researchers as well as co-authors of research papers. He also was developing a research agenda that focused on the role of emotions in the classroom (Alexakos, 2014). For me, participation in the research project was an opportunity to apply theoretical knowledge I gained only a few weeks earlier

during the final course of my program taught by Tobin. I wondered if the recently ignited theory-driven romance with interpretive research would have the same appeal when tested "in the field." Working in the trenches and interacting with the study participants aligned well with my intuitive conception of the type of researcher I wanted to be. In addition, as Tobin (2006) comments, I found working side by side with more experienced colleagues, as is the case in the Australian educational system, a preferred way of developing research skills. Such Deweyan *learning by doing* combined with being supported by a group of like-minded associates stands in contrast to the sense of loneliness felt by novice researchers as described by Alexakos (2014). Not only was I a novice in conducting interpretive research, I knew close to nothing about mindfulness and had absolutely no exposure to meditative practices. Through participation in the research, I was able to get familiar with the concept and to adopt its tenets. As I illustrate below, I was one of many who benefited from the research in a profound way.

"We Can Do Better"–Conducting Authentic Research

Mindfulness-related investigations are often motivated by the researcher's desire to improve the human condition. This drive to "do better" is grounded in a belief that altering the status quo rather than merely documenting it should be the focus of social inquiry. One could frame this approach in terms of a social contract between the researcher and the society where research, as a privilege, is not merely to benefit an individual (the researcher) but ought to benefit a collective (the society). Following the principle of beneficence (The Belmont Report, 1979), our major goal is for the research participants to directly benefit from our studies. When this happens, research is considered *authentic*, namely, it meets the standards associated with conducting social inquiry of high quality. It is this aim rather than rigidly conforming to any one methodological and/or theoretical framework that motivates our work. As outlined by Tobin (2006) we adopt and

expand on the authenticity criteria as theorized and practiced by Egon Guba and Yvonna Lincoln (1989). Often, at the forefront of the study is accomplishing ontological authenticity which is manifested through changes in individual ontologies (the way life is experienced). For example, learning about and adopting mindfulness practices may impact teachers' relationship towards stress as they become more attuned to their emotional states. Learning from and with other members of the collective is essential for the ontological changes to occur. Educative authenticity is accomplished when opportunities are created for everyone to express their perspectives and when no particular standpoints are privileged. Mindfulness may help in increasing levels of acceptance of difference. Through the increased present-moment awareness, teachers and students alike may be better equipped to recognize and adequately respond (rather than react) to the subtleties and nuances inherent in each individual.

One way to promote authenticity research is to develop and implement interventions that would catalyze improvements for all involved in the study. Based on the relevant literature and personal experience, it was clear that the in-service and pre-service teachers who participated in our studies, as did we (we consider it unreasonable to draw a demarcation line between the researchers and the researched), needed mindfulness-focused tools to assist in managing the stressors of the daily professional lives. Our approach was unique in that we did not develop a freestanding mindfulness-based course or program. Instead, we decided to weave our interventions into existing courses. The idea was to minimize interruption of what is often referred to as the "official curriculum." We theorized that if successful those interventions could become part of any course or class. Mindfulness heuristic and a three-minute deep breathing practice were two interventions we developed and enacted in our studies. Both interventions are central to the discussion in the sections below.

Heuristics, Hermeneutics and Reflexivity–Grasping the Construct of Mindfulness

How does one explain the concept of mindfulness? According to Kabat-Zinn (1994), to cultivate mindfulness is to "pay attention in a particular way: on purpose, in the present moment, and non-judgmentally" (p. 4). At the same time, mindfulness is one of the concepts that Pema Chödrön refers to as ineffable. Our Australian colleagues, Nichole Albrecht, Patricia Albrecht and Marc Cohen (2012) agree by saying that "capturing and defining mindfulness in words is complex as it requires similar consideration to defining human consciousness" (p. 3). Therefore, when writing about mindfulness, they aim at allowing the reader to experience "a taste of mindfulness" and to develop "his or her own understanding" of the concept. To that end they provide an experiential account of mindfulness from perspective of teachers who have been exposed to mindfulness-based training. Paul Grossman (2008) argues that mindfulness cannot be fully comprehended by discursive, theoretical, or intellectual thinking but primarily relies on practical introspective practices. Grossman is concerned that depending on the amount and type of meditation practice people may have different semantic interpretations of mindfulness.

In our hermeneutic approach to conducting research, we adopt Tobin's (2009) standpoint on definitions. For him, "definitions can comprise thick descriptions and be contingent on the circumstances of a study" (p. 507). Accordingly, rather than trying to formulate a definition of mindfulness, we attempt to surround the construct with meaning. One way to accomplish this is by generating a heuristic where the heuristic is a means of unpacking a construct. A heuristic may be a series of statements that describe different aspects of mindfulness. We call these statements *characteristics* where the characteristics are meant to give insights into what the construct is. For example, being able to pay attention in the present moment is one of the facets of mindfulness. "*I pay attention to my moment-to-moment sensory experiences"* is an example of

a characteristic that describes this feature. Through a heuristic we attempt to create what Joe Kincheloe (2003) refers to as a hermeneutic cycle or interplay between a whole (the abstract) and parts (the particular). Hence, mindfulness may be understood through interpretation of its parts expressed through the characteristics. Unlike Grossman, we are not concerned with the convergence among the meanings people ascribe to the construct of mindfulness or its parts. Instead we acknowledge difference and nuance as typical, inescapable and, axiologically speaking, valuable aspects of social life.

Heuristic is an inherently malleable tool and thus it may take various forms and serve different functions. Tobin refers to it as a "shape shifter" since it is meant to change so as to be situationally relevant. Accordingly, one of our mindfulness heuristics is contextualized to an educational setting and includes characteristics reflective of the teaching-learning environment. For example, a characteristic, "*I can tell when something is bothering the teacher,*" refers to the ability to be aware of and sensitive to the class instructor's negative emotions. This characteristic encompasses awareness and compassion which are central to the construct of mindfulness. In its format, a heuristic may resemble a survey where each characteristic is accompanied by a rating scale. The rating scale is used to allow the respondent to make a personal connection with a particular characteristic in the heuristic. A student may read, "*During this class, I can focus my attention on learning"* and consider where on the continuum between "always" and "never" she might fall. This requires that she pause, even if briefly, think and make a judgment call. Since we strongly reject ontological realism, the point is not to gain an accurate assessment of how the person enacts social life but to draw her attention to the way mindfulness may be manifested (in this case through paying attention and focusing on the task at hand). The aim is to create an opportunity for self-reflection in relationship to a series of characteristics that describe what

being mindful may mean. *Reflexivity* or becoming aware of what one may be unaware of is a big part of how the heuristic works. To Bourdieu, when applied to research in social sciences, reflexivity entails the systematic exploration of the "unthought categories of thought which delimit the thinkable and predetermine the thought" (Bourdieu & Wacquant, 1992, p. 40). The following quotes by students of an undergraduate physics course who participated in one of our studies are examples of reactions to the heuristic. They appear to testify to the reflexive power of the heuristic:

> Many of the questions [characteristics] asked were of things that I unconsciously did and when my attention was brought to that aspect through a question, I had a realization that I did do many of these things.
>
> I never actually thought about any of these questions [characteristics] during class, but now that I am looking back, I am noticing more than I thought I did about my surroundings.
>
> This heuristic made me think and reflect on my existence in the classroom/lecture hall more than I ever would have without it.

Since awareness and paying attention are at the core of mindfulness, the heightened awareness reported by the students may be indicative of an increased incidence of mindfulness in their practices. The quotes also confirm the realization that many of us go through daily life on autopilot, without being fully aware of our conscious experience even though attention and awareness are universal human qualities. Sadly, as noted by Albrecht and her colleagues (2012), we are often "trained out of mindfulness through fast paced and outcome driven lives" (p. 5).

Heuristics may be experienced in different ways: they may be completed on-line or using a more traditional paper and pencil format. We also use heuristic as tool to guide a conversation.

To that end, we invite individual participants to meet with one or two researchers so that we may have a discussion about each of the characteristics in the heuristic. We avoid referring to these meetings as interviews since interviewing usually denotes working towards predetermined goals. Rather, we allow the conversation to unfold without privileging anyone's perspective. I find these conversations particularly rich and nuanced. The meaning making is aided through each person's ability to ask the other for clarifications and negotiate the flow of the conversation. Naturally, each of the conversations is unique in that the respondents have distinctive interpretations and commentaries regarding mindfulness. Embracing multiple ontologies and difference is consistent with the multi-perspectival way of doing research. At the same time, unifying themes may emerge. Such was the case during my mindfulness-heuristic-centered conversations with three student-participants. Even though each may have found a different set of characteristics salient to their lives, they all expressed a desire to "improve" some aspect of their conduct reflective of those characteristics.

In addition to acting as a vehicle for obtaining first-person self-reports, heuristics may be used as tool for structuring an observation. The observation may be conducted in real-time or using video files to determine what happened in terms of each characteristic and to gage the extent to which the practices in the classroom are mindful. There is also emerging evidence that heuristics maintain their appeal when translated into other languages or when used with school-aged children. As of this writing, a Polish version of the heuristic was incorporated into a mindfulness-based study at one of Poland's public universities. In New Zealand, Joanna Higgins and her colleagues (2013) used an age-appropriate version of the heuristic in a school-based study conducted with 11- to 13-year-old students. The preliminary results of the two studies point to the applicability of the heuristic to those environments. At the same time, in both these

studies we experienced pushback when our colleagues tried to apply psychometrics to the way they thought about heuristic. It is important to acknowledge that at early stages of our mindfulness studies, we experienced a fleeting temptation to construct and validate a psychometrically sound instrument. However, since our focus is never on generalizing from sample to population but rather on illuminating nuance and difference, heuristic emerged as a more appropriate alternative to a survey. Even though it may appear similar, heuristic does not possess the psychometric qualities of a questionnaire. Paul Grossman (2008) points to a number of issues inherent in investigations driven by the psychometric assessment and attempting to quantify of the construct of mindfulness. When speaking of bridging the Eastern and Western paradigms, he warns, "haste toward an understanding of mindfulness may limit a genuine opportunity to expand perspectives beyond the familiar" (p. 408).

"I Breathe to Live, Not to Manage My Emotions." Breathing Meditation as Medication?

> The program of observation and analysis through which it is affected is not a blueprint that you draw up in advance, in the manner of an engineer. It is, rather, a protracted and exciting task that is accomplished little by little, through a whole series of small rectifications and amendments inspired by what is called le métier, the "know-how," that is, by the set of practical principles that orients choices at once minute and decisive. (Bourdieu & Wacquant, 1992, pp. 227-228)

Contingency is a big part of our methodology. When Tobin was planning one of his studies on emotions in the classroom, he encountered literature that connects emotions with breathing patterns. Therefore, he imagined that breathing practice would be one of the emotion-regulating interventions enacted in our study. However, as we were embarking on the study, we did not have an a priori plan of what form intervention would take. I learned that there is no need to be

uneasy about prearranging all aspects of the study. After all, social life is complex and to a large extent unpredictable. It is characterized by what William Sewell (2005) refers to as "thin coherence" and ever-present contradictions. Our methodological commitment to providing phenomenological description of what is happening and to hermeneutically figuring out why it is happening rests on embracing instability. Thus it is quite impossible and unrealistic to plan for all aspects of the study. When referring to research work in progress, Bourdieu speaks of "fermenting confusion" full of mishaps and misfirings, false starts, wavering, impasses, renunciations, and so on (Bourdieu & Wacquant, 1992, pp. 219-220). Our research was often like that. At times, we realized that our research agenda was in direct conflict with the goals of the instructor. Whenever that happened, we engaged in negotiating a course of action that would be acceptable to all stakeholders. Student-participants were also involved in the decision-making regarding what would or would not be done. When they protested against an aspect of a study, it got suspended immediately. Conversely, there was a time when our suggestion to discontinue a particular practice was struck down by the student-participants. As I noted in the previous section and discuss in Chapter 2, contingency played a major role in the development of the mindfulness heuristic; we generated four versions in response to the shifting circumstances and foci of the study.

Enacting a Breathing Intervention

Since we were among science teachers, we wanted our intervention to focus on physiological aspects of breathing meditation. One of the student-participants noted that breathing exercise could be thought of as a medical intervention. Indeed, when speaking to the class, Tobin experienced a comic slip of tongue when he referred to *breathing meditation* as *breathing medication*. When considering the benefits one may reap from engaging in breathing meditation,

another participant compared it to brushing one's teeth–you do not particularly care for doing it but you do it because you know it is good for you. Since two of the master's program students on the research squad, Nataha and Parvathy, had prior experience with breathing meditation, they volunteered to model the technique to the class. Alexakos considered it beneficial that the practice was introduced to his students by their peers. He believed that this way the intervention would not be seen as part of the required activities and students who felt reluctant to participate would feel less pressure to do so. The collective three-minute breathing practice was done right before the class started.

Figure 3.1. Natasha (at the front of the classroom) leads deep breathing practice.

The facilitator(s) asked the students to sit comfortably, to close their eyes (if they wished) and to take slow and deep breaths in and out. Since breathing was meant as an intervention to mediate negative emotions, we emphasized diaphragmatic (abdominal) as opposed to thoracic (chest) breathing. Participants were asked to place hands on their abdomens to monitor how their

stomachs expanded with each in-breath and how they collapsed with each out-breath. In studies conducted by the Belgium-based researchers Pierre Philippot and Gaetane Chapelle and their Canadian colleague Sylvie Blairy (2002), slow and deep regular breathing through the nose was associated with production of happiness/joy. As noted by these authors, their studies offer support to theories of emotion stating that the quality of emotional feelings are, at least in part, modulated by body feedback. More precisely the alteration of respiration is sufficient to induce emotion. Therefore, we had the empirical and theoretical grounds confirming that the breathing exercise in our study might translate into production of positive emotional states right before the class which in turn could catalyze improved learning.

We discovered that awareness of the link between physiology and emotions is not universally shared among students preparing to become teachers. A number of the characteristics in our mindfulness heuristic referred to this connection. For example, one heuristic item stated, "*During this class, I am aware of the relationship between my emotions and breathing pattern*." When responding to this characteristic, over 65% of 174 physics course students answered *rarely*, *hardly ever* or *never.* One of the students commented: "It never appeared to me that we have different breathing patterns as our emotions change therefore I haven't ever been aware of this change." When the connection between breathing and emotions was made by the study participants, it was usually salient for intense, negative emotional states such as being nervous, stressed, angry, upset, frustrated and anxious. These states were often associated with exams and being graded or with difficulties in grasping the course content. Our heuristic pointed to the bi-directionality of the connection between breathing patterns and emotions. Responses to the characteristic, "*I use breathing to manage my emotions"* revealed that only 35% of the study

participants did so at least occasionally in the physics class. Among the other 65% was a student who commented that she "breathed to live, not to manage her emotions."

Breathing is such a natural and "automatic" function that it usually goes unnoticed. Bringing attention to the breath is often at the center of mindfulness training. Kabat-Zinn (1994) notes that as we begin befriending our breath, we see immediately that unawareness is everywhere (p. 20). At least one of the study participants noted that with each practice she was able to increase her focus. For her, taking deep breaths not only assists in releasing stress but also helps concentration. Amy Saltzman (n.d., para. 2) notes that "one of the primary ironies of modern education is that we ask students to 'pay attention' dozens of times a day, yet we never teach them *how*." Maintaining focus on the present moment may be challenging because of our brain's natural tendency to wander. It turns out that *mind wandering* is the default network of the brain causing our mind to always be preoccupied with thoughts. A neuroscientist and representative of scientific skepticism, Sam Harris refers to the phenomenon as an "incessant" "cascade of thoughts" (Wood, 2013, p. 7). Jha (2012) explains that to the brain the state of *REST* translates into *Rapid, Ever Present, Self-Related Thinking*. Engaging in mindfulness-based training helps in taming the inclination for always being engulfed by thoughts as beautifully expressed by Alexakos' student, Nashia:

> I think of it [meditation] as trying to clear my thoughts, to focus on my breathing and nothing else, to allow the outside world to blow through me without disrupting. (Nashia, in service teacher, March 3, 2012, Week 5 of the study)

One misconception around mindfulness practice is that it involves repressing our emotions or thoughts. Harris explains:

> The goal is not to be without thought, but to be aware of the character of your experience

> in each moment and not suffer unnecessarily. Almost all our suffering is the product of our thoughts. We spend nearly every moment of our lives lost in thought, and hostage to the character of those thoughts. You can break this spell, but it takes training just like it takes training to defend yourself against a physical assault. (Wood, 2013, pp. 6-7)

Mindfulness practice allows us to recognize that we are not our thoughts or emotions; it is meant to change our relationship towards our thoughts and emotions. That is where the ontological shifts are meant to occur. Our lives may still be characterized by negative thoughts or emotions but we are able to accept them for what they are–negative thoughts or emotions. In that sense mindfulness is about allowing thoughts and feelings without engaging in them in any way. It is about allowing thoughts to come and go without trying to stop them, without chasing after pleasant thoughts or trying to get rid of unpleasant feelings. It is about stepping back and resting in the space of awareness. The following characteristics in one of our mindfulness heuristics are reflective of these ideas: "*I recover quickly when I am unsuccessful," "When I produce strong emotions, I easily let them go,"* and *"I identify distracting thoughts but let them go (without them influencing future action)."*

Healthy Teaching and Learning

Examining how contemplative practices might affect quality of instruction, stress and immunological reactivity, burnout within profession, and health are among goals of teacher-centered mindfulness research (MLERN, 2012, p. 151). Nichole Albrecht and her colleagues (2012) recognize stress in school system as "a catalyst stimulating the proliferation of wellness promoting programs" (pp. 1-2). The scholars report that mindfulness practice has been shown to help teachers reduce their stress levels, assist with behavior management strategies and improve

self-esteem. At the onset of our study, a pre-service teacher-participant seemed to grasp a connection between stress, contemplative practice and health when he said:

> Unfortunately I don't practice meditation. Although, from the crazy classroom stories I've been hearing lately, I think I might need to master this art form in order to keep my sanity! From what I understand, meditation involves a breathing regime and moments of silence in order to reflect on your inner self and to find some sort of inner peace. Personally, it seems like we stress ourselves from the everyday grind and the hustle and bustle of life. I think it would be beneficial for everyone to partake in meditation or just some sort of inner reflection, not necessarily through meditation. It should be any form of relaxation that allows a moment to reflect. (Brad, pre-service science teacher, February 28, 2012, Week 4 of the study)

Indeed, Roeser and his colleagues (2012) characterize teaching as uncertain, emotional and attentionally demanding work. They hypothesize that mindfulness training may promote development of teachers' habits of mind which "include tendencies to gather data through all of the senses, to be aware of and reflect on experience in a non-judgmental manner, to be flexible when problem solving, to regulate emotions and be resilient after setbacks, and to attend to others with empathy and compassion" (p. 167). Not unlike us, they consider emotion regulation especially important because when stressed, teachers must be able to self-regulate in the presence of the class and the stressor itself. In our research we were able to capture increased emotional states experienced by the in-service and pre-service teachers as they were making presentations to their peers. These emotionally charged states manifested themselves through teachers' physiology such as fluctuations in heart rate and in levels of oxygenation in blood as recorded by *oximeters* worn on instructors' wrists and emitting Bluetooth signals to a computer. Roeser et al.

agree that when doing mindfulness-related research with teachers, we need measures of biological factors (such as cortisol, inflammatory cytokines, or heart variability) to assess outcomes such as teachers' stress, burnout, and general health.

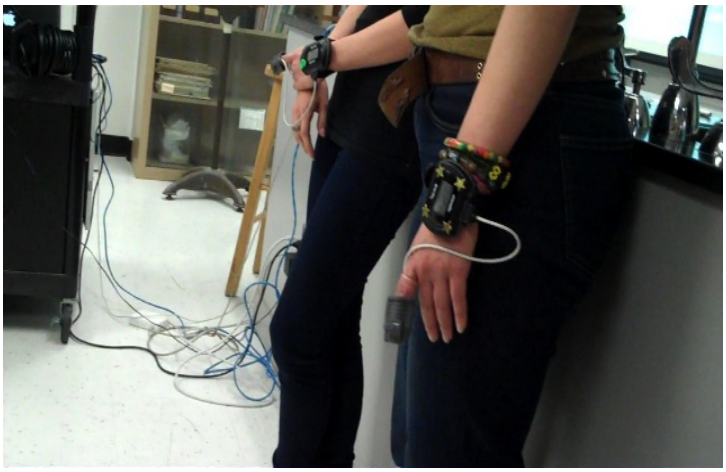

Figure 3.2. Student-presenters wearing oximeters.

Often, unless their attention is brought to it, teachers and students do not make a connection between emotions and learning. When responding to the heuristic, one of our study participants commented:

> I don't think emotions play a huge role in a physics class, but if this was in a psychology class, I feel like a majority questions [characteristics] would be more relevant.

At the same time, as is evident from a quote by another student, a heuristic might be an effective way for igniting this awareness:

> I never completed a survey [referring to the heuristic] with these kinds of questions. But I feel like the questions [characteristics] are very important. Emotions are big part of our lives. This survey is good one because it connects our emotions to other crucial aspects in class.

According to some students, the heuristic may assist in gaining awareness of emotion-mediating interventions that they already have and use:

> The questions [characteristics] really made me think about my emotions during class. They made me understand that I do things during class to try and improve my frustrated emotions and make me realize what I do when I get emotional. It has helped me realize that breathing is one of the techniques I use and before this survey [heuristic] I was not aware of this as I am now.

The idea is for more students and teachers to incorporate mindfulness interventions into their hectic lives. We found that the three minutes of the collective breathing practice we enacted in Alexakos' class were characterized by a profound silence and a sense of tranquility. Those who chose to participate (not everyone did) often commented on the calming effect the practice had on them. They also reported noticing desirable changes in their physiology. Having recognized the benefits of breathing meditation, a number of participants adopted the practice into their lives that stretched beyond the professional realm. Aimee is one of the students who embraced and gained benefits offered through our research. Below is her brief story.

One Hundred Seventy One Beats Per Minute

It is week seven of the study and it is Aimee's turn to make a presentation in class. The topic is charter schools, assessment, and accountability. Aimee is new to the program and unlike her co-presenter she has no teaching experience. She is nervous and eager to wear the oximeter to monitor her heart rate and level of oxygen in her blood–the physiological manifestations of her emotional state. Knowing that a deep breathing activity is planned for the class this evening, she approaches the researchers and wants to practice breathing with them even before her classmates arrive. Her heart rate is elevated at 98 beats per minute (bpm).

She and the researchers briefly discuss some of the benefits of mindful breathing in regulating emotions. Aimee admits to being a smoker and that she is increasingly concerned about her health. Subsequently, during the group breathing exercise, Aimee's heart rate drops notably. However, when she starts presenting, her heart rate increases dramatically reaching 171 bpm only a few minutes into the presentation. The class instructor decides to intervene. He approaches Aimee and encourages her to regulate her breathing and to refocus. Aimee's reaction is that of surprise–she has no idea that her heart rate is off the charts–record high among the class presenters to date. After the intervention, Aimee's heart rate drops to 148 and then further to 139 bpm. Throughout the remainder of the presentation, Aimee's heart rate fluctuates between 107 and 130 momentarily jumping to 158 bpm.

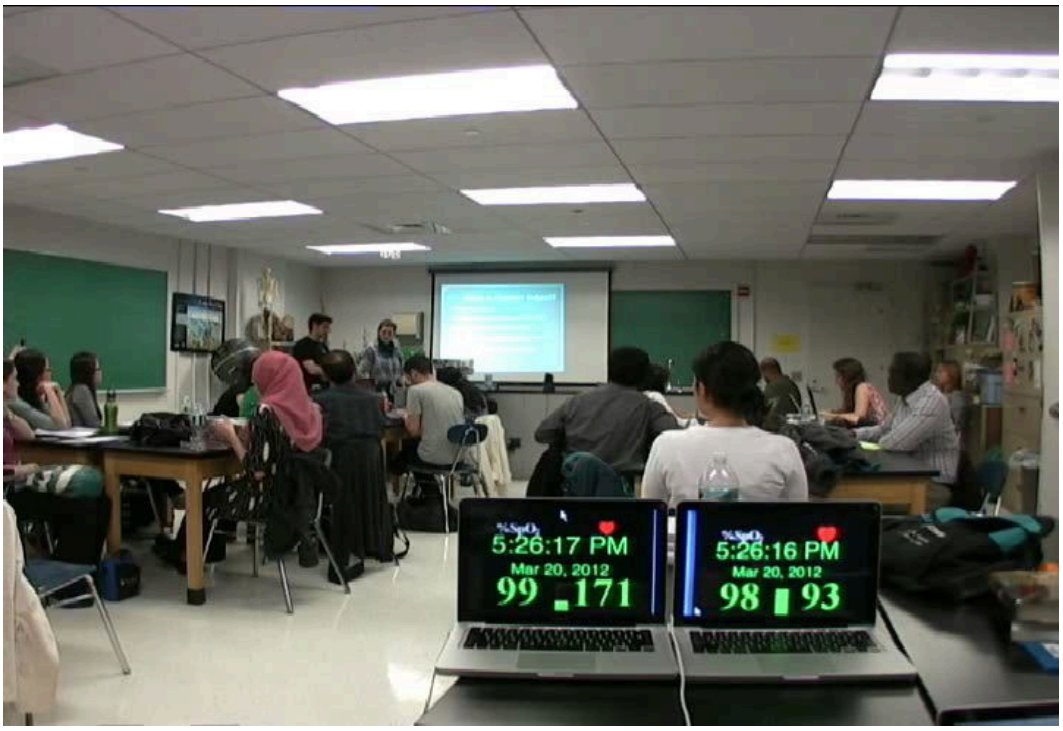

Figure 3.3. The monitor at the left displays Aimee's heart rate at 171 bpm. Aimee and her co-presenter (both wearing oximeters) are at the front of the room next to the screen.

This vignette is not atypical of what we witnessed during our research. Here, when faced with a stressful situation, Aimee experiences what some might consider dangerously elevated levels of heart rate. More importantly, she is unaware of the powerful effect the emotions have on her physiology. An analysis of Aimee's responses to an early version of the mindfulness heuristic reveals that she often struggles with separating herself from her emotional states. She chooses *"often true"* in response to the following four characteristics: *"When I have distressing thoughts or images, they tend to consume me," "I feel the need to judge how I feel," "I make judgments about whether my thoughts are good or bad,"* and *"I tend to react strongly to distressing thoughts and/or images."* In our conversations, Aimee does confirm that she considers herself a very emotional person who often exhibits strong reactions to those she interacts with. What works to Aimee's advantage is her curiosity and love for science. Therefore, once she becomes aware of a potential problem (the negative impact of unmediated emotions) as well as a scientifically sound solution (such as breathing meditation), she seeks to enact ontological changes as evidenced in the following quote:

> I can be very passionate about issues that concern humanity or the world at large. Sometimes my emotions in relation to such things can get me a little flustered and I lose my pace in the teaching/learning sphere. I am trying to learn how to talk myself into slowing down my thoughts and breathing before speaking. Sometimes I get upset when people are unkind or disrespectful. I used to react very strongly in these instances but am learning not to take that behavior personally. I am in control of my emotions when I feel like I am being treated fairly. (…) I think meditation frees a person of as much "thought" as possible. In doing so, he/she will feel more at peace. I would like to become more in touch with the act. So far, I stick with breathing exercises and burning sage on occasion.

Figure 3.4. Aimee (and other participants) engaged in deep breathing practice.

Both our mindfulness interventions had a profound impact on Aimee's way of being in the world. She often comments on her appreciation of the heuristics (see Appendix 6). As we witnessed in the vignette and may see in Figure 3.4, Aimee was also an eager participant of the breathing practice in class. The practice extended to other fields of her life including the oft-stressful work as a buyer for a high-end health food store. Subsequent to our study, Aimee joined our research squad and has written reflective pieces regarding her participation in research and its transformative effects. She also shared her experiences at presentations we made for other researchers. Aimee continues to monitor her heart rate as she embarks on her teaching career through completing her student-teaching assignment in one of New York's public high schools. At times, Aimee feels powerless as a student teacher. For example, when she tried to introduce breathing meditation to the students she co-teaches with the class instructor of record, she got discouraged by their lack of enthusiasm towards it. Indeed she often comments on the students'

dismissive attitude towards most of what goes on in school. Therefore, she practices breathing when in the classroom and says that it helps in coping with the daily challenges she encounters there. In our recent meeting, Aimee used an interesting metaphor to describe her way of "intervening" whenever she experiences intense emotions, "I always imagine that through breathing I'm taking my hands and I'm holding my feelings [makes a holding gesture with her hands] as opposed to my arms just flapping widely [flaps her arms vigorously] while my emotions take over. So I'm learning to hold it and keep it there." Aimee and I became good friends and we continue to exchange mindfulness-focused wisdom. A few days ago, we celebrated a special anniversary–during our research squad meeting Aimee proudly announced that it had been a year to the day since she quit smoking. Aimee's journey exemplifies the principles guiding achievement of ontological and educative authenticity through participation in research.

Ethical Considerations in Mindfulness-Based Research

> My main interest is promoting ethics without touching religion. Ethics are universal values. We must find a way to promote the basic human values in a secular way without touching religion. In order to do this, the scientific findings are very convincing and Richard Davidson's work is very helpful in this field. Sometimes I call him Guru of Science! (His Holiness the Dalai Lama as cited in "The Dalai Lama's Madison Connection," 2013, para. 11)

In light of church-state separation governing our public school system, one concern is that forms of meditation might be perceived as an attempt at infusing Buddhism or Hinduism into school curricula. Addressing similar fears, Kabat-Zinn (Davidson et al., 2013) points to fundamental principles of mindfulness and asks, "Paying attention, awareness–how Buddhist is that?'

Elsewhere, he also states emphatically that "mindfulness will not conflict with any beliefs or traditions–religious or for that matter scientific–nor is it trying to sell you anything, especially not a new belief system or ideology" (Kabat-Zinn, 1994, p. 6). Tobin (personal communication, February 26, 2013) maintains that appropriating ideas with roots in spiritual practices and applying them in the field of education does not constitute indoctrination of religious practices. He argues that the tenets of mindfulness and breathing meditation are not saturated with Buddhist doctrine. On the contrary, he points to a burgeoning research in social science that supports health benefits associated with these practices.

We were very much aware of a possibility that mindfulness might be seen as "spiritual" even though our intent has always been to frame and present it as a secular construct. To that end, our early version of the mindfulness heuristic did not include loving-kindness and compassion. By excluding these dimensions of mindfulness we were partly responding to the class instructor's initial reservations about them as well as the fact that many of the existing mindfulness surveys we modeled our heuristic on did not incorporate this element of mindfulness. The practitioners of the ideas of contingency and emergence, as the study progressed, we felt that there was no escaping of incorporating the concept of compassion into the heuristic. We believe that cultivating qualities such as caring, kindness, compassion and other altruistic qualities could be among the purposes of secular education rather than being relegated to the realm of spirituality. In other words, in addition to cultivating *habits of mind,* mindfulness could assist in the development of *habits of heart* or what Kabat-Zinn (1994) refers to as "heartfulness" (p. 7). In her article exploring aggression among students in Bogota, Carolina Castano (2012) argues that by encouraging compassion based on understanding the emotional and social lives of others, science education could serve as a special place for interrupting

violence. When discussing the issue of bullying so pervasive in classrooms across the United States, participants in our study identified mindfulness as a possible way to ameliorate hostility and to assist teachers in identifying and intervening when faced with cases of physical and emotional violence. An intersection of awareness and compassion as well as replacing reacting with responding–all components of mindful conduct–could contribute to a more peaceful and harmonious school environment. Much of current aggression and violence that spills over to schools is attributed to computer games. As part of their mindfulness-based projects, Davidson's research team entered into collaboration with developers of electronic games to create and investigate the effects of apps cultivating loving-kindness and compassion in children and youth (Davidson et al., 2013).

To gain an understanding of student assumptions regarding the intersection of spirituality and meditation, as part of the early version of the mindfulness heuristic, we invited 18 participants of our study to respond to two relevant questions. Following the conclusion of the study, I met with two participant-researchers (Aimee and Aga) and our colleague, Gene Fellner, to collectively analyze the responses. We discovered that to the question exploring understandings of spirituality, about half respondents, particularly those who appeared to consider themselves spiritual, saw a connection between spirituality and religion or some form of a higher being/power. Students who did not make that connection considered spirituality in ethical terms as a relationship of self to other living organisms including humans and as a peace of mind. One person actually equated spirituality with what might be perceived as mindfulness describing it as the "awareness of the universe, yourself and your thoughts." We noted that when answering the question on their understanding of meditation and the extent to which they practiced meditation, the vast majority of the students described meditation in secular terms. In

addition, we agreed that the respondents framed meditation in positive or neutral terms. Some of the words and expressions they used included: *mindfulness, self-reflection, relaxation, concentration, clearing the mind, getting rid of anxious energy, centering yourself, calm, inner thoughts, peace, balance, tranquility*. Two students appeared to link meditation to praying or religious practices and another (a practicing Christian) favored "filling mind with God's word" over meditation. Aga explained that to Catholics meditation may be the opposite of prayer because in prayer you want to fill yourself with god whereas with meditation you're clearing your mind and letting go of everything. In that sense, meditation may be contradictory to Christian practice. We noticed that many students perceived meditation as an intervention: *it can be relaxing; a stress-coping technique; practice that can adjust or improve your feeling through breathing technique; a way that person can calm her/him self down and push away bad or stressful thoughts; helps people to feel at ease and to be relaxed.* We concluded that understanding meditation as "medication" is separate from spirituality. Gene explained the difference in the following way:

> If it works as intervention, it's fantastic–it doesn't cost anything; you can get your blood pressure down; it makes perfect sense, why wouldn't you do it. If you practice it [meditation] spirituality, you're practicing it ontologically. It's understanding reality and your role as being organically intertwined with everything else. That your breath is not just your breath, but it's everybody's breath. That we live in a connected world.

During our meeting, when reflecting on her participation in the study, Aga joined the voices of her peers regarding the secular dimension of the practice we enacted:

> We didn't talk about meditating together, we talked about breathing together [referring to what was done during the study]. Breathing is physiological; it's a thing we do all the

time anyway. And just breathing in a certain way may be thought of as similar to saying, "Guys, we will be doing jumping jacks right now." How is that different from taking gym? You don't have to meditate, nobody's telling you to meditate. We are getting in touch with our bodies, we are listening to our bodies; I would think of it as a biological function almost. It's like doing sports together.

One of the student-participants voiced having her initial misconception about the nature of mindfulness and meditation resolved when she stated during one of the class discussions:

> I think by basically doing the open-ended questions [in the heuristic] it kind of widened my whole thinking as to what mindfulness and meditation is really about because it ties in to what we're currently doing. I was seeing it as a spiritual thing. And what Parvathy is talking about, the yoga thing and deep breathing, all that ties in because it's more of your own inner personality coming out, your own beliefs and stuff like that. So it may be good for research to answer these questions because I was thinking just religiously but then it goes further out. (Laura, in-service science teacher, Week 4 of the study)

These findings may point to a relatively weak link between mindfulness and religion or religious practices as perceived by participants in our study. To the majority of them, meditation does not appear to be a philosophical or religious notion but a medical intervention–an emotion-ameliorating, focus-enhancing, awareness-increasing technique.

Where To From Here?

> Mindfulness is like clothes. Not everyone can fit in the same dress. You have to have it tailored. A lot of it is learning about yourself. It's something that we cannot form into a pill and have everyone swallow it. (Aga, an in-service biology teacher, study participant-researcher, March 3, 2013)

Should mindfulness be part of education in public schools? Roeser and his colleagues (2012) recognize that current concerns about teacher stress and health care costs as well as concerns about enhancing student engagement and achievement represent a way mindfulness training can enter school systems. Shapiro and her colleagues (2008) suggest that it might be useful to expand the traditional definitions of education to include the development of social, emotional and other valuable forms of intelligence relevant to occupational accomplishment, life satisfaction, ethics, and pro-social engagement. Indeed, Davidson considers attending to the development of emotional intelligence as more important than development of cognitive intelligence (Dyekjaer & Ambo, 2012). To Tobin, fostering wellness should become a priority for science curriculum reform. We believe that potential benefits of mindfulness to well-being and moral growth of those involved in education is reason enough for promoting mindfulness-based interventions similar to those presented in this chapter. To that end, we have been engaged in actively incorporating the practices into our immediate environments. At the Graduate Center, Tobin was successful at introducing an elective course on mindfulness and contemplative practices within the Ph.D. program in Urban Education. He also started incorporating breathing practice into the courses he teaches where he models the practice and then invites his students to take turns in leading the meditation with their peers. At our sister institution, Brooklyn College, some faculty members monitor their pulse rate during departmental meetings and adjust their breathing patterns to mediate their emotional states. Heuristics are used routinely as part of the graduate teacher-education courses taught by Alexakos. Led by our study participants, middle school students perform deep breathing practice before exams. Those among us with administrative appointments make mindfulness part of teachers' professional development. My sleeping patterns have largely improved when I realized that I did not need to engage emotionally in or

"take home" work-related issues. We call on others in the education community to consider incorporating mindfulness into their practice. Existing models are plenty. Just like Etty-Leal, the author of Meditation Capsules program offered in Australian schools, we encourage educators to listen to their own intuition and wisdom when cultivating mindfulness in education (Albrecht, Albrecht, & Cohen, 2012).

CHAPTER 4

MINDFULNESS AND SCIENCE EDUCATION[1]

> … it is my fervent aspiration that our culture will pay more attention to well-being, will include strategies to promote well-being with our educational curricula and within the healthcare arena, and will include well-being within our definitions of health. These changes would help to promote greater harmony and well-being of the planet. (Davidson, 2013)

In the above quote, Richard Davidson, a leading scholar and one of the pioneers of contemplative neuroscience, echoes the wishes of a growing number of like-minded enthusiasts who call for the expansion of the goals of the 21st century education to include promotion of wellness and sustainability. After decades of seemingly nonstop curriculum reform that has focused on the production of scientists and participation in science-related professions, it is desirable to revamp the goals of science education to address wellness and sustainability as well as goals that relate to the grand challenges faced by humanity. It is opportune to orient curricula to understanding the body and the mind and developing tools to afford lives as functionally literate citizens. Adapted from Buddhist traditions, mindfulness practices offer a unique opportunity to address in the classroom the cognitive and the oft-neglected affective dimensions of human ontology. As evidenced by the exponential growth of mindfulness-related publications (Figure 4.1), there is widespread interest in the applicability and potential benefits of mindfulness in various fields of social life including educational contexts. This interest is fueled largely by the recent developments in the field of contemplative neuroscience that provide compelling evidence for our *brain's* enormous *plasticity* (ability to change its structure and function) and for the significance of the bi-directionality of the mind-body connection.

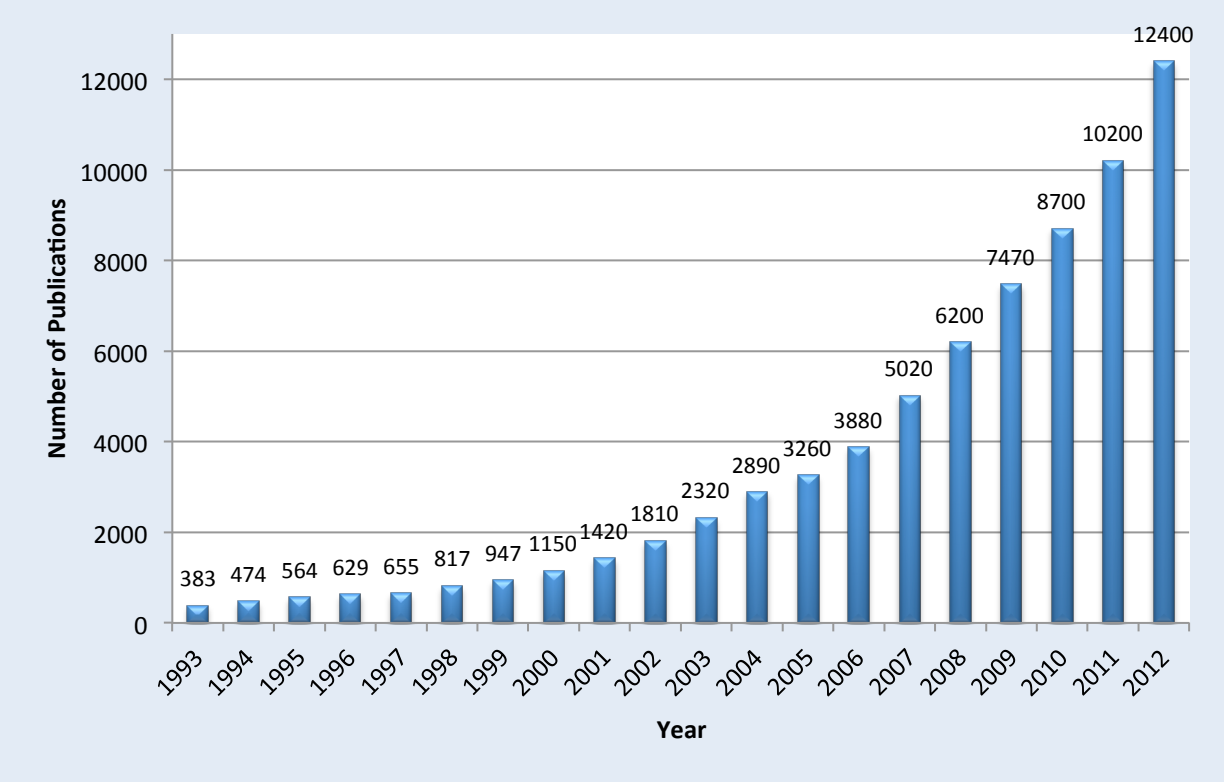

Figure 4.1. Growth in the number of mindfulness-related publications over the last two decades. Data obtained from a search for "mindfulness" in Google Scholar.

Mindfulness training emerges as affording a number of positive changes in the brain which in turn improve the functioning of our bodies.

Mindfulness involves intentionally remembering to pay attention to the present moment experience–a disposition that defies our default preoccupation with analyzing and obsessing about the past or charting out and worrying about the future (so-called *mind wandering*). This present moment awareness is accompanied by a non-judgmental acceptance of one's thoughts, feelings and perceptions and seeing things for what they are without identifying with them. Such an accepting mindset extends to all sentient beings and may translate into increased levels of caring for the natural world. Mindfulness training has been linked to a range of cognitive, social, and psychological benefits to students and teachers. It supports development of self-regulatory

skills associated with emotion and attention, self-representations, and prosocial dispositions such as empathy and compassion (MLERN, 2012). Furthermore, mindfulness tends to decrease stress, depression, anxiety, and hostility. An increase in mindfulness may involve a higher incidence of focus, heightened awareness of thoughts and emotions and their relevance to learning, and awareness of what is happening in the moment.

Research for at least a half century has shown a relationship between emotions and cognitive focus. For example, studies indicate that positive emotions are associated with broadening of cognitive processes and negative emotions are associated with narrowing of cognitive processes. There are numerous ways to interpret the research and associated theoretical frameworks in relation to the teaching and learning of science. However, it seems clear that the valence and intensity of emotion are salient. We conclude that it is important to be aware of the mediational potential of emotions. In terms of mindfulness, a goal is to be aware of emotions and endeavor to "let them go," making sure that they do not stick to participants' conduct in ways that prove to be distracting and deleterious to learning. In the event that a participant decides that emotions are persisting and are adversely affecting learning, it is important to know how to intervene to sever attachments and/or reduce the intensity of the emotions.

Research on the intensity of emotions and focus has implications for teaching science. For example, during a lesson on conversion of units a teacher and several students were frustrated with most students' performance on a recent quiz (Tobin & Llena, 2010). The regular science teacher had been absent due to illness and a substitute had been teaching the class. Students were having difficulty following their science teacher's efforts to re-teach the work. An altercation broke out when a student leant across to clarify for another student what the teacher had said. The teacher reprimanded her for speaking while he was speaking. Almost immediately

the learning environment became dysfunctional in many respects. The teacher's anger was intense, represented through his gestures, prosody, and spoken text. Consistent with the intensity of emotion decreasing focus, the teacher was less able to attend to teaching the students about conversions from one unit to another. His oral presentation was slow, contained long pauses, and included utterances about "rude student." Some students regarded the altercation as a performance and laughed at what was happening, regarding the text as unintelligible, an object for humor and ridicule. For the student who had been reprimanded, words such as "rude student" were inflammatory and catalyzed further outbursts, ratcheting up the intensity and distribution of high emotions.

In a very short time interval of less than a minute the teacher endeavored to continue teaching while at the same time he referred to the student as rude and taunted her by mimicking her prosody and chanting "temp, temp, temper" as she reacted with high-intensity–"you have every nerve to call me a rude student…" At the same time laughter punctuated a turbulent classroom environment in which an increasing number of students' actions were accusing and disrespectful and the teacher's words were taunting and escalating. Laughter was polysemic, some instances possibly intended to encourage an escalation of the altercation, other instances reflecting amusement at what was happening, and nervous laughter that projected anticipation and acknowledgment that unfolding events were dangerous and cascading out of control. A key point of emphasis is that the learning environment was not mindful and the intensity of emotions focused actions away from the teaching and learning of science. Although there was widespread awareness of what was happening, there were no corrective interventions to reestablish a focus on learning science. In this context we regard it as a critical priority for science educators to use

interventions, such as heuristics and breathing meditation, to create and maintain mindful learning environments.

Lack of fluency in a classroom is often associated with high levels of emotional intensity and low levels of mindfulness. Of concern is the impact of sustained intense emotions on the well-being of teachers and students, especially given well-documented trends associated with teacher turnover and student absenteeism. It is therefore imperative to understand and minimize undesirable negative emotions in the classroom and produce more positive emotional climates and more desirable states of wellness. The potential of mindfulness to address some of the intractable problems of education constitutes a strong rationale for the use of mindfulness-based interventions.

Cultivating Mindfulness in the Classroom–Mindfulness-Based Interventions

Over the last decade a number of approaches to cultivating mindfulness in educational settings have been developed. Many of the programs are loose adaptations of the Mindfulness Based Stress Reduction Program (MBSR) originally created for clinical purposes by Jon Kabat-Zinn. Another approach to incorporating mindfulness-based interventions into teaching and learning practices involves the use of *heuristics*. (Refer to Appendix 7 for an example of a heuristic). Consistent with the hermeneutic tradition, using a heuristic is a way of surrounding the construct with meaning through a series of statements (referred to as characteristics) each describing some aspect of mindfulness. As students or teachers read each characteristic, they select a point on the available rating scale. This process is meant to afford getting insights into one's conduct vis-à-vis various dimensions of mindfulness. The theory that supports this intervention is reflexive inquiry (Bourdieu & Wacquant, 1992) where reflexivity may be understood as becoming aware of the unaware. Because so much of what happens in social life happens without conscious

awareness, reflexivity is important for actors, such as science teachers and their students, so that they can identify aspects of their practice and their supporting rationale, changing them as desirable to benefit the collective (Tobin, 2012). Accordingly the use of heuristics aims at deepening awareness of self and others and of the surrounding structures. As students and teachers ponder the characteristics of mindfulness, they become aware of them and may pay attention to conduct that reflects those characteristics within themselves and each other. As the participants' awareness of mindfulness increases, they often indicate the desire to change their conduct to closer reflect an idea expressed in a heuristic. Consequently, changes in their conduct may become visible. Such positive changes have a potential of contributing to a more harmonious learning environment. For example, students and their teachers may develop more compassionate attitudes towards self and others and learn to replace reacting with responding which may be associated with decreased incidence of aggression and bullying.

A useful feature of a heuristic is its malleability. A heuristic may be adapted to fit any educational context: a science class at different grade levels, teacher training or professional development, a cogen session (Tobin, 2013), etc. It may change its format (i.e., become a narrative); characteristics may be added, deleted or altered to adequately reflect salient features of a particular educational setting. Similarly a heuristic may or may not include a rating scale associated with each characteristic. If a rating scale is included, the scale points can be written to fit the context of use. A heuristic may be completed in "one sitting" or alternatively individual characteristics may be used each day to draw attention to different dimensions of mindfulness allowing students and teachers to make personal choices about each in meaningful ways. This could be done in a variety of ways including the use of technology, cell phones, blogs, chalkboards, etc. Heuristics may be used for planning and guiding classroom activities with the

purpose of facilitating adoption of practices that are characterized by mindful attention, focus, and compassion to self and others.

Figure 4.2. Students in science teacher education course engaged in a breathing meditation practice.

Breathing meditation is often an integral part of mindfulness training. Focusing on the breath allows participants to bring their attention to the present moment. It also assists with disassociating oneself from any (especially negative) thoughts and emotions. Breathing meditation may be used at the beginning of a class session to help students and teachers calm their minds and sharpen attention and focus. Using breathing meditation in a science classroom may afford exploration of the relationship between emotional feelings and respiration (the mind | body connection) (Tobin, 2013) and its significance for emotion regulation. Accordingly, students and teachers may observe changes in their emotional states as they practice deep abdominal breathing. Conversely, their attention may be brought to the changes in their breathing patterns (and possibly other physiological markers such as fluctuating heart rate) as

their emotional states shift. Increased awareness of these connections may be accomplished through the use of relevant characteristics in a heuristic or through other techniques such as the use of oximetry (Tobin, 2013). Breathing meditation may be presented as a medical intervention that is associated with improvements in one's well being. Breathing meditation may be modeled and facilitated by the teacher or by students (as was the case in Figure 4.2). It may be a relatively short activity lasting between 3 and 5 minutes at a time. Participants may be encouraged to maintain the practice outside the classroom if they find it beneficial.

Mindfulness in Science Education

Science process skills became a visible part of the science curriculum in the post-Sputnik reform movement associated with the 1960s and 1970s. Basically, curriculum developers considered the steps of the scientific method and/or problem-solving and broke them down into skills. Different projects had different lists of process skills, largely because materials were developed around different psychological theories of learning. Prominent among these were the learning theories of Jean Piaget and Robert Gagné. Consider the 5 Es (engagement, exploration, explanation, elaboration, evaluation), a present-day articulation of the Learning Cycle, which was based on Piaget's developmental theory and emerged in the post-Sputnik era as a framework for the *Science Curriculum Improvement Study*. From a sociocultural point of view each of the 5 Es is an interaction chain (Collins, 2004); that is, involving multiple interactions between individuals and social artifacts that is enacted using available structures (i.e., resources). The quality of enactment reflects criteria such as fluency (i.e., enactment occurs just in time, is anticipatory, and is appropriate) and the extent to which others' actions are in synchrony and maintain flow. It is essential for successful interaction chains to occur in order for students to enact any of the 5 Es effectively and appropriately. The likelihood of this happening can be heightened if students

establish and maintain focus and fluency while being aware of (attentive to) unfolding events that are salient to their learning. If others are involved in an interaction, for example, it is important that an actor is aware of emotional styles related to the extent to which she/he or others are expressing emotional cues. Language is an important tool for enacting process skills when actions are internal (i.e., thought), external (i.e., spoken or written), and a combination of both internal and external. For example, the quality of enactment of a process skill concerns the words and utterances used, their prosody (e.g., loudness, frequency modulation, intonation etc) and proxemics (e.g., gestures, body movement and orientation, eye gaze, head tilt, etc). Quality counts. In addition, what counts as quality will reflect the theoretical frameworks that underpin central criteria such as teaching and learning. For example, in terms of the sociocultural framework that we adopt in our research, dialogue is central. No matter what happens to be the focus of the curriculum we want the enactment and associated interaction chains to be characterized by dialogic inquiry. That is, as teachers and students interact we want them to be respectful to one another, share time of talk and the number of talking turns, listen attentively to what others have to say, make sense of it, and understand its affordances in comparison to alternatives. Also, if injustices arise we expect participants to speak out in favor of corrective action. When individuals speak, they do so for the benefit of others, not just for themselves.

When science process skills were initially emphasized in science education, there were clichés to the effect that "science is a verb," “science is something that is done,” and “authentic science” – meaning that what children might do, as science, would likely differ significantly from what postdoctoral researchers would do as science. It was argued that science had a role in terms of enhancing functional literacy in an increasingly technological society in which citizens have the knowledge to feel at home with the technologies they use in their lifeworlds and are not

intimidated by them. The process skills learned and employed in school science would be available for use in different fields of the lifeworld, including shopping, working, hobbies, and consuming media. Now, more than six decades later there is a compelling argument that students should know about healthy lifestyles and bodies, including neuroplasticity. To know, in the sense we use it here, extends far beyond just knowing the facts to include enacting healthy lifestyles and engaging in activities that transform the structure and functioning of the brain. We offer mindfulness as the process skill of the present decade.

Sound Bodies and Sound Minds

The emerging science behind the benefits of mindfulness to wellness provides support for incorporating contemplative practices into the educational arena. Mindfulness-based interventions are associated with positive outcomes for students and teachers through addressing cognitive and affective dimensions of teaching and learning. Whereas mindfulness can be a constituent of a traditional approach to science education, we regard it as a central component of a radical transformation of science education to embrace overarching goals related to wellness and sustainability. Mindfulness is a way of enacting social life in ways that expand learning potential and ameliorate the nature and intensity of emotions that rise and fall in the normal course of life. As part of the toolkit that individuals possess, mindfulness heightens awareness of emotions and their attachment to the ongoing conduct of social life. Given the alarming increase of violence in institutions that previously have been regarded as sanctuaries, such as schools, we regard as a priority for all humans to learn about mindfulness and to enact it in the course of everyday life, including schooling, and science education. Because science has traditionally been involved with learning about life and bodies and relationships between humans and the living

and nonliving environments in which they conduct their lives we regard mindfulness as central to a transformed science education that includes the science of learning and being in the world.

CHAPTER 5

FACING THE GRAND CHALLENGES THROUGH HEURISTICS AND MINDFULNESS[2]

Slow Down and Smell the Roses

> "I'm like a horse with the blinders on running to the finish line, not seeing anything but the goal it's trying to reach." (Ola, graduate student of teacher education program, University of Warsaw, May 2013)

Ola is a twenty-some year old female student based in Poland and a participant in one of our collaborative studies on mindfulness. In the above quote, she was responding to a mindfulness heuristic characteristic, "When I'm walking, I deliberately notice the sensations of my body moving." Dialoguing with her instructor, Ola admitted that she usually runs everywhere she needs to be. Many of us–me included–may relate to the above quote. In today's results-oriented society, we tend to always be "on the go" both physically (moving from one place to the next) and mentally (planning our next move or ruminating about the past). Indeed, one of the leading contemplative neuroscientists, Richard Davidson (2013), points to modern research indicating that the average adult American spends nearly 50% of his waking life *mind wandering* – not paying attention to what he is actually doing. Too often, the "here and now" is considered insignificant; its actors (such as a salmon featured in Clayton Pierce's (2013) narrative) coexisting but invisible to us. We miss out on life by failing to embrace and value every moment. We tend to forget that our lives are a sum of moments or, in the words of microsociologist Randall Collins (1981), they are a sequence of microsituations or microexperiences that are essential to grasping macrostructures or the big picture of social life.

Sometimes we like having our minds wander. It in itself can be a very creative, innovative, and enjoyable activity. Oftentimes though we get stuck in something we want to get

away from and cannot, or walk through life with little awareness of not only the world around us but even of ourselves. Lack of attention may lead to becoming unaware of and numb to how our individual and collective actions impact our minds and bodies, how they impact the minds and bodies of our fellow human beings and those of other sentient life forms. We become blind to our emotions and those of others. Unable or unwilling to notice or care about the pain around us, we walk past people in need. When in the classrooms, we are unable to register our students' cries for help. As Mike Mueller (2013) argues, we are prone to falling prey to neoliberalism, with its emphasis on individualism, competition, and hyperconsumerism. Subsequently, Mueller continues, we fail to notice how our conduct contributes to waste, the suffering and abuse of animals, other people's ailments, and degraded ecosystems. Motivated by our supremacist and egocentric view on the role of humankind (or rather humankindlessness), we forget about the interconnectedness inherent in life on earth and its significance to maintaining a symbiotic balance on our planet.

As argued in Chapter 4, addressing issues of wellness, sustainability and literate citizenship are among highly desirable aims of education. We consider mindfulness to be a promising practice in accomplishing such goals. Jon Kabat-Zinn explains that mindfulness involves "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally" (1994, p. 4). The recent explosion of interest in mindfulness, by scholars representing diverse disciplines, has generated a multitude of compelling evidence linking the practice with positive effects on mental and physical health. Much of current mindfulness-focused science rests on the latest insights into seemingly unrestricted connections between *brain plasticity* and mental training. Thus, Davidson (2013) advocates that learning to remain aware of the present moment in and of itself can powerfully facilitate well-being and reduce suffering. We

consider a science classroom as one of many fields where such learning could occur. Accordingly, I argue that mindfulness may represent a process skill, related to students enacting healthy lifestyles and engaging in activities that transform the structure and functioning of the brain. Mindfulness allows us (and our students) to pause, zoom-in on the microsituations and cancel out the cacophonic noise inside and around us and thus to develop a sense of equanimity. Through developing increased awareness of ourselves and of others, we are more likely to cultivate such traits as loving-kindness and compassion that are directed both in- and outwardly. Accordingly, teaching mindfulness may assist in the process of awakening or enhancing the traditional moral values as argued by our British colleague, Terry Hyland (2013):

> What mindfulness adds to the moral tradition is, first, the clarity of vision and equanimous stability of mind and body that allow for the full expression of moral principles and practice and, second, the passionate motivation to engage with the world in the moral project of challenging injustice, poverty, inequality and all the other factors that stand in the way of human flourishing and well-being (p. 6).

Considering the increasingly visible signs of the negative impacts of the "mindless" way of living on the well-being of our planet and its dwellers (such as the increased frequency and magnitude of "natural disasters," the disappearing species of flora and fauna, and stress-induced modern day diseases), we regard promotion of mindfulness as an ethical obligation of those who participate in educating current and future generations. Therefore, our ongoing work has focused on developing and implementing mindfulness-based interventions into teacher-education programs at undergraduate and graduate levels.

Stepping In

Since a goal of our work is to transform practice through research, we seek to design interventions to facilitate teachers and students improving the quality of teaching and learning (Tobin, 2013). We consider *a heuristic* as one such intervention. Accordingly, a series of our recent studies have aimed at developing and implementing heuristics in the educational milieu. Consistent with the idea that social fields intersect, we find that engagement in mindfulness-promoting research expands beyond the confines of the classroom as the study participants (including us) apply mindfulness practices when at home, at the gym, or in the subway. As evidenced in the volume edited by Gerd Gigerenzer, Ralph Hertwig, and Thorsten Pachur (2012), social scientists theorize and appropriate heuristics in a number of ways. For example, to Clark Moustakas, "heuristics is a way of engaging in scientific search through methods and processes aimed at discovery; a way of self-inquiry and dialogue with others aimed at finding the underlying meanings of human experiences" (1990, p. 15). Our approach to heuristics builds on earlier work conducted by Wolff-Michael Roth and Kenneth Tobin (2002) with pre-service teachers. Back then, used as a pedagogical instrument, the heuristics captured effective practices to be enacted by future teachers while engaging with the educational craft. A decade later, our thinking around heuristics has evolved to a considerable degree. To illustrate our current theory and practice surrounding heuristics, we discuss one of our research studies involving applications of the *Mindfulness in Education* heuristic.

Mindfulness applies to social life writ large and how it is enacted is mediated by the structures of fields in which activities occur. Accordingly, when we create a heuristic to increase mindfulness in activities that are of interest in our research, the most salient characteristics of mindfulness will be selected and described in ways that relate to the activity's structures. For

example, the characteristics of mindfulness in a physics lecture might be described somewhat differently than those considered to be of primary importance in a chemistry lab or during a karate lesson. We use the term shape shifter as a metaphor for the idea that heuristics include characteristics that are related to specific features of an activity – including the construct of interest (e.g., mindfulness) and the context, such as activity goals, features of participants, and other structures including time, place, communities, and the nature of participating institutions. Characteristics included in a heuristic can and should be adapted to be contextually appropriate. In the case of the *Mindfulness in Education* heuristic we recommend that researchers change the wording and number of the characteristics so that participants recognize their relevance to the contexts that apply in a particular study. We encourage potential users of the heuristic to select and adapt characteristics to include a set that bears a family resemblance to the original set. If certain characteristics create undesirable problems after an initial administration, it is desirable to make changes since the primary function of a heuristic is for participants to connect their personal practices to the characteristics included in the heuristic. Accordingly, shape shifting, or changes to the set of characteristics, should be contingent and occur if, when, and as necessary.

The Mindfulness Study

This ongoing research is conducted with undergraduate students preparing to enter an elementary teacher education program. The students are engaged in a gateway physics course at a large urban four-year college. Karim Gangji, who is passionate about physics as well as about assisting his students to learn the content, teaches the course. Over the years, Gangji has identified students' negative emotions as a major deterrent to learning science. Therefore, high on his (and our) axiological ladder is alleviating the fear and anxiety surrounding science learning that the

majority of the students bring into the college classroom as evidenced in the comment by one of his students:

> Most of my emotions are just nervousness, being worried, anxiety. I'm always thinking ahead. "What happens if I do bad on Exam 2?" "If the Exam 1 material was hard how will I manage to pass the second or third?" how how how? (Amna, Pakistani-American)

This student's way of engaging with learning science exemplifies low levels of mindfulness: not being in the moment but "thinking ahead" and worrying about a future that generates negative feelings. We find that for many students the sense of anxiety is associated with the historically constituted perception of the difficulty in grasping the "hard" scientific concepts. This anxiety is amplified by the institutional structures that not only emulate the way science is taught (in the words of one student, "This class is more of a class to go, sit, and take notes") but also place the course in the high-stakes realm. Therefore, this teacher-researcher seeks to create a supportive environment and an orientation towards attainability of success by each person. To that end, similar to a growing number of educators, Gangji embraces mindfulness as a promising practice for himself and his students. The mindfulness heuristic constitutes part of his toolkit. One of his goals is to assist students with increased awareness of emotions and their impact on learning as well as providing tools to alleviate intense detrimental emotional states that arise in the teaching | learning environment. When provided with opportunities to express and reflect on their emotions as well as ways of dealing with negatively valenced emotional states, one of Gangji's students comments, "I do really like the fact that our professor gives us time before and after our exams to describe how we felt about the exam" and another adds, "The usual nervous and sad emotions of whether or not I will pass the class are completely gone." In addition, as evident in the following

quote, these future teachers take cue regarding the route to becoming more mindful from their professor:

> He takes baby steps when we do not understand. It makes me believe, wow, there's a professor who is so gentle to his students. That is how I want to be with mine. Not having doubts but confidence in each and every student. (Stephanie, Spanish-American)

Alleviating emotions may afford increased openness towards learning science that includes the ability to connect what is learned in the classroom with the larger context of the lifeworld. After all, Gangji's students will enact several social roles in addition to being elementary school teachers. Therefore, what constitutes science content is of much importance. Similar to other authors in the 2014 Special Issue on Ecological Mindfulness and Cross-Hybrid Learning in Cultural Studies of Science Education (later Special Issue), our epistemological stance regards scientific literacy as stretching beyond traditional canonical knowledge (i.e., dispelling a notion that the sky is blue because of the ocean's reflection as currently maintained by 80% of students in this class). To us, doing science means accessing skills and knowledge (such as mindfulness) that allow one to recognize and possibly transform structures that might threaten the individual | collective wellbeing on earth. Doing science must have ethical grounding and involve a pursuit of alternative ontologies and epistemologies. As argued by contributors to the Special Issue (2014), available alternatives may include re-turn to animistic sensibility, education for ahimsa (i.e., nonviolence), hybrid learning, indigenous science, and the heteroglossia of street medics' craft. We propose heuristics as a possible medium for engaging in exploration of ideas and practices, such as those presented in the Special Issue, that open up possibilities of countering destructive structures of Western scientific hegemony.

So What in the World (of Social Science) is a Heuristic?

Consistent with the hermeneutic tradition, a heuristic is meant to reveal the meanings associated with a particular social construct. We accomplish this through generating a series of statements, each describing some aspect (characteristic) of the construct. Accordingly, we refer to these statements as *characteristics*. The characteristics are accompanied by a rating or frequency scale. We ask respondents to choose a point on the rating scale that best reflects their current state as relating to a construct such as mindfulness (see Appendix 7). As students read each characteristic, they are exposed to a certain feature of mindfulness.

In its format, a heuristic may resemble a survey, questionnaire or a scale. However, the principles governing the way heuristics are created and used are a far cry from the psychometric features of their look-alikes. For example, since establishing statistical validity and reliability of a heuristic is not among our goals, we are able to avoid repetitiveness and redundancy among the characteristics. Heuristics are not used to generalize from sample to population. On the contrary, consistent with William Sewell's (2005) notion of social life being experienced as patterns of thin coherence and contradictions, they assist in bringing difference into light. Thus, responses to the heuristic provide a window into both the individual and collective enactments of specific characteristics in a social field such as a science classroom. Similar to our Dutch colleagues, Arjen Wals and Jifke Sol (2013), who place pluralism and heterogeneity over singularism and homogeneity, difference rather than sameness is valued as a resource for learning from members of the collective.

Heuristics are meant to afford changes in the way a person enacts social life. We theorize that such changes are possible through *reflexivity* or becoming aware of the unaware (Bourdieu & Wacquant, 1992). As a person reads a characteristic, in addition to becoming aware of a

particular feature of mindfulness, he or she makes a determination as to the extent this characteristic is salient to his/her ontology. During this reflective process, certain characteristics in the heuristic (more than others) may resonate with the respondent. In the process, he or she may consider adopting practices that would be aligned more closely with those characteristics. In addition to the availability of the rating scale to indicate the frequency of occurrence of certain characteristics in one's social life, we provide space for additional reflections over each characteristic. The resultant narratives along with the numerical data may assist in answering a phenomenological question: What is happening in this science classroom? Equally importantly, the data afford engaging in hermeneutic interpretation of why what is (or is not) happening is happening. The awareness raising and the transformative potential of heuristics have important implications for science teaching | learning particularly in the context of promoting sustainability, wellness, and justice. In the following section, we discuss what Gangji, his students, and we learned from enacting the latest version of the *Mindfulness in Education* heuristic in this physics course.

A Heuristic at Work

Since mindfulness is a complex and multifaceted construct, it is impossible and unrealistic to generate an exhaustive list of all its possible aspects. Therefore, an effective strategy is to contextualize a heuristic. In other words, a heuristic should reflect characteristics that are salient to a particular setting and purpose. Through assuming different foci in social life a heuristic may aim at highlighting characteristics relevant to sustainability, wellness, and (eco) justice. The mindfulness heuristic discussed in this section is reflective of our research agenda that focuses on the salience of emotions in education and the now well-documented connection between mindfulness practices (in the form of mental training) and emotion regulation.

To Be Aware is to Beware

Richard Davidson's seminal work in the field of *affective neuroscience* (the study of the brain basis of human emotion) which provides grounding for his theory of *Emotional Styles* (Davidson & Begley, 2012) afforded the current shape of this heuristic. Involving six dimensions, Emotional Style is "a consistent way of responding to the experiences of our lives" which "is governed by specific, identifiable brain circuits and can be measured using objective laboratory methods" (p. xi). Davidson's work provides compelling, empirical evidence that challenges a long-held scientific assertion that we are stuck with who we are. Quite contrary, the ability to rewire our brains at virtually any age affords shifting to a considerable degree our Emotional Style towards a more desirable direction as determined by each individual. It turns out that we have the capacity to exert control over the extent to which emotions rule the way we live our lives including taking charge of our wellbeing. Awareness, which is at the core of mindfulness, is the requisite first step or a building block to becoming CEOs of our minds and bodies.

7. Even when I am focused, I use my senses to remain aware.
4. I notice my emotions without reacting to them.
14. When I produce strong emotions, I can let them go.

Consistent with Kabat-Zinn's definition of mindfulness, two forms of attention are relevant to Emotional Styles: *selective attention* and *open, non-judgmental awareness*. While "selective attention refers to the conscious decision to selectively focus on certain features of one's environment and ignore others," "open, non-judgmental awareness reflects the ability to take in signals from the external environment as well as the thoughts and feelings popping up within our brain, to broaden our attention and sensitively pick up on the often subtle cues that continuously impinge upon us – but to do so without getting stuck on any one stimulus to the detriment of others" (Davidson & Begley, 2012, p. 86). Characteristic 7 in our heuristic captures

the seemingly conflicting idea of being focused while at the same time remaining aware of the surroundings. The vast majority of students (70%) indicate engaging in this type of conduct *always, very often or often*. Some students appear to be confused about the idea and ask, "Aren't the senses essentially needed to stay focused?" or state, "I do not understand this question." Still other respondents consider maintaining focus as their primary and exclusive objective, "I try to tune out the distractions the best I can and limit my focus point on my professor and the lecture to get the best out of the class." For these participants, possibly, an absolute focus on what they believe to be relevant to science learning (obtaining canonical knowledge) is what a good student does. One person appears to appeal to the transferability of the focused-yet-aware concept between social fields. She states, "My skills as a parent and dealing with young children have forced me to become more focused and at the same time aware of my surroundings most of the time." To this student, skills developed outside the science classroom find applicability in the college environment. As lamented by one of the Concord High students featured in Susan Finley's documentary (Finley & Barton, 2013), school is often associated with being forced to learn canonical knowledge that has little relevance to "real life." It is our desire for the science classroom to be a space where students get a chance to develop skills that are applicable to leading healthy and fulfilling lives. Finley documents that when tried, this concept appears to gain traction. At Concord High, the initial skepticism about being able to change destructive habits of mind through mindfulness practice gave way to a conviction by these "troubled youth" that it was possible and rewarding to take charge of one's mental and emotional life.

Many students in this physics class might have encountered this characteristic for the first time when they read the heuristic. Accordingly, they might struggle to make sense of the characteristic and/or fail to see its relevance to the physics class, elementary teaching, and life in

the world. This is what we expect. It does not matter that they selected *very often* or *often* when, on reflection, *seldom* might have been a more appropriate choice. The purpose of the heuristic is to heighten awareness about characteristics of mindfulness and to consider the question – to what extent does my conduct reflect this practice? Once a person is aware of a characteristic, there are possibilities for associated practices to change in quantity and quality. We expect that awareness about a characteristic increases the likelihood of noticing examples of synchrony and asynchrony in regard to particular practices. Increasing experience will likely change understandings of the meanings of characteristics, their value concerning personal and others' practices relevant to the characteristic, and perceptions about how frequently and in what ways the characteristic is enacted. In other words, heightened awareness can fuel a reflexive process that serves as an intervention, driven by hermeneutic-phenomenological processes.

As noted, mindful awareness is characterized by a non-judgmental quality. In the context of affective states, the idea is that we are able to observe emotions that arise without the urge to identify with them or react to them (as in characteristics 4 and 14). Davidson has shown that "circuits in the brain that control and regulate emotions overlap with those involved in functions we think of as purely cognitive" (2012, p. 89). Therefore, emotions tend to cloud our perception and hamper the quality of focus, which may have important implications for learning. As demonstrated by Jeffrey Huntsinger (2013), the mechanisms underlying the well-established relationship between affective states and attentional scope continue to be investigated by modern science. Students in this class do indicate that they occasionally lose focus and get distracted by random thoughts and negative emotions: the workings of the *monkey mind* as described by Heesoon Bai (2013). In addition, about 1/3 of students find themselves getting stuck on emotions (e.g., "I have never been good at letting emotions go – especially strong ones"). Persisting strong

emotions may result in a destructive conduct: lingering self-criticism for bumming a test, an angry email response to a co-worker, an explosive argument with a life partner, or, as described in previous the chapter, in deleterious exchanges between a teacher and a student. Often, unmediated, long-lasting negative emotions have disastrous implications for our wellbeing in the form of anxiety, depression, memory and concentration impairment, high blood pressure, cancer, heart disease, digestive disorders, sleep and many other problems. Pausing and letting go of an emotional state may afford taming aggression directed at self as well as at other human and non-human beings. Bai, who challenges the binary perception of the world as animate and inanimate, argues that curbing our mind's constant chatter and busywork will stop the continual draining and dissipation of vital energy. In the process, with our nervous system nourished and replenished, we are more likely to see the world in greater animation.

The ability to get unstuck and recover quickly from adversity constitutes the *Resilience* dimension of Emotional Style (characteristics 5 and 6). Over 50% of students indicate being kind to themselves and able to bounce back after an academic failure. Many understand that if they dwell on failure, "things can go worse" for them. For example, if they "stress over a test during class, when something important is mentioned in class, they can miss out on an important fact." For some, a bad grade is "no reason to beat oneself up" but rather a motivator to "get extra help" or "work harder." A smaller group of students falls on the *slow-to-recover* end of the resilience spectrum. It includes a student who comments, "If something goes wrong, it's hard for me to let it go."

5. I am kind to myself when things go wrong for me.
6. I recover quickly when things go wrong for me.
10. I maintain a positive outlook.

A closely related dimension of Emotional Style is *Outlook,* which reflects how long and how well one can sustain a positive emotion (characteristic 10). Seventy percent of the physics students say that they maintain positive outlook *often, very often or always*. For some students

"attitude is a little thing that makes a big difference." Many attribute positive outlook in class to the encouragement and confidence building (mindful) practices of their instructor ("Even if I face a difficult problem, professor's Gangji's words run through my head: 'Relax everyone. Just breathe.'") We find it encouraging when students step outside the traditional teaching | learning environment and begin connecting what they learn to their lifeworlds as evident in the following quote:

> I believe that maintaining a positive outlook is one of the most important things a student, or even any individual, can do for themselves. A positive outlook on things not only alleviates unnecessary stress, but also allows you to think clearer. Often I can be a stress ball, but knowing the grass is greener on the other side can help me get through things. (Maggie, Asian-American)

Maggie appears to advocate applying the self-tested and now scientifically-grounded principles to the one's way of enacting life that stretches beyond the science classroom.

Sensitivity, Intuition, Kindness and Compassion

18. I am kind to others when they are unsuccessful.
19. I can tell when something is bothering another person.
20. I am aware of others' emotions from the tone of their voices.
21. I recognize others' emotions by looking at their faces.

There should be little doubt that life of and on this planet would be much enhanced if people were more sensitive, kind, compassionate and empathetic towards themselves and other sentient beings. Indeed, Davidson (2013) confirms that according to modern research kindness and compassion toward others is associated with peripheral biological (i.e., biology below the neck) changes that are salubrious. In other words, that good feeling we get when we extend kindness towards others may be indicative of us benefiting from it. The connection between mindfulness and compassion has now been well established through multiple studies. For example, in a recent research project conducted with female teachers, Margaret Kemeny and her colleagues (2011)

found that mindfulness training increased recognition of emotions in others and appeared to activate cognitive networks associated with compassion. Our heuristic explores not only the level of awareness of emotions in self and others but also the ability to respond with kindness to both self and others. Characteristics 19 through 21 represent the *Social Intuition* dimension of Emotional Style and "test" how adept we are at picking up social signals from the people around us. They appeal to awareness of the emotions of others as a requisite condition to recognizing that someone is in distress. When it comes to the ability to recognize when something is bothering another person (characteristic 19), 30% of students are at the "tuned-out" end, 35% are at the "tuned-in" end and another 35% fall somewhere in the middle of the spectrum. Interestingly, however, when responding to characteristic 18 (which registers the highest mean of all characteristics), the vast majority of students self-profess high levels of compassion towards others. Regarded in ethical terms such finding is encouraging and flies in the face of a conviction that people living in large metropolitan areas (like students in this class) lead anonymous, selfish and indifferent-towards-others lives. It might be, however, that since these young people have chosen to enlist to become elementary school teachers, they share traits often associated with femininity (95% of the group is female) and with emotional labor of teaching young kids. In their comments, many students indicate a willingness to assist as well as to console and commiserate with their classmates. For some students their kindness towards others is somewhat conditional, but compassion does kick-in in the face of failure:

> Whether someone is unsuccessful or not, I am in general kind to everyone if they did not do anything wrong to me. However, I do notice that I do treat a person extra nicer if they, for example, fail their exams, or get a bad grade on their essay. (Alice, Chinese-American)

Appropriate and timely response to another's distress requires not only high levels of *Social Intuition* but also of *Sensitivity to Context* (how good we are at regulating emotional responses to take into account the context we find ourselves in) as covered by characteristics 11 and 12. As noted earlier, mindfulness has been shown to assist in increasing levels of attunement with and ability to respond to social cues.

Self-Awareness

Characteristics 8, 9, 15, and 16 aim at increasing awareness about the well-documented connections between emotions and our physiological responses to heightened emotional states. They refer to the awareness of a well-documented bi-directional mind-body connection, which is reflective of a mindful way of being. As pointed out by authors in the Special Issue, this ontological orientation stands in contrast with the dualistic worldview of Western civilization. Richard Davidson states that, emotions "are arguably the most embodied form of mental activity" (2012, p. 136). If we do not pay attention to the signals our bodies send to our brains, we are running a risk of subjecting ourselves to enduring unhealthy states such as those caused by chronic stress. Bai (2013) maintains that unmitigated and accumulating stress burns out the nervous system and leaves its victim consumed and depleted, physically, emotionally, and otherwise. In an earlier study, we explored with our participants the physiological changes in their heart rate and oxygen level. The recorded fluctuations (often considerably deviating from the norm) were in response to heightened emotional states occurring during oral presentations on highly controversial topics. We found that once equipped with this information, some students turned to mindfulness practices with the goal of alleviating the possibly debilitating states.

8. When I am emotional, I notice my breathing.
9. When I am emotional, I notice my heart beat.
15. When my emotions change, I notice changes in my body temperature.
16. The way I position and move my body changes my emotions.
17. I use breathing to manage my emotions.

In terms of the Emotional Styles, this group of characteristics represents the *Self-Awareness* dimension. In this class, we register low statistical means associated with these characteristics. This finding may suggest that for many students self-awareness may be at the low end of the spectrum. For example, over 40% of students indicate that they *never or hardly ever* notice how their breathing changes in response to emotions. Additionally, 23% state that this happens *rarely*. Only a slightly higher percentage of students indicate being able to discern changes in heart rate when experiencing heightened emotional states. Such low-levels of self-awareness are indicative of disembodied perception of self and possibly a de-animated view of the world. Being able to tune into one's body's responses is part of being mindful. High levels of self-awareness may afford recognizing affective triggers and being able to regulate one's emotions and to minimize potentially unhealthy reactions. Characteristic 17 is meant to offer breathing meditation as an effective technique to alleviate strong emotions, a technique that only about one fifth of the students in this class practice on a regular basis. Some students comment on engaging in breathing when prompted by the instructor's encouragement "to take deep breaths" as exemplified by the following quote by an Asian-American female student:

> During this class, I do not use breathing to manage my emotions. But at times, our professor would jokingly say, "breathe in and out" or "take three breaths" when the class seems to be down or stressed. These would be the only times I would use breathing.

Others, like Maggie, indicate having been exposed to the practice (possibly through experience with Eastern traditions which, as demonstrated by Bai's (2013) autobiographical story, tend to get devalued and marginalized by Western schooling):

> I was always taught to use breathing exercises, but have not really tried them. I think it will help though. Sometimes, I just can't get over my anxiety in order to actually breathe.

Maggie appears to be "instinctively" aware of the likely benefit of using "breathing exercises" yet, similar to 60% of her classmates (who indicate doing them *rarely, hardly ever or never*), she does not appear to be able to apply this knowledge and reap its potential particularly when faced with strong emotions. Accordingly, Maggie's Korean-American colleague is among those who "try to take deep breaths" but when their "emotions are too strong, it is hard to take control and manage" them. Because sustained strong emotions may wreak havoc with one's mental and physical health, it is of utmost importance to not only know about but also implement effective interventions, such as breathing meditation, to let them go, to get unstuck and to be able to return to a healthy equilibrium relatively quickly.

Adopted from centuries-old Buddhist traditions and backed by the empirical evidence of modern science, mindfulness and breathing meditation promise assistance with self-regulation and, if/when necessary, self-healing. Similarly, as described by Matthew Weinstein (2013), street medics practice herbalism and naturopathy as an effective alternative or a complement to allopathic (Western) medicine. Embracing the alternative traditions usually requires commitment and resolve. In the case of meditation, as accurately noted by Bai, the practice is a challenging activity as we are deeply conditioned to run on the monkey mind. We are also conditioned to reach for quick fixes such as popping pills as a remedy for an ever-growing number of afflictions. Even street medics experience ambivalence towards standardized practice and find it challenging to reject it. In that sense, the students' apparent difficulty with applying breathing practice is not unusual.

The Transformative Potential of Heuristics

> To be an agent means to be capable of exerting some degree of control over the social relations in which one is enmeshed, which in turn implies the ability to transform those social relations to some degree (Sewell 2005, p. 143).

Our approach to research embraces the authenticity criteria that Tobin (2006) adapted from the work of Egon Guba and Yvonna Lincoln (1989). The approach rests on an assumption that participants in research benefit from their engagement in it. To that end, heuristics are meant as an intervention affording ontological shifts towards better alignments with the qualities of (in this case) a mindful way of being. As argued by Sewell (2005, p. 144) "a capacity for agency – for desiring, for forming intentions, and for acting creatively – is inherent in all humans." In this study students' agency may be interpreted through the degree to which they engage with the characteristics in the heuristic. Using student comments, we can gauge their openness to reflecting on and perhaps adopting (or rejecting) particular characteristics of mindfulness (or shifting dimensions in their Emotional Styles). We find that while some students decide to provide a commentary to every characteristic in the heuristic (which might be indicative of relatively high level of engagement), others reflect in this way on a few self-selected characteristics. As noted earlier, some characteristics more than others are likely to resonate with individual respondents. There is a group of students who appear to just "run through" the heuristic merely "bubbling in" the numerals with no apparent "deep" engagement with them. On closer inspection, however, we find that a few students in this group opt to share their overall opinion about the heuristic. Unsurprisingly, their comments vary to a considerable degree. While one student finds the heuristic to have no application to her class, another, who says she never has been asked "these types of questions," appears to have been intrigued by the unique character

of the heuristic. Yet another student, Catina, points to the reflexive feature of the heuristic which made her "think about the stuff" she does or feels when she is emotional, even when she doesn't realize it at the time. Still another (Indian-American) respondent displays a similar-to-ours understanding of the ideas included in the heuristic and expresses a desire to take better control over her negative emotions:

> Emotions tend to take over the mind, body and spirit. I have noticed within myself that negative emotions (sad, anger, stress, etc.) affect my well-being and my physical connection with those around me. However, being a positive person for the most part I can control these emotions and even hide them. Taking this survey helped me to realize that I should focus more on my breathing once I am presented with negative emotions.

These comments appear to indicate that the heuristics mediated reflection over what being mindful may mean and, in at least one case, an explicitly stated desire to make a change in how one enacts social life ("I should focus on my breathing").

We regard mindfulness as a feature of being in the world, a central and irreducible component of lifeworlds. As is the case for any activity an individual might engage, mindfulness is both a process and an outcome. Hence, it is part of science achievement, not separate from it. From many perspectives there is folly in efforts to reduce mindfulness to a collection of constructs, as we have done here, since any effort to represent with language falls well short of the full meaning of a construct – especially in the context of polysemia. What we mean by this is that the particular understandings we have for mindfulness are not fully represented in our attempts to articulate our research and its enactment in interventions involving the use of tools associated with reflexivity, heuristics, and breathing meditation. It might even be considered greater folly to further reduce the information obtained from heuristics by quantifying

attachments to the characteristics of mindfulness included in the *Mindfulness in Education* heuristic. Accordingly, our quantification and associated search for constituent scales/dimensions of mindfulness are presented as part of a larger hermeneutic-phenomenological inquiry that employed multiple systems of logic, methods, and levels in a project that sought deeper understanding of social life and embraced the goal of doing research for the purposes of enhancing life. The teaching and learning of science, for the purpose of educating for literate citizenry, needs to move beyond 20th century goals of science for economic and militaristic superiority. Instead of focusing on science education for the purposes of competing with other nations to become the international leader we embrace science as a collaborative activity that seeks to promote wellness for all sentient beings and sustain the living and nonliving universe. Accordingly, mindfulness is not regarded as a means of advancing science achievement as it might be measured by multiple-choice quizzes or as it was enacted in the present teacher education programs that provide a context for this research. As is the case in all teacher education programs, we regard mindfulness as part of achievement–not separate from it and certainly not a precursor to, or subordinate to, what is often highly valued cognitive achievement–in this case knowledge of conceptual physics.

Why do I care?

I can think of a few life threads that contributed to my inclination to being drawn to the so-called alternative ways of addressing issues of justice, sustainability and wellness. To begin with, I have my family to thank. My parents, who were first generation college degree earners, cultivated the values instilled in them by their humble peasant beginnings. In addition, every school break, they shipped me off to live with my grandmother on her small farm, in rural Poland. It was there I co-participated in what I now understand to be a sustainable way of living.

On my grandmother's farm nothing went to waste: it was consumed, reused or composted (needless to say, a garbage truck was an abstract concept). I helped my grandmother to raise animals and grow produce. Much of what was harvested in the summer got preserved and stored for the winter months. My grandmother bartered with other villagers for goods she did not produce. She also knew how to prepare and use natural remedies to cure simple afflictions. Her "medicine cabinet" contained tisanes, tinctures, syrups, and balms she made out of organic ingredients all having specific medicinal qualities with no apparent side effects. My grandmother's knowledge did not come from studying agriculture or pharmacy in a lecture hall; she only completed six grades of elementary education. She possessed what Mike Mueller refers to as *intergenerational knowledge,* which she inherited from her ancestors. Even though I did not recognize it at the time, that rich know-how was being passed on to me. Reflecting back on life on the farm, I consider it a multi-semester, lecture-less and textbook-free course in science with my grandmother acting as a scientist and a healer even though she never got (or cared) to wear a lab coat. It was where and how I learned to live in symbiosis with and respect for the natural world.

While I enjoyed the "simple" bucolic summer life on my grandmother's farm, I failed to categorize as knowledge what I was learning there. Back then, my "modernity"-driven epistemological stance equated legitimate knowledge with formal schooling. Axiologically speaking, of value was knowledge originating from academic texts and experts and supported by scientific evidence. A young, ambitious woman situated in a communist country, I was convinced that assuming a reason-based ontology was a marker of having attained a status of a respect-worthy educated person. It was not until years later that I realized how little of what I was taught in schools (often through rote learning) had any relevance or application to my life.

(In that sense, students like those at Concord High (Finley & Barton, 2013) or schools in Newark (Fellner, 2014) are better informed than I was at their age.) It turned out that much of what I needed to know was not part of any official curricula. Accordingly, I spent years of my adulthood leading what I now recognize to be a frequently mindless life. Just like Ola in our study back in my home country, I lived my life with the blinders on. I constantly worried about the future and beat myself up over the smallest of failures. Like some students in Gangji's class, I allowed myself to be consumed by emotions and thoughts unable to get unstuck thus "scoring" quite low on the resilience dimension of my emotional style. No one taught me that simple breathing exercises could assist with reining in my emotions, taming my monkey mind, and providing a much-needed relief. Through my dualistically trained ontology, unaware of the power of the mind-body connection, I subjected myself to long periods of unnecessary stress that left me sleep-deprived and physically | mentally exhausted. I was unable to recognize that my emotions were making me sick and unaware that it was within my own power to help myself. I lived in the grip of unawareness. Finally, when faced with Western medicine's helplessness against an autoimmune disorder I developed, I turned to the "alternative." I attribute freeing myself from the debilitating symptoms of my affliction to undergoing an intense therapy based in the Eastern healing tradition.

Quite unexpectedly (for I am back in the formal academic setting), it is the experience in the final stages of the doctoral program that has afforded my building bridges between what many still view as irreconcilable knowledge systems. I had a good fortune to get involved in research on emotions and *Mindfulness in Education* conducted by the co-authors of this manuscript. What I am learning (and am on a mission to share with others) is that mindfulness appears to be an example of a long-standing Eastern tradition (the "alternative") earning its

legitimized status through evidence provided by modern science (the "mainstream"). Accordingly, I agree with the contributors to the Special Issue that it is time to expand our understanding of what science is, what it does, who does it, and to what ends it is appropriated. Giving up on the destructive dualistic habits of mind might be a fairly suitable way to start this journey. We, the co-authors of this manuscript, suggest embracing a dialectic (or multilectic: see Fellner 2014) way of thinking where ideas like mind | body, animate | inanimate, human | non-human, local | global, individual | collective, alternative | mainstream do not compete but coexist one necessarily presupposing the other (the vertical line | represents the dialectic relationship between concepts). But there is more. Through the collaborative work with Tobin, I learned that doing research (science) is loaded with ethical responsibilities since, in one of Gangji's student's words, "we are put on this earth to do our best and not our worst." That is why we practice authentic inquiry where our participants have an opportunity to learn from knowledge that emerges. Faced with what we refer to as grand challenges, we imagine that science education could contribute to the development of process skills allowing people to understand and take charge of how their (and others') ways of conducting social life mediate their wellbeing and the wellbeing of their immediate animate | inanimate environment. Conceived in this manner, scientific literacy promises to spare us from, as noted by Pierce (2013), being "at the mercy of experts and corporate stakeholders for defining the terms in which people heal, feed and educate themselves."

Improving the Quality of Life

We consider wellness as a high priority item for inclusion in science education curricula. That there are many reasons and evidence for concern regarding our health is documented in the 2013 report issued under a telling title by the National Research Council and Institute of Medicine

(NRC/IOM). The report reveals that relative to those living in other "economically advanced, high income countries" Americans live "Shorter Lives" and are in "Poorer Health." This "health disadvantage" (as the authors refer to the phenomenon) exists despite the United States' "enormous level of per capita spending on health care, which far exceeds that of any other country" (NRC/IOM, 2013, p. 4). The report identifies complex factors (e.g., health systems, individual behaviors, social and environmental influences) contributing to the American health disadvantage which are shaped by public and private sector policies that we recognize as being driven by the plutocratic interests and neoliberal agendas (in other words, by what in this country is considered mainstream). Notwithstanding some of the underlying purposes behind the report that clearly are misaligned with our axiological stance, one of the recommended actions by its authors is to "alert the public" to their troublesome findings. Put differently, raising awareness about what makes us sick and why it does so is considered an essential action towards changing the alarming status quo. It is our contention that heuristics may serve as an effective vehicle for bringing into focus wellness-promoting practices such as mindfulness. Schools appear to be an ideal environment for conducting the heuristic-based preventive work since, as stated in the NRC/IOM report:

> [t]he seeds of illness that strike older adults are often planted before age 25, a period when adverse social and environmental exposures and the establishment of unhealthy behaviors and risk factors can lead to life-long consequences (p. 9).

Thanks to their inherent malleability (the shape shifting quality), heuristics may be easily adopted and used towards raising awareness about other areas of concern within the category of grand challenges. For example, since it may be impractical/impossible to provide students like those sitting in Gangji's classroom with the hands-on experiences similar to those I had on my

grandmother's farm, heuristics may carry meanings associated with promotion of sustainable ways of living. Likewise, they may tap into topics like healthy eating habits, alternative ways of healing, etc. By offering a heuristics-grounded approach, we join the contributors to the Special Issue in advocating a shift away from the traditional framing of science teaching | learning and towards inclusion of the "alternatives" through embracing *heteroglossia* with its emphasis on multiplicity, openness and democracy.

CHAPTER 6

FROM THE GRIPS OF DEPRESSION TO A NEWFOUND EUPHORIA FOR LIVING– GLIDING ACROSS THE SPECTRA OF RESILIENCE AND OUTLOOK

The Shocking Meaning Behind 'He Finally Did It!'

It is a cold evening in early October of 2012. After a relaxing and satisfying dinner at our favorite restaurant, my dining companion and I are on our way back home. I am looking forward to getting there in a matter of minutes and to spending some time lounging on the sofa in front of the TV before turning in to conclude my busy weekday. At the moment, I am unaware that this evening will mark the beginning of a profoundly significant chapter of my life, a chapter which will create openings to enacting and embodying theories and practices I learned through mindfulness-grounded research. My blissful-like state gets interrupted when my cell phone rings. I hear a friend of mine speaking in Polish in a grave tone, "It's about Piotr; he finally did it; he tried to commit a suicide. There was a lot of blood … he's unconscious. The ambulance just took him to Bellevue Hospital. My wife and I are on the way there." As I hear these words, a wave of emotions floods over my mind and body. The familiar knot in the stomach associated with fear and anxiety settles in instantly. I can sense adrenaline rushing through and my heart pounding in the chest. Simultaneously, my brain is busy cognitively processing information and coming up with the plan of action. Guided by the resultant thoughts mixed with emotions I call my now adult son, Alex, and break to him the disturbing news about his father. Moments later Alex and I arrive at the hospital's ER where we are relieved to learn that Piotr will make it. We stay through the night witnessing three consecutive shifts of ER staffers attending to Piotr in an unhurried manner with long periods of in-between non-actions. Fourteen hours later we are informed that

Piotr will be transported to the psychiatric ward where he will need to stay for observation and further evaluation.

What to Do? Who's to 'Blame'?

It takes extreme situations like those involving attempts at self-inflicted (or other-directed) harm for some of us to reflect (even if briefly) on the *why* questions. When it happens, mass media that thrive on sensationalizing individual and collective tragedies will parade reactions by members of the victim's community who reside in his/her varied social fields (be it family, friends, neighbors, co-workers or co-worshipers, to name a few). Invariably, these commentaries will fall somewhere on the spectrum between an utmost surprise (e.g., *"He was such a quiet [meaning: pleasant and 'normal'] person."*) and an acknowledgement of "troubling signs" (e.g., *"He has always been an outcast."*) Informed by theoretical frameworks and empirical applications associated with mindfulness-based research, I find both scenarios troubling. In my view, the "surprisees" are possibly people who exhibit low levels of Davidsonian *Social Intuition Dimension* of Emotional Style (Davidson and Begley, 2012). The "knowers," while seemingly well positioned to intervene, appear to lack compassion or perhaps opt not to exercise their agency in mediating the relevant structures. As for the "victims" themselves, if we were to peer into their brain activity, we would likely find that they exhibit physiological markers associated with low levels of *Resilience* and *Outlook*. As I demonstrate below, such was the case with Piotr. Additionally, members of the collective within his closest circle (including me) could not claim ignorance of his gradually deteriorating state of mind.

Piotr and I had been married for 20 years but decided to go our separate ways 10 years prior to the events described in the opening vignette. After the split, even though we did not reside together, we maintained regular contact and managed not to harbor negative feelings

towards each other. Indeed, we agreed that as a "non-couple" we were better positioned to (and we actually did) genuinely care for and support one another in our separate lives. I cannot quite pinpoint the time when (following our separation) Piotr started to openly speak about being unhappy, about not having the desire or motivation to wake up in the mornings, and about "being in a very dark place."

Figure 6.1. "In a Very Dark Place." Photo by Piotr Powietrzyński.

Thus, I was aware (as were people around him) of Piotr's deepening depression that was to a large extent catalyzed by his unrealized dream of "making it" as an artist. We (the people in his circle) were also aware that Piotr resorted to unregimented self-medicating practices involving a variety of pharmaceutical anti-depressants prescribed by his primary physician. Piotr made it known that the pills had a very fleeting calming effect and were not particularly helpful in offsetting his undesirable mental | emotional states. Furthermore, it was hardly a secret that Piotr

(often in the company of some of his male friends) regularly engaged in consuming excessive amounts of hard liquor in a potentially lethal combination with the prescription pills. Some of Piotr's frustration was compounded by his deteriorating physical health. In our frequent conversations, I tried to make him realize that the body and mind (his physical and mental health) were strongly interrelated. I attributed his emerging afflictions to years of working a night shift that left him sleep-deprived. It was clear that Piotr's worsening physical health catalyzed the decline in his mental wellbeing which in turn affected negatively his physical condition. As Piotr was experiencing this downward spiral neither he himself nor those who knew him seemed to be able to come to the rescue. Thus, while devastating, his ultimate act of desperation was hardly a surprise to those close to him.

After his release from the hospital, Piotr and I agreed that he would need to make major modifications in how he enacted his life (an ontological transformation) along with a necessary restructuring of his value system (an axiological shift). Therefore, we began conversing about mindfulness and its wellness-mediating advantages as supported by recent neuroscientific findings. At first skeptical, Piotr developed a curiosity towards the topic as he read about Davidson's research (Davidson & Begley, 2012) and reluctantly agreed to co-participate with me in a five-week long beginners' meditation course at New York's Shambhala Meditation Center. In addition to providing the introduction to a meditation practice, our trips to and from the Shambhala Center afforded Piotr and me the "together" time. With passing days, weeks, and months, I witnessed Piotr adopting the meditation practice into his daily routine. A year later, sitting across the table from me in a local Indian restaurant, Piotr announced that he was turning his two ten-minute daily sessions into a half hour practice. Piotr's trajectory towards improved wellness may be viewed as well-aligned with two of his identities: one based in his scientific

background as a trained (yet non-practicing) engineer and the other guided by his deep commitment to artistic sensibilities as a creative photographer. As I noted in Chapter 3, to Jon Kabat-Zinn the pursuit of contemplative practice may serve as the unifying factor of the different ways of knowing (artistic and scientific).

Since the infamous day over a year ago Piotr has undergone a profound transformation as his outlook on life improved gradually. He has *re*-turned to his upbeat self who welcomes each day with renewed energy and optimism. He has also resumed his artistic work with reinvigorated creative passion. What may come as a surprise to some, he accomplished this "re-birth" without relying on conventional ("mainstream") means: soon after being released from the hospital, he ceased resorting to pharmaceutical "mood boosters" and did not subject himself to the doctor-recommended psychotherapy. Piotr and I consider his disciplined daily engagement in breathing meditation practice a major intervention that has mediated improvements in his mental wellness. In other words, breathing meditation has become Piotr's medication or his proverbial "apple a day" which he administers to himself regularly because he knows he needs it and because he knows it helps. When considering a mindfulness characteristic, "When I'm emotional, I notice how my breathing changes," Piotr recently commented:

> Dzięki ostatnim medytacjom, w momencie kiedy zaczynam być zdenerwowany, staram się myśleć o oddychaniu i kontrolować przez oddychanie swoje emocje co udaje mi się coraz częściej. Bingo!
>
> *Thanks to my recent meditation practice, when I begin getting upset, I try to think about breathing and through breathing to control my emotions, which I am able to do more and more often. Bingo!*

Hence, according to a Davidsonian framework, Piotr has traveled a considerable distance toward the Positive end of the Outlook dimension of his Emotional Style. Physiologically speaking, he was possibly successful in increasing "the activity in the nucleus accumbens–activity sustained by signals from the pre-frontal cortex–which underlies the ability to sustain positive emotions" (Davidson & Begley, 2012, p. 85). Piotr appears to have also strengthened his resilience in coping with adversity; while at times he will still temporarily brood over occasional failures, they no longer send him to a "dark place" as his ability to help himself to "get unstuck" has strengthened. Even though I can attest to Piotr's progress, he maintains that he has not quite reached where he would like to be in regards to coping with what he perceives as occasional hardships (such as a monthly statement reporting low royalties from sales of his images). When we discussed a mindfulness characteristic, "I quickly recover when things go wrong for me," Piotr rated himself as still being at a slow-to-recover end of the spectrum. At the same time, he quickly added that he wished to move in "the other direction," i.e., he wanted "to be able to bounce back quicker" and to "decrease the [emotional] inertia." In neuroscientific terms, a decreased level of Resilience is associated with low activity in the prefrontal cortex or from a paucity of connections between the left prefrontal and the amygdala. To cultivate greater Resilience and faster recovery from setbacks, Davidson recommends mindfulness meditation as "it strengthens [those] connections between the prefrontal cortex and the amygdala, promoting an equanimity that will help keep one from spiraling down" (p. 243). Therefore, it is safe to assume that if Piotr sustains his "romance" with meditation, he will continue developing new neural pathways and will eventually reach desirable (as defined by him) levels of Resilience.

Even though my involvement in the aftermath of Piotr's ordeal was not formal research, in my eyes he became a beneficiary of the knowledge I had acquired through my engagement in

social inquiry into mindfulness. The uplifting quality of this very personal experience furthered my commitment to conducting authentic research. In the context of the porous character of the boundaries among social fields, participation in Piotr's triumphant journey provided powerful and compelling evidence supporting the desirability of promoting mindfulness-based interventions through research and practice.

Figure 6.2. Piotr in a happy place.

The Brahm's Concerto that Never Was–The Emergent Nature of Social Inquiry

Piotr's engagement with breathing meditation practice became an impetus for conducting a research study on social resonance. It was about the time when Tobin intensified his theorizing of social resonance following his emotional, teary-eyed, early morning encounter with Johannes Brahms' violin concerto (Tobin, 2013). Curious about this historically constituted emotional reaction, Tobin initiated a self-study aiming at investigating the intensity and possible

fluctuations in his heart rate, oxygenation level in his blood and facial expressions while watching the concerto performance of a Japanese-born soloist Sayaka Shoji. Coincidently at the time, Tobin acquired a bio-harness and was testing its utility for conducting research on physiological manifestations of emotions enacted in teaching | learning science. To that end, he analyzed the readings captured by the bio-harness during his engagement in a meditative practice. Highly intrigued by what he was learning, Tobin encouraged a few of his colleagues (including Chris Siry, Helen Kwah, Gene Fellner and me) to replicate his two self-investigations. While my meditation was not very consistent, I knew that Piotr has been keeping up with his for about six months. In addition, since I knew Piotr to be a classical music lover, I theorized that the concerto would generate waves of emotions in him. Therefore, instead of doing a self-study, I recruited Piotr's participation with relative ease, as by then he was an avid supporter of my doctoral journey.

On the day of "the study," I, now a fairly knowledgeable and experienced researcher who learned the craft working shoulder-to-shoulder with her academic colleagues (as I describe in previous Chapters), confidently set up a flip camera and established a Bluetooth connection between a PC laptop and a finger pulse oximeter whose two components I had placed on Piotr's wrist and index finger respectively (for more extensive description of the use of oximeters refer to Olga Calderón's 2014 dissertation). Piotr and I sat on a moss green, plush-like sofa in the living room of his rented apartment in Queens. In this "phase one" of the study, the loosely-defined plan was to establish whether a 10-minute breathing meditation practice was associated with particular physiological patterns (as expressed in the level of Piotr's heart rate (HRD) and oxygenation in his blood (SpO2)) that would be distinct from the state of equilibrium (or the base line). Most of the studies investigating what happens during contemplative states focus on brain

activity. For example, in research involving Buddhist monks, Richard Davidson uses functional magnetic resonance imaging (fMRI) in order to peer into what happens during different types of meditation practices as well as to ascertain how brains of experienced meditators differ from those of novices or non-meditators. An older and less advanced method employed to gain similar insights is the use of electroencephalography (EEG) which measures basic brain electrical activity. EEG may be used to give mindfulness trainees information concerning the brain waves they produce as illustrated in the Concord High School study (Finley & Barton, 2013). In an investigation that examined reflexive practices involved with learning to teach, Tobin utilized EEG to examine his neural processing as he observed his teaching of a doctoral level class (Tobin & Ritchie, 2012). In reporting the study results, Tobin and Richie point out that "the equipment available for neural level research does not allow for extensive movement, including movement of muscles surrounding the mouth while talking, movement of the head, gestures, and body movements in general" (p. 126). In that sense, notwithstanding high cost of the neuroscientific equipment, while it is an undeniably powerful source of valuable information, its utitlity in a classroom situation is highly impractical. As I describe in Chapters 1-3, in our studies centered on emotions, we favor investigations involving HRD and SpO2 readings and analyses of facial expressions.

Since during breathing meditation a person focuses on his/her breath, the breathing pattern is expected to change; I find that my breath slows down and it is deeper than usual. I theorized that in a meditative state Piotr's HRD would be lower and his SpO2 would be higher as compared to the respective readings in a non-meditative state. My theorizing was supported by the empirical evidence that emerged from the Brooklyn College study where the participants' HRD appeared to have been mediated (dialed-down) by deep abdominal breathing. In order to

obtain a base line for his SpO2 and HRD during a non-meditative state Piotr and I engaged in a 35-minute dialogue (in our native tongue) around the characteristics in one of the versions of the mindfulness heuristic. We followed a protocol similar to that employed in the study described in Chapter 1 where individual characteristics in the heuristic are used to guide a conversation. Piotr engaged in his meditation practice immediately after we completed our discussion. What was to follow on another day was the "second phase" of the study involving Piotr watching the Brahm's concerto. As is usually the case in our multi-method research, this study was an affordance for collecting a variety of data sources: a video file that captured our heuristic-focused dialogue and the oximeter readings for both non-meditative and meditative states.

"Can It Be That My Body Does Not Need All That Oxygen?"

In order to analyze the oximeter data readings, I loaded up the file into SPSS and ran basic descriptive statistics (see Tables 6.1 and 6.2). Upon eyeballing the results, I discovered that Piotr's HRD was indeed slightly lower and had less variability in a meditative state as compared to a non-meditative state or what I naively considered the state of equilibrium (more on this later). What drew my attention, however, were Piotr's SpO2 readings, as they appeared low compared to what is regarded a healthy level (95%-100%). To investigate this finding further, I proceeded to running frequencies (see Tables 6.3 and 6.4).

Table 6.1
Piotr's SpO2D and HRD (Non-Meditative State)

		SpO2D	HRD
N	Valid	6582	6582
	Missing	0	0
Mean		95.3	64.1
Median		95	64
Mode		95	63
Std. Deviation		.6	2.8
Minimum		94	59
Maximum		97	88

Table 6.2
Piotr's SpO2D and HRD (Meditative State)

		SpO2D	HRD
N	Valid	1839	1839
	Missing	0	0
Mean		93.6	63.3
Median		93	63
Mode		93	63
Std. Deviation		.8	2.5
Minimum		93	58
Maximum		97	74

In the non-meditative state, 62% of the time Piotr's SpO2 was at 95%. Interestingly, however, during the meditative state, 87% of the time, his SpO2 was below the 95% mark with the majority of the time (59%) recording a relatively low reading of 93%. Alarmed by the oxygenation data, I shared with Piotr my findings and my concern for his wellbeing.

Table 6.3
Piotr's SpO2D (Non-Meditative State)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	94	373	5.7	5.7	5.7
	95	4102	62.3	62.3	68.0
	96	2083	31.6	31.6	99.6
	97	24	.4	.4	100.0
	Total	6582	100.0	100.0	

Table 6.4
Piotr's SpO2D (Meditative State)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	93	1086	59.1	59.1	59.1
	94	521	28.3	28.3	87.4
	95	164	8.9	8.9	96.3
	96	45	2.4	2.4	98.7
	97	23	1.3	1.3	100.0
	Total	1839	100.0	100.0	

In his immediate reaction Piotr wondered if his body simply did not need "as much" oxygen. When I expressed doubts, he brought up as a possible culprit his 30-plus history of intense cigarette smoking. Indeed, some research establishes a connection between smoking and lowered oxygenation in blood. For example, in a 2002 study of 38 healthy volunteers, cigarette smoking was associated with a decrease in nocturnal oxygen saturation (Casasola, Alvarez-Sala, Marques, Sanchez-Alarcos, Tashkin, & Espinos, 2002). Similar to Aimee whose story I feature

in Chapter 3, becoming aware of a potentially unhealthy condition gave Piotr pause and yet another reason to consider quitting the habit. Even though, unlike Aimee, Piotr continues to smoke, as his health improves, his resolve to free himself from cigarettes continues to strengthen. Indeed, a few days ago, he told me that it was the very next thing he wishes to change in his life. Based on his recent track record of self-managed improvements in wellbeing, I have every reason to believe that he will be able to accomplish this goal relatively soon.

The Unexpected Within Social Life–The (Indisputably) Emergent Nature of Social Research

> If you read original scientific papers, it is easy to get the impression that the researchers thought of a question, designed a clever experiment to answer it, and carried out the study with nary a dead end or setback between them and the answer (Davidson & Begley, 2012, p. xv).

In the above quote, Davidson remarks on the serendipity implicit in conducting research that is often invisible to those who receive the study's final product. While some scholars claim that they are able to exert full control over their work (by carefully designing a study and then testing the predetermined hypotheses and answering the pre-fixed research questions), I find it valuable for researchers to explicitly acknowledge that the "messiness" and unpredictability of social life must necessarily play a major role in their practice. Assuming a theoretical framework in which research (including its design) is expected to be contingent and emergent creates spaces for exciting and unanticipated explorations that enter and expand our field of vision as we dive into our work. A key component of this principle rests in the researcher's willingness (ability) to step down from the "expert" pedestal and to invite the study participants to partner with her in a democratic dance of give and take. Thus, she needs to feel at ease with shifts, twists, and turns

accompanying the storyline as the study unfolds. This openness and flexibility are requisite for research to be authentic, i.e., if research participants are to benefit from it, they must have a say in how the research evolves. I still experience the challenge of not privileging a single voice (particularly my own) and to understand and accept other people's standpoints. A considerable amount of time during our research squad meetings was (and continues to be) devoted to discussing the importance of valuing and learning from difference. The emergence of our recent heuristics: *Mindfully Speaking* and *Mindfully Listening* was mediated by similar conversations often in response to our research findings. As I illustrate below, while valuing difference ranks high in my axiology, I am still working towards incorporating it into my in-the-moment enactments. Unsurprisingly, positioning myself within another's vantage point becomes a particularly formidable task when strong emotions are involved, i.e., when I (and those I happen to interact with) feel passionately about a given concept. Fortunately, for those of us who wish to transform their practice, there are tools that may help with this challenge. I find video recording an invaluable resource in assisting with reflecting back on a practice and bringing into a conscious level much of what may be invisible to us in real time. Frequently, it is not until we analyze data captured by a camcorder, when we zoom in to a micro-level, that hidden treasures of social life reveal themselves. As I have seen in our research, a reflexivity booster feature of video files (and other electronic media such as oximeters) may become a useful tool assisting in building mindfulness which rests in increased awareness of social structures relating to self and to others. I consider it of utmost importance that video recordings be used by pre-service and in-services educators towards improvement of their classroom practice or any other practice involving interactions with other sentient beings. Ergo, we (the members of Tobin's research squad collective) routinely record (and later analyze and share with participants) all aspects of

our interpretive research. In addition, Tobin makes available to his students (via Dropbox) recordings of class sessions they are engaged in. These files may assist in recollecting the conceptual content of the class and, perhaps more importantly, in examining practices and enactments (including the non-verbal ones) that emerge during the class. We are in the company of our New York University colleagues, Susan Kirch and Kara Naidoo, who utilize video of "shared authentic teaching experiences" as a training tool towards honing "transformative reflection" skills in pre-service science education teachers (Naidoo, 2014).

One might ask why it is that NYC Department of Education considers video recording an unacceptable practice in the public school context. Can video recording cause harm? I still remember the initial apprehension associated with the awareness of being recorded during the research-related work and with having to watch myself when analyzing video files. I often wonder if being "camera-shy" was my individual trait or was a direct result of having been educated in the communist system where *conforming* rather than *performing* was valued so development of skills such as public speaking was not taught or encouraged. Instead public humiliation and criticism of students by teachers reigned supreme in schools. In addition, raised Catholic, I was impacted by the church's expectation of humility among the members of its flock. Hence, my anxiety might have been a result of being my own worst critic (possibly seasoned with a pinch of vanity). Thankfully, once a member of the research collective, it did not take me long to adapt to the omnipresence of cameras in the research context. Principles of mindfulness to refrain from judgment of self and of others might have been a mediating factor in this relatively effortless transition. I doubt that being video recorded poses a problem for our young generation who is used to the ubiquity of ever-smaller, ever-faster, and ever-smarter audio-visual technologies combined with the instantaneous Internet. In the current era of selfies,

text messaging, Instagram, Facebook, and YouTube, it has become their second nature to capture and publish images and videos of self and others. Therefore, it seems unwise of educational policymakers (such as those at the NYC Department of Education) to be restrictive about the use of video in the educational setting towards the improvement of practices. Let's not forget that those involved in research are bound by ethical obligations implicit in the principles of beneficence (The Belmont Report, 1979).

"Oh-oh! Do I See What I Think I See?"

> At peak moments [of entrainment] the pattern tends to be jointly shared among all participants: in high solidarity moments, bodies touch, eyes are aligned in the same direction, movements are rhythmically synchronized. At moments of failure of the interaction, bodies turn away from each other, heads turn downward or inward toward one's body, eyes look down or away (Collins, 2004, p. 135).

Figure 6.3. Emotional entrainment.

Figure 6.4. Failure of the interaction.

Following my visit to Piotr's apartment, I proceeded to *re*-viewing the video file of our heuristic discussion. My initial interest was in the discursive content of our conversation, i.e., I wanted to remember and transcribe what each of us had said. A few minutes into the file, however, my attention was drawn to our physical conduct. I started noticing evident synchronies in the way Piotr and I positioned and moved our bodies, in how we gesticulated, in our facial expressions, and in our eye movements. To further investigate what I was seeing, I shifted the level of analysis by watching the recording first in slow motion and then frame-by-frame. There was no denying it; what was captured in images moving in front of my eyes was an instance of what at the time I understood to be a manifestation of social resonance. In this instance, Emotional Energy (EE) (Collins, 2004) constituted a structure that generated high levels of physical entrainment unbeknownst to us in the moment. The outtakes from the video file in Figure 6.5 capture some of our bodily synchronies.

When arguing the empirical nature of EE, Collins points to bodily postures and movements, eyes, voice, hormone level, and facial expression as possible ways of identifying its existence. Knowing that the occurrence of social resonance is historically constituted, I thought about the significance of Piotr and I having spent 20 years living together. At the experiential

level we know that by being in with the other, we may become like the other. We possibly develop similar patterns of conduct and we are able to understand each other "without words." I find that our perception of social world is limited by our senses and by lack of attention to the in-the-moment enactments prevalent in Western cultures. It is quite possible that through mindfulness practices, we may develop increased awareness of what otherwise happens at a subconscious level. It was enlightening to learn that other forms of perception exist. For example, Zoran Jasipovic (2014) shared his findings around the practice of non-dual awareness meditation that is characterized "by a progressive decrease in habitual fragmenting of the field of experience into self-related versus other-related processes" (p. 13).

Figure 6.5. Synchronic body movements.

"I Want to Make Happy Someone Who Truly Needs Help." Can Compassion Be Selective?

Our synchronic dance took an abrupt turn 29 minutes and 50 seconds into our conversation. While considering a mindfulness characteristic: "I'm compassionate to people even if I don't know them," Piotr and I encountered a disagreement that generated an emotionally charged exchange lasting about 3 minutes and 15 seconds. To counter Piotr's self-rating of *often*, I brought up a situation that occurred on a cold March evening during one of our trips back from a mediation class. On that occasion, we were approached by a homeless person who politely asked

for money. I engaged the young man in a brief conversation and handed him $5. After we had walked away, Piotr, who believed that the person appeared able-bodied and possibly a "scammer," expressed his disapproval of my action. Now, evoking the situation, I questioned Piotr's assessment of his level of compassion towards others. The following is a one-minute-nineteen-second excerpt of our conversation represented by text (both in Polish and in its italicized English translation) and by the select outtakes from the video file:

Małgorzata: Nie masz dla wszystkich, bo …

You don't have it [compassion] for everyone because …

Piotr: Nie mam, nie mam …

No, I don't, I don't have it …

Małgorzata: Bo ty wybierasz kto zasługuje na *compassion* a kto nie zasługuje. A *compassion*, według mnie jest, powinna być, niezależna od tego co dany człowiek sobą reprezentuje …

Because you choose who deserves your compassion and who doesn't. And compassion, I believe, is … should be, independent of what a particular person represents …

Piotr: Idealistycznie rozmawiając tak, a praktycznie, umm …

Idealistically speaking, yes, but in practice, umm ….

Małgorzata: ... dlatego, że to nie jest **twój** problem co się z tymi pieniędzmi stanie. Czy ten człowiek był uczciwy, czy ten człowiek był nieuczciwy, czy on wyda na jedzenie, czy wyda na crack …

*... because it is not **your** problem what will happen to the money. Whether the person was honest, whether he was dishonest, whether he spends the money on food or on crack ...*

Piotr: Aaa …

Aaa ...

Małgorzata: ... bo to nie jest **twój** problem, to jest **jego** problem, to jest jego problem, że on jest nieuczciwy. Twój problem jest taki, że …

*Because it is not **your** problem, it's **his** problem; it is his problem that he is dishonest. Your problem is that …*

Piotr: Mój problem jest taki, że jeśli mam 5 dolarów, które mam wydać to chcę je wydać, chce kogoś naprawdę uszczęśliwić kto tej pomocy potrzebuje.

My problem is that if I have $5 that I want to spend it, I want to make happy someone who truly needs such help.

Małgorzata: Ale skąd wiesz … Ale kim ty jesteś żeby decydować kto tej pomocy naprawdę potrzebuje?

And how do you know? But who are you to decide who truly needs that help?

Piotr: Żyjemy w świecie …

We are living in a world …

Małgorzata: Ale ty nie znasz tego faceta, nie masz zielonego pojęcia kim jest ten człowiek; czy on potrzebuje, czy nie potrzebuje, czy jest chory, czy jest głodny, czy jest cwaniakiem, czy jest pijakiem, nie wiedziałeś tego …

But you don't know this fellow, you have no idea who he is; whether he is needy or not needy, whether he is sick or hungry, whether he is a scammer or a drunk, you did not know that …

Piotr: Aaa …

Aaa …

Małgorzata: Ty zrobiłeś założenie.

You made an assumption.

Watching the video I noticed how Piotr's and my conduct reflected our elevated, negatively valanced emotional state even though when "caught in the moment" we might have been oblivious to it. For example, unaware of it at the time, I crossed my arms 49 seconds into the exchange as if closing myself off.

As may be evident in the transcript of our conversation (notwithstanding its imperfect and incomplete representation of what transpired (see Fellner, 2014)), I kept on interrupting Piotr and

challenging his point of view while trying to convince him of my position by speaking over him. In other words, I was failing miserably at engaging in *radical (mindful) listening*. Even without conducting a formal prosody analysis, the increased volume, pitch, and frequency of our voices (particularly mine) were evident at the meso level. Piotr's bodily response occurred 18 seconds after I folded my arms when he visibly shifted his body and crossed one of his legs over the other seemingly mimicking my crossed arms.

Interestingly, for a few seconds Piotr's leg and one of my then-very-animated arms were moving in unison. When we watched this fragment of the video file together, Piotr admitted to "boiling" inside. However, "on the outside" he was much more successful than I was in waiting his turn and in controlling his emotions. In other words, while I was *reacting* (a feature of an unmediated emotional state), he was *responding* (a quality of a mindful state). Ironically, throughout our conversation I felt that having devoted a considerable amount of time to conducting mindfulness-based research, I knew more on the subject than did Piotr. Therefore, I was convinced that I had something I could educate him about. In that sense I assumed a familiar role of a "teacher," or a person with "knowledge" which represented a fairly traditional epistemological stance. It turned out that it was Piotr who embodied mindfulness principles to a much greater degree than I did. In retrospect, I realized (yet again) that the value of knowledge lies not in what you know

cognitively but in how well you are able to enact or apply it. Furthermore, I was reminded of dialectic relationships (in this case between teaching | learning) inherent in social life. One must never forget that teaching and learning are reciprocal activities. Therefore, it is limiting and artificial to ascribe static roles and identities (such as that of a student and a teacher) to actors in an educational field.

Piotr and I noticed that despite the argument getting "heated," we did not allow for negative emotions to totally take over and we were able to move on by "agreeing to disagree." Such a scenario would not have been possible when we were younger and perhaps less mindful. We remembered situations during our marriage when discussion like this one ended with feelings getting hurt and doors being slammed (both literally and figuratively) followed by long periods of mutual silent treatment. I wished I had known then what I know now about mindful ways to prevent from emotionally charged reactions from arising or to deflect potentially explosive situations. There is plenty of evidence that outside of our homes and living rooms students and teachers need assistance with mediating emotional climates in schools for the benefit of learning and wellness. Similarly our workplaces are sites where a good dose of mindfulness could potentially assist with calming rough emotional waters. Sometimes as little as a softened facial expression or a gentler tone of voice might do the trick as was the case with Piotr and I concluding our argument.

What Makes for an Event?

Consistent with William Sewell's (2005) theoretical framework of *an event-oriented social inquiry* where an event constitutes a unit of analysis of (social) life, the 3 minutes and 15 seconds may represent an event. In the context of phenomenological-hermeneutic investigations, an event may be identified using multiple methods and through applying multi-level (macro | meso | micro) analyses. As illustrated in the above example, video files may provide data for rich analyses including that of the content of a conversation, of facial expressions of emotions, of prosody, and of proxemics. Peering into fluctuations in one's physiology is yet another conduit to identifying and further analyzing an event. In the case of our discussion around compassion, Piotr's emotional response did register as a change in his heart rate. It is represented in Graph 1 as a steep peak that occurred between 21:19:49 and 21:25:22. Supported by the empirical and theoretical evidence, we may conclude that Piotr's increased heart rate was a reflection of his body's reaction to his emotional state. From the methodological standpoint, a curious researcher might decide to use the peak and the seconds surrounding it as her unit of analysis.

Another feature of an event is that it represents a contradiction or what Tobin (2012) refers to as a breach in cultural fluency of an interaction. It is "when the unexpected occurs that actors take stock of what has happened and reflect on action" (p. 2). In what I described above,

our disagreement constituted such contradiction in otherwise fluent conversation complemented by the context-appropriate non-verbal conduct. Studying contradictions through event-oriented social inquiry is one way a researcher may get closer to constructing meanings that comprise the complexity, multiplicity, and dialectics inherent in an interaction. As Fellner (2014) reminds us in his compelling manifesto "we need multidimensional ways of representing collected data in order to provide the clearest picture possible of the educational landscape" (p. 170).

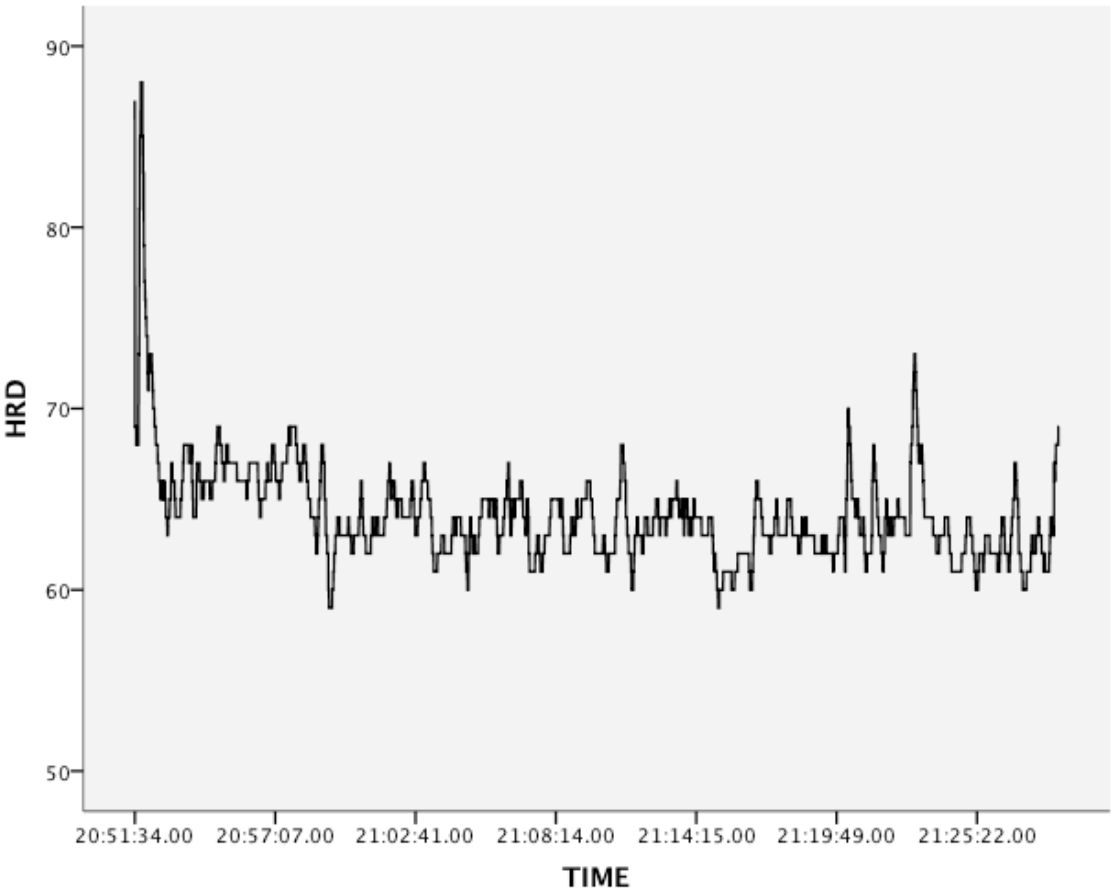

Figure 6.6. Peaks and valleys of Piotr's HRD during the heuristic discussion.

How May It Be Relevant to You?

If we were to follow Margaret Eisenhart's (2009) logic regarding theoretical generalizability of "qualitative research," we should leave it up to the reader to decide how relevant to their context is what I have discussed in this section. However, propelled by my passion and sensibility as a veteran educator and now a curious hermeneutic researcher, it behooves me to share my understandings of possible implications my work may have for teaching and learning. First, I need to underscore that having been exposed to and having plunged into the waters of sociocultural framework I have began to frame education broadly as extending beyond (or rather including) the walls of a formal classroom. Indeed, I can think of very few aspects of social life that would not present an opportunity for learning to occur. The roots of my conceptualizing education in this way lie in the gradual shifts in my epistemological and axiological stance away from the (non-egalitarian) mainstream that privileges the dominant (as determined by a socio-economic affiliation) ways of being, (inter)acting, and knowing. Applying sociocultural lenses to research is meant to widen, sharpen, and nuance our understandings of the lifeworlds of ourselves and those we study. The lenses serve to legitimize diverse ways of knowing and they acknowledge the multiplicity of the pathways we travel to arrive at that knowledge. Such comprehensive understanding of learning is not unique. Others who work in the sociocultural tradition including Maria Varelas, Danny Martin and Justine Kane (2012), consider "learning as a sociocultural activity that encompasses interactions among people, artifacts, and ideas in sociohistorical, cultural spaces that people shape, and are shaped by, as they act and interact within these spaces" (p. 324). Schools are a special instance of sites where acting and interacting is expected to lead to knowledge (re)production. With their narrowly defined, legislatively-dictated mandates many public schools in US (particularly those serving minority populations in

urban neighborhoods) become dysfunctional, unsafe, and hostile spaces where difference (in all its shapes and colors) creates friction and clashes between students and teachers, among students, and among representatives of school personnel. Accordingly, too many members of school communities experience well-documented high levels of stress, depression, and burnout that may originate and be amplified within the school walls and outside of them. In other words, similar to Piotr, many of the actors in educational spaces may find themselves in a "very dark place." If the same actors are to be able to "shape spaces," they may need interventions that lead to the transformation of existing structures including their health. Health might be one of the most important aspects of human experience. In the absence of good health, it is challenging to accomplish the smallest of tasks and to fully enjoy life (as was the case with Piotr). Undeniably, physical and mental wellbeing is crucial for quality educational experience and it is time we focused on wellness as part and parcel of the teaching | learning process. Conventional (Western) medicine (supported by the deep pockets of the almighty pharmaceutical corporations) would have us believe that our health is the exclusive purview of trained doctors and that we have little control over our wellbeing. What I have documented in the pages of this chapter is that it is possible to take charge of one's wellness. I consider Piotr's transformation profoundly compelling empirical evidence of the health mediating effects of mindfulness practices. My participation in Piotr's journey afforded me becoming an eyewitness to how through mental exercise a person may be able to rewire his/her brain and shift dimensions of his/her Emotional Style towards a more desirable direction. I am convinced that if we used fMRI to obtain images of Piotr's brain "pre and post-intervention," we would likely register positive changes similar to those recorded in meditation practitioners (including relative novices) by contemplative neuroscience researchers such as Richard Davidson. Hence, it would follow that it might prove

beneficial to incorporate exploration and adoption of mindfulness-based interventions into educational curricula including those in schools of education and in teacher professional development trainings. That there is scientific evidence supporting the benefits associated with mindfulness practices is additional reason to legitimize inclusion of this knowledge base in schools as part of the toolkit shared by teachers, students and school administrators. It is not without significance that Piotr was able to undergo his transformation because he was supported and encouraged by someone who genuinely cared for him. Since mindfulness assists with strengthening our sense of compassion towards self and others, cultivating it may contribute to creating more caring and supportive school environments similar to those Piotr and I share.

I am not trying to argue that mindfulness is a remedy that can cure all ills of today's educational system; I am painfully aware of the powerful, change-resistant, inertia-laden macrostructures (including economics and politics) that mediate what can and cannot happen in schools. However, I do believe that we have the ability to exert a great deal of agency over our daily enactments regardless of which fields of social life we find ourselves in. Mindfulness-amplified awareness and compassion may allow those enactments to be more responsive, sensitive, and altruistic rather than reactive, hostile, and self-serving.

To be sure, careful consideration needs to be given when selecting an approach to rolling out contemplative practices in schools. While a number of models have already been implemented successfully in a variety of educational settings across the country, they tend to be local in nature and they are typically originated and conducted by well-intentioned, highly motivated mindfulness enthusiasts. Therefore, promoting introduction of mindfulness on a larger scale as a mandated part of curricula might be unrealistic on one hand and counterproductive on the other. Indeed, what amounts to an attempt at legislating a form of mindfulness training into

schools is the Academic, Social, and Emotional Learning Act of 2013. Introduced by a vehement mindfulness advocate, Congressman Tim Ryan, the legislation has a predicted 1% chance of being enacted. What complicates matters is that, if mandated, "teaching" mindfulness may be perceived by teachers and students alike as yet another task that needs to be completed within their already busy schedules. The unintended result may include teachers shouting commands in preparation for a deep breathing practice or, even worse, students being tested and/or graded on their competence with mindfulness skills. A grassroots-like movement of exposing small groups of individuals to mindful ways of being might be a more promising course of action. In other words, starting small and creating ripple effects may prove effective. As I noted in previous chapters, individual members of our research squad collective have begun this work in their respective communities.

Two of my identities were salient throughout the unfolding experiences I described in this chapter: my familial identity as a caretaker of a former spouse and my rapidly-gaining-prominence identity of a researcher. Taking cue from Tobin (2012) I gradually adopt the "ontological stance that theory illuminates experience, affording participants making sense of their social life" (p. 2). Accordingly, in this case mindfulness theory assisted Piotr and me in identifying and traveling viable pathways towards healing. In addition, unexpectedly, a brief event during our mutual journey became an affordance for self-reflection and realizing how much of what we do happens without our awareness. It also reminded me of how challenging it is to relinquish the power we often assume as teachers especially when high emotional states are part of the structural flux. What this means for an educational arena is that teachers need to be familiar with research methodologies and they need to be encouraged to do research on their own practice. They need to be able to increase their own and others' (e.g., their students') awareness

of how the classroom interactions are mediated by their conduct and the conduct of others. They need to bring to their own and others' attention how raised voices and animate gestures may disrupt mutual focus and interfere with maintaining positive climates. From a methodological standpoint, cameras need to be part of teacher-led research to sharpen our individual and collective perceptions. It's essential to know that reflexivity affords a possibility of making transformations. As Tobin remarks, "thinking back on what happened during a science lesson with the purpose of identifying desirable changes necessitates evaluations being made about what is and is not working for the benefit of the teachers and students." I find unacceptable current policies banning NYC public school teachers from conducting research and from using video recording in their classrooms. Our teachers and students deserve a chance to shape their school practices based on what they learn about the uniqueness of their collectives.

If schools are to provide preparation for life, they need to help our young people develop skills that will help them in life writ large. Skills like reflexivity and mindfulness promise to assist in slowing down and watching life in a frame-by-frame mode as advocated in a recent CNN interview by a successful businessman and a social and environmental activist Russell Simmons:

> The moving meditator is the watcher and he realizes that all that is outside is small and everything that's informed and important, inspirational and promotes happiness is inside. So all the outside is just fun. And you have to make the world fun. The idea of stress and anxiety that relates to "stuff" that comes and goes is self-imposed (Gupta, 2014).

Follow Your Heart−Looking Ahead While Learning From a Look Behind

> [O]ne of modern science's distinguishing features is its epistemological alliance to matters of the natural world and claims of purity from the sociocultural. The work of modern science, in other words, has been understood since modernity as taking place in the objective and knowable universe out there as opposed to the messy human world that is cluttered with things like values, morality, and above all else politics (Pierce, 2013, p. 3).

I am writing these words upon recommendation of the members of my Doctoral Advisory Committee subsequent to the successful and joyful occasion of my Ph.D. defense exam. Accomplishing milestones similar to earning a three-lettered acronym to follow one's name seems like a legitimate reason for reflecting back and looking ahead. Invariably two slightly annoying queries, both by self and by other(s), emerge: "What have you learned?" and "What is next for you?" When I was embarking on a doctoral journey a good while back, partly encouraged by my then co-worker to enroll in the program together, I was not entirely sure why I was doing it. What I knew for certain was that I did not imagine pursuing research activities as a career. Once in the program, I watched my industrial and efficiency-driven co-worker "knock off" four to five courses a semester with a pragmatic goal of getting to the finish line quickly, all the while working full time. She was like a horse with the blinders on from the opening quote of Chapter 5. Even though I was progressing at a snail pace of my part-time status, I, too, appeared to be focused on reaching the destination rather than on enjoying what, I hope, is meant to be an intellectually stimulating ride. As I remark in the Foreword, when nearing the last stop of my uneventful Ph.D. expedition, I was fortunate to cross paths with individuals who assisted in igniting a scholastic fire inside me. Since then, captivated by the new ideas that resonated with

me deeply and supported by a collective of like-minded scholars, I have been experiencing a profound, revolutionary-like epistemological |ontological | axiological transformation.

Contrary to my prediction, I have become a researcher with a passion for utilizing a sociocultural framework. A sociocultural lens helped me realize that research is not "out there," disconnected from human experience and a purview of elite scientists clothed in proverbial white coats. Research is one way of making sense of, in Pierce's words above, "the messy human world" that is cluttered with values, morality, and politics. When conducting interpretive research, I acknowledge that the phenomenological perception of "how things are" is radically subjective and so there is no one objective truth. Accordingly, I endeavor to capture and represent multiple "truths" of lived experience through voices and meanings of research participants. To that end, I have adopted the principles of polysemia and polyphonia that I consider part and parcel of the theory of difference. I have been learning to value difference, or Sewellian contradictions within thin coherence, as a crucial and unavoidable fixture in a structural flux of social life.

Difference has been omnipresent in the course of my research. For example, it was manifested in what each of us identified as salient and in the multiplicity of interpretations of specific events. It was evident in endless negotiations of individual (researchers' and student-participants') goals and agendas that were at times (particularly in the early stages) accompanied by clashes. It also revealed itself in the variety of ways people responded to mindfulness. In a hermeneutic process, they each made their own sense of what a mindful way of being meant by adopting specific aspects that resonated with them in this multidimensional construct. In other words, those who adopted a mindful ontology (me included) made it their own in the heuristically driven reflexive process that might have occurred at varied degrees of

consciousness. I must acknowledge that I have found it fairly challenging to fully embrace difference and to abandon the tendency to shove everyone into a single mold. I am convinced, however, that learning of and gradually adopting mindful practices has mediated my (and others') ability to negotiate difference. To illustrate, engaging in mindful speaking and listening (what may be referred to as radical listening) involves being fully present and attentive (as opposed to being focused on one's own thinking or letting one's mind wander). It also involves assuming a non-judgmental and compassionate disposition towards self and other(s) and avoiding getting stuck on thoughts or emotions. Furthermore, it is about giving up on the *either/or* dichotomies in favor of the *both/and* dialectic. Taken together, such practice affords heightened ability to exercise educative authenticity of situating oneself in the other's shoe.

Dialectical thinking has become my preferred way of making sense of social life. In light of my conviction that research is profoundly social, the individual | collective dialectic has gained particular salience. I grew to appreciate the supportive sense of connectedness and togetherness inherent in conducting interpretive research studies. I also understood that research is done *with* others and not *on* others and how artificial and delusional it is to make a distinction between the researcher and the researched. I have recognized that with its emphasis on individualism and competition the US ideology of market economy turns otherwise lofty ideas such as "United we stand, divided we fall" or "No child left behind" into empty proclamations. Exposed to mindfulness (with its roots in dialectically-friendly Eastern thought), I have rejected the tenets of Cartesian ways of thinking and being.

At the heart of the research I subscribe to is an unbreakable commitment to the principles behind conducting authentic inquiry. To a large degree, this commitment is motivated by ethical principles and compassion inherent in a mindful way of being. My engagement in authentic

research around mindfulness has elevated promotion of wellness to a prominent position within my axiology. As I comment across the chapters, concern for wellbeing of our fellow men and women has motivated feverish work of other enthusiasts of contemplative science. Jon Kabat-Zinn offers his signature program as a way to assist in coping with ever-present and devastating stress. Richard Davidson endorses meditation and yoga as mental | physical exercise mediating, among others, symptoms of PTSD and ADHD. As I document in the pages of this dissertation, my wellness-promoting mission originated at the Brooklyn College Study. Initially, having recognized potentially debilitating effects of powerful emotions, I was framing mindful practices as interventions to alleviate heightened affective states that emerge in educational settings. Over time, however, my thinking about mindfulness has evolved and the way I understand it today is profoundly different than it was when I commenced my research in this area. Accordingly, I see mindfulness as stretching beyond engagement in deep breathing practice. I see it as requiring a commitment to an ontological change; a change similar to that I have witnessed in my former husband Piotr; similar to the changes others have registered in me. I also recognize that what greatly assists in the hermeneutic process of getting to know and of adopting mindfulness practices is *being in with* people who embody mindful ways of living, people like Tobin, Fellner, Dachos, or Gangji (among others).

Consistent with the theory of difference, I humbly acknowledge that mindfulness may not be for everyone and for anyone all of the time. As experienced by Richard Davidson (Dyekjaer & Ambo, 2012) and as I have witnessed in our own research, some people opt to bail out. Furthermore, by no stretch of the imagination should mindfulness be perceived as cure for all ills. As remarked by Aga in Chapter 3, mindfulness cannot be formed into a pill to be swallowed. At the same time, it may be presented as a toolkit offering practices that promise to afford

production of new, more desirable, wellness promoting structures. In this sense, mindful enactments represent knowledge that is radically different from the canon-based epistemology.

As I reflect back on my journey and look towards the future, I am fully aware that the research paradigm as well as the subject matter I have embraced occupies a fringe position in academia. Too often, this "lowly" status is associated with a push back and rejection from the gatekeepers of "true" science or, as Tobin refers to them, "cynics in the scholarly community" (personal communication, December 9, 2013). A number of colleagues who courageously subscribe to analogous research programs have endured mistreatment as manifested in limited hiring opportunities or in denial of promotion and tenure by those who appear to mistake scientific rigidity for scientific rigor. As further remarked by Tobin, this state of affairs in and of itself calls for infusion of mindful practices into the academic arena. An inspiration may be found in the trajectories of the trailblazing minds and souls, including Richard Davidson, who worked against the grain of privileged paradigms and plopped mindfulness in the center of hard sciences against all odds (as I remark in Chapter 3). I am also motivated by and relate to my Advisor's scholarly "transformations from quasi experiments to interpretive forms of inquiry" (Tobin, 2006, p. 15) and his growing interest in and care for the welfare of others. I, too, have made a decision to follow what feels right as I finally found my passion and myself. The joy I draw (along with others) from my engagement in conducting sociocultural research may be epitomized by facial expressions captured in Figure 6.7. Therefore, I am committed to staying the course and continuing my mindfulness-based research program.

After hearing the news of my successful doctoral defense, my mom wrote in a congratulatory email what translates into, "Fifty-two years ago, I [my mom] was the first in our family to earn a college degree and now you are first to earn a doctorate." While being first may

have its virtue, for me earning the degree is just another milestone in my educational trajectory. As I am reminded by Frederick Erickson, "Learning is ubiquitous in human experience throughout the life cycle, and humans are good at it" (1987, p. 343). I look forward to continuing to learn about me, to learn how to be in the world, to learn how to be with others. I look forward to continuing my engagement in the collective activism towards spreading mindfulness for the benefit of the dwellers of this planet. I wholeheartedly welcome the contingent and emergent unfolding of the road ahead.

Figure 6.7. A joyful moment. Sharing excitement with members of my Doctoral Advisory Committee upon the successful defense. Captured from left are Konstantinos Alexakos, Kenneth Tobin, Malgorzata Powietrzynska, Gene Fellner, and Gillian Bayne.

APPENDIXES

APPENDIX 1

Poem on Nature of Science Education

Dear Teacher,

I am a survivor of a concentration camp. My eyes saw what no man should witness.

Gas chambers built by learned engineers.

Children poisoned by educated physicians.

Infants killed by trained nurses.

Women & babies shot & burned by high school & college graduates.

So, I am suspicious of education. My request is that teachers help students become human. Your efforts must never produce learned monsters, skilled psychopaths, educated Eichmanns.

Reading, writing, arithmetic are important only if they serve to make our children more humane.

from: Haim Ginott (1972). *Teacher & Child p. 317.*

[Anonymous. Attributed to a high school principal in the US]

APPENDIX 2

Mindfulness Scale

Instructions: We are interested in your day-to-day experiences. Below is a list of things that people sometimes experience. Please read the statements below and rate each using the scale provided. Choose the number that best describes your own opinion of what is generally true for you. There are no "right" or "wrong" answers, so please answer in a way that reflects your own experiences.

Scale:

1=Never or very rarely true

2=Rarely true

3=Sometimes true

4=Often true

5=Very often or always true

1. When I'm walking, I deliberately notice the sensations of my body moving.
2. I'm good at finding words to describe my feelings.
3. I do not allow myself to get distracted from the task at hand.
4. I don't criticize myself for having irrational or inappropriate emotions.
5. I perceive my feelings and emotions without having to react to them.
6. I have a hard time separating myself from my thoughts and feelings.
7. I am not curious to see what my mind is up to from moment to moment.
8. It is hard for me to put my beliefs, opinions, and expectations into words.
9. I do not feel the need to judge how I feel.
10. I seek to control unpleasant thoughts and feelings.
11. When I have distressing thoughts or images, they tend to consume me.

12. I rarely notice the wind in my hair or sun on my face.
13. I focus consciously on everything I do.
14. I am not curious about my thoughts and feelings as they occur.
15. When I'm terribly upset, no words can describe how I feel.
16. I make judgments about whether my thoughts are good or bad.
17. In difficult situations, I can pause without immediately reacting.
18. I remain curious about the nature of my experiences as they arise.
19. I am more invested in just watching my experiences as they arise, than in figuring out what they could mean.
20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
21. My natural tendency is to put my experiences into words.
22. I rush through activities without being really attentive to them.
23. I approach my experiences by trying to accept them, no matter whether they are pleasant or unpleasant.
24. I am curious about my reactions to things.
25. I notice the smells and aromas of things.
26. I do jobs or tasks automatically without being aware of what I'm doing.
27. I am curious about what I might learn about myself by just taking notice of what my attention gets drawn to.
28. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
29. I tend to react strongly to distressing thoughts and/or images.
30. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.

31. I have trouble noticing visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
32. I can usually describe how I feel at the moment in considerable detail.
33. I am aware of my thoughts and feelings without over-identifying with them.
34. I find myself doing things without paying attention.
35. When I have distressing thoughts or images, I just notice them and let them go.

Spirituality, Meditation, and Emotions

36. What are your understandings of spirituality and to what extent are you a spiritual person?
37. What do you understand by meditation and what to what extent do you practice meditation?
38. In what ways and to what extent are you emotional in teaching/learning contexts?
39. Please let us know how long (approximately) it took you to complete this survey.

☐ Less than 1/2 hour

☐ Between 1/2 hour and 1 hour

☐ More than 1 hour

☐ Other (please specify)

40. Please share other thoughts regarding this scale.

APPENDIX 3

Mindfulness Heuristic

Your name: _____ Week: _____

For each characteristic circle the numeral that best reflects your current state of mindfulness. As necessary, provide contextual information that applies to your rating.

1. I am curious about my feelings as they occur.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

2. I easily find words to describe my feelings.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

3. I observe my thoughts without being caught up in them.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

4. I perceive my emotions without having to react to them.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

5. I am compassionate to myself when things go wrong for me.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

6. I quickly recover when things go wrong for me.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

7. I pay attention to sensations, such as the wind in my hair or sun on my face.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

8. When I am emotional, I notice how my breathing changes.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

9. When I am emotional, I notice changes in my heart beat.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

10. I maintain a positive outlook on life.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

11. I can tell when something is bothering another person just by looking at him/her.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

12. The extent to which I show my emotions depends on where I am.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

13. The extent to which I show my emotions depends on whom I am with.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

14. If I decide to focus my attention on a particular task, I can keep it there.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

15. I am kind to others.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

16. I feel compassion for people even if I do not know them.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

17. When I produce strong emotions, I can easily let them go.

5=Very often or always, 4=Often, 3=Sometimes, 2=Rarely, 1=Never or very rarely

Comments:

APPENDIX 4

Mindfulness in Education Heuristic

Your name: _____ Week: _____

For each characteristic circle the numeral that best reflects your current state of mindfulness in this class. As necessary, provide contextual information that applies to your rating.

During this class:

1. I am curious about my feelings as they rise and fall.

    5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

2. I find words to describe the feelings I experience.

    5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

3. I identify distracting thoughts but let them go (without them influencing future action).

    5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

4. I am not hard on myself when I am unsuccessful.

    5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

5. I recover quickly when I am unsuccessful.

    5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

6. I pay attention to my moment-to-moment sensory experiences.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

7. I am aware of the relationship between my emotions and breathing pattern.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

8. I am aware of changes in my emotions and pulse rate.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

9. I maintain a positive outlook.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

10. I can tell when something is bothering the teacher.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

11. I can tell when something is bothering other students.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

12. The way in which I express my emotions depends on what is happening.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

13. The way in which I express my emotions depends on who is present.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

14. I can focus my attention on learning.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

15. I feel compassion for myself when I am unsuccessful.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

16. I feel compassion for others when they are unsuccessful.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

17. When I produce strong emotions I easily let them go.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

18. I gauge my emotions from changes in my body temperature.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

19. I am aware of others' emotions from characteristics of their voices.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

20. I am aware of my emotions being expressed in my voice.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

21. I recognize others' emotions by looking at their faces.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

22. I am aware of my emotions as they are reflected in my face.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

23. My emotions are evident from the way I position and move my body.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

24. The way I position and move my body changes my emotions.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

25. I can tell others' emotions from the way they position and move their bodies.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

26. I am aware of emotional climate and my role in it.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

27. Seeking attention from others is not important to me.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

28. Classroom interactions are characterized by winners and losers.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

29. I meditate to manage my emotions.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

30. I use breathing to manage my pulse rate.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

31. I use breathing to manage my emotions.

5= Very often or always; 4= Often; 3= Sometimes; 2=Rarely; 1=Hardly ever or never

Comments:

APPENDIX 5

Mindfulness in Education (and Beyond)–Select On-Line Resources in the United States

Note: Some websites listed here offer links to additional resources including mindfulness-related research literature.

Amishi Jha's Lab http://www.amishi.com/lab

Association for Contemplative Mind in Higher Education http://www.acmhe.org

Association for Mindfulness in Education http://www.mindfuleducation.org

Center for Compassion and Altruism Research and Education, Stanford University http://ccare.stanford.edu

Center for Mind and Brain, UC Davis http://mindbrain.ucdavis.edu

Center for Mindfulness in Medicine, Health Care, and Society (founded by Jon Kabat-Zinn), University of Massachusetts http://www.umassmed.edu/cfm/home/index.aspx

Center for Investigating Healthy Minds http://www.investigatinghealthyminds.org

CUNY Contemplatives' Wiki http://cunycontemplatives.pbworks.com

Garrison Institute http://www.garrisoninstitute.org

Garrison Institute CARE (Cultivating Awareness and Resilience in Education) http://www.garrisoninstitute.org/contemplation-and-education/care-for-teachers

Lab for Affective Neuroscience (founded by Richard Davidson), University of Wisconsin http://psyphz.psych.wisc.edu/web/index.html

Learning to BREATHE http://learning2breathe.org

Mindfulness Awareness Research Center, UCLA http://marc.ucla.edu

Mindfulness and Education Working Group, Teacher's College

http://www.tc.columbia.edu/centers/mindfulness

Mind & Life Institute and M&L Education Research Network

http://www.mindandlife.org/ & http://www.mindandlife.org/research-initiatives/mlern1

Mindfulness for Teachers and Students in NYC

http://www.learnmindfulnessnyc.com/teachersstudents

Mindfulness in Education Network http://www.mindfuled.org

Mindfulness Research Guide http://mindfulexperience.org

Mindful Schools http://www.mindfulschools.org

Omega http://eomega.org

The Hawn Foundation – MindUP™ Program http://www.thehawnfoundation.org

The Inner Resilience Program http://www.innerresilience-tidescenter.org

Santa Barbara Institute for Consciousness Studies (founded by B. Alan Wallace)

http://www.sbinstitute.com

The Still Quiet Place http://www.stillquietplace.com

Solloway Mindfulness Scale & Resources https://www.devtestservice.org/mindfulness/SMS/m-intro.html

Washington Mindfulness Community http://mindfulnessdc.org

Waisman Laboratory for Brain Imaging and Behavior http://brainimaging.waisman.wisc.edu

APPENDIX 6

Aimee Commenting on the Mindfulness Heuristic

The concept of mindfulness was first introduced to me through a heuristic during my first graduate course in science education. I was so excited to see the type of material the heuristic addressed because I have always had a strong interest in the notion of self-improvement practices for the sake of good mental health. I particularly enjoyed the free response components because I love having the opportunity to express the details in my thinking. When I first completed the heuristic, I thought back on the huge strides I have made since high school with regard to my self-esteem and outlook on the world. Completing the heuristic each week encouraged me to deeply see that my personal process of bettering my health (both for me and those around me) is far from complete.

APPENDIX 7

Mindfulness in Education Heuristic (22 Characteristics)

Your name: _____ Week: _____

For each characteristic circle the numeral that best reflects your current state of mindfulness in this class. As necessary, provide contextual information that applies to your rating.

5=Very often or always; 4=Often; 3=Sometimes; 2=Rarely; 1=Hardly ever or never

During this class:

1. I am curious about my emotions.
2. I find words to describe my emotions.
3. I allow thoughts to come and go without being distracted by them.
4. I notice my emotions without reacting to them.
5. I am kind to myself when things go wrong for me.
6. I recover quickly when things go wrong for me.
7. Even when I am focused, I use my senses to remain aware.
8. When I am emotional, I notice my breathing.
9. When I am emotional, I notice my heart beat.
10. I maintain a positive outlook.
11. The way in which I express my emotions depends on what is happening.
12. The way in which I express my emotions depends on who is present.
13. I can focus my attention on learning.

14. When I produce strong emotions, I can let them go.

15. When my emotions change, I notice changes in my body temperature.

16. The way I position and move my body changes my emotions.

17. I use breathing to manage my emotions.

18. I am kind to others when they are unsuccessful.

19. I can tell when something is bothering another person.

20. I am aware of others' emotions from the tone of their voices.

21. I recognize others' emotions by looking at their faces.

22. When I am with others, my emotions tend to become like their emotions.

REFERENCES

FOREWORD

Bai, H. (2013). Peace with the earth: animism and contemplative ways. *Cultural Studies of Science Education.* Advance online publication. doi:10.1007/s11422-013-9501-z

Davidson, R. J., & Begley, S. (2012). *The emotional life of your brain: How its unique patterns affect the way you think, feel, and live - and how you can change them.* New York: Hudson Street Press.

Kincheloe, J. L., & Tobin, K. (2006). Doing educational research in a complex world: Prefece. In K. Tobin, & J. L. Kincheloe (Eds.), *Doing educational research: A Handbook* (pp. 3-13). Rotterdam, The Netherlands: Sense Publishers.

Kress, T. (in press). "Can't you just know?": Critical research as praxis. In K. Tobin & S. R. Steinberg (Eds.), *Doing Educational Research: A Handbook* (2nd ed.). Rotterdam, The Netherlands: Sense Publishers.

Newberg, A. B., Serruya, M., Wintering, N., Moss, A. S., Reibel, D., & Monti, D. A. (2014). Meditation and neurodegenerative diseases. *Annals of the New York Academy of Sciences, 1307*, 112-123.

Sewell, W. H. (2005). *Logics of history: social theory and social transformation.* Chicago: The University of Chicago Press.

Stone, L. (2012, May 7). *The connected life: From Email apnea to coscious computing.* [Web post]. Retrieved from http://www.huffingtonpost.com/linda-stone/email-apnea-screen-apnea-_b_1476554.html.

Taylor, P. C. (2013). Contemporary qualitative research: A multiple paradigm perspective. Unpublished manuscript.

Van Maanen, J. (2011). *Tales of the field: on writing ethnography.* (2nd ed.). Chicago: The University of Chicago Press.

CHAPTER 1

Alexakos, K., & Pierwola, A. (2013). Learning at the "boundaries": radical listening, creationism, and learning from the "other". *Cultural Studies of Science Education, 8* (1), 39-49. doi:10.1007/s11422-012-9470-7.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*, 27-45. doi: 10.1177/1073191105283504

Bourdieu, P., & Wacquant, L. J. (1992). *An invitation to reflexive sociology*. Chicago, IL: The University of Chicago Press.

Brown, K., & Ryan, R. (2003). The benefits of being present: Mindfulness and its tole in psychological well-being. *Journal of Personality and Social Psychology, 84*, 822-848. doi: 10.1037/0022-3514.84.4.822

Dachos, N. (2012). *Pause, breathe and be mindful in science teacher education*. Unpublished manuscript.

Davidson, R. J., & Begley, S. (2012). *The emotional life of your brain: How its unique patterns affect the way you think, feel, and live-and how you can change them.* New York: Hudson Street Press.

Davis, K. M., Lau, M. A., & Cairns, D. R. (2009). Development and preliminary validation of a trait version of the Toronto Mindfulness Scale. *Journal of Cognitive Psychotherapy: An International Quarterly, 23* (3), 185-197. doi:10.1891/0889-8391.23.3.185

Erickson, F. (1998). Qualitative reserach methods for science education. In B. J. Fraser, & K. G. Tobin (Eds.), *International Handbook of science education* (pp. 1155-1173). Dordrecht, The Netherlands: Kluwer Academic Publishers. doi:10.1007/978-94-011-4940-2_67

Fellner, G. (2012). *Street smarts, school smarts and the failure of educational policy in the inner city: A multilectical approach to pedagogy and the teaching of language arts* (Doctoral dissertation). The Graduate Center of The City University of New York, New York.

Guba, E., & Lincoln, Y. S. (1989). *Fourth generation evaluation*. Newbury Park, CA: Sage Publications.

Harmon, A. (2008, August 24). A teacher on the front line as faith and science clash. *The New York Times*, p. A1.

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present and future. *Clinical Psychology: Science and Practice, 10*, 144-156. doi:10.1093/clipsy.bpg016

Schutz, P. A., & Zembylas, M. (Eds.). (2009). *Advances in teacher emotion research: The imact on teacher's lives.* New York: Springer. doi:10.1007/978-1-4419-0564-2

Tobin, K. (2006). Qualitative research in classrooms: Pushing the boundaries of theory and methodology. In K. Tobin, & J. Kincheloe (Eds.), *Doing educational research: A handbook* (pp. 15-59). Rotterdam, The Netherlands: Sense Publishers.

Tobin, K. (2012). Sociocultural perspectives on science education. In B. J. Fraser, C. J. McRobbie, & K. G. Tobin (Eds.), *Second international handbook of science education* (pp. 3-17). Dordrecht, The Netherlands: Springer. doi:10.1007/978-1-4020-9041-7_1

Tobin, K. (2013). A sociocultural approach to science education. *magis, International Journal of Research in Education*, *6* (12), 19-35.

Tobin, K., & Richie, S. R. (2012). Multi-method, multi-theoretical, multi-level research in the learning sciences. *The Asia-Pacific Education Researcher, 21* (1), 117-129.

Zembylas, M., & Schuts, P. A. (2009). Research on teachers' emotions in education: Findings, practical implications and futue agenda. In P. A. Schuts, & M. Zembylas (Eds.), *Advances in teacher emotion research: The impact on teachers' lives* (pp. 367-377). New York: Springer. doi:10.1007/978-1-4419-0564-2_18

CHAPTER 2

Alexakos, K., & Tobin, K. (Eds.). (2014, forthcoming). *Methodologies for multilevel research in teacher education.* Dordrecht, The Netherlands: Springer.

Alexakos, K., & Pierwola, A. (2013). Learning at the "boundaries": radical listening, creationism, and learning from the "other". *Cultural Studies of Science Education, 8* (1), 39-49. doi:10.1007/s11422-012-9470-7.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13* (1), 27-45. doi: 10.1177/1073191105283504

Baer, R. A., Walsh, E., & Lykins, E. L. B. (2009). Assessment of mindfulness. In F. Didonna (Ed.), *Clinical handbook of mindfulness* (pp. 153-168). New York: Springer. doi: 10.1007/978-0-387-09593-6_10

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. C., Carmody, J., et al. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*, *11*, 230-241. doi:10.1093/clipsy.bph077

Bourdieu, P., & Wacquant, L. J. (1992). *An invitation to reflexive sociology.* Chicago, IL: The University of Chicago Press.

Camrody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 31*, 23-33. doi: 10.1007/s10865-007-9130-7

Collins, R. (2004). *Interaction ritual chains*. Princeton, NJ: Princeton University Press.

Davidson, R. J., & Begley, S. (2012). *The emotional life of your brain: how its unique patterns affect the way you think, feel, and live–and how you can change them.* New York: Hudson Street Press.

Davis, K. M., Lau, M. A., & Cairns, D. R. (2009). Development and preliminary validation of a trait version of the Toronto Mindfulness Scale. *Journal of Cognitive Psychotherapy: An International Quarterly, 23* (3), 185-197. doi:10.1891/0889-8391.23.3.185

Ekman, P. (2003). *Emotions revealed: Recognizing faces and feelings to improve communication and emotional life.* New York: St. Martin's Griffin.

Erickson, F. (1998). Qualitative research methods for science education. In B. J. Fraser & K. G. Tobin (Eds.), *International handbook of science education* (pp. 1155-1173). Dordrecht, The Netherlands: Kluwer Academic Publishers.

Ingersoll, R. M., & Perda, D. (2010). Is the supply of mathematics and science teachers sufficient? *American Educational Research Journal*, *47*, 563-594. doi: 10.3102/0002831210370711

Jha, A. (2012, March). *Improving attention and working memory with mindfulness training.* Keynote address at the Fifth Annual Conference on Mindfulness: Foundation for Teaching and Learning, Bryn Mawr, PA.

Kabat-Zinn, J. (1994). *Wherever you go, there you are: Mindfulness meditation in everyday life.* New York: Hyperion.

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present and future. *Clinical Psychology: Science and Practice, 10,* 144-156. doi:10.1093/clipsy.bpg016

Kraus, S., & Sears, S. (2008). Measuring the immeasurable: Development and initial validation of the Self-Other Four Immeasurables (SOFI) Scale based on Buddhist teachings on loving kindness, compassion, joy, and equanimity. *Social Indicators Research, 92* (1), 169-181. doi:10.1007/s11205-008-9300-1

Marlatt, G. A., & Kristeller, J. L. (1999). Mindfulness and meditation. In W. R. Miller (Ed.), *Integrating spirituality into treatment* (pp. 67–84). Washington, DC: APA. doi: 10.1037/10327-004

Roth, W.-M., & Tobin, K. (2002). *At the elbow of another: learning to teach by coteaching.* New York: Peter Lang Publishing, Inc.

Solloway, S. G., & Fisher, W. P. (2007). Mindfulness in measurement: Reconsidering the measurable in mindfulness practice. *International Journal of Transpersonal Studies, 26*, 58-81.

Tobin, K. (2010). Collaborating to transform and reproduce science education. *Enseñanza de las Ciencias*, *28,* 301-313.

Tobin, K., & Llena, R. (2012). Colliding identities, emotional roller coasters, and contradictions of urban science education. In M. Varelas (Ed.), *Identity construction and science education research: learning, teaching, and being in multiple contexts* (pp. 137-152). Rotterdam: Sense Publishers. doi:10.1007/978-94-6209-043-9_10

Tobin, K., Seiler, G., & Walls, E. (1999). Reproduction of social class in the teaching and

learning of science in urban high schools. *Research in Science Education, 29*, 171-187. doi:10.1007/BF02461767

Turner, J. H. (2002). *Face to face: toward a sociological theory of interpersonal behavior.* Palo Alto: Stanford University Press.

CHAPTER 3

Albrecht, N. J., Albrecht, P. M., & Cohen, M. (2012). Mindfully teaching in the classroom: a literature review. *Australian Journal of Teacher Education, 37* (12), 1-14. doi: 10.14221/ajte.2012v37n12.2

Alexakos, K. (2014). Being a science educator | researcher: a personal narrative from the sociocutural perspective. In C. Milne, K. Tobin, & D. DeGennaro (Eds.), *Sociocultural studies and implications for science education* (pp. xxx-xxx). Dordrecht, The Netherlands: Springer.

Bourdieu, P., & Wacquant, L. J. (1992). *An invitation to reflexive sociology.* Chicago, IL: The University of Chicago Press.

Burke, C. A. (2009). Mindfulness-based approaches with children and adolescents: A preliminary review of current research in an emergent filed. *Journal of Child and Family Studies, 19*, 133-144. doi:10.1007/s10826-009-9282-x

Castano, C. (2012). Extending the purposes of science education: addressing violence within socio-economic disadvantaged communities. *Cultural Studies of Science Education, 7*, 703-718. doi:10.1007/s11422-012-9412-4

Davidson, R. J., & Begley, S. (2012). *The emotional life of your brain: How its unique patterns affect the way you think, feel, and live–and how you can change them.* New York: Hudson Street Press.

Davidson, R. J., Jha, A. P., & Kabat-Zinn, J. (2013, February 6). *Becoming conscious: Uncovering the science of mindfulness*. Panel presented at the New York Academy of Science. New York.

Dyekjaer, S. (Producer), & Ambo, P. (Director). (2012). *Free the mind: Can you rewire the brain just by taking a breath?* [Documentary]. Denmark: Danish Documentary Production.

Eisenhart, M. (2009). Generalization from qualitative inquiry. In K. Ercikan, & W.-M. Roth (Eds.), *Generalizing from educational research: Beyond qualitative and quantitative polarization* (pp. 51-66). New York: Routledge.

Erickson, F. (1998). Qualitative reserach methods for science education. In B. J. Fraser, & K. G. Tobin, *International Handbook of science education* (pp. 1155-1173). Dordrecht, The Netherlands: Kluwer Academic Publishers.

Fellner, G. (in press). A multilectical approach to research in inner city middle schools. In K. Tobin & J. Kincheloe (Eds). *Doing Educational Research*. Rotterdam The Netherlands: Sense Publishers.

Garrison Institute Report. (2005). *Contemplation and education: A survey of programs using contemplative techniques in K-12 educational settings: A mapping report.* New York: The Garrison Institute.

Grossman, P. (2008). On measuring mindfulness in psychosomatic and psychological research. *Journal of Psychosomatic Research, 64*, 405-408. doi:10.1016/j.jpsychores.2008.02.001

Guba, E., & Lincoln, Y. S. (1989). *Fourth generation evaluation.* Newbury Park, CA: Sage Publications.

Higgins, J. (2012, November 28). *Report from New Zealand: Investigating the emotinal climate of an elementary school classroom.* Presentation at the Research Squad meeting at the Graduate Center of the City University of New York. New York.

Jha, A. P. (2012, March). *Improving attention and working memory with mindfulness training.* Keynote address at the Mindfulness in Education Network's Fifth Annual Conference. Bryn Mawr, PA.

Kabat-Zinn, J. (1994). *Wherever you go, there you are: Mindfulness meditation in everyday life.* New York: Hyperion.

Kincheloe, J. L. (2003). *Teachers as researchers: Qualitative inquiry as a path to empowerment* (2nd ed.). New York: RoutledgeFalmer.

Meiklejohn, J., Phillips, C., Freeman, M., Griffin, M., Biegel, G., Roach, A., et al. (2012). Integrating mindfulness training into K-12 education: Fostering the resilience of teachers and studnets. *Mindfulness, 3* (4), 291-307. doi:10.1007/s12671-012-0094-5

Mind and Life Education Research Network (MLERN). (2012). Contemplative practices and mental training: Prospects for American education. *Child Development Perspectives, 6* (2), 146-153. doi:10.1111/j.1750-8606.2012.00240.x

National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. (1979). The Belmont report: Ethical principles and guidelines for the protection of human subjects of research [The Belmont Report]. Department of Health, Education, and Welfare. Retrieved from http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.html

Philippot, P., Chapelle, G., & Blairy, S. (2002). Respiratory feedback in the generation of emotion. *Cognition & Emotion*, *16*, 605-627. doi:10.1080/02699930143000392

Roeser, R. W., Skinner, E., Beers, J., & Jennings, P. A. (2012). Mindfulness training and teachers' professional development: An emerging area of research and practice. *Child Development Perspectives, 6* (2), 167-173. doi:10.1111/j.1750-8606.2012.00238.x

Ryan, T. (2012). *A mindful nation: how a simple practice can help us reduce stress, improve performance, and recapture the American spirit.* New York: Hay House, Inc.

Saltzman, A. (n.d.). *Education Resources: K-12.* Retrieved from The Center for Contmepmplative Mind in Society: http://www.contemplativemind.org/resources/k-12

Sewell, W. H. (2005). *Logics of history: social theory and social transformation.* Chicago: The University of Chicago Press. doi:10.7208/chicago/9780226749198.001.0001

Tobin, K. (2006). Qualitative research in classrooms: Pushing the boundaries of theory and methodology. In K. Tobin, & J. Kincheloe (Eds.), *Doing educational research: A handbook* (pp. 15-59). Rotterdam, The Netherlands: Sense Publishers.

Tobin, K. (2009). Turning into others' voices: radical listening, learning from difference, and escaping oppression. *Cutlural Studies of Science Education, 4* (3), 505-511. doi: 10.1007/s11422-009-9218-1

Tobin, K. (2012). Interpretive approaches to multi-level, multi-method, mulit-theoretical research. In S. R. Steinberg, & G. S. Canella (Eds.), *Critical qualitative research reader* (Vol. 2, pp. 116-128). New York: Peter Lang Publishing.

Tobin, K., & Richie, S. R. (2012). Multi-method, multi-theoretical, multi-level research in the learning sciences. *The Asia-Pacific Education Researcher, 21* (1), 117-129.

Wood, G. (2013, April 24). *What martial arts have to do with atheism*. Retrieved from The Atlantic: http://www.theatlantic.com/national/archive/2013/04/what-martial-arts-have-to-do-with-atheism/275273/

Zajonc, A. (2009). *Meditation as contemplative inquiry: When knowing becomes love.* [Kindle version]. Retrived from http://www.amazon.com.

CHAPTER 4

Bourdieu, P., & Wacquant, L. J. (1992). An invitation to reflexive sociology. Chicago, IL: The University of Chicago Press.

Collins, R. (2004). *Interaction ritual chains*. Princeton, NJ: Princeton University Press.

Davidson, R. J. (2013, May 10). What does science teach us about well-being? [Web post]. Retrieved from http://www.huffingtonpost.com/richard-j-davidson/science-well-being_b_3239792.html

Mind and Life Education Research Network (MLERN). (2012). Contemplative practices and mental training: Prospects for American education. *Child Development Perspectives, 6* (2), 146-153. doi:10.1111/j.1750-8606.2012.00240.x

Tobin, K. (2012). Sociocultural perspectives on science education. In B. J. Fraser, K. Tobin, & C. J. McRobbie (Eds.), *Second international handbook of science education* (pp. 3-17). Dordrecht, The Netherlands: Springer. doi:10.1007/978-1-4020-9041-7_1

Tobin, K. (2013). Teacher research. In: R. Gunstone (Ed.), *Encyclopedia of science education* (pp. xxx-xxx). Dordrecht, The Netherlands: Springer.

Tobin, K., & Llena, R. (2010). Producing and maintaining culturally adaptive teaching and learning of science in urban schools. In: C. Murphy, & K. Scantlebury (Eds.), *Coteaching*

in international contexts: Research and practice (pp. 79-104). Dordrecht, The Netherlands: Springer. doi:10.1007/978-90-481-3707-7_5

CHAPTER 5

Bai, H. (2013). Peace with the earth: animism and contemplative ways. *Cultural Studies of Science Education.* Advance online publication. doi:10.1007/s11422-013-9501-z

Bourdieu, P., & Wacquant, L. J. (1992). *An invitation to reflexive sociology.* Chicago, IL: The University of Chicago Press.

Collins, R. (1981). On the microfoundations of macrosociology. *American Journal of Sociology. 86*, 984-1014. doi:10.1086/227351

Davidson, R. J. (2013, May 10). What does science teach us about well-being? [Web post]. Retrieved from http://www.huffingtonpost.com/richard-j-davidson/science-well-being_b_3239792.html

Davidson, R. J., & Begley, S. (2012). *The emotional life of your brain: How its unique patterns affect the way you think, feel, and live - and how you can change them.* New York: Hudson Street Press.

Fellner, G. (2014). Broadening our lenses of perception to advance learning: An introduction to multilectics. *Teaching and Teacher Education, 37*, 169-182. doi: 10.1016/j.tate.2013.04.015

Finley, S. (Creator & Director), & Barton, P. (Producer). (2013). *Changing minds at Concord High School* [Documentary]. (Available from http://changingmindsprogram.com/contact-us).

Gigerenza, G., Hertwig, R., & Pachur, T. (2012). (Eds). *Heuristics: the foundations of adaptive behavior*. New York: Oxford University Press.

Guba, E., & Lincoln, Y. S. (1989). *Fourth generation evaluation.* Newbury Park, CA: Sage Publications.

Huntsinger, J. R. (2013). Does emotion directly tune the scope of attention? *Current Directions in Psychological Science, 22* (4), 265-270. doi:10.1177/ 0963721413480364

Hyland, T. (2013). Moral education, mindfulness, and social engagement: fostering social capital through therapeutic Buddhist practice. *Sage Open, 3*, 1-9. doi:10.1177/2158244013509253

Kabat-Zinn, J. (1994). *Wherever you go, there you are: mindfulness meditation in everyday life.* New York: Hyperion.

Kemeny, M., Foltz, C., Cavanagh, J. F., Cullen, M., Giese-Davis, J., Jennings, P., et al. (2011). Contemplative/emotion training reduces negative emotional behavior and promotes prosocial responses. *Emotion, 12* (2), 338-350. doi:10.1037/a0026118

Mueller, M. P. (2013, October 19). *A theory of socioecological characteristics for food mindfuness*. Paper presented at the Urban Science Education Research Seminars, New York.

Moustakas, C. (1990). *Heuristic research: design, methodology, and applications.* Newbury Park, CA: SAGE Publications, Inc.

National Research Council and Institute of Medicine. (2013). *U.S. Health in International Perspective: Shorter Lives, Poorer Health.* Panel on Understanding Cross-National Health Differences Among High-Income Countries, S. H. Woolf & L. Aron, (Eds.) Committee on Population, Division of Behavioral and Social Sciences and Education,

and Board on Population Health and Public Health Practice, Institute of Medicine. Washington, DC: The National Academies Press.

Pierce, C. (2013). Learning about a fish from an ANT: actor network theory and science education in the postgenomic era. *Cultural Studies of Science Education.* Advance online publication. doi:10.1007/s11422-013-9498-3

Roth, W.-M., & Tobin, K. (2002). *At the elbow of another: learning to teach by coteaching.* New York: Peter Lang Publishing, Inc.

Sewell, W. H. (2005). *Logics of history: social theory and social transformation.* Chicago: The University of Chicago Press. doi:10.7208/chicago/9780226749198. 001.0001

Tobin, K. (2006). Qualitative research in classrooms: Pushing the boundaries of theory and methodology. In K. Tobin, & J. L. Kincheloe, (Eds.), *Doing educational research: A handbook* (pp. 15-59). Rotterdam, The Netherlands: Sense Publishing.

Tobin, K. (2013). A sociocultural approach to science education. *magis, International Journal of Research in Education*, *6* (12), 19-35.

Wals, A., & So, J. (2013). Strengthening ecological mindfulness through hybrid learning in vital coalitions. Manuscript submitted for publication.

Weinstein, M. (2013). Sciences for the red zones of neoliberalism. *Cultural Studies of Science of Education.* Advance online publication. doi:10.1007/s11422-013-9490-y

CHAPTER 6

Calderón, O. (2014). *Transformative science education through action research and self-study* (Doctoral dissertation). The Graduate Center of The City University of New York, New York.

Casasola, G. G., Alvarez-Sala, J. L., Marques, J., Sanchez-Alarcos, J. M., Tashkin, D. P., & Espinos, D. (2002). Cigarette smoking behavior and repsiratory alterations during sleep in a healthy population. *Sleep and Breathing, 6*(1), 19-24. doi:10.1055/s-2002-23152

Collins, R. (2004). *Interaction ritual chains.* Princeton, NJ: Princeton University Press.

Davidson, R. J., & Begley, S. (2012). *The emotional life of your brain: How its unique patterns affect the way you think, feel, and live - and how you can change them.* New York: Hudson Street Press.

Dyekjaer, S. (Producer), & Ambo, P. (Director). (2012). *Free the mind: Can you rewire the brain just by taking a breath?* [Documentary]. Denmark: Danish Documentary Production.

Eisenhart, M. (2009). Generalization from qualitative inquiry. In K. Ercikan, & W.-M. Roth (Eds.), *Generalizing from educational research: Beyond qualitative and quantitative polarization* (pp. 51-66). New York: Routledge.

Erickson, F. (1987). Transformation and school success: The politics and culture of educational achievement. *Anthropology & Education Quarterly, 18*, 335-356.

Fellner, G. (2014). Broadening our lenses of perception to advance learning: An introduction to multilectics. *Teaching and Teacher Education, 37*, 169-182. doi: 10.1016/j.tate.2013.04.015

Finley, S. (Creator & Director), & Barton, P. (Producer). (2013). *Changing minds at Concord High School* [Documentary]. (Available from http://changingminds program.com/contact-us

Gupta, S. (2014, March 10). Chasing life: Mediation made simple. [Video file]. Retrieved from http://sanjayguptamd.blogs.cnn.com/

Naidoo, K. (2014, February 15). *Developing elementary teacher candidates' practice through transformative reflection within a science methods course.* Paper presented at the Urban Science Education Research Seminars, New York.

National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. (1979). The Belmont report: Ethical principles and guidelines for the protection of human subjects of research [The Belmont Report]. Department of Health, Education, and Welfare. Retrieved from http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.html

Pierce, C. (2013). Learning about a fish from an ANT: actor network theory and science education in the postgenomic era. *Cultural Studies of Science Education.* Advance online publication. doi:10.1007/s11422-013-9498-3

Sewell, W. H. Jr. (2005). *Logics of history: social theory and social transformation.* Chicago: The University of Chicago Press. doi:10.7208/chicago/9780226749198.001.0001

Tobin, K. (2006). Qualitative research in classrooms: Pushing the boundaries of theory and methodology. In K. Tobin, & J. Kincheloe (Eds.), *Doing educational research* (pp. 15-57). Rotterdam, The Netherlands: Sense Publishers.

Tobin, K. (2012). Sociocultural perspectives on science education. In B. J. Fraser, C. J. McRobbie, & K. G. Tobin (Eds.), *Second international handbook of science education* (Vol. 24, pp. 3-17). Dordrecht, The Netherlands: Springer. doi:10.1007/978-1-4020-9041-7_1

Tobin, K. (2013, August 7). Social resonance. [Web blog comment]. Retrieved from http://kennethtobin.com/blog

Tobin, K., & Ritchie, S. M. (2012). Multi-method, multi-theoretical, multi-level research in the learning sciences. *The Asia-Pacific Education Researcher, 21*(1), 117-129.

Varelas, M., Martin, D. B., & Kane, J. M. (2012). Content learning and identity construction: A framework to strengthen African American students' mathematics and science learning in urban elementary schools. *Human Development, 55*, 319-339. doi:10.1159/000345324

NOTES

[1] This encyclopedia entry was co-authored with Kenneth Tobin (Powietrzynska, M. & Tobin, K. (in press). Mindfulness and science education. In R. Gunstone (Ed.), *Encyclopedia of science education* (p. ***). Dordrecht: Springer.)

[2] This manuscript was written in collaboration with Kenneth Tobin and Konstantinos Alexakos (Powietrzynska, M., Tobin, K. & Alexakos, K. (2014). Facing the grand challenges through heuristics and mindfulness. *Cultural Studies of Science Education.* Advance online publication. doi:10.1007/s11422-014-9588-x.)