Teaching to Transfer in the Social Emotional Learning Context:
The Case for an Instructional Model of the Human Emotion System

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ABSTRACT

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Social emotional learning (SEL) is an increasingly important area of study, which aims to help students develop skills critical for healthy social functioning as well as academic and professional success. There is general agreement that SEL, like other subjects, should result in knowledge transfer. However, there has been little research aimed at identifying instruction methodologies that might enable such transfer. In my dissertation, I propose that SEL knowledge transfer may be facilitated by way of direct teaching of a model of the human emotion system (HES). I provide a functional definition of the emotion system, demonstrate how the principles of the HES represent the deep structures that underlie key SEL skills, discuss why the direct teaching of the HES is necessary despite the spontaneous formation of implicit models of emotion, and propose a set of components that may comprise an instructional HES model. I then describe a pilot study demonstrating that HES model learning can transfer to new problems and produce improvements in aspects of social emotional competence (SEC), specifically other awareness and empathy. Compared to the control group, the pilot’s model learning group rated “socially inappropriate” emotional responses as significantly less blameworthy, indicating greater cognitive empathy and the transfer of emotion model knowledge to a novel set of problems. A larger, follow-up study sought to replicate the results of the pilot while conducting the intervention online and exploring
several additional hypotheses. The study successfully replicated the pilot’s results with respect to other-awareness, while also demonstrating that HES model learning had a positive effect on self-awareness: participants in the model learning condition rated their own hypothetical undesirable emotional reactions as significantly less blameworthy than those in the control condition, demonstrating increased acceptance of emotions in the self. The results also suggest HES model learning produces a stronger short-term effect on other-awareness than self-awareness, and shed new light on the design considerations for preparation for future learning (PFL) activities in the SEL context, namely, the need for precise targeting of relevant deep structures and the potential for learning interference caused by the activation of existing emotion theories. Exploratory post-hoc analyses further point to the possibility of gender playing a role in the success of HES model learning, with males potentially being more resistant to such learning than females. I discuss the study results as well as the broader significance of the HES model learning approach to SEL.
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To my parents.
Introduction

There is an old eastern saying which alludes to the traits one would wish for in dealing with a complex, unpredictable and often unforgiving world: the serenity to accept the things one cannot change, the courage to change the things one can, and the wisdom to know the difference. If a single area of study could be said to have the goal of developing these three abilities, and that of wisdom in particular, it is social emotional learning (SEL).

The term social and emotional learning was coined by the Fetzer Group in the mid 1990s to refer to a conceptual framework for fostering children’s social, emotional, and academic competencies (Weissberg, Durlak, Domitrovich, & Gullotta, 2015). The impetus for creating such a framework came from the recognition that the mission of schools and education more broadly went beyond fostering students’ academic achievement, and included the development of skills that would enable students to become well-adjusted, healthy and responsible citizens (Osher, Kidron, Brackett, Dymnicki, Jones, Weissberg, 2016; but see Tyack, 1992 for alternative viewpoints). As importantly, it was coming to be understood that social and emotional skills played a significant role in academic success (Boekaerts, 2011; Weissberg et al., 2015; Zins, Weissberg, Wang, & Walberg, 2004). Indeed, as scores of SEL programs were implemented in schools across the country, it was found that improvements in these skills were associated with better school performance (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011), while conferring additional benefits such as reductions in behavioral problems, greater psychological well-being, and healthier relationships, among others (e.g. Eisenberg, Fabes, Guthrie, & Reiser, 2000; Fine, Izard, Mostow, Trentacosta, & Ackerman, 2003; Rivers, Mayer, Brackett, Caruso, Reyes, & Salovey, 2012). These developments were accompanied by a crystallization of the SEL framework as defined by the Collaborative for Academic, Social and Emotional Learning (CASEL)--the organization that grew out of the original Fetzer Group initiative--including the high-level skill set that SEL
aimed to cultivate: self-awareness, social awareness, self-management, relationship management, and responsible decision-making (CASEL, 2008).

As the SEL field continued to mature, researchers have also proposed guidelines for the development of effective SEL programs. At a macro level, findings suggest that SEL programs are more effective when they are not restricted to a single classroom, but are ecologically comprehensive, and include the entire school, as well as components aimed at the community beyond the school (Tolan, Guerra, & Kendall, 1995; Weissberg et al., 2015). At the instructional level, the guidelines indicate that SEL programs should set explicit learning goals, employ sequenced training, provide sufficient time for skill development, and use active forms of learning (Durlak et al., 2011).

At the same time, there is general agreement that SEL, like other subjects, should result in knowledge transfer (Durlak et al., 2011; Durlak, Domitrovich, Weissberg, & Gullotta, 2015; Yeager, 2017a; Zeidner, Roberts & Matthews, 2002), yet there has been little research aimed at identifying instruction methodologies that might facilitate such transfer. Below, I argue that social emotional knowledge transfer may be enabled by way of direct teaching of a model of the human emotion system. In Part I, I lay out the theoretical rationale for my argument. In Part II, I describe a pilot study that tested the effects of teaching a “core” model of the emotion system. In Part III, I describe the follow-up dissertation study, which builds on the pilot. In Part IV, I provide a general discussion of the results of the preceding studies, and review the broader significance and implications of the HES model learning approach to SEL.
PART I: THEORETICAL RATIONALE

I begin this section by outlining the current state of SEL practice, with a focus on existing instructional and design guidelines. I then highlight the central role transfer is thought to play in the educational process, and how it applies to SEL specifically. I proceed to discuss the importance of deep learning to achieving successful transfer, and describe the way deep learning often relies on abstracting the deep structure of a concept or problem. I then identify the core SEL skills and demonstrate that the principles of the emotion system represent the deep structures that underpin the knowledge necessary to master those skills. I go on to show why the emotion system should be taught despite the spontaneous formation of implicit models of emotion, provide examples of past research involving the teaching of the emotion system, offer a set of possible components for an instructional model of the system, and address the developmental considerations of teaching the HES.

Current State of SEL Practice

In recent years, a number of social emotional learning frameworks have been developed (Jones, Barnes, Bailey, & Doolittle, 2017; Nagaoka, Farrington, Ehrlich, & Heath, 2015). Of these, CASEL’s framework is seen as the most widespread and well-established (Osher et al., 2016). This framework identifies five high level abilities as central to social emotional competence: self-awareness, social awareness, self-management, relationship management, and responsible decision-making (CASEL, 2008; Durlak et al., 2015; Zins et al., 2004). The development of these skills could be said to represent the chief goal of modern social emotional learning programs (Weissberg et al., 2015). Additionally, researchers have suggested key criteria for successful SEL program design, including being developmentally appropriate, culturally relevant, systemic, comprehensive, evidence-based, and forward
thinking (Osher et al., 2016). The literature also provides a set of recommended SEL instructional practices that includes sequenced training, active forms of learning, focus on sufficient time and practice for skill development, and explicit learning goals (Durlak et al., 2011). Together, these practices are referred to by the acronym SAFE. The above guidelines are currently used by SEL researchers to evaluate the quality of program implementation (Durlak et al., 2010, 2011) and to make recommendations to schools and policymakers in selecting effective SEL programs (CASEL, 2015). Over the past three decades, hundreds of SEL programs have been implemented in schools throughout the US and beyond (Durlak et al., 2011; Osher et al., 2016; Weissberg et al., 2015). Many of them had been designed or evaluated on the basis of the above guidelines. Yet in the course of these efforts, relatively little attention has been paid to the question of SEL knowledge transfer.

**Transfer and SEL**

Literature on cognition and education has consistently singled out transfer as one of the most important concepts when gauging depth and quality of learning (Barnett & Ceci, 2002; Salomon & Perkins, 1989; Schwartz, Chase, Oppezzo, & Chin, 2011). Transfer refers to the ability to use prior knowledge to solve novel problems (Cormier & Hagman, 1987; Perkins & Salomon, 1992). More broadly, transfer implies the ability to deal with new concepts and phenomena on the basis of prior experience (Chi & VanLehn, 2012). The ability to deal with or “treat” these novel phenomena may refer to various actions such as “categorizing, deciding, diagnosing, explaining, identifying, learning, problem solving, and analogical reasoning in or across different contexts, concepts, problems, patients, phenomena, or situations” (Chi & VanLehn, 2012). In other words, transfer is what needs to occur for knowledge acquired in the classroom (or anywhere else) to be employed outside the learning context and with new content. Without transfer the entire educational enterprise fails:
knowledge that can only be utilized in the classroom, on familiar tasks, is of relatively little use. While some expectations of transfer, such as from learning to write computer code or speak Latin, have proven to be overly optimistic (Pea and Kurland, 1984), there is a great deal of evidence validating the construct as well as providing insight into the teaching methodologies that support it (e.g. Bassok & Holyoak, 1989; Bransford & Schwartz, 1999; Brown & Kane, 1988; Gick & Holyoak, 1983; Salomon & Perkins, 1989; Schwartz & Martin, 2004; Singley & Anderson, 1989).

The SEL literature is unambiguous on the need for social emotional skills to transfer across different situations (Durlak et al., 2011; Durlak et al., 2015; Zins et al., 2004), and researchers and practitioners have expressly advocated for SEL programs to be designed with deep learning and transfer in mind (Kam, Greenberg & Kusche, 2004; Osher et al., 2016; Zeidner, Roberts & Matthews, 2002). However, the majority of SEL programs have been evaluated in the same context in which they were implemented, usually in school or in after school programs, and few studies have expressly focused on the transfer of acquired social emotional skills as an outcome measure or a design criterion (Durlak et al., 2011; Durlak, Weissberg, & Pachan, 2010; Sklad, Diekstra, Ritter, Ben, & Gravesteijn, 2012). Furthermore, research has shown that SEL programs focused on improving the school climate often do not lead to improved behavior outside that climate (Yeager, 2017a). Consequently, at present there is relatively little concrete evidence of SEL knowledge transfer beyond the school or classroom, or even across different situations within the school or classroom, despite there being ample evidence that many SEL programs produce positive results (Durlak et al., 2015; Osher et al., 2016). Of course, this does not constitute proof that transfer of social skills acquired from SEL programs does not and has not occured. Indeed, it is quite probable that some transfer does occur some of the time, particularly for successful programs. However, research has shown time and again that when learning, transfer is far from guaranteed.
(Barnett & Cecci, 2002; Lave, 1988; Reed, Ernst, & Banerji, 1974; Thorndike & Woodworth, 1901; Schliemann & Nunes, 1990) and that for students to be reliably capable of transfer, instruction should be structured in a deliberate way (Chase, Shemwell, Schwartz, 2010; Chen & Klahr, 1999; Perkins & Salomon, 2012; Salomon & Perkins, 1989). The current SEL instructional guidelines contain some aspects of such a structure, such as providing sufficient time for skill mastery and employing active forms of learning, but I argue that they do not go far enough to ensure its achievement. For instance, it has been repeatedly shown that skills can be “mastered” yet be accompanied by minimal ability to transfer them to new contexts and problems (Bransford & Schwartz, 1999; Detterman, 1993; Lobato, 2012; Schwartz & Martin, 2004; Thorndike & Woodworth, 1901). Indeed, is has been shown that SEL programs that focus on specific skill-development (rather than e.g. altering students’ mindsets) tend to be ineffective for adolescents (Yeager, 2017a), implying a failure of knowledge transfer. The current SEL program development guidelines may well be deficient in regard to ensuring learning transfer partly because there is little available research on how transfer might be achieved in the SEL context. The goal of my dissertation is to begin to address this gap in knowledge. Below, I make the argument that a potentially effective way to facilitate knowledge transfer in the context of SEL may be to teach a model of the human emotion system. At the heart of this argument lie the twin concepts of deep learning and deep structure.

**Deep Learning and Transfer**

A central tenet of transfer literature is the importance of deep understanding of learned concepts (Brown, 1989; Gentner & Schumacher, 1986; Schwartz, Chase et al., 2011). That is, learning that goes beyond the surface, to grasp the deep structure that underlies a concept or problem (Chi & VanLehn, 2012). It’s important to note that the term “deep structure” has
been used to mean somewhat different things in different research contexts. For instance, in the problem-solving literature, the term is likely to refer to a problem-solving procedure, such as a probability principle (Ross, 1987), or another mathematical rule such as the equation for calculating distance traveled (Reed, Dempster, & Ettinger, 1985), as opposed to the problem cover story, which would contain surface features like descriptions of moving cars or trains (Chi & VanLehn, 2012). Critically, simply learning a formula is not the same as grasping a deep structure. Rather, one should understand the nature of the structure that the formula represents, and the interrelations of the structure’s elements. For example, in their work, Schwartz and colleagues (1998, 2011) showed that helping students understand the nature of the ratio structure that underlies the concept (and formula) of density, i.e. mass / volume, led to better transfer. A deep structure may also refer to an abstract rule or principle such as “density is invariant under transformation” (Schwartz, Chase, Oppezzo, & Chin, 2011). Deep structure has also been defined as a schema, as in the analogical reasoning tasks used by Gick and Holyoak (1980, 1983), in which participants had to arrive at a common problem-solving approach, or schema (e.g. overcoming a large obstacle by means of multiple converging lines of attack), that could be reused on subsequent problems. Deep structure has been used in the context of stories, where the setting and the characters’ names and appearance would be considered the surface features, while the causal plot would represent the story’s deep structure (Gentner, Rattermann, & Forbus, 1993). In the learning literature, deep structure usually corresponds to learners’ mental models of the concepts or systems they are studying (Johnson-Laird, 1995). In order to understand a system, a learner needs to construct a mental model of that system (Ferrari & Chi, 1998; Johnson-Laird, 1995). Their deep understanding is reflected in the accuracy of their mental models. Students’ understanding of the circulatory system, for instance, has been evaluated based on the correctness of a representation of their mental model of the system (Chi, de Leeuw, Chiu, & LaVancher, 1994). By capturing the
interrelations of the elements of a system, causal mental models allow for reasoning and inference-making that facilitates problem-solving (Barnett & Cecci, 2002; Chan & Black, 2005, 2006; Chi, de Leeuw, Chiu, & LaVancher, 1994; Mayer, 1987). Conversely, when the necessary model or underlying principle is lacking, i.e. is not known or not recognized, people will often rely on surface features of the situation and represent the problem incorrectly (Chi, Feltovich, & Glaser, 1981; Fialkov, Jackson & Rabinowitz, 2014). In a seminal study highlighting this idea, Chi and colleagues (1981) showed that when evaluating physics problems, novices tended to group problems based on superficial characteristics while experts grouped them by the underlying physics principles they represented. More recently, Fialkov et al. (2014) demonstrated a similar phenomenon in the psychological realm, showing that psychology students with exposure to an ethics curriculum were better able to group hypothetical clinical scenarios on the basis of the deep structure of the ethical issue involved.

In short, deep structure is a fairly broad, multi-purpose term, but its versatility makes it well suited to my purposes, as I will explain below. The overarching idea is that grasping a deep structure, that is, abstracting a schema, model, principle, or set of principles, is thought to enable transfer by allowing learners to map that schema, model, or principle onto new problems or situations while getting past their superficial attributes (Brown & Kane, 1988; Chi & VanLehn, 2012; Gick and Holyoak, 1983), and using these to reason and make inferences about the problem or situation (Chan & Black, 2006; Johnson-Laird, 1995; Mayer, 1987).

Another key factor in successful transfer is motivation (Perkins & Salomon, 2012; Nokes & Belenky, 2011). That is, whether a learner is motivated to apply what is learned in a novel context. Acquiring a deep understanding of a concept may have the added benefit of enhancing the motivation to use the concept (Perkins and Salomon, 2012) by making it
meaningful to the learner (Chi & VanLehn, 2012).

Researchers have offered a number of recommendations regarding teaching approaches that support the sort of deep learning that enhances transfer, including explicit identification of underlying principles (Chen & Klahr, 1999), the use of diagrams (Mayer, 1989), preparation for future learning (PFL) activities (Schwartz, Chase & Bransford, 2012), and varied practice (Marton, 2006; Salomon & Perkins, 1989), among others. In order to understand how these recommendations, and the notion of deep learning more generally, might apply to SEL, it is necessary to examine more closely the primary skills SEL targets.

The Foundations of SEL

According to CASEL’s (2008) SEL framework, the five key competencies targeted by SEL are self-awareness, social awareness, self-management, relationship management, and responsible decision-making. Of these, relationship management and responsible decision-making are higher order skills that could not be effectively accomplished without first attaining some level of self-management ability, self-awareness and social awareness (Durlak et al., 2015; Smith, Killgore & Lane, 2017). For instance, relationship management depends on social awareness insofar as one needs to be able to correctly interpret others’ emotions and behavior in order to respond to them appropriately (Decety & Jackson, 2004). Similarly, responsible decision-making depends on both awareness and self-regulation. If one lacks self or other awareness, poor decisions may be made due to a failure to correctly understand the meaning and causes of a given situation (Crick & Dodge, 1994; Graham, 1996, 1997; Stegge & Meerum Terwogt 2007), or an inability to appreciate the negative consequence of an action for oneself or others. By the same token, irresponsible decisions may result from an inability to regulate one’s emotional reactions (Crick & Dodge, 1994; Dodge, Coie, & Lynam, 2006). Indeed, one of the chief goals of self-regulation is the avoidance of the harmful consequences
of such decisions (Tamir, Chiu & Gross, 2007; Wranik, Barrett, & Salovey, 2007). Thus self-awareness, other awareness and self-regulation could be seen as foundational abilities upon which other social emotional competencies are built (Weissberg et al., 2015). It is also generally agreed upon that emotional awareness of self and others (Fonagy and Target, 1998; Lane and Schwartz, 1987; Mennin & Fresco, 2014; Pocock, 2010; Smith, Killgore & Lane, 2017), as well as emotional self-regulation (Gross, 2002; Gross & Munoz, 1995; Snyder, Simpson & Hughes, 2007), are conducive to psychological health and effective social functioning. And many if not most existing SEL and affect management programs incorporate the development of awareness and regulation in some form (e.g. Berking and Schwarz, 2014; Greenberg, Kusche, & Mihalic, 1998; Kemeny, Foltz, Ekman, Jennings, Rosenberg, Gilliath, et al., 2011; Maurer & Brackett, 2004; Mennin & Fresco, 2014; see Durlak et al., 2011 for a meta-analysis of school-based programs). Given the foundational role that these abilities play in social emotional learning and competence, it is on them that I intend to focus.

I had previously discussed the concept of deep learning, and that it often involves the apprehension of a deep structure that underlies the content being learned. Such learning has been shown to support knowledge transfer by enabling learners to map the deep structure onto new problems. Might there be a deep structure or set of deep structures to SEL content? Below, I argue that such deep structures exists, and that they can be represented by the principles and processes of the human emotion system. I begin by providing a functional definition of the emotion system and then demonstrate how self and social awareness, as well as self-regulation, are enabled by an understanding of the system.

The Emotion System

The idea of an emotion system has previously been described both in the neurological
(Barrett, Ochsner & Gross, 2007; Cicchetti, Ackerman, & Izard, 1995) and conceptual
(Berking & Schwarz, 2014; Boekaerts, 2006; Gross & Thompson, 2007; Levenson, 1999;
Mischel & Shoda, 1995; Sloman 1987; Stegge & Meerum Terwogt, 2007) sense. While
researchers continue to debate the precise nature of the system’s neurological makeup and
mechanisms (e.g. Barrett, Ochsner & Gross, 2007; Barrett, Wilson & Barsalou, 2014; Smith,
Killgore, & Lane, 2017), I am more concerned with the high level functions that it is thought
to be responsible for, as well as the generally understood principles, components and
processes that govern those functions.

Cicchetti and colleagues (1995) proposed that the “central function of the emotions
system is to motivate and organize behavior” and that the “system is composed of separable
components involving... neural processes, expressive behavior, and subjective experiences or
feeling states.” Stegge and Meerum Terwogt (2007) have offered a succinct definition of the
system as “a kind of radar and response facility that enables us to quickly appraise and
respond to situations that are relevant to our well-being.” A somewhat expanded definition
might run as follows: the emotion system helps identify potentially self-relevant stimuli,
evaluates those stimuli in relation to one’s goals and needs--an evaluation that depends on
one’s values and beliefs--and then activates an appropriate (and largely automatic) neural,
motor and physiological response that drives and guides the organism’s behavioral reaction to
the situation and produces the phenomenological experience we call emotion (Barrett, Wilson
& Barsalou, 2014; Cole, Martin, & Dennis, 2004; Frijda, 1988; Gross & Thompson, 2007;
Kahneman, 2003; Levenson, 1999; Lindquist et al., 2012; Ochsner & Gross, 2007; Stegge &
Meerum Terwogt, 2007). Critical to this definition is the assumption that the products of the
emotion system, i.e. emotions, are essentially adaptive, in that they help the organism rapidly
determine how to respond to self-relevant events (Frijda, 1988; Levenson, 1999; Roseman &
Smith, 2001). At the same time, because of the necessity for speed, the system’s output is
inevitably stereotypical--the term ‘emotion program’ is sometimes used (Gross & Barrett, 2011)--and may not represent the optimal response in relation to e.g. long term goals, thus requiring some situational fine-tuning (Levenson, 1999; Stegge & Meerum Terwogt, 2007). To account for this dual need and function--speed as well as flexibility--Levenson (1999) proposed the two-system emotion model, in which a core emotion “engine” generates rapid, stereotypical responses that can be adjusted by a context-aware, more deliberative control system. This echoes the two-system cognitive model advanced by researchers like Kahneman (2003) and Stanovich and West (2000). In this model, System 1 (the core emotion system) operates rapidly, automatically, and intuitively, producing swift emotional impressions, which offers the advantage of speed but tends to lack flexibility and nuance, whereas System 2 (the control system) allows for purposeful deliberation and functions as a monitor of the output of System 1, adjusting that output when necessary (Kahneman, 2003). The two-system model is useful for illustrating how knowledge of the emotion system enables the skills of awareness and regulation, and how, consequently, the processes and principles of the emotion system represent the deep structures underpinning SEL content, as discussed below.

**SEL Skills and Emotion System Knowledge**

The idea of developing an understanding of emotions and the emotion system as a means of fostering social emotional competence (SEC) has previously been put forth by a number of researchers. Boekaerts (2011) has argued that self-regulation is influenced by knowledge and beliefs about the emotion system. Similarly, Wranik, Barrett, and Salovey (2007), building on Salovey and Mayer’s (1990) emotional intelligence theory, suggested that emotion knowledge is instrumental for effective self-regulation, and in particular that an understanding of the appraisal process that is central to emotion generation could facilitate more effective regulatory strategy selection. Similarly, Cognitive Behavioral Therapy (CBT;
Meichenbaum, 1977), which has strongly influenced modern approaches to SEL, is based on elucidating the connections between “thoughts, cognitive schema, beliefs, attitudes, and attributions that influence one’s feelings” and behavior (Osher et al., 2016). In their lucid and persuasive account, Stegge and Meerum Terwogt (2007) argue that explicit knowledge of the emotion system contributes critically to the process of reflection, that understanding the causes of emotion and having strategies for emotional responding are crucial for effective regulation, and that children should be helped to acquire a two-level “emotion theory,” which emphasizes both the autonomous nature of the emotion process as well as the capacity and need for regulation. However, the literature has not offered a clear, comprehensive account of the relationship between emotion system knowledge and key SEL skills; nor has it highlighted the potential advantages of teaching the HES from the standpoint of deep learning and learning transfer—topics which I begin to address in this and the following sections.

Self-Awareness. Self-awareness is defined by Weissberg and colleagues (2015) as the understanding of one’s emotions, personal goals and values; furthermore, a high level of self-awareness is seen as requiring the ability to understand the interconnections between thoughts, feelings and actions. It should be added that practical self-awareness would go beyond mere understanding to include the capacity to recognize and monitor the interaction of these elements in something like real time (Wranik, Barrett & Salovey, 2007). Meanwhile, as discussed above, the emotion system is the “engine” that combines stimuli, personal goals, values, and thoughts, and transforms them into emotional responses that drive behavior. In other words, developing self-awareness would entail the development of a metacognitive (Flavell, 2004) understanding of the emotion system. That is, meta-level cognitive processing aimed at evaluating one’s emotions and related mental states and phenomena (Lambie &
Using the two-system model of emotion and cognition (Kahneman, 2003; Levenson, 1999), one might describe this process as System 2 (the control system) purposefully evaluating the operations and output of System 1 (the core system). Such metacognitive evaluation of one’s emotional processes relies on what has been called second order awareness (Lambie & Marcel, 2002), to distinguish it from the first order phenomenal experience of having an emotion. In the case of second order awareness, we are consciously considering how we feel, why we feel that way, and how we can respond (Stegge & Meerum Terwogt, 2007). The quality of this assessment will depend on one’s general understanding of how emotions operate, i.e. of the functioning of the emotion system (Barrett 2006; Barrett, Gross, Christensen, Benvenuto, 2001). At a most basic level, for example, one would need to be able to categorize the emotion one is experiencing, for instance as anger or fear or joy or something else, which would call on conceptual emotion knowledge most of us acquire through experience, but which can also be deliberately cultivated through instruction and practice (Barrett, 2006; Barrett, Wilson & Barsalou, 2014; Smith, Killgore & Lane, 2017; Stegge & Meerum Terwogt, 2007; Wranik, Barrett & Salovey, 2007; Zelazo and Lyons, 2012). One would also benefit from being able to recognize the cause of the emotion, a task made easier by the knowledge that emotions are generated in response to evaluations of events with respect to one’s goals and needs (Scherer, Schorr, Johnstone, 2001). Similarly, knowing that emotional experiences often involve blends of emotions (Lane & Schwartz, 1987), could help one recognize and disentangle several simultaneous and possibly conflicting emotional responses (such as relief and disappointment), and so on. Returning to the two-system model (Kahneman, 2003; Levenson, 1999), System 2 could now be said to be intelligently monitoring System 1, that is, using knowledge of System 1 (and its own relationship to that system) in order to make better sense of System 1’s output (Figure 1.1).
Social awareness. Whereas self-awareness is concerned with monitoring one’s own emotional processes, social awareness involves recognizing and understanding the emotions of others, including taking others’ perspective and feeling empathy (Decety & Jackson, 2004; Weissberg et al., 2015). In the psychological literature self and other awareness are collectively grouped under the rubric of Theory of Mind, which deals with the “mentalizing” activity of interpreting and making inferences and attributions about the mental states of oneself and others (Flavell, 2004; Gallagher & Frith, 2003; Frith & Frith, 1999). It makes intuitive sense for self and other awareness to be functionally related, and indeed numerous neuroimaging studies have provided evidence that there is a substantial overlap in the neurological processes involved, with some of the same brain regions, such as the medial prefrontal cortex, posterior cingulate cortex, and the parietal cortex, implicated both in attending to one’s own emotions and those of others (e.g. Gallagher & Frith, 2003; Ochsner, Knierim, Ludlow, Hanelin, et al., 2004; Rizzolatti & Craighero, 2004; Vogeley, Bussfeld, Newen, Herrmann, et al., 2001). Research in the area of grounded cognition and emotion embodiment suggests that when we attempt to interpret others’ emotions and behavior, we model their mental states by simulating them via our own emotion system (Barsalou, 2008; Buckner, 2011; Damasio, 1994, 2003; Decety, & Grèzes, 2006; Flavell, 2004; Gallese,
Keysers, & Rizzolatti, 2004; Goldman, 2006) enabling us to infer their affective states (Gallese et al., 2004; Niedenthal, 2007; Wicker, Keysers, Plailly, Royet, Gallese, & Rizzolatti, 2003). As Barsalou (2008) put it, “[we] represent other people’s minds using simulations of our own minds.” In particular, affect simulation is facilitated by a process whereby the observation of others’ postures and facial expressions results in neural activity in the corresponding motor cortices, which may or may not result in overt physical movement, but which will activate associated emotion constructs (e.g. perceiving a smile may engender the activation of the neural representations of joy or happiness; Gallese et al., 2004; Decety, & Grèzes, 2006; Niedenthal, 2007). Furthermore, the construction and semantic comprehension of the context and situation that gave rise to the other’s emotions relies on some of the same top-down mechanisms that interpret the meaning of self-relevant situations and events (Ochsner et al., 2004; Ochsner, Ray, Hughes, McRae, Cooper, Weber, Gabrieli, & Gross, 2009; Wondra & Ellsworth, 2015). The product of the top-down meaning-making can then be plugged in, so to speak, into bottom-up emotion generation circuits like the amygdala to create a simulated experience of the other’s condition (Ochsner & Gross, 2007; Ochsner et al., 2009).

This kind of mental simulation is also thought to be the mechanism which allows us to comprehend the emotional and mental states of characters in films and books (Anderson & Hanson, 2010; Decety, & Grèzes, 2006; Fletcher, Happé, Frith, Baker, Dolan, Frackowiak, et al., 1995; Niedenthal, 2007; Wondra & Ellsworth, 2015). Thus it is not puzzling to us when a character in a story feels angry upon being insulted: the simulation of the character’s experience that occurs as part of engaging with the story allows us to understand his anger. The capacity for such simulation depends on the common structure of the emotion system -- that is, on the implicit expectation of consistency in the general interrelations between emotions, their causes and consequences, within the observer and the subject (Decety &
It is this assumption that makes it possible for the same neural mechanisms that govern the experience and interpretation of one’s own emotions to be utilized to experience those of another. (Note that I am referring to the general principles of the emotion system, e.g. that a stimulus will be evaluated with respect to an individual’s goals and needs, rather than the specific goals, values, beliefs, experiences, temperament and other factors that may produce individual differences in emotional responding.) Furthermore, the aforementioned simulation process is generally thought to be carried out automatically as we engage with another person (whether real or fictional) (Decety & Jackson, 2004; Wondra & Ellsworth, 2015), suggesting that this occurs largely by means of the core affective system. As Wondra and Ellsworth (2015) write, “Empathy is not a special process. Instead it is a part of normal emotion processes.”

Because of the reliance on one’s own emotional processing capacity to understand the emotions of others, researchers have argued that enhancing this capacity, that is, improving one’s emotional self-awareness, would support social awareness (Decety & Jackson, 2004; Flavell, 2004; Lane and Schwartz, 1987). To paraphrase Rousseau, knowing your own heart allows you to better understand your fellow man (or woman). This perspective has obvious implications when considering the role of emotion system knowledge in enabling social awareness. Simulating others’ emotional states in our own mind allows us to make sense of their emotions in much the same way that we make sense of our own (Wondra & Ellsworth, 2015): by interpreting the situation, identifying the attendant feelings, uncovering their causes, and other factors, such as beliefs and values, that may have played a role in the person’s emotional reaction—a process that would clearly benefit from an understanding of the emotion system, just as it does in the case of self-awareness. Here again, System 2 can leverage its knowledge of how System 1 works to make a better evaluation of System 1’s
output, only this time the output being evaluated is one that results from a simulation of another’s mental and emotional state (see Figure 1.2).
Figure 1.2. Social awareness as a function of the 2-level affective-cognitive system: another’s emotional state is simulated via System 1 (the core system) and the result of the simulation is evaluated by System 2 (the control system), a process aided by an understanding of the HES much as it is in the case of self-awareness.

Emotion regulation. Knowledge of the emotion system would also be expected to be linked with emotion regulation. Emotion regulation is generally defined as the purposeful management of one’s emotions to facilitate the achievement of one’s goals (Gross & Thompson, 2007). Regulation can take a variety forms, including situation selection, attention deployment, cognitive change, and emotion suppression (Gross, 2015). For the present discussion, regulation through cognitive change, e.g. by means of reappraisal (Ochsner & Gross, 2007), is of particular interest for several reasons. First, it is a form of regulation that occurs “in the moment,” i.e. as someone is experiencing an emotion, which is the time when the challenge and need to regulate might be greatest. Second, there is evidence that it is generally a healthier form of regulation compared to emotion suppression (e.g. Richards & Gross, 2000), and third, it has been extensively studied (Gross, 2015).

While emotion regulation via cognitive change is often thought to be distinct from emotion generation (Barrett, Ochsner & Gross, 2007; Gross & Thompson, 2007), a growing body of evidence suggests that the two may in fact be carried out by overlapping neural circuitry (Barrett, Wilson & Barsalou, 2014; Ochsner, Ray, Gabrieli, & Gross, 2004; Ochsner
& Gross, 2007; Ochsner et al., 2009) and may represent two functions whose distinction is more theoretical and conceptual than anatomical (Gross & Barrett, 2011; Barrett et al., 2014; Ochsner et al., 2009). In particular, Barrett and colleagues (Barrett 2006; Barrett et al., 2014) argue that emotions are continuously updated “situated conceptualizations” that are both generated and altered, or regulated, by the same underlying, distributed neural components and mechanisms. Essentially, emotional experience is triggered in response to the perceived meaning, or conceptualization, of a situation or stimulus. When that meaning changes, whether as a result of deliberate effort or spontaneously, the emotion and its attendant psychological and physiological experience change with it. In short, while regulation may subjectively feel different due to its effortful and deliberate nature, its effects are produced by the same underlying meaning-making processes that automatically generate emotional experience, i.e. by means of the emotion system. At the same time, successful regulation strategy selection depends on a grasp of the emotional structure of a given episode (Crick & Dodge, 1994), which is aided by an understanding of the emotion system (Stegge & Meerum Terwogt, 2007). Similarly, determining whether regulation succeeded (and whether or not additional efforts or an alternate strategy may be called for) depends on the evaluation of the effect of the regulation effort (Bonanno & Burton, 2013), i.e. a metacognitive, second order-type assessment of the emotion system’s state following the regulation attempt. In the two-system (Kahneman, 2003; Levenson, 1999) parlance, when regulation occurs, System 2 is both evaluating and modulating the output of System 1 (by providing new inputs in the form of altered conceptualizations (Barrett, Wilson & Barsalou, 2014)), and subsequently evaluating and acting on the result of the modulation, in an ongoing regulatory feedback loop whose success depends in part on how well System 2 understands the functioning of System 1 (Figure 1.3).
In sum, the set of neural structures and processes comprising the human emotion system can be said to be responsible for generating emotions and their attendant subjective experience, as well as allowing for mentalizing about one’s own and others’ emotions, and regulating emotions. The emotion system is thus the universal chassis, so to speak, upon which social emotional functioning is built. By the same token, knowledge of how the emotion system functions is critical for enabling core SEL skills like self-awareness, social awareness and self-regulation. In the next section, I expand on this idea to show that the HES may be an optimal target and basis for transfer-focused SEL instruction.

The Emotion System as Deep Structure

The universal nature of the emotion system makes it a logical focus for transfer-enabling SEL instruction. I propose that the HES, its components, principles and processes, can be seen as the set of deep structures that underpin social emotional learning content. These deep structures can come in several forms: that of a causal mental model of emotions to be used in reasoning about an emotional situation, of key principles and emotion schemas that factor
into the model and can influence attributions and secondary appraisals, and combinations of the above. The use of these deep structures should help learners make the most of the information generated by the emotion system to solve social and emotional problems.

Though emotions have long been regarded as mysterious and inscrutable (Frijda, 1988), the type of information processing involved in managing social-emotional challenges is similar to the process of general problem-solving (Crick & Dodge, 1994; Stegge & Meerum Terwogt, 2007). In order to determine how best to respond to a given situation, “one has to analyze the situation to establish the nature of the problem” (Stegge & Meerum Terwogt, 2007). The accuracy of this situational appraisal, which enables adaptive response selection, will be strongly influenced by emotion knowledge (Barrett, 2006; Boekaerts, 2011; Crick & Dodge, 1994; Stegge & Meerum Terwogt, 2007; Wranik, Barrett, & Salovey, 2007). Specifically, knowledge of how emotions arise (i.e. their causes), and an ability to apply that knowledge to make inferences and draw conclusions in a given (often novel) situation.

Unlike broad behavioral rules, such as “be respectful,” or stereotypical attributions such as “teachers are caring (or strict),” which may be useful social heuristics but don’t lend themselves to flexible deployment for socio-emotional problem-solving, the workings of the emotion system represent the fundamental principles upon which our socio-emotional functioning is based. Consequently, understanding of the emotion system should allow for a more accurate and nuanced analysis--which would most likely occur at the level of second order awareness (Lambie & Marcel, 2002)--of the nature and causes of one’s own and others’ emotions, and subsequently for choosing more appropriate responses.

For instance, knowing that emotions are generated on the basis of appraisals which evaluate events in relation to one’s goals and needs (Scherer, Schorr, Johnstone, 2001)--an aspect of the causal mental model of the HES--can help trace the emotion’s origins and provide insight into how to manage it (Stegge & Meerum Terwogt, 2007; Wranik, Barrett, &
Salovey, 2007). For instance, incipient anger in reaction to a request from a partner or spouse might be determined to be caused by the pressure to make a deadline, rather than the nature of the request itself, which can help damp the anger and select a constructive response (such as communicating the demands of the deadline). Similarly, when observing someone else having an emotional reaction, one would be able to make use of the model of emotions based on goal-congruent appraisals, try to identify the goals in question, and manage the situation accordingly. In this latter case, HES model knowledge would be supporting social awareness. In both cases, use of the model would be laying the groundwork for more fruitful regulation and behavior response selection.

To take another example, learning about the automaticity of appraisal (Ochsner & Gross, 2007; Scherer, Schorr, Johnstone, 2001)—a principle of the HES—and the limited control one has over the emotion generation process, would be expected to positively influence how accepting one is of emotions in oneself and others (Flavell & Green, 1999; Frijda, 1988). Being accepting of emotions involves non-judgment of the emotional experience, and is in itself a form of regulation associated with psychological well-being (Hayes, Strosahl, & Wilson, 1999; Zelazo & Lyons, 2012), which gives a person an opportunity to better understand the emotion and respond adaptively to it. Understanding that initial emotion generation is largely outside one’s control may reduce the sense of blame one would attach to an ‘inappropriate’ emotion (Knobe, 2006), and increase acceptance of one’s own emotions as well as tolerance for the emotions of others, providing potential regulatory benefits (Stegge & Meerum Terwogt, 2007). In this manner, learning and applying a specific HES principle could alter one’s conceptualization of an emotional situation, thus altering one’s emotional reaction and contributing to a more adaptive behavioral response. That is, it can help lead to greater socio-emotional competence.

These are just a few examples of how knowledge of the HES model and principles
could impact SEC. I posit that a more complete instructional model of the HES, which would incorporate a number of other components and principles, and which I describe below, could be expected to provide a variety of specific benefits in the context of socio-emotional problem-solving. An understanding of the system would facilitate getting past superficial aspects of a situation such as the external characteristics of the environment or of the people one is interacting with—e.g. social role, appearance, and so on—and simplistic, stereotyped attributions, and to reason and make inferences on the basis of underlying socio-emotional principles. Overall, it should boost learners’ emotional complexity (Kang & Shaver, 2004) and enable them to respond to emotion-eliciting events in a maximally flexible fashion across contexts and situations (Stegge & Meerum Terwogt, 2007; Wranik, Barrett & Salovey, 2007; Yeager, 2017a), fostering what’s known as regulatory flexibility (Bonanno & Burton, 2013).

The above perspective is consistent with evidence showing that conceptual emotion knowledge can influence emotional experience (Barrett, 2006; Barrett, Wilson & Barsalou, 2014; Lane and Schwartz, 1987; Smith, Killgore & Lane, 2017; Wranik, Barrett, & Salovey, 2007), and that an understanding of one’s emotion system can help regulate that system, supporting self-management and psychological wellbeing (Barrett et al., 2014; Berking & Schwarz, 2014; Boekaerts, 2011; Lane and Schwartz, 1987; Philippot, Baeyens, Douilliez, & Francart, 2004; Stegge & Meerum Terwogt, 2007; Wranik, Barrett & Salovey, 2007; Yeager, 2017a, 2017b). Furthermore, use of such conceptual knowledge can be automatized with practice, allowing for it to be incorporated into a person’s repertoire of everyday regulation methods (Barrett, Wilson & Barsalou, 2014; Berking & Schwarz, 2014; Gross & Thompson, 2007).

Teaching the emotion system also offers a motivational advantage. First, this advantage has to do with the fact that the instruction is not prescriptive or rule-based. Prescriptive approaches undermine learners’ sense of autonomy, reducing their motivation to
follow the prescriptions (Deci and Ryan, 1985; Koestner, Ryan, Bernieri, & Holt, 1984). For example, Yeager (2017a) has documented the finding that many existing SEL programs that take a more prescriptive approach to learning (e.g. teaching particular ways to solve socio-emotional problems) tend not to be effective for adolescents. In Yeager’s words, “when SEL programs feel to adolescents like a mother telling them how to make their personal choices, null effects should not surprise us” (2017a). Conversely, teaching the HES model is not based on telling learners the right way to behave (nor on training them to use a particular regulation or behavior strategy), but on elucidating the system that governs their emotional functioning, and facilitating inference-making and problem-solving based on the system’s logic and principles. Thus it should not infringe on one’s autonomy. Additionally, it should foster motivation for transferring the knowledge to other contexts by making it meaningful to the learner (Perkins and Solomon, 2012). For similar reasons, this approach may also be expected to lead to greater teacher buy-in, which is integral to the successful implementation of SEL programs and which may not always be forthcoming (Reyes, Brackett, Rivers, Elbertson, & Salovey, 2012). Understanding of the emotion system would be expected to provide a further motivational boost by way of increased self-efficacy (Bandura, 2002). Knowledge of how emotions arise as well as of other aspects of the emotion system increases confidence in managing one’s emotions, i.e. one’s sense of regulatory self-efficacy (Berking and Schwarz, 2014). Increased self-efficacy and a greater expectation of success are believed to enhance motivation (Bandura, 2002; Wigfield & Eccles, 2000). Indeed, a belief in the ability to manage one’s emotions has been shown to support regulation efforts (Sapolsky, 2007).

To sum up, I propose that the principles, processes and components of the emotion system represent the deep structures that underpin key elements of social emotional learning. And that an understanding of the emotion system--i.e. having a well-developed causal mental
model of the system and understanding its principles—would be expected to enable improved reasoning and inference-making about one’s own and others’ emotions and behavior across varied contexts, as well as to boost the motivation to engage in such reasoning, thereby enhancing self and social awareness, and regulatory flexibility, and consequently all other social emotional competencies.

**Implicit Emotion Models and the Need for Direct HES Instruction**

Given that people are able to mentalize on the basis of a naturally developed, intuitive grasp of the emotion system (Decety & Chaminade, 2003; Flavell, 1999, 2004; Goldman, 1989; Gordon, 1986; Harris, 1991, 2000), one might reasonably ask why it would need to be taught. The answer lies in the fact that while we spontaneously construct models of the world, including of our own and others’ emotional functioning, and adjust these models over time (Crick & Dodge, 1994; Flavell, 2004; Gelman & Wellman, 1998), such models, or theories, are often at least partially inaccurate even after considerable experience (Decety & Jackson, 2004; Flavell & Green, 1999; Fonagy & Target, 1998; Molden & Dweck, 2006). An incorrect emotion system model is, by definition, an impediment to a high level of self-awareness. Such models can lead to incorrect interpretations of (Dweck, 2008) and problematic reactions to emotional experiences (Bushman & Huesmann, 2010; Crick & Dodge, 1994; Dodge, Coie, & Lynam, 2006; Romero, Master, Paunesku, Dweck, & Gross, 2014, Yeager, Trzesniewski, Tirri, Nokelainen, & Dweck, 2011). Low self-awareness and a poor understanding of one’s emotions will also impair a person’s ability to make sense of others’ emotional experiences, as discussed above. Furthermore, spontaneously developed theories of emotions, often called “lay” or “naive” theories (Molden & Dweck, 2006), are generally implicit (Dweck, 2006; Dweck & Leggett, 1988; Flavell, 2004; Romero et al., 2014). An implicit theory may influence a person to behave in a certain way, such as responding with more or less
aggression to a provocation (Yeager, Trzesniewski, Tirri, Nokelainen, & Dweck, 2011) or being more or less likely to take on a challenge (Dweck, 2006), but it won’t enable a learner to reason deliberately and flexibly about a novel situation because it has not been abstracted as an explicit, content-independent schema or model to be used in problem-solving (Bassok & Holyoak, 1989; Gick & Holyoak, 1983). As previously discussed, such deep structure abstraction is at the heart of knowledge transfer, enabling one to get past a problem’s surface features to its underlying principles (Chi & VanLehn, 2012).

In sum, people are frequently operating on the basis of implicit and inaccurate, or only partially accurate, emotion models, which may contribute to incorrect social attributions (Dweck, 2008; Graham, 1996, 1997) and maladaptive behaviors (Crick & Dodge, 1994; Dodge, Coie, & Lynam, 2006; Fonagy & Target, 1998; Romero et al., 2014; Yeager et al., 2011), and clearly isn’t optimal if one’s goal is high social emotional competence. Meantime, though existing SEL programs often rely on models of emotional functioning to develop their curricula, the curricula themselves tend to communicate those models only implicitly and indirectly (Durlak et al., 2011; Jennings & Greenberg, 2009; Zeidner, Roberts & Matthews, 2002; Zins et al., 2004). This pedagogic tendency may be tied to SEL’s roots in behavior prevention (Durlak et al., 2011; Osher et al., 2016), which has been known to suffer from a somewhat paternalistic approach to learners, resulting in methodologies that often favored rule-based instruction over conceptual understanding and deep learning (Durlak, 1997; Dusenbury & Falco, 1995). Another reason may be that many SEL programs for middle and high school students are adapted from materials intended for younger learners, with only relatively superficial alterations (Yeager, 2017a). While activities that are not expressly designed to teach the emotion system model may still provide experiences that enhance aspects of people’s social emotional competence and provide other benefits, in most cases they will not lead to the spontaneous generation of a complete and accurate mental model of
the system and its principles. For this to occur, instruction has to be deliberately structured to lead to the understanding of the interrelations and common principles that govern the system (Chase, Shemwell, Schwartz, 2010; Chen and Klahr, 1999; Klahr and Chen, 2011; Perkins & Salomon, 2012; Salomon & Perkins, 1989). In other words, the system has to be deliberately taught with the intention of enabling learners to grasp the underlying model in order for this to reliably occur.

It is important to emphasize that the emotion system model I refer to should be founded on actual neurological and physiological processes involved in generating, experiencing and regulating emotion, such as the rapid ‘bottom-up’ neural processing of perceptual stimuli (Ochsner & Gross, 2007; Ochsner et al., 2009); the more cognitively intensive, cortical, ‘top-down’ processes that evaluate stimuli in relation to a person’s goals (Barrett, Ochsner & Gross, 2007; Ochsner & Gross, 2007; Ochsner et al., 2009); the cascade of physiological--autonomic nervous system, endocrine--responses that accompany an emotion (Lindquist, Wager, Kober, Bliss-Moreau, & Barrett, 2014; Rainville, Bechara, Naqvi, Damasio, 2006; Sotres-Bayon, Cain & LeDoux, 2006), and so on. This is another reason why one would not expect learners to derive the emotion model spontaneously, without direct instruction: much of the knowledge pertaining to the emotion system has been obtained by means of extensive psychological research as well as neuroscience techniques such as fMRI, and often would be quite difficult to arrive at independently (particularly for a younger person), even if it is easily understood once learned. In order to keep the material digestible, the model would not need to delve very deeply into processes’ underlying mechanisms. Yet a clear indication of the biological, research-based foundations of the model’s principles and components is seen as an important aspect of instruction because of the greater credibility and persuasiveness, and consequently greater capacity to affect extant beliefs (Aronson, Fried, & Good, 2002; Chiu, Hong, & Dweck, 1997), it would lend to the
model. According to behavior change theories such as the theory of reasoned action (Fishbein & Ajzen, 2010), belief change is critical to behavior change, which is the ultimate purpose of SEL (Brackett, Elbertson, & Rivers, 2015). In effect, having access to the same essential findings as academic researchers and psychologists would allow everyone to become their own therapist, just as universal literacy enabled everyone to become their own teacher (though just as literacy did not make teachers obsolete, so HES learning would not be likely to obviate therapists).

**Automatization of HES Knowledge**

For HES model knowledge to be useful, learners need to be able to employ it on the fly, in a real world context, just as they would normally make use of their spontaneously generated emotion models, rather than to merely recite it back in a classroom or lab (Durlak et al., 2011; Berking and Schwarz, 2014). That is, the knowledge must move from a declarative to something like a procedural state (Anderson, 2009). Hence, the declarative knowledge of the model would need to be translated into procedural actions, a process that has been referred to as declarative to procedural transfer (Nokes & Belenky, 2011). It is well established that practice is the means by which procedural skills are acquired (Salas & Cannon-Bower, 2001), and existing SEL guidelines make clear that practice would be an essential element of any effective SEL program (Durlak et al., 2011). Consequently, teaching the HES model must incorporate practice exercises aimed at translating knowledge of the model into procedural skills that can be used in real time. A critical feature in this automatization would be the development of a habit of reflection (Bosoevski & Zelazo, 2008; Teasdale, 1999), which would support second order self and other awareness (Stegge & Meerum Terwogt, 2007). This type of awareness is what enables and prompts deliberate regulatory activity (Levenson, 1999; Stegge & Meerum Terwogt, 2007). Extant research on SEL as well as transfer and skill
development suggests a number of important characteristics for the practice activities intended to produce the automatization of HES knowledge. These include grounding practice in realistic examples of human behavior, e.g. using narrative (Brackett, Rivers, Reyes & Salovey, 2012; Greenberg, Kusché, & Mihalic, 1998), ensuring that practice is sufficiently varied (Marton, 2006; Salomon & Perkins, 1989), as well as inference-driven (Mayer, 1989) and constructive (Chi, 2009), and making use of conceptual models such as diagrams (Mayer, 1987, 1989).

At the same time, one of the challenges of reasoning effectively about emotional situations is that the attendant emotions are prone to impact cognitive function (Crick & Dodge, 1994; Frijda, 1988; Stegge & Meerum Terwogt, 2007; Zelazo & Lyons, 2012). Such so-called “hot” cognition (Prencipe, Kesek, Cohen, Lamm, Lewis & Zelazo, 2011) may be biased by the prevailing emotional state (Lambie & Marcel, 2002; Teasdale, 1999), which can effectively “hijack” the cognitive system (Frijda, 1988; Zelazo & Lyons, 2012). Thus making effective use of emotion knowledge to improve socio-emotional problem-solving requires some baseline level of self-regulation that can provide the space for the strategic deployment of such knowledge. Notably, the practice involved in the automatization of HES model knowledge should in itself be expected to boost this kind of regulation. As alluded to above, HES model learning would involve fostering a reflective stance (Teasdale, 1999), which calls for self and situational observation. “Observing” an emotionally charged situation is a type of psychological distancing (Gross, 1998), which has been shown to make an emotion less potent (Wilson-Mendenhall, Barrett & Barsalou, 2011) and can become more effective with practice (Denny & Ochsner, 2014). Similarly, attending to one’s internal emotional state can attenuate an ongoing emotion by redirecting attention away from the eliciting stimulus (Silvia, 2002). At the same time, the HES model and principles would provide a framework of abstract conceptual terms to be used to “deconstruct” emotional
experience. Deconstructing emotion (Barrett, Wilson-Mendenhall & Barsalou, 2014), and representing a stimulus in terms of abstract conceptual descriptions (Bosoevski & Zelazo, 2008), are both methods thought to produce down-regulation effects. In sum, HES model learning possesses some inherent characteristics that should support learners’ regulation and facilitate emotion knowledge use. In this way, aspects of HES model learning can be seen as not unlike mindfulness training, which is thought to reduce bottom-up interference with top-down regulatory processes, diminish reactivity and provide more opportunity for adaptive emotional responding (Zelazo & Lyons, 2012). Indeed, some recent mindfulness-based SEL programs have begun to incorporate information about the emotion system (e.g. Broderick & Metz, 2014; Kemeny, Foltz, Ekman et al., 2011).

Over time, the acquisition and automatization of HES model knowledge would be expected to lead to changes in the structure of emotion representation. Barrett and colleagues describe how interventions like cognitive behavioral therapy (CBT) may produce their effects by helping people modify their conceptual system of emotions, altering “how conceptual knowledge is used to construct the situated conceptualizations that are emotion” (Barrett, Wilson-Mendenhall, & Barsalou, 2014). This echoes Lane and Schwartz (1987) who described how acquiring emotional knowledge would be expected to alter the structural organization of one’s internal conceptions of emotion, which “determines how the internal world of emotion is experienced.” HES model learning and automatization, besides facilitating reasoning about emotion, would be expected to accomplish precisely that: altering the structure of learners’ internal concepts of emotions, thereby altering how emotions are experienced and ultimately regulated. The benefits to regulation would potentially extend beyond cognitive change skills to situation and response selection, as greater understanding of emotional functioning would enable better prediction of situational and behavioral outcomes (see Figure 1.4 for a theory of change diagram).
Past Evidence of the Benefits of Teaching the Emotion System

Several recent interventions aimed at improving the emotion regulation of different target populations have produced some evidence of the potential benefits of teaching a model of the emotion system. Berking, Schwarz and colleagues (Berking, Wupperman, Reichardt, Pejic, Dippel, & Znoj, 2008; Berking & Schwarz, 2014; Berking & Whitley, 2013), developed an emotion processing model which was taught to participants in a clinical setting as part of the Affect Regulation Therapy (ART) program which combines with more traditional cognitive behavioral therapy (CBT) treatment. Participants in the program showed improvements in emotion regulation compared to a control group exposed to CBT treatment only. However, the emotion model was just one of several elements of the program, and the model did not appear to be explicitly tied to underlying neurological processes that would help explain the causal interrelations of the elements of the system. Similarly, Mennin and Fresco (2014) have
described a CBT-based program called Emotion Regulation Therapy (ERT), which involves providing clinical patients information about how emotions work, along with various other forms of emotion training and skill-building. As with ART, ERT is a comprehensive, multifaceted program, and shows considerable promise as a clinical intervention (Mennin & Fresco, 2014). However, it appears to devote only a relatively small portion of its training time to learning about emotions’ underlying mechanisms, so that it is unclear how much of its effects may be related to emotion system knowledge (Mennin & Fresco, 2014). Kemeny, Ekman and colleagues (2011) recently tested an intervention aimed at teachers, in which meditation and perceptual emotional awareness training was combined with information about certain aspects of the emotion system, resulting in regulation improvements among subjects in the treatment group. However, the emphasis of the intervention appeared to be primarily on meditation and perceptual awareness (e.g. recognition of emotion expressions) rather than the mastery of the emotion system model per se.

Yeager, Dweck and Trzesniewski (2013) showed that high-school students’ aggressive behavior could be reduced (i.e. their emotional self-regulation improved) by influencing their beliefs with regard to personality traits. In some respects, this last study offers some of the strongest and clearest evidence for the promise of teaching the principles of the emotion system. The study relied on Dweck’s (2008) previous work on implicit beliefs, and involved a manipulation of personality beliefs whereby students were shifted away from an “entity” view of personality toward an “incremental” one. That is, the intervention attempted to increase students’ sense of their capacity to change so that they were less likely to think of personality traits as fixed. Crucially, as with other recent mindset-based interventions (e.g. Blackwell, Trzesniewski, and Dweck, 2007) this process depended on teaching students about brain plasticity, and the brain’s inherent capacity for growth and change, particularly as it relates to personality, behavior and emotions. Yet what this amounts
to is changing students’ conceptual knowledge about an aspect of their affective-cognitive system. In other words, Yeager, Dweck and colleagues’ mindset interventions are a specific example of the general principle of teaching salient aspects of cognitive and emotional functioning in order to produce substantive changes in attitude and behavior. As Yeager at al. (2013) put it, “patterns of aggressive retaliation are better understood not as inborn traits or intractable habits, but rather as resulting in important ways from the social-cognitive frameworks that adolescents have developed.” By the same token, “teaching the incremental theory of personality would provide students with a new framework for understanding the social world” (Yeager et al., 2013). Taking the transfer and deep learning perspective, the power of this approach lies in explicitly providing an accurate mental model of an aspect of emotional functioning, in this case the high level concept of the nature of personality. Students then rely on this model to reason about their own and others’ behavior, leading to altered interpretations of and responses to social situations such as bullying and victimization (Yeager et al., 2013). Significantly, Yeager et al. (2013) note that “there were no differences across nations or across ethnic or racial groups in the impact of an entity theory on the desire for vengeance, suggesting that implicit theories of personality may influence the motivation to respond aggressively in many contexts.” The implication is that providing an alternate (i.e. incremental) model of personality development would similarly influence learners’ response patterns across various contexts, which is the very definition of transfer. Yeager (2017a) makes this connection explicit when he writes “[the] mindsets model is promising for producing internalized, lasting change, because it’s a mental model that stays with people over time... [which] they can apply when they eventually leave [the school] climate.”

Furthermore, in considering the underlying causes of the effect of the intervention as compared to the control group, in which students learned coping skills, Yeager et al. (2013) partly attribute it to the motivation students in the experimental condition had to make use of
their new knowledge, which was thought to arise out of the change in their understanding of the nature of personality. This view aligns with the argument made by Perkins and Solomon (2012) that students would be more motivated to transfer their learning if it was made meaningful as a result of a deep, causally linked understanding of the material (Chi and VanLehn, 2012). Similarly, it fits in with theories of motivation that suggest non-prescriptive approaches that provide learners with a sense of autonomy and competence will produce the highest levels of intrinsic motivation (Deci and Ryan, 1985). And indeed, Yeager and colleagues (2013) highlighted the fact that their intervention did not offer students ready-made solutions to problems, but assisted them in learning new ways to consider and interpret a given situation (i.e. facilitated a form of secondary appraisal or reframing, leading to positive self-regulatory outcomes). In a related finding, Jamieson, Mendes, Blackstock, and Schmader (2010) showed that informing people of the beneficial aspects of emotional arousal led to better performance on a standardized test as a result of reframing the meaning of arousal (e.g. physiological preparedness rather than merely anxiety), further demonstrating the potential power of learning about the functioning of the emotion system.

It is important to note that interventions such as those carried out by Yeager et al. (2013) and Jamieson et al., (2010) focused on a single, albeit clearly important, aspect of the emotion system (the nature of personality traits and of emotional arousal, respectively). While these interventions demonstrate the power of teaching certain aspects and principles of the affective-cognitive system, they do not represent full-fledged, emotion system model-based SEL programs. Rather, they highlight the need for such comprehensive programs by demonstrating the inadequacy of the alternative, piecemeal approach. If, as research suggests, there are multiple key, interrelated HES processes, components and principles (e.g. see Cicchetti et al., 1995; Crick & Dodge, 1994; Frijda, 1988; Levenson, 1999; Ochsner & Gross, 2007) that may each produce a meaningful impact on SEC, it would be impracticable to
create individual interventions around each. Nor would it make sense to teach such interconnected principles independently. Indeed, doing so could be misleading, as learning only isolated pieces of the system can create misconceptions about the entire system. For example, whereas Yeager and colleagues (2013) focused on the upside of learning about the ability to change one’s personality, other researchers have suggested that an understanding of some aspects of the emotion system over which we have little or no control can be beneficial as well (Flavell & Green, 1999; Frijda, 1988; Stegge & Meerum Terwogt, 2007). More broadly, appraisals and emotional responses (and by extension stress and behavior responses) are a product of a unique person-situation interaction (Gross, 2015; Roseman & Smith, 2001), that will vary in a multitude of ways across individuals and situations. An intervention that focuses on a single construct or idea, even one as seemingly powerful as the implicit theory of personality (Yeager, 2017a, 2017b; Yeager & Dweck, 2012; Yeager et al., 2013), is unlikely to be helpful or applicable in every case or even a majority of cases in which social emotional problem-solving will be required (but see Yeager & Walton, 2011 for a perspective in favor of such narrowly targeted interventions). Therefore, I argue that the elements and principles of the HES should be incorporated into a single, comprehensive model and taught together (though the instruction would likely occur sequentially such that the full model would be learned over a period of time), in the same way that the principles and processes of other systems, whether radar, the nitrogen cycle, or the workings of a camera (Mayer 1989), are taught together because they comprise a coherent whole. This view is in keeping with findings that suggest SEL interventions should be comprehensive in nature rather than isolated and disconnected (Greenberg, Weissberg, O'Brien, Zins, Fredericks, Resnik, & Elias, 2003; Durlak et al., 2011; Osher et al., 2016; Weissberg et al., 2015). While the research supporting systemic and comprehensive approaches to SEL tends to emphasize ecological completeness (i.e. incorporation at the class, school, community and district levels), it also
points to the need for content unity and cohesion (Osher et al., 2016; Weissberg et al., 2015; Zins et al., 2004). I posit that the causal interconnections and principles of the emotion system represent such cohesive, foundational content. Below, I outline a set of components that could comprise an inclusive instructional HES model.

**Defining the HES Model**

One of the obvious challenges of trying to present a teachable model of the HES is that the system is both complex and not yet fully understood (Levenson, 1999). However, my contention is that there is sufficient understanding of the system to be able to teach certain key aspects of it with relative confidence (Frijda, 2007; Smith, Killgore & Lane, 2017). For example, Berking and Schwarz (2014) developed a similar model to facilitate affect regulation training in a clinical adult population. However, the model was just one piece of a larger intervention, and its overall contribution to the observed effects was not assessed. Furthermore, Berking and Schwarz’s (2014) model was not grounded in the emotion system’s underlying neurological processes (insofar as these processes were not emphasized as part of the instruction), thus losing one of the more powerful bases of causal reasoning about the model. As with any instructional model, the ART emotion model was necessarily simplified for teaching purposes, and it is only one of a variety of possible HES models that could be developed. To my knowledge, no systematic attempt has been made to determine which specific elements of the HES, when learned, are capable of producing improvements in SEC, thus warranting inclusion in a model used for instruction. As demonstrated by the interventions carried out by Yeager et al. (2013) and Jamieson et al. (2010), teaching a single key principle of the emotion system can have meaningful effects on learners’ social emotional functioning. And it is likely that some model elements are more useful in the context of SEL while others less so. In fact, some very important elements may be
overlooked by a given model, while including others of little value (Roseman & Smith, 2001). Therefore, one of the goals in developing an instructional model of the HES would be to identify those model components that can be shown, or might be expected, to produce improvements in SEC. Below, I propose a preliminary set of such components and principles.

Several elements of the emotion system which are frequently cited in the literature appear to warrant inclusion and emphasis in an instructional model of the HES:

1) the stimulus that triggers the emotion generation process, which may be internal or external (Frijda, 1986; Gross & Barrett, 2011; Scherer, 2000);

2) the situational appraisal process that gives rise to an emotion by evaluating a stimulus in relation to one’s goals and needs (Frijda, 1988; Gross & Barrett, 2011; Scherer, Schorr, Johnstone, 2001);

3) the resulting emotional response, its valence and intensity, its linguistic label, e.g. fear or anger, and external signs such as facial expression, tone of voice, and posture (Barrett, 2006; Decety & Jackson, 2004; Gross & Thompson, 2007; Niedenthal, 2007);

4) the action tendencies that accompany emotional reactions, including physiological changes such as heart rate and perspiration (Frijda, 1988; Lane and Schwartz, 1987; Rainville et al., 2006; Roseman & Smith, 2001).

I propose that the components listed above can be seen as a kind of core of the HES. Stegge and Meerum Terwogt (2007) and Levenson (1999) have also identified the emotion generation “engine” as the core of the emotion system. A similar suggestion was made by Wranik et al. (2007), who highlighted appraisal as a key concept in learning about the emotion system. Preliminary evidence based on a pilot study I ran, and which I describe below, suggests that an appraisal-focused, core HES model contains enough meaningful information to produce positive, short-term changes in SEC. The notion of a core model is also useful in that it can function as a foundation upon which a fuller model can be built, in
keeping with the recommendation that knowledge and skills which are more complex should be mastered sequentially, after being broken down into smaller steps (Durlak et al., 2011), and that the key ideas to be learned in any subject ought to be regularly revisited in multiple contexts to solidify understanding (Bruner, 1960).

The full HES model would incorporate additional components and principles such as:

5) the bottom-up, perception-driven aspects of the emotion generation process and how they contribute to the evaluation of a stimulus, including the concept of emotional conditioning (Barrett, Bliss-Moreau, Duncan, Rauch, and Wright, 2007; Britton, Shin, Barrett, Rauch, and Wright, 2008; LeDoux, 2000; Ochsner & Barrett, 2001; Ochsner & Gross, 2007; Ochsner et al., 2009; Phillips, Drevets, Rauch, & Lane, 2003; Quirk & Gehlert, 2003);

6) the influence of one’s preexisting emotional state on the appraisal and emotion generation process (Kavanagh & Bower, 1985; Lerner and Keltner, 2000; Loewenstein, 1996; Quigley & Tedeschi, 1996; Schwarz & Clore, 1996; Wright & Bower, 1992);

7) the origins and development of individual goals and desires in relation to cultural influences and universal psychological needs (Markus & Kitayama, 1991; Ryan, 1995; Smith, Killgore & Lane, 2017)

8) the ongoing, constructive nature of emotion generation, in which emotional responses are part of a feedback loop that give rise to subsequent emotions (Lindquist et al., 2012; Barrett et al., 2014; Gross, 2015; Gross & Thompson, 2007);

9) the regulatory processes (such as reflection and reappraisal) that allow for emotion modulation by manipulating situated conceptualizations (Barrett et al., 2014; Barrett & Gross, 2011; Bosoevski & Zelazo, 2008; Gross & Thompson, 2007; McRae et al., 2011; Ochsner & Gross, 2007); in conjunction with
10) the two-level model (i.e. the core and control systems) of emotional functioning (Kahneman, 2003; Levenson, 1999);

11) the changeable nature of regulation ability, emotions and personality (Barrett et al., 2014; Blackwell, Trzesniewski, and Dweck, 2007; Denny & Ochsner, 2014; Dweck, 2006, 2008; Graham, 1997; Wranik, Barrett, & Salovey, 2007); and

12) the concept of complex and blended emotions (Lane & Schwartz, 1987; Stegge & Meerum Terwogt, 2007).

The above set of proposed components, processes and principles is necessarily not definitive. It is entirely possible that learning about other facets of the HES may also support SEC development. For instance, learning about emotions’ attributional dimensions such as locus of control (Weiner, 1985; Roseman & Smith, 2001), could be useful in better understanding one’s emotional functioning. This aspect of emotion processing was part of the SEC intervention developed by Kemeny, Foltz, Ekman and colleagues (2011), and Wondra & Ellsworth (2017) have suggested that it could be useful for interventions seeking to enhance perspective-taking and empathy. Similarly, the reciprocal connection between external manifestations of emotions and internal feeling states, e.g. that while happiness makes you smile, smiling may also produce a feeling of happiness (Decety & Jackson, 2004; Niedenthal, 2007), is another principle of the HES that may be useful to include in the model. Additionally, it may be useful to articulate the evolutionary purpose of emotions and their critical role in our survival (Frijda, 1988; Levenson, 1999) in order to increase learners’ interest and motivation to engage with the subject. At the same time, it is possible that some of the components and principles proposed above are not found to contribute significantly to improvements in SEC. Thus determining the proper makeup of the emotion system model is one of the essential tasks facing those who may wish to implement this SEL method, and represents a potentially fruitful research opportunity.
I now turn to the developmental considerations of teaching the HES, and subsequently describe a pilot study designed to test the hypothesis that learning a core emotion system model can produce improvements in aspects of SEC.

**Developmental Considerations**

Instructional materials and methodologies must be developmentally appropriate, and this is perhaps especially true of SEL (Brackett et al., 2015; Osher et al., 2016; Yeager et al., 2013), which is meant to foster skills that are closely linked to neurological and psychological development (Durlak et al., 2015; Saarni, 1999). Abilities like metacognition and perspective taking, which support self-awareness and social awareness respectively, develop with age (Flavell, 2004; Decety & Jackson, 2004; Perner & Lang, 1999; Smith, Killgore & Lane, 2017), as does self-regulation, which is tied to executive functioning and the development of the prefrontal cortex (Prencipe et al., 2011; Teicher, Andersen, Polcari, Anderson, Navalta, & Kim, 2003; Zelazo & Lyons, 2012). Furthermore, the specific instructional approach I advocate for here depends on the notion of abstracting underlying principles of the emotion system, which at first glance may seem too sophisticated a cognitive task for younger learners. However, Brown and Kane (1988) showed that children as young as preschool-age are able to learn, i.e. abstract, general principles from multiple examples. And a number of ostensibly successful SEL programs have been developed for the pre-K population (Bierman & Motamedi, 2015). Indeed, pre-K is an age group which has garnered perhaps the greatest amount of SEL interest and support (Weissberg et al., 2015). There is also evidence that certain theory of mind capacities, such as understanding false beliefs, develop earlier than previously believed (Onishi & Baillargeon, 2005), suggesting that children may able to benefit from socio-emotional instruction at a very young age. Therefore, a simplified, age-appropriate version of the HES model could conceivably be utilized with fairly young
learners, a view that appears to be supported by some researchers (e.g. Stegge and Meerum Terwogt, 2014; Yeager, 2017a). Indeed, teaching young learners emotion vocabulary and other basic emotion concepts, which are elements of a number of established SEL programs implemented with the K-8 population, such as the RULER approach (Brackett et al., 2012), could be seen as an important preparatory step to introducing them to the more elaborate and sophisticated version of the emotion system model, which assumes learners’ familiarity with fundamental ideas like emotion categories.

Further research is needed to understand at what developmental stage and in what form the teaching of the HES model should ideally commence. Meanwhile, research evidence already exists demonstrating that the approach can work with older learners, such as students in high school, college, and beyond. For instance, Yeager and colleagues (2013; Yeager, Lee, & Jamieson, 2016) have demonstrated that a similar conceptual knowledge approach to SEL can be effective with students of high school age. Jamieson and colleagues (2010) made use of it with college students; Kemeny et al., (2012) with teachers; Berking and Schwarz (2014) and Mennin and Fresco (2014) with adults from a clinical population; and in my studies I have successfully worked with people aged 18 and up. Below, I provide details of two such experiments, which tested the effects of teaching a core HES model to two different target groups. The first of these was a pilot study, in which I worked with graduate students at Columbia Teachers College. The second was a larger, follow-up study, in which I conducted an online experiment with US high school graduates aged 18 to 25.
PART II: PILOT STUDY

Given above theory and findings, I designed and ran a pilot study to test the hypothesis that learning a core model of the HES would transfer to a novel context and influence aspects of emotional awareness, specifically other awareness and empathy. A small sample (ages 22-53, n=20) of graduate students at Columbia Teachers College was randomly assigned to a model learning group or a control group. The model learning group was taught a simple, appraisal-based model of emotion generation. Compared to the control group, which read literary fiction, the model learning group rated “socially inappropriate” emotional responses of characters in fictional scenarios as significantly less blameworthy, indicating altered attributions of responsibility and greater cognitive empathy. The findings support the hypothesis that conceptual knowledge about the emotion system can enhance SEC, specifically other awareness, and that these improvements would transfer to novel problems in a new context.

Other Awareness, Empathy, and Blame

As previously mentioned, other awareness is one of the foundational SEL skills and is closely linked to empathy (Weissberg et al., 2015). Research suggests that empathy depends on several distinct processes including aspects of other awareness such as perspective-taking and comprehending the other’s emotional state, also known as cognitive empathy (Decety and Jackson, 2004). Such comprehension is affected by one’s conceptual emotion knowledge (Barrett, 2006; Stegge & Meerum Terwogt, 2007; Wranik et al., 2007). Increasing such knowledge would thus be expected to support empathy, specifically cognitive empathy, and thus other awareness more generally.

In the present study, participants in the model learning group were provided
conceptual emotion knowledge in the form of a core model of the HES focused on the appraisal process (see Presentation 1 in Appendix B). Appraisal is a key concept in the emotion literature (Frijda, 1986, 2007; Gross & Barrett, 2011; Scherer, Schorr, Johnstone, 2001), and Wranik et al. (2007) have suggested that a better understanding of emotional appraisal may support SEC. The model created for the present study emphasized the automatic nature of appraisal and its central role in emotion generation (Scherer, Schorr, Johnstone, 2001). Acquiring such knowledge would be expected to influence participants’ attributions of responsibility when considering people’s emotional reactions (Weiner, 1995; Cushman & Young, 2010). Understanding that much of the emotion generation process happens outside a person’s control would be expected to reduce attributions of control and responsibility when evaluating an emotional reaction (Wondra & Ellsworth, 2015), and consequently attributions of blame (Knobe, 2006). Attributions of blame are thought to be instrumental in the generation of anger (Scherer, Schorr, Johnstone, 2001) and subsequent aggression (Crick & Dodge, 1995; Weiner, 1995), while aggressive behavior has been an ongoing target of interventions in schools and other contexts (Crick & Dodge, 1994; Durlak, 1997; Yeager et al., 2013). Altered attributions of responsibility and reductions in blame (Gasser, Malti & Gutzwiller-Helfenfinger, 2012; Graham, 1997; Yeager et al., 2013) as well as greater empathy (Batson, 1991; Decety & Hodges, 2004; Zahn-Waxler, Cole, Welsh, & Fox, 1995) have been previously linked to reductions in aggressive tendencies. Thus, if the present intervention were to lead to reductions in blame with respect to others’ emotions, it would be demonstrating that increased understanding of the emotion system, specifically of the automaticity of the appraisal process and its integral role in emotion generation, has the potential to reduce anger and consequently aggression (i.e. improve regulation), by increasing other awareness. Specifically, the acquired emotion knowledge would be impacting an aspect of other awareness known as cognitive empathy (Decety & Jackson, 2004), i.e. the ability to
better understand someone’s emotional state and its causes.

Figure 2.1 demonstrates the intervention’s hypothesized pathway of change. Importantly, the taught material did not directly address the issue of blame: altered attributions of blame were expected to occur as a result of the transfer and application of HES knowledge to a novel context.

![Hypothesized pathway of change](image)

Figure 2.1. Hypothesized pathway of change. Learning about appraisal is expected to influence perceptions of control and responsibility and consequently blame. Dashed lines represent effects not evaluated in the study.

**Types of Deep Structure Learned and Their Expected Level of Integration**

It may be worth noting here that deep learning is not defined by the *length* of time spent on learning but by *what* is learned and *how well* it is learned. One may spend hours studying without achieving what might be called deep learning, and conversely in some cases it may be achieved in as little as a few minutes. For instance, in their studies on transfer, Gick and Holyoak (1983) showed that given particular instruction methods people were able to abstract the solution of a sample problem and apply it to solve a subsequent, analogously structured but superficially different problem, in procedures that lasted well under an hour. The key was grasping the solution’s deep structure, also known as a mental model (or schema) in the learning literature (Johnson-Laird, 1995). Doing so was thought to enable transfer by allowing learners to map that structure onto new problems while getting past their surface
attributes, and using it to reason about the problem (Gick and Holyoak, 1983). Similarly, in the present study, my focus was on the deep structures participants would be assimilating, and the methods used to communicate them, with the expectation that this could be achieved in a relatively short amount of time.

The HES model taught as part of the intervention encompassed at least two types of deep structure: a causal mental model of the core emotion system, and principles that factor into that model. Central aspects of the causal model included a stimulus that sets off the emotion generation process, the appraisal process which interprets the stimulus and gives rise to the emotion, and the resulting emotional response. Additionally, it included the individual’s goals and needs which factor into the appraisal, with either a positive or negative appraisal arising due to the congruence or incongruence of the stimulus or event with the individual’s goals and needs (see Presentation 1 in Appendix B). The HES principles included the automaticity and speed of the appraisal process, such that it is largely outside of conscious control.

It is important to note that not all of the information provided would likely be novel to the participants. Study subjects were graduate students at Columbia Teachers College, who would be expected to have fairly well developed and sophisticated models and theories of people’s emotional functioning. Consequently, the causal relationship between an event, one’s goals, and resulting emotions, while it may not have been previously articulated to them so explicitly, would likely not be surprising or new but would fit in with participants’ naturally developed emotion models (Barrett, Ochsner & Gross, 2007; Flavell, 2004; Goldman, 2006; Gordon, 1986). The most novel piece of the model was likely to be the appraisal process, which most participants would not be expected to know about. Thus it is primarily the principles of the appraisal process (i.e. its speed, automaticity, and lack of conscious control) and its role in emotion generation that would be expected to produce
changes in participants’ conceptual emotion knowledge. To be precise, learning about the appraisal process would be expected to affect participants’ conceptual emotion knowledge in at least two critical ways: first, it would introduce the concept of appraisal into the naturalistic or “naive” mental model of emotion generation depicted in Figure 2.2A (i.e. stimulus->response), so that it becomes more like the appraisal-based model in Figure 2.2B (i.e. stimulus->appraisal->response); second, it would introduce the principle of appraisal automaticity, so that participants can come to appreciate one’s lack of control of this process.

Figure 2.2A. Naturalistic or “naive” model of emotion generation.

Figure 2.2B. Appraisal-based model of emotion generation.
I expected the new emotion knowledge to be relatively readily assimilated because it too would build on participants’ existing understanding of emotions and brain functioning. For instance, people already tend to believe emotions may not be entirely controllable (Barrett, 2006; Barrett, Ochsner & Gross, 2007; Frijda, 1986; Roseman & Smith, 2001), and they are also likely be aware that the brain is responsible for interpreting one’s environment and producing emotions. Even if participants did not fully master all aspects of the model due to the brevity of the intervention (e.g. the involvement of goals and needs in the appraisal), I expected sufficient knowledge transfer to occur on the post-test tasks as part of the “knowing with” that participants bring with them to the activity, as outlined by Bransford and Schwartz (1999). The notion of “knowing with” refers to the fact that the way a person approaches an activity is influenced and informed by pre-existing knowledge, even if there is not a perfect one-to-one, whole-cloth match of a previously learned solution to the present problem, such as with the more ‘sequestered’ analogical problems used by Gick and Holyoak (1983). This is similar to the “transfer-in-pieces” process described by Wagner (2006), whereby transfer occurs by means of a gradual collection of smaller chunks of knowledge rather than by the wholesale formation of a schema.

Similarly, I did not expect the new emotion information to be fully integrated into participants’ store of conceptual emotion knowledge at a level where it would impact the automatic appraisal of an event (Barrett, 2006; Barrett et al., 2014). Rather, I expected that the new knowledge would figure into the secondary appraisal (Lambie & Marcel, 2002) that occurs in the context of regulation (Gross & Thompson, 2007; Ochsner & Gross, 2007) and empathy (Decety & Jackson, 2004). Such a follow-up appraisal can make use of additional information as part of a more deliberate cognitive analysis of the original stimulus (Gross & Thompson, 2007; Lambie & Marcel, 2002). In a real world context, second order appraisal should ideally arise from a habit of reflection (Teasdale, 1999) which would lead an
individual to become aware of an emotional reaction and to evaluate it for its nature, causes and consequences, as well as possible response strategies (Stegge & Meerum Terwogt, 2007). In the case of the present intervention, by asking participants to consciously consider the blameworthiness of a character’s conduct I effectively induced them to carry out a second order appraisal by making them reflect on the situation (Crick & Dodge, 1994). I expected this secondary appraisal to be influenced by the emotion knowledge they had been taught.

The control group read a literary fiction selection, as it has previously been shown that reading literary fiction produces short-term improvements in theory of mind (ToM, Kidd & Castano, 2013). Thus this group might have been expected to show some short-term increases in ToM skills like empathy, making it a more meaningful comparison group than one that got no social emotional training at all. This group got no explicit emotion knowledge instruction. Effects were measured immediately following the intervention.

Hypotheses

My hypotheses were that the model learning intervention would:

1. result in the transfer of the learned emotion knowledge to a novel context;

2. reduce the perceived blameworthiness of others’ emotional reactions, thus signaling a (short-term) positive change in social awareness and empathy, and the potential for more regulated functioning.

Method

Sample

Recruitment. Participants were recruited from several classes (all graduate level) at Columbia Teachers College. The study was announced by the researcher in class, and study information
was made available through the school website. The study was announced as offering one hour of course credit for participating in the study. Separately, the study was posted on the Teachers College bulletin board as offering $20 compensation for participating.

Participants. The study sample was drawn from the student body of Columbia Teachers College. The population of interest was preservice and younger working teachers, and many TC students are either actively teaching, have taught in the past, or are working toward graduate degrees that will enable them to teach, making TC a suitable recruitment environment. The reason for focusing on teachers was that teachers’ SEC has been correlated with the quality of implementation of SEL programs (Jones, Bouffard, & Weissbourd, 2013; Reyes et al., 2011) as well as teachers’ psychological wellbeing (Goddard, Hoy, & Woolfolk Hoy, 2004) and burnout rate (Provasnik & Dorfman, 2005), the general quality of the classroom climate (Marzano, Marzano, & Pickering, 2003), and ultimately students’ social emotional and academic outcomes (Jennings & Greenberg, 2009). Meanwhile, teachers often get little to no direct instruction aimed at enhancing social emotional competence as part of regular professional training (Zins et al., 2004), and only a few standalone SEC enhancement programs aimed at teachers have been implemented or evaluated (Jennings & Greenberg, 2009; Jones et al., 2013).

Twenty male and female participants, aged 22 to 53 (M=27.2) took part in the study. Of these, 6 (30%) were male and 14 (70%) were female. After random assignment, 5 males and 5 females were in the control group and 1 male and 9 females in the experimental group. (Note that I examined the means of the males in the control group compared to the females, to see if males had harsher blameworthiness ratings and thus skewed the outcome toward the desired result, but in fact the opposite was true, and males had lower average blameworthiness ratings than females: 6.47 vs 7.73). For the majority of participants (12),
English was not their native language. Native and non-native English speakers were evenly split between groups. Of the non-native speakers, six (50%) were native speakers of Chinese, Cantonese or Mandarin, 2 (16.7%) were Japanese speakers, as well as 1 (8.3%) of each of the following: Ukrainian, Hindi, Turkish, Spanish. The participants represented a diverse set of areas of study, with 3 (15%) in Clinical Psychology, 3 (15%) in Philosophy and Education, 2 (10%) in Cognitive Studies, 2 (10%) in Developmental Psychology, and 1 (5%) of each of the following: Economics, Science Education, Social-Organizational Psychology, School Psychology, Autism, Arts Administration, Teaching Social Studies, Instructional Technology and Media, and Applied Linguistics. Of the participants, 9 participated in the study for monetary compensation and these participants were evenly distributed across conditions, with 5 in the experimental condition.

In all, these individuals were considered sufficiently comparable to the broader teacher population to justify their use in an exploratory study. Two participants were excluded from the final analysis, both from the experimental group. One was excluded because she correctly surmised the true nature of the study, and the other because she had gotten 4 out of 9 questions wrong on the model learning quiz. These exclusions did not significantly alter the results of the analysis (F(1,20)=7.93, p=.011 versus F(1,18)=6.97, p=.018).

Procedures

Overview. The study followed a randomized, 1x2 between-subject, post-test only design (see Table 2.1). Participants were randomly assigned to either the experimental or control group. The experimental group was taught the emotion model (see Presentation 1 in Appendix B), whereas the control group read literary fiction. Both groups then completed an outcome measure in which they rated the blameworthiness of reactions of characters in fictional
scenarios. The experimental and control groups were given two different cover stories to create the impression that the outcome measure is unrelated to the preceding activities in order to test for spontaneous transfer of the model and reduce the possible impact of social desirability. All activities for both groups, with the exception of the outcome measure, were conducted on a computer. For the outcome measure, participants were moved to a desk without a computer, and asked to complete a scenario-based post-test. Both groups filled out a computer-based exit questionnaire, which included demographic information and a suspicion probe, and were then be debriefed.

<table>
<thead>
<tr>
<th>Experiment</th>
<th>PFL Activity (General Explanation of Emotion)</th>
<th>Model Learning (Diagrams, Direct Teaching)</th>
<th>Practice (Varied, Grounded, Constructive)</th>
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Table 2.1. 1x2 between-subject, post-test only study design.

Content of Model Learning Intervention

PFL Activity. Bransford and colleagues (1989) offered evidence that before instruction occurs, students need to experience the problems that render told knowledge useful. Building on this, Schwartz and colleagues (1998, 2011) have shown that specific activities, such as analyzing contrasting cases, done before undertaking direct teaching of a topic, create an
optimal “time for telling” and lead to deeper learning and better transfer of knowledge. Such activities readied students to more fully appreciate the expert solutions and deep structures (i.e. the concepts’ underlying schema or model) when they were explained (Schwartz et al., 2011). Thus, given the goal of teaching a model of the emotion system, PFL activities were thought to represent a fruitful instructional strategy. Having learners grapple with questions about how their emotions work may make them more receptive to the subsequently offered expert ‘solutions’--in this case, research-based depictions of aspects of emotional functioning--and more likely to internalize them. That is, the information may be more likely to be integrated into learners’ belief structures and become part of their theory of emotion. Previous studies have shown “explanation” PFL activities to produce better learning outcomes compared to thinking aloud or simply describing the given cases (Williams & Lombrozo, 2010). Thus a PFL activity was designed in which participants were asked to come up with a generalized explanation for how emotions arise based on a set of contrasting cases of comics-like scenarios. The scenarios depicted three characters, each of whom experienced two different emotional reactions, one negative and one positive (see Activity 1 in Appendix B). The model learning group began by engaging in this PFL activity. They were given ten minutes to complete the explanation, but were free to take less time.

**HES Model Learning.** One of the most effective ways to ensure that learners grasp a concept’s deep structure or schema is to explicitly highlight it (Chen and Klahr, 1999; Klahr and Chen, 2011). This helps ensure that the underlying principles and key interrelations of the system are indeed known to the learners, and are not lost or overlooked in the process of instruction. Thus, participants were taught the HES model directly (see Presentation 1 in Appendix B), following the PFL activity.
Three components, which are commonly featured in the scientific literature in the context of emotion generation, were identified as a kind of core of the emotion system, and formed the basic instructional model of the HES used in the study. These components included: 1) the stimulus that triggers the emotion generation process (Frijda, 1988; Scherer, 2000; Gross & Barrett, 2011) 2) the top-down cognitive appraisal process that gives rise to an emotion (Gross & Barrett, 2011; Ochsner & Gross, 2007; Scherer, Schorr, Johnstone, 2001) and 3) the resulting emotional response (Frijda, 1988; Gross & Thompson, 2007).

The HES model was presented by means of a powerpoint. Participants were told to go through a powerpoint at their own pace. The model was presented using diagrams. Diagrams, also known as conceptual models, have been shown to help students build more accurate mental models of a system, and subsequently perform better on transfer problems (Mayer, 1987, 1989). The key concepts that were meant to be communicated by the model were appraisal’s causal role in emotion generation, and the automatic nature of the appraisal (i.e. the fact that it happens extremely quickly and without one’s conscious control) as it evaluates stimuli with respect to a person’s goals, needs and desires. Because the HES model, like all social emotional knowledge, only has utility in relation to actual instances of human emotions and interactions, the diagrams included simple narrative illustrations of how aspects of the model map to concrete human experiences.

*Practice Exercises.* As previously discussed, social emotional knowledge is meant to be used on the fly, in a real world context, rather than to be merely recited back in a classroom or lab (Durlak et al., 2011; Berking and Schwarz, 2014). Achieving this requires practice. While it is too much to hope that a true automatization of using the more accurate HES model for interpreting emotion information could be accomplished in a single short experimental session, having the opportunity to practice is still expected to increase the likelihood of the
assimilation of the new emotion knowledge and hence at least partial transfer (Bransford & Schwartz, 1999; Marton, 2006; Perkins & Salomon, 1992; Salomon & Perkins, 1989; Wagner, 2006). Consequently, the intervention included a number of computer-based practice exercises.

SEL content must be grounded in concrete human behavior (Brackett et al., 2015; Durlak et al., 2011), and such grounding often takes the form of narrative (Brackett, Rivers, Reyes & Salovey, 2012; Maurer & Brackett, 2004; Greenberg, Kusché, & Mihalic, 1998). Engaging with narrative activates the simulation of others’ mental states, representing a training exercise of the mentalizing system in its own right (Barrett, 2006; Hutcherson et al., 2005; Keen, 2007; Lane, Fink, Chau, & Dolan, 1997; Niedenthal, 2007). It also allows for the abstract principles of the HES to be connected to specific examples of human emotions, actions, problems and conflicts, without which HES model learning would be a purely academic (i.e. not readily transferrable) endeavor. The practice exercises, therefore, took the form of narrative scenarios. These scenarios were based on scenarios my colleagues and I developed for previous pilot studies (see Practice Exercises 1 in Appendix B).

It has been shown that making correct inferences is associated with building accurate mental models, because it reinforces the understanding of the causal interrelations of the system’s elements (Mayer, 1989). Thus the narrative-based exercises emphasized inference-making on the basis of the core HES model, focusing in particular on the causal role appraisal plays in emotion generation. For instance, a learner would be given the following scenario: “You go to move your brand new car.” They were then asked the question, “Given the above, suggest an event that is likely to produce a *negative* appraisal.” Such inference-based exercises were also expected to support constructive learning (Chi, 2009) by ensuring that participants were not passively absorbing information, but were both active and producing responses that went beyond the information that is given. Chi (2009) has provided evidence
that constructive learning is more conducive to deep cognitive processing as compared to merely active or passive learning.

It has also been convincingly argued that varied practice is essential to deep structure acquisition and successful transfer (e.g. Marton, 2006; Salomon & Perkins, 1989). Such practice reinforces the abstraction of shared underlying problem structures, while exposing learners to numerous problem variants with differing surface characteristics (Marton, 2006). In the case of the present intervention, the goal was to alter learners’ mental models of emotion generation by helping them understand the role of appraisal in that process. Consequently, the practice exercises were varied in their surface features, i.e. the details of the scenario, as well as the scenario’s situational meaning (i.e. whether it was seen as motive congruent or incongruent), but invariant in that in each case the appraisal was identified as central to the meaning-making process. They were also varied in the type of inference participants were asked to make: either predicting an event that would give rise to a particular type of appraisal in a given situation, or inferring a situational antecedent that would produce a certain appraisal given an event. There were ten exercises in all, each featuring a different scenario. The exercises had two parts: the first part focusing on the appraisal and the second part on the resulting emotion, tying the two together. Thus there were twenty practice questions in all.

Finally, participants were prompted to reflect on the experience of answering the questions. Research suggests that reflection facilitates deep learning that enables transfer (Bransford & Schwartz, 1999; Kuhn & Pease, 2009; Perkins & Salomon, 1992). Reflection is also a critical part of developing self and other awareness (Teasdale, 1999). To encourage reflection, participants were asked to notice how given a hypothetical scenario they were able to effortlessly assess the valence of their emotional response (positive or negative), highlighting the automatic nature of appraisal (see Practice Exercises 1 in Appendix B).
Self-quiz. Following the practice exercises, participants completed a computer-based self-quiz based on the HES model they learned earlier (see Quiz 1 in Appendix B). The quiz was meant to assess their grasp of the main ideas--that is the key causal relations and principles of the HES--that the model was meant to communicate. They then received feedback on their answers. Education research has produced strong evidence that feedback is crucial to learning success (Hattie & Timperley, 2007). Feedback can draw students' attention to potential gaps in knowledge, and provide guidance on how to improve performance (Hattie & Timperley, 2007). Since the success of the experiment depended on participants developing a sufficiently accurate understanding of the provided HES model, aside from being a way to establish the level of model learning that occurred, the quiz provided an opportunity to correct misperceptions. The feedback focused on those questions where the participants’ answers differed from suggested answers. In such cases the study administrator discussed the question with the participant and explained why the suggested answer had been chosen. The quiz included 9 questions. In most cases, participants responded at rate of 7 correct (78%) or more, but in one case a participant got 4 responses incorrect. This participant was excluded from the analysis, on the assumption that they had not learned the model sufficiently well. Overall, the results of the self-quiz tended to show ceiling effects, as subjects were able to reason about the model principles presented in the experiment with relative ease. This represents the risk that the taught content was too easy or too familiar. However, exit questionnaires from previous pilots have consistently shown that key aspects of the model, i.e. appraisal and its role in emotion generation, were new to most participants, and thus would still be expected to contribute to the hypothesized effects.
**Fiction Content**

The control group’s main activity was reading a literary fiction selection and answering reading comprehension questions. The fiction selection was a short story called “The Big Cat” by Louise Erdrich, originally published in *The New Yorker*, and selected from the *Best American Short Stories 2015*. This material was chosen because Kidd and Castano (2013) demonstrated that reading high quality literary fiction such as that published in the Best American Short Stories anthologies led to short-term theory of mind improvements, as compared to reading “popular” or “pulp” fiction. The story was also selected because its length was expected to require control group participants to spend about as much time reading and answering questions as the model group participants spent on the model learning activities. The reading comprehension questions that accompanied the fiction selection did not focus on the emotional aspects of the story but on basic story content, and were meant to be a way to ensure participants were paying attention to the narrative rather than to increase their conceptual emotional knowledge or understanding. The control group was not be taught any explicit emotion-related information. The story and questions were presented on the computer.

**Measures**

*Post-test.* The primary outcome measure was based on participants’ responses to social scenarios presented to the groups under a deception-based cover story (see Outcome Measure 1 and Researcher Script 1 in Appendix B). Participants were asked to rate the actions of individuals in fictional scenarios with regard to how “blameworthy” they appeared to be. This was considered a transfer task, though it was necessarily operationalized somewhat differently from approaches often taken in experiments focused on academic learning. In education research, transfer assessments usually take the form of teaching some concept that
can be used in problem solving, e.g. the ratio structure in density, then seeing if students can utilize that concept on novel problems, e.g. using the spring constant in a trampoline problem (Schwartz et al., 2011). In the present study, I was interested in seeing how HES model learning affected socio-emotional functioning. The material being taught was the appraisal-focused, core HES model, and the question was whether this conceptual knowledge could be used in a novel context. The prototypical “problem” in this case is an emotion-eliciting (and often social) situation, which one needs to evaluate and manage. Unlike academic problem-solving, such socio-emotional problem solving needs to occur more or less in real time, so I was less interested in having participants use the HES model to solve elaborate social puzzles offline, than to see if the knowledge could be utilized in the sort of heuristic manner that resembled its real world use. At the same time, I needed to deal with the issue of social desirability (Reynolds, 1982) which would likely come up if I simply asked participants transparently model-based questions (such as those used on the self-quiz). That is, I needed an activity where participants wouldn’t be likely to realize what I wanted to hear and give the answers they thought they were supposed to give. Asking participants to rate the blameworthiness of characters’ emotional responses was a transfer task that fit these criteria. It was distinct from the activities involved in learning and practice in a number of respects. When learning, participants were asked to complete partial scenarios based on the logic of the emotion model, and to suggest the emotional reactions that would arise in the given scenarios. On the post-test, participants were asked to evaluate complete, novel scenarios on the basis of an 11-point Likert scale of blameworthiness. This represents a difference in task content (Barnett & Ceci, 2002; Klahr & Chen, 2011). Furthermore, the purpose of the activities as explained to the participants, i.e. the task’s functional context (Barnett & Ceci, 2002) or how it was framed (Nokes & Belenky, 2011), was different for practice and post-test (model learning and scenario database creation, respectively). Moreover, during learning and
practice, scenarios were all presented in the second person, i.e. they all focused on the reactions “you” (the participant) would have in a given situation. By contrast, the outcome measure scenarios all focused on the emotions of others: the characters described in the scenarios. Because the HES model underpins the emotional functioning of both self and other, I expected that learning it with a focus on the self would still allow for the model to transfer when reasoning about others. Additionally, the scenarios in the post-test included more superficial details, such as descriptions of the environment and the characters, to introduce some extraneous factors a person might attend to. Finally, for the post-test I deliberately changed the activity context by moving the participant to a different location with no computer, and having them fill out the questionnaire using pen and paper rather than digitally, i.e. a modality change (Barnett & Ceci, 2002). The general structure of the approach was analogous to that of a study by Shariff, Greene, Karremans, et al., (2014), in which participants were taught about the lack of free will, and then asked to decide on a punishment for a convicted criminal.

The post-test target scenarios were broken up into two distinct categories: socially inappropriate emotional reactions, and socially appropriate emotional reactions. A scenario was categorized as showing an inappropriate emotional reaction if the person might be expected to be criticized for exhibiting it, given the prevailing social and cultural norms. The following is a scenario that would be considered socially inappropriate: “An instructor is teaching a large class during fall semester. One day, a student sitting in the back row asks a great deal of questions in class, raising his hand every few minutes. After a while, the instructor starts to feel impatient with the student.” This scenario is deemed inappropriate because an instructor would generally be expected to keep his or her cool even in the face of a difficult student. I expected participants to rate such inappropriate reactions more negatively even though they only depicted emotions and not outward behaviors. Conversely,
the following sample scenario would be considered more socially appropriate: “Having risen extra early so as not to miss an important appointment, for which he will have to drive across town, a man misplaces his keys just as he is about to leave. He is very annoyed and ready to turn his apartment upside down to find the keys.” The rationale for the socially appropriate/inappropriate dimension comes from research on moral judgment, which suggests people’s judgments of responsibility (and blameworthiness) are influenced by whether behavior is seen as morally reprehensible (Cushman & Young, 2010; Knobe, 2006). Thus in the more inappropriate scenarios, characters would likely be seen as more responsible and more blameworthy. However, I expected HES model training to alter participants’ attributions of responsibility by increasing their understanding of how emotions occur, and lead them to assign less blame for the characters’ reactions. I expected the effect to be more pronounced than for appropriate scenarios, where attributions of responsibility and blame would be low to begin with, and thus would be less susceptible to influence. In sum, I expected the experimental group to assign significantly lower blameworthy ratings than the control group to characters’ reactions in inappropriate scenarios. For appropriate scenarios, I expected lower blameworthy ratings in the experimental group, but did not expect the difference across groups to be significant.

The post-test consisted of three “inappropriate” scenarios, three appropriate “scenarios,” and six filler scenarios that were designed to have no strongly salient emotional dimension. The following is an example of a filler scenario: “A woman sits alone in an office. It is after 10pm. She is concentrating on her work. She gets a phone call, glances to see who it is, but does not pick up.” The rationale for including the filler scenarios was to bolster the credibility of the cover story (that the researchers are creating a scenario database) and to decrease the likelihood that participants discover the true purpose of the activity (measuring the effects of the model learning intervention). Two counterbalanced versions of the post-test
were used. Participants were randomly assigned one or the other version of the post-test, with an equal number of participants using each version.

*Exit Questionnaire.* Participants also responded to an exit questionnaire that included a suspicion probe (see Exit Questionnaire 1 in Appendix B). The suspicion probe asked participants to describe what they understood the purpose of the experiment to be. Participants were excluded if they described the actual nature of experiment as opposed to the what was given to them in the cover story. Only one person was excluded on this basis. In addition, I asked participants directly whether they suspected the different parts of the experiment were connected, and how, as part of the final debrief. No additional participants were excluded on the basis of this direct questioning. The exit questionnaire also asked for participants’ demographic data including age, gender, ethnicity, native/primary language, and subject specialization (e.g. math, language arts, etc.).

*Data Analysis*

Data was analyzed using ANOVA to compare outcomes across groups. The primary goal was to compare the experimental group’s DV scores with the control group to establish the effects of the manipulation, i.e. whether learning the core HES model has a short-term positive impact on blameworthiness. I ran several individual one-way ANOVAs to compare: overall blameworthiness scores by condition, as well as blameworthiness for the two types of scenarios, appropriate and inappropriate, by condition. I also ran a 2x2 mixed ANOVA to confirm the difference between appropriate and inappropriate scenarios based on blameworthiness ratings. Finally, I ran a MANOVA to confirm the results of the individual ANOVAs.
Results

I ran several planned one-way ANOVAs, with condition as the fixed factor, to test the effects of the intervention. There was a significant difference across conditions for scenarios with inappropriate emotional responses, with higher blameworthiness ratings observed in the control group, as predicted (Control M=7.1, SD=1.58, Experimental M=5.1, SD=1.57, F(1,18)=6.97, p=.018, $\eta^2=.3$). The effect size of .3 is large according to Cohen (1988). There was no significant difference across conditions for scenarios with appropriate emotional responses (F(1,18)=.432, p=.52). However, the mean was higher for the control condition, as expected (Control M=3.75, SD=2.14, Experimental M=3.1, SD=2.29). The difference in the overall means for the blameworthiness rating across conditions approached significance (F(1,18)=3.39, p=.08, $\eta^2=.175$), with the mean for the control condition higher than the experimental, as would be expected (Control M=5.43, SD=1.68, Experimental M=4.09, SD=1.29). See Figures 2.3A, B, and C.
Figure 2.3A. The contrast between means for inappropriate emotional reactions. The difference was significant with $p=.018$ and $\eta^2=.3$. 

Error bars: 95% CI
Figure 2.3B. The contrast between means for appropriate emotional reactions, which was not significant.
I also ran a 2x2 mixed ANOVA looking at appropriate and inappropriate scenarios across conditions, which showed that there was a main effect for appropriateness, i.e. a significant difference in blameworthiness ratings of appropriate and inappropriate scenarios (Appropriate M=3.44, SD=2.17, Inappropriate M=6.22, SD=1.83, F(1,16)=24.06, p<.001, $\eta^2=.6$). Because there was no significant interaction between appropriateness and condition (F(1,16)=1.36, p=.26, see Figure 2.4), I could conclude without further analysis that appropriate and inappropriate scenarios were indeed depicting reactions that elicited significantly different ratings of blameworthiness.
Additionally, I ran a one way MANOVA with condition as the fixed factor and appropriate and inappropriate scenarios scores as the two DVs. Box’s test of equality of covariance matrices was non-significant (p=.332). Levene’s test of equality of error variances was non-significant for both DVs across groups (F(1,18)=.234, p=.634 and F(1,18), p=.384). These results suggest that the MANOVA assumptions are not violated and the MANOVA can be run. The results of the MANOVA between-subject effect tests showed significance for the inappropriate scenario ratings across conditions (F(1,19)=7.931, p=0.011), and insignificant effects for appropriate scenario ratings across conditions (F(1,19)=.03, p=.865), matching the results of the one-way ANOVAs.
**Discussion**

In the past several decades evidence has emerged that enhanced SEC can have a significant positive impact on performance in the classroom and beyond (Jennings & Greenberg, 2009; Zins et al., 2004). Teachers in particular stand to benefit from SEC improvements. Teachers are constantly dealing with students’ emotions and behavior which may create challenges in regulation (Jennings & Greenberg, 2009). At the same time, teachers are expected to manage their emotions and the classroom, and build positive relationships with their students (Hargreaves, 1998). Consequently, higher levels of SEC, including better regulatory capabilities, would be expected to enable teachers to more effectively achieve their teaching goals. However, research on ways to accomplish improvements in teacher SEC is lacking. The present study was intended to begin to close this gap in knowledge.

In the present study, I asked whether knowledge acquired in learning a core HES model will affect aspects of emotional awareness, and thus SEC, and spontaneously transfer to a novel situation. That is indeed what I observed (see Figure 2). In learning the HES model, participants in the experimental group learned about the role of appraisal in emotion generation, and the largely automatic nature of that process. This knowledge was expected to influence participants’ perceptions of the level of control one has over emotional reactions, and consequently how blameworthy one is for exhibiting such reactions. I thus expected to see reduced blameworthiness scores for the experimental group compared to the control group. More specifically, inappropriate emotional reactions, which would generally be seen as more blameworthy compared to appropriate reactions, would be rated as significantly less blameworthy by the model learning group than the control group. That is, the experimental group would be more tolerant and empathic when they perceived someone having what might be seen as an inappropriate emotional reaction. The model group did indeed rate characters’ “inappropriate” emotional reactions as significantly less blameworthy than the control group,
indicating a transfer of some or all of the emotion model by the experimental group, and thus a change in the experimental group’s conceptual emotion knowledge, other awareness, and empathy. It is noteworthy that this occurred after an intervention lasting merely an hour, of which only about half an hour was devoted to the manipulation itself. Furthermore, the training had been entirely “you”-focused, i.e. the model was taught with the participant as the primary actor. Whereas the post-test was entirely other-focused, highlighting the universal nature of the emotion system, which allows it to be utilized in reasoning about one’s own or others’ emotions. Moreover, the control group read literary fiction, which was shown to produce short-term theory of mind improvements like perspective-taking (Kidd & Castano, 2013), and thus might have been expected to positively influence social awareness, thereby blunting the contrast with the experimental group. Nevertheless, the effect of the manipulation remained significant, pointing to the efficacy of the transfer-focused, emotion system model approach to SEL as compared to less deliberately structured approaches like simply exposing learners to fiction.

As anticipated, responses to appropriate emotional reactions were not significantly affected by the manipulation, though the rating trends were in the expected direction, i.e. with the control group showing higher average blameworthiness ratings.

The results of the intervention provide some direct empirical support for the hypothesis that teaching the emotion system model may be a viable approach to SEL and to facilitating transfer in this context, specifically as part of teacher training. They also offer evidence of the instructional value of specific aspects of the HES model, namely the appraisal-based, core system model. This has wider implications for the way social emotional content is taught, which I discuss below.
Limitations

The present study includes several limitations. One limitation is the study’s small sample size. For example with the final sample size of 18 and observed effect size $f$ of .31, I only had power of .24. Additionally, the sample was too small for a meaningful analysis of the influence of factors like gender, ethnicity, and area of study. Furthermore, the sample of TC masters students suffers from selection bias. It is arguably not representative of the population of teachers more broadly. These issues might be addressed by a future study with a larger and more representative sample.

Another limitation is the absence of a baseline SEC measure, which would allow an analysis of covariance using the baseline and the examination of effects for low SEC vs high SEC subgroups. In future studies, a baseline SEC measure should be obtained prior to conducting the intervention, with the the Level of Emotional Awareness Scale (LEAS, Lane et al., 1990) being one possible instrument which could be used for this purpose.

A further limitation is that the outcome measure used in the study is based on scenario ratings, so that it only captures judgements of emotional reactions depicted in narrative, rather than changes in behavioral responses to ‘real world’ (that is, not narrative-based) events. This might arguably render the results less compelling than a behavioral measure such as allocating hot sauce to a peer following a social exclusion manipulation (Yeager et al., 2013). At the same time, this form of assessment can be said to focus more closely on actual impact on SEC, such as other awareness, which I am interested in capturing, rather than on the behavioral outcomes that are expected to result from changes in SEC.

Additionally, only the short-term effects of the intervention were measured, and thus the findings cannot tell us anything about the long-term effects of teaching the emotion model on awareness, empathy or SEC.

I intend to address a number of the above limitations in the proposed follow-up study.
which I outline below.
PART III: DISSERTATION STUDY

The dissertation study closely followed the design of the pilot study described above, with some alterations. To begin with, participants were US high school graduates aged 18 to 25, rather than graduate students at Teachers College. This population was chosen for several reasons. First, this is a somewhat understudied population when it comes to SEL (Durlak et al., 2015), and one that has often proven resistant to social emotional interventions (Yeager, 2017a; Yeager et al., 2013). At the same time, this is an age at which significant and often stressful life transitions occur, such as leaving home, starting college or a job, making social emotional competence and the protective factors that it provides especially important (Yeager, 2017a). Additionally, teaching an HES model such as the one used in the present study, which focuses on internal cognitive processes like appraisal, was expected to be most readily accomplished with older learners who already had a fairly sophisticated theory of emotions and capacity for self-reflection, such as those of high school age and up (Harris, Olthof, Terwogt, 1981).

Participants were recruited via Amazon MTurk, and the intervention was administered entirely online and remotely rather than in person in the lab. This is significant because while educational technology is increasingly pervasive, most SEL interventions have so far remained “low-tech” (Osher et al., 2016). Though several studies examining the use of technology for SEL purposes have been conducted (Stern, Harding, Holzer, & Elbertson, 2015), additional research is called for to investigate technology’s potential in the space (Osher et al., 2016; Weissberg et al., 2015). This is especially true given the negative associations that have arisen between modern technologies, such as smartphones and social media, and psychological adjustment and wellbeing (e.g. Shakya & Christakis, 2017). In light of such concerns, there are grounds to further examine these technologies’ capacities to
support social and emotional growth.

Participants were randomly assigned to 3 groups: a model learning (ML) group, a model & preparation for future learning (M+PFL) group, or a control group. The two model learning groups were taught an appraisal-based model of emotion generation that was very similar to the one used in the pilot study. The M+PFL group was exposed to the same material as the ML group, but it also took part in the PFL activity used in the pilot study prior to the model learning. The ML group did not engage in the PFL activity. PFL activities have previously been shown to lead to deeper learning and better transfer (Schwartz & Bransford, 1998; Schwartz, Chase, Oppezzo, & Chin, 2011), and my goal was to see if this might apply in the SEL context, i.e. whether the PFL activity significantly influences emotion knowledge transfer.

Furthermore, I considered the effects of the intervention on self-awareness as well as other awareness. Thus, in addition to considering how blameworthy other people’s emotional reactions may be, participants were also asked to rate how much blame they would assign to their own emotions in hypothetical scenarios. Lower levels of blame would reflect higher levels of acceptance of one’s emotions. Acceptance of one’s emotions, which involves non-judgment of the emotional experience, is an important form of regulation associated with psychological wellbeing (Hayes, Strosahl, & Wilson, 1999). Greater emotional acceptance in the experimental groups would signal the intervention’s positive impact on self-awareness. Because of the universal nature of the emotion system discussed above, such that other awareness is facilitated by self-awareness (Decety & Jackson, 2004; Lane & Schwartz, 1987; Smith, Killgore & Lane, 2017; Wondra & Ellsworth, 2015), I was expecting self and other awareness changes to occur in tandem, and indeed for the effect on self-awareness to be greater. In both cases, participants were evaluating blameworthiness, as mentioned above. As in the pilot, blame level was chosen as the preferred outcome measure because attributions of
blame are thought to be instrumental in the generation of anger (Scherer, Schorr, Johnstone, 2001) and subsequent aggression (Crick & Dodge, 1995; Weiner, 1995). At the same time, altered attributions of responsibility and reductions in blame have been previously linked to reductions in aggressive tendencies (Gasser, Malti & Gutzwiller-Helfenfinger, 2012; Graham, 1997; Yeager et al., 2013). Thus, reductions in blame have a meaningful association with other positive emotional and social outcomes. At the same time, blame has been used as an outcome variable in past studies evaluating judgments of moral responsibility (Nadelhoffer, 2006; Woolfolk, Doris & Darley, 2006), and I was able to successfully use it in this manner in the pilot described above.

As in the pilot, the rating of blameworthiness was considered a transfer task. As previously discussed, this way of operationalizing transfer is somewhat different from how it is often done in experiments focused on academic learning. In education research, transfer assessments usually take the form of teaching some concept that can be used in problem solving, such as the ratio structure of density, then seeing if students can use that concept on novel problems (Schwartz et al., 2011). In the present study, I was interested in seeing how HES model learning affected socio-emotional functioning. The prototypical “problem” in this case is an emotion-eliciting, usually social situation, which one needs to evaluate and manage. Unlike academic problem-solving, such socio-emotional problem solving needs to occur more or less in real time, so I was less interested in having participants use the HES model to solve complex social ‘problems’ offline, than to see if the knowledge could be utilized in the sort of heuristic, on-line manner that resembled its real world use. Even if participants did not fully master all aspects of the model, I expected sufficient knowledge transfer to occur on the post-test task as part of the “knowing with” that participants bring with them to an activity (Bransford & Schwartz, 1999). That is, given that the way a person approaches an activity is influenced and informed by pre-existing knowledge (Bransford &
Schwartz, 1999), I expected critical aspects of the knowledge acquired as part of the intervention (e.g. the idea of appraisal automaticity) to influence participants’ reasoning on (i.e. to transfer to) the post-test tasks. Wagner (2006) referred to this process as “transfer-in-pieces,” whereby transfer occurs by means of a gradual collection and carry-over of incremental chunks of knowledge. This perspective aligns with research on ‘mindset’ SEL interventions, where learners’ mental models of certain aspects of social functioning (e.g. the nature of personality) are altered, providing a new way of viewing social situations, which can be carried over across contexts (Yeager, 2017a).

As in the pilot, the control group read a literary fiction selection, and effects were measured immediately following the intervention.

Hypotheses

In addition to the two hypotheses from the pilot study, I have introduced three additional hypotheses for the follow-up study (in bold below).

My hypotheses are that the model learning intervention would:

1. Result in the transfer of the learned emotion knowledge to a novel context.
2. Reduce attributions of the blameworthiness of others’ hypothetical emotional reactions, thus signaling a positive short-term change in social awareness, empathy, and the potential for more regulated functioning.
3. Reduce blame ratings of one’s own hypothetical emotional reactions, thus signaling a positive short-term change in self-awareness, emotional acceptance, and the potential for more regulated functioning.
4. Show more pronounced effects when coupled with a PFL activity.
5. Have a greater effect on self-awareness than other awareness.
Method

Sample

Recruitment. Participants were recruited online via Amazon Mechanical Turk (MTurk). MTurk is an online platform that allows people to perform small online tasks for compensation. Participants are able to select tasks on the basis of the amount of compensation offered, the anticipated length of the task, and the nature of the task. The platform has been used to recruit subjects for numerous studies in recent years, and MTurk workers have been found to be “relatively representative of the population of U.S. Internet users” (Paolacci, Chandler & Ipeirotis, 2010). As there has been as a surge of interest in using technology for SEL, yet scant research on its effectiveness (Osher et al., 2016), this method of recruitment and content delivery offered a chance to expand our knowledge in this area.

Participants were paid $3.25 for participating, with the expectation—based on an earlier MTurk pilot study—that the study activities would take roughly half an hour. Participants were provided detailed information about the nature of the study, as well as their study participant rights, prior to engaging in the study activities (See Online Consent in Appendix A).

Participants. The participants were young adults aged 18-25 (M=22.36), all of whom were US high school graduates. A power analysis based on an observed effect size $f$ of .31 in a previously run pilot study indicated that a total of 263 participants would have been required to achieve a power of .95 for 3 groups and an ANCOVA analysis. However, previous MTurk pilot studies suggested that a large proportion of participants would need to be excluded based on non-completion, previous exposure to the content, time spent on the study, and other factors. Given this, a total of 556 participants were recruited, or roughly twice the number required.
A number of participants were then excluded on the basis of: failure to complete the study, previous exposure to some of the study materials, quiz scores, study participation duration, and suspicion probe responses. A total of 144 participants were excluded for failing to complete the study. Of this group, 65 participants completed 0% of the study, while the rest completed varying percentages from 52% to 96%. Following this exclusion, the totals for the three groups were Control=140, Model Learning (ML)=145, and Model+PFL (M+PFL)=127. A Chi-Square analysis of the completion rate for the three groups was not significant (N=556, Chi-Sqr=4.55, p=.1), indicating that the resulting groups were not statistically imbalanced. However, when conducting the analysis only with participants with non-zero completion percentages, i.e. those who had spent enough time to get to the learning content, the Chi-Square analysis was significant (N=491, Chi-Sqr=7.06, p=.029), suggesting that the resulting groups may in fact suffer from some selection bias (e.g. more people not finishing in the M+PFL condition because it may have been perceived as more difficult).

Of the 412 participants who completed the study, an additional 94 indicated that they had previously been exposed to some of the content (through several preceding pilot studies), and were also excluded. No Chi-Square analysis was performed at this stage because previous exposure to study content would be random in relation to group placement, and considering an underlying selection bias would not be meaningful.

The remaining 318 participants were further culled based on the time they spent completing the study and on their performance on a quiz assessing their understanding of the HES model (in the two experimental conditions). As in the pilot study, the rationale for doing so was that HES model knowledge transfer would only be expected to occur if that knowledge was acquired in the first place.

With regard to quiz scores, the criterion for exclusion was similar to the one used in the pilot study: participants could be considered for exclusion if they answered 5 or less
questions correctly out of 9 (i.e. <= 56% correct). However, in the present study an additional
criterion had to be met if the participant scored exactly 5 points: that at least one of the
incorrect answers dealt with the automaticity of appraisal (questions 4 and 9), which was the
central idea participants would need to learn for their perception of control of emotion to be
affected. Thus both these criteria had to be met for exclusion to occur if the participant had 5
correct answers. All participants scoring below 5 were excluded. A total of 13 (5%)
participants were excluded (from the two experimental groups) on the basis of the above
criteria, 8 from the ML group and 5 from the M+PFL group. A Chi-Square test with the two
affected groups was not significant (N=200, Chi-Sqr=.32, p=.57), indicating that this
exclusion was likely not marked by selection bias.

Unlike in the pilot study, participants in the present study were participating online,
with no experimenter to oversee their progress. Furthermore, pilot study participants were all
Teachers College students, while the participants in the present study were “average” internet
users 18 to 25 years of age, who might be expected to be somewhat less conscientious with
regard to the quality of their responses. This was reflected in the average duration of their
engagement with the study, which was approximately 22.5 minutes, compared to
approximately one hour in a laboratory setting. It should be noted, however, that in the
laboratory, participants were given a certain amount of time to complete the various parts of
the study and they would often wait for the experimenter to check on them rather than
immediately alerting the experimenter upon finishing the section. Thus the longer average
time for the laboratory setting is not simply a function of greater care and fastidiousness on
the part of the pilot participants. Nevertheless, some of the online participants managed to
complete the study in a very short amount of time, in some cases as little as 2.5 minutes. It
would be unreasonable to expect that meaningful learning could take place in so short a time,
especially given the number of different parts of the study (there were seven sections all
together in the M+PFL condition) and thus that any subsequent transfer would occur. Similarly, participants in the control condition would not be expected to be substantially impacted by the fiction they read if they merely skimmmed or speed-read it. By the same token, participants who rushed through the study activities would be much less likely to give thoughtful responses on the post-test. Therefore the participants with the lowest study duration times in all three groups were excluded from the final analysis. The cutoff duration was set at 10 minutes, which was just over one standard deviation (720 seconds) below the mean of 22.5 minutes (note that a single extreme outlier with a duration of 29,914.2 seconds was excluded when calculating the mean and standard deviation). Based on this cutoff, 16 participants (5%) were excluded: 14 from Control, 1 from ML, and 1 from M+PFL. A Chi-Square analysis indicated that this exclusion was not statistically balanced ($N=303$, Chi-Sqr=17.3, $p<.001$), with significantly more participants excluded from the control group compared to the experimental groups. This may have had to do with the fact that reading fiction was a more passive activity, with comprehension questions occurring only halfway through the narrative and at its end, encouraging more participants to move through it quickly with only superficial engagement. Additionally, several participants in the experimental conditions with very short duration times had already been excluded on the basis of their low quiz scores, adding to the imbalance. (Note that an analysis was also conducted including the low-duration participants, and it did not significantly alter the results.)

Exclusion was also considered on the basis of the suspicion probe, which sought to determine if participants correctly guessed the purpose of the study and thus might be influenced in their responses by social desirability (Reynolds, 1982). While a number of participants (14) did speculate that the study sought to examine whether learning about emotions or reading a story influenced judgments of blame, only 2 accurately guessed the purpose of the manipulation in relation to the blame scenarios (i.e. that blame scores would
be expected to decrease), and thus only those 2 participants were excluded on this basis. The final sample size was 287. Of these, 91 (32%) were males and 196 (68%) were females.

Procedure

Overview. A randomized, 1x3 study design was used. Participants were randomly assigned to either the two experimental (ML, M+PFL) groups or a control group (see Table 3.1). The final group sizes following exclusion were: Control=102, ML=99, M+PFL=86. Males and females were evenly distributed among the groups (control group was 28% male, ML group 34%, and M+PFL group 32%).

All activities were done online using the Qualtrics survey platform. The procedure largely followed that of the pilot study, with the following difference: all groups completed the Empathic Concern and Perspective-Taking subscales of the Interpersonal Reactivity Index (IRI; Davis & Oathout, 1987) prior to undertaking any other study activities. Differences in content between groups are discussed below.
Table 3.1. 1x3 study design. Every group completed two subscales of the Interpersonal Reactivity Index (IRI) prior to all other study activities. All groups also completed a scenario-based post-test.

Content of Model Learning (ML) Intervention

*HES Model Learning.* The HES model learning content was largely identical to that of the pilot study (minus the PFL activity). Slight changes were made to the diagrams and text used in the model learning activity to avoid giving the false impression that appraisals and emotions are merely binary (positive/negative). See Presentation 1 in Appendix A.

*Practice Exercises.* The practices exercises in the M+PFL group were virtually identical to those used in the pilot study. However, for the ML group, the number of exercises was increased to sixteen (as compared to ten in the pilot study and the M+PFL group), to account
for the time the M+PFL group spent on the PFL activity. Additionally, some language was updated to better highlight some of the HES model concepts. See Practice Exercises 1 and 2 in Appendix A.

Self-quiz. The self-quiz was largely identical to the one used in the pilot study. Slight changes in the phrasing of some of the questions and answers were made to better emphasize the key concepts from the taught emotion model. Additionally, participants were shown whether their responses to the quiz questions matched the suggested answers, and in some cases provided explanations of why the suggested answer was chosen. See Quiz 1 in Appendix A.

Model Learning Plus PFL (M+PFL)

The M+PFL group followed the same procedure as the ML group, with two exceptions: the group began by doing a PFL activity, and the number of practice exercises following the model learning was smaller (ten rather than sixteen) to account for the time spent on the PFL activity.

PFL Activity. The PFL activity in the present study was identical to the one used in the pilot study. I had previously attempted to use an alternative version in a separate MTurk pilot, but the results were not encouraging—the PFL group did not show lower blame scores than control—and I returned to the version from the pilot. The main difference in the alternative version had been that instead of depicting six different events, to which the three characters had different emotional reactions, all three characters reacted to the same two events. This was meant to reduce the amount of the variation in the contrasting cases, and draw participants’ attention to the fact that the same event can give rise to different emotional reactions in different people based on their individual desires, a key idea in appraisal theory.
(Roseman & Smith, 2001). See PFL Activity 1 in Appendix C. However, I suspect that this also made the contrasting cases too trivial, in part because participants already had quite sophisticated theories of emotion (as compared to younger students asked to do a PFL dealing with novel concepts like density), resulting in weaker learning.

*Fiction Content*

As in the pilot study, the control group’s main activity was reading a literary fiction selection and answering reading comprehension questions. The fiction selection was the same as that used in the pilot.

*Measures*

*Pre-test.* All participants completed the Empathic Concern and Perspective-Taking subscales of the Interpersonal Reactivity Index (Davis & Oathout, 1987; see Pre-Test 1 in Appendix A). These subscales are often used to measure empathic disposition (McCullough, Emmons, Tsang, 2002). They have adequate internal reliability (.73 and .71, respectively, Davis & Oathout, 1987). The two subscales consist of seven (7) items each, for a total of fourteen (14) items. Respondents use a 5 point Likert scale to indicate to what extent the statements in the subscales describe them. The subscale scores were used to approximate respondents baseline, trait empathic tendencies. I expected that these scores would covary with participants’ responses to other-blame scenarios on the post-test. Since empathy and perspective-taking, and similar theory of mind capacities, are thought to be closely related to emotional self-awareness (Lane & Schwartz, 1987; Ochsner et al., 2004), I also expected the scores to covary with participants’ responses on the self-blame scenarios.
**Post-test.** The post-test was based on the outcome measure used in the pilot study, i.e. a set of fictional scenarios which are rated with regard to how “blameworthy” characters’ reactions appear to be. Blameworthiness has been used in past studies evaluating judgments of moral responsibility (Nadelhoffer, 2006; Woolfolk, Doris & Darley, 2006), and I was able to use it successfully in my pre-dissertation pilot described above. The scenarios were designed to depict “socially undesirable” emotional responses. The notion of social desirability (Crowne & Marlowe, 1964) has been widely used by researchers to establish if participants are susceptible to the so-called approval motive, which would push them to provide responses which they believed were desired by the questioner. The Social Desirability Scale (Crowne & Marlowe, 1964) relies on items which offer opportunities to provide socially desirable but highly improbable responses (e.g. that one is always courteous even with people who are disagreeable). Based on a similar, but reverse logic, the scenarios in the present study were designed to depict emotional responses which would be seen as socially undesirable yet which are fairly plausible, such as an instructor getting impatient with a student asking a lot of questions. The expectation was that the scenarios’ social undesirability would push participants to rate them as having relatively high blameworthiness. To improve reliability, one of the original pilot scenarios was replaced, and an extra scenario added, for a total of four scenarios rather than three as in the pilot. (See Outcome Measure 1 in Appendix A). The resulting internal consistency of the other-blame scenarios was acceptable at .74.

The other-blame scenarios were accompanied by an additional section in which participants were asked to rate how blameworthy they would find emotional reactions they themselves may experience in hypothetical self-focused scenarios. This section of the post-test was intended to measure the intervention’s effects on self-awareness. The section had the same number of scenarios as the other-blame section (4), and the scenarios were similarly designed to depict “socially undesirable” emotional reactions. The following is an example of
one of the self-blame scenarios: “One evening you hear on the news that a person of about
the same age as you, and with the same background, has recently achieved considerable
success and fame. You feel a surge of envy on hearing the story.” (See Outcome Measure 1
in Appendix A). The internal consistency of the self-blame scenarios was good at .82.

Additionally, as in the pilot, there was an equal number of “filler” scenarios, which
were designed to have no explicit or salient reference to emotional reactions. These scenarios
were primarily meant to help maintain the plausibility of the cover story. They also provide a
comparison group for the self-blame and other-blame scenarios: I expected that because there
was no overtly emotion-referencing content in these scenarios the intervention would have no
significant impact on people’s responses to the fillers (note that this does not mean the fillers
were completely devoid of emotion, just that emotional reactions were not a overt component
of the scenarios). The following is an example of one of the filler scenarios: “A woman sits
alone in an office. It is after 10pm. She is concentrating on her work. She gets a phone call,
glances to see who it is, but does not pick up.” (See Outcome Measure 1 in Appendix A.) The
internal consistency of the filler scenarios was excellent at .92.

Blameworthiness for all scenarios was rated on an 11-point Likert scale. The other-
focused scenarios were written to ensure gender balance, such that there was approximately
the same number of male and female protagonists, with some characters’ gender being left
deliberately ambiguous. Similarly, self-focused scenarios were written to allow universal
gender identification. The order of the scenarios was randomized to ensure the sequence did
not affect the outcome.

Exit Questionnaire. Participants responded to the same exit questionnaire as in the pilot
study, which included questions about demographic information such as age and gender. In
addition, they were asked their highest achieved level of education. As in the pilot,
participants were also asked to describe their understanding of the purpose of the study activities they had participated in. This was meant to serve as a suspicion probe (Shariff et al., 2014).
**Results**

**Between Group Differences**

*Demographic Variables, Empathy, Participation Duration.* Groups did not differ significantly based on age, education level, empathy scores, or participation duration (all ps > .05). Descriptive statistics for the three groups can be found in Table 3.2.

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>ML</th>
<th>M+PFL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>22.29 +/- 1.82</td>
<td>22.37 +/- 1.88</td>
<td>22.46 +/- 2.32</td>
</tr>
<tr>
<td>Education</td>
<td>1.3 +/- .84</td>
<td>1.44 +/- .8</td>
<td>1.6 +/- 1.09</td>
</tr>
<tr>
<td>Empathy</td>
<td>37.97 +/- 9.54</td>
<td>39.18 +/- 7.79</td>
<td>38.59 +/- 9.15</td>
</tr>
<tr>
<td>Duration</td>
<td>1498 +/- 650</td>
<td>1381 +/- 648</td>
<td>1421 +/- 856</td>
</tr>
</tbody>
</table>

Table 3.2. Descriptive statistics for Age, Education, Empathy and Duration for each condition. The groups did not significantly differ from each other on any of the measures.

**Blame Scores.** A one-way multiple analysis of covariance (MANCOVA) was run with Group as a factor, three dependent variables (Self-blame scores, Other-blame scores, and Non-emotional blame scores), and two covariates (Empathy and Duration). Covariates were included based on the fact that Empathy had a significant positive correlation with Other-blame (Spearman’s rho=.144, p=.01) and a marginally significant positive correlation with Self-blame (Spearman’s rho=.1, p=.08), and Duration had a marginally significant negative correlation with Other-blame (Pearson r=-.1, p=.1) and Self-blame (Pearson r=-.1, p=.09). Neither of the other potential covariates--age and education--were correlated with any of the blame scores (ps > .05) and were not included in the analysis. Similarly, preliminary tests showed no multivariate significance for Gender as a factor or for the interaction of Gender and Condition (ps > .05), and consequently Gender was not included in the analysis.
Multivariate tests for Group were significant (Wilks’ Lambda=.92, F(6, 560)=3.8, p=.001), as were the overall between-subject models for Other-blame (F(4,282)=4.99, p=.001), Self-blame (F(4,282)=3.57, p=.007), and Non-emotional scenario blame (F(4,282)=3.28, p=.012). Group was a significant between-subject predictor of blame scores for both Other-blame (F(2, 282)=6.33, p=.002, $h_p^2=.043$) and Self-blame (F(2,282)=3.97, p=.02, $h_p^2=.027$) but not Non-emotional scenario blame (F(2,282)=1.4, p=.25, $h_p^2=.01$).

Pairwise comparisons revealed that for Other-blame, both experimental groups produced significantly lower blame scores than the control ($M_{\text{Control}}=6.47$ vs $M_{\text{ML}}=5.49$, p=.001; $M_{\text{Control}}=6.47$ vs $M_{\text{M+PFL}}=5.69$; p=.01), as predicted. These results essentially reproduced those of the pilot. However, the M+PFL blame scores were somewhat higher than the ML scores ($M_{\text{ML}}=5.49$ vs $M_{\text{M+PFL}}=5.69$; see Figure 3.1), counter to expectations, though this difference was not significant (p=.51).

For Self-blame, the scores in the ML condition were significantly lower than control ($M_{\text{Control}}=5.28$ vs $M_{\text{ML}}=4.5$, p=.008), but those in the M+PFL condition were not ($M_{\text{Control}}=5.28$ vs $M_{\text{M+PFL}}=5.13$, p=.62). Indeed, the M+PFL group scores were only slightly lower than control, such that they were still significantly higher than the ML group ($M_{\text{M+PFL}}=5.13$ vs $M_{\text{ML}}=4.5$; p=.039). See Figure 3.2 for Self-blame score comparisons and Table 3.3 for estimated marginal means.

Counter to expectations, the effect on Other-blame scores were greater than the effect on Self-blame scores. The overall effect size for Other-blame was $h_p^2=.043$, while for Self-blame it was $h_p^2=.027$. Looking at the simple contrast effects, the M+PFL group’s Self-blame scores weren’t different from control, whereas the group’s Other-blame scores were significantly lower than control, offering an obvious disparity in effects. On the other hand, the ML group’s scores were significantly different from control for both Self-blame and Other-blame. The effect sizes for these contrasts again showed a stronger effect for Other-
blame ($h^2_p=.053$) than for Self-blame ($h^2_p=.033$). However, there was a significant difference between the control group’s Self-blame and Other-blame scores ($M_{\text{other-blame}}=6.43$ vs $M_{\text{self-blame}}=5.24$, $F(1,101)=53.98$, $p<.001$), which introduces a confound in comparing effect sizes in this case because lower ‘baseline’ scores for Self-blame may have provided less opportunity for blame reduction. Nevertheless, the fact that the Self-blame scores in the M+PFL condition were no different from control, whereas they were significantly lower than control for Other-blame, points to the likelihood that the intervention’s effect on Self-blame may indeed be weaker than on Other-blame.

See Table 3.4 for a summary of outcomes broken down by hypothesis.

![Other-Blame](image)

Figure 3.1. Comparisons of the estimated marginal means of Other-blame scores for the 3 conditions. Both experimental groups scored significantly lower than control.
Figure 3.2. Comparisons of the estimated marginal means of Self-blame scores for the 3 conditions. The Model Only (ML) group scored significantly lower than control. The M+PFL group scores were not significantly lower than control.

Figure 3.3. Comparisons of the estimated marginal means of Non-emotional scenario blame scores for the 3 conditions. None of the pairwise comparisons were significant.
### Table 3.3. Estimated marginal means for the three groups with Duration and Empathy as covariates. For the group in each column, groups that scored significantly differently (p<.05) are listed in parenthesis.

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>ML</th>
<th>M+PFL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Other-blame</strong></td>
<td>6.47 +/- .2 (ML, M+PFL)</td>
<td>5.49 +/- .21 (Control)</td>
<td>5.69 +/- .22 (Control)</td>
</tr>
<tr>
<td><strong>Self-blame</strong></td>
<td>5.28 +/- .21 (ML)</td>
<td>4.5 +/- .21 (Control, M+PFL)</td>
<td>5.13 +/- .22 (ML)</td>
</tr>
<tr>
<td><strong>Non-emotional scenario blame</strong></td>
<td>5.35 +/- .27</td>
<td>5.5 +/- .27</td>
<td>5.99 +/- .29</td>
</tr>
</tbody>
</table>

Table 3.3. Estimated marginal means for the three groups with Duration and Empathy as covariates. For the group in each column, groups that scored significantly differently (p<.05) are listed in parenthesis.

### Table 3.4. Summary of study outcomes as they relate to the hypotheses.

<table>
<thead>
<tr>
<th>Hypothesis #</th>
<th>Expectation</th>
<th>Outcome</th>
<th>Outcome Supports Hypothesis?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Conceptual emotion knowledge will transfer to a novel context</td>
<td>Experimental and control conditions differed significantly on blame scores</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Ratings of the blameworthiness of others’ hypothetical emotional reactions will be significantly reduced</td>
<td>Blameworthiness scores in the ML and M+PFL conditions significantly lower than control</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Ratings of the blameworthiness of one’s own hypothetical emotional reactions will be significantly reduced</td>
<td>Blameworthiness scores in ML condition significantly lower than control, not significantly lower in M+PFL condition</td>
<td>Partially</td>
</tr>
<tr>
<td>4</td>
<td>M+PFL condition will show greatest reductions in blame</td>
<td>ML group showed equivalent (other-blame) or greater (self-blame) reductions in blame than M+PFL group</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>Effects will be greater for self blame than for other blame</td>
<td>Effects were greater for other-blame than for self-blame</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 3.4. Summary of study outcomes as they relate to the hypotheses.
Exploratory Analyses

PFL Effects. Counter to expectations, the PFL group did not exhibit significantly better results (i.e. lower blame scores) than the the model only group, despite engaging in a preparation for future learning activity. In the case of Other-blame, the M+PFL group scores were slightly higher than the ML group scores, though there was no significant difference between the two. For Self-blame the M+PFL group scores were significantly higher than the ML group. One possibility was that something about the PFL activity had ended up interfering with learning rather than aiding it. For instance, asking participants to explain how emotions arise might have activated their existing emotion theories. Such theories can be highly personal, and their activation may conceivably make participants less rather than more receptive to an alternative ‘expert’ explanation provided by the intervention. This is in contrast to PFL activities carried out with material which is both new to the learners and superficially different from the content being taught, as for example in the case of middle school students learning about density having to come up with a ‘clown car crowdedness index’ as part of an invention PFL activity (Schwartz, Chase et al., 2011). In a similar vein, the activity might have distracted participants from—or at least failed to enhance the absorption of—the key idea of appraisal automaticity, since it would have focused their attention instead on the process of interpreting a situation in relation to one’s goals and needs.

To try to test these possibilities, a correlation analysis was carried out between the length of time spent on the PFL activity, as well as the quality of the explanation produced, and blame scores, along with other measures (Table 3.6). The PFL explanations were made in response to the following prompt:

Below, three characters are shown having emotional reactions to different events. Using the scenes below as a starting point, your task is to come up with a GENERAL
EXPLANATION for how different emotions arise. Your explanation should be generally predictive, that is, you should be able to use it to predict what type of emotion will arise given a specific situation. The type of emotion does not need to be totally exact, like frustration or contempt. A broad emotional category would be sufficient. Your explanation should work for all the scenarios below, and ANY OTHER hypothetical situation.

The quality of explanation was determined by two independent raters and given a score of 0 to 3 (see Table 3.5 for rubric and sample responses). Inter-rater consistency of .75 was achieved, and any discrepancies were resolved through discussion. The distribution of the scores is shown in Figure 3.4.

<table>
<thead>
<tr>
<th>Score</th>
<th>Explanation</th>
<th>Example</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No serious attempt made to answer the question</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Explanation is attempted but it's not general and not predictive</td>
<td>Mrs. Sellers is happy because she received a gift from her friends on Christmas. Jenny is happy because she got an A on her math tests which equates to being good at math for her. Jack is happy about his promotion because it can help him move ahead in life.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>General explanation is attempted but it’s not predictive or otherwise incomplete</td>
<td>Emotions arise as a result of a tendency or attitude being activated by a specific stimuli. People have certain traits and categories inside of them, which predispose them to respond with specific emotions when presented with specific stimuli. When they are accurately presented with that specific</td>
<td>A positive emotional reaction will arise from someone when something they support, like, or find important is supported by another or an event/outcome. A negative emotional reaction will arise from someone when something they like is negated by someone else or an event, or when</td>
</tr>
</tbody>
</table>
stimulus, they experience that specific emotion. something they don't like is supported by another person/outcome/event.

Table 3.5. PFL score rubric and sample PFL explanation responses.

Figure 3.4. Distribution of PFL scores.

<table>
<thead>
<tr>
<th></th>
<th>PFL Score</th>
<th>PFL Time</th>
<th>Gender</th>
<th>Quiz</th>
<th>Other-blame</th>
<th>Self-blame</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFL Score</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFL Time</td>
<td>.18, p=.09</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-.03, p=.78</td>
<td>.09, p=.44</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quiz</td>
<td>.27*, p=.01</td>
<td>.2, p=.06</td>
<td>-.17, p=.12</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other-blame</td>
<td>-.09, p=.42</td>
<td>-.01, p=.95</td>
<td>.23*, p=.035</td>
<td>-.19, p=.08</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Self-blame</td>
<td>-.04, p=.75</td>
<td>-.13, p=.22</td>
<td>.21, p=.06</td>
<td>-.17, p=.12</td>
<td>.8**, p&lt;.001</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3.6. Correlations between PFL score, PFL time and blame scores and other measures for the M+PFL Group. *Significance at the .05 level. **Significance at the .01 level.
As can be seen from Table 3.6, PFL time and PFL score were not significantly correlated with blame scores (ps > .05). Instead, PFL scores were significantly and positively correlated with quiz scores (r=.27, p=.01), and PFL time was positively correlated with quiz scores at a marginally significant level (r=.2, p=.06) indicating that spending more time on and producing a better explanation on the PFL activity was generally associated with better learning of the emotion material presented in the study. At the same time, gender was significantly positively correlated with other-blame scores (r=.23, p=.035), suggesting that males tended to rate others’ emotional reactions as more blameworthy than did females. Similarly, gender had a marginally significant positive correlation with self-blame (r=.21, p=.06), indicating that males also tended to rate their own undesirable emotional reactions as more blameworthy.

Given these gender correlations, a two-way MANCOVA was run with Gender and Group as factors and Duration and Empathy as covariates, to explore Gender by Group interactions for Other-blame and Self-blame only (i.e. excluding Non-emotional scenario blame). The multivariate test of the Gender by Group interaction was marginally significant (Wilks’ Lambda=.97, F(4,556)=2.16, p=.07), and the tests of between-subject effects for the interaction were significant for both Other-blame (F(2, 279)=3.22, p=.041) and Self-blame (F(2,279)=3.36, p=.036). Two-way ANCOVAs (with Group and Gender as factors) for Other-blame and Self-blame confirmed the significance of the interactions, which are depicted in Figures 3.5 and 3.6.
Figure 3.5. Group x Gender interaction for Other-blame. The interaction was significant (p=.036).
Figure 3.6. Group x Gender interaction for Self-blame. The interaction was significant (p=.04).

Comparing estimated marginal means of Other-blame for Gender conditional on Group revealed no significant differences in scores for the Control group (F(1, 98)=.56, p=.46) or the ML group (F(1,95)=1.21, p=.27). However, for the M+PFL group males produced significantly higher blame scores than females (6.48 vs 5.34, F(1,82)=4.73, p=.03) with the overall model marginally significant (F(3,82)=2.19, p=.095). See Table 3.7 for the estimated marginal means.
Comparing estimated marginal means of Self-blame for Gender conditional on Group revealed no significant differences in scores for the Control group (F(1, 98)=.4, p=.53) or the ML group (F(1, 95)=1.62, p=.2), whereas in the M+PFL group the males scored significantly higher than females (5.82 vs 4.8, F(1, 82)=4.61, p=.04) with a significant overall model (F(3, 82)=2.65, p=.05). See Table 3.8 for the estimated marginal means.

At the same time, there was no significant difference in PFL score means by gender (Female: 2.24, Male: 2.18, t(85)=.32, p=.75), nor PFL time by gender (F: 232.1, Male: 252.3, t(85)=.66, p=.51), suggesting that gender did not play a role in the quality of PFL explanations produced or the time spent on them. The above data could mean that doing the given PFL activity interacted with gender to impede the integration of the new emotion.
knowledge, especially among males, possibly by activating their existing emotion models, or by distracting from the key idea of appraisal automaticity, or both.

Another possibility is that there were practice effects whereby the ML group performed better due to the larger number of practice exercises they completed (in order to compensate for the absence of the PFL activity). However, ascertaining practice effects posed a challenge for several reasons. First off, the extra exercises completed by the ML group were not simply tacked on to the end of the set of exercises performed by the M+PFL group. This was because there were two distinct subsets of exercises, with the first subset dealing with inferences about future events, while the second subset dealt with inferences about situational antecedents. Furthermore, each subset consisted of multiple choice as well as open response questions. Therefore, when new exercises were added in the ML condition, they were integrated into the set such that an equal number of exercises was added to both subsets, and new questions were grouped with existing ones by type, i.e. multiple choice with multiple choice and open response with open response. In other words, in seeking to analyze the results it wasn’t possible simply to split the ML exercise set and compare the means of the equivalent of the M+PFL set and the new add-on set, because the questions in each were interleaved. Had it been possible to do such a split, improved performance on the add-on set compared to the preceding M+PFL set equivalent might have arguably pointed to the presence of practice effects.

However, there was a further factor that would have undermined the usefulness of such a comparison. Namely, that there was effectively no way for participants to provide a wrong answer on the practice exercises with respect to the HES model taught. This was because the purpose of the exercises was to give participants repeated exposure to the concept of appraisal as it fits into the emotion generation process in the real world, rather than to present them with problems that they might have failed on. Thus the exercises were simple
vignettes dealing with everyday occurrences, which asked participants to either select or imagine events that would produce positive or negative appraisals and emotional responses. For example, given the following scenario, “You go to move your brand new car,” participants were asked, “Given the above, suggest an event that is likely to produce a *negative* appraisal.” As cognitively unimpaired English-speaking adults who have been taught the concept of appraisal, all participants were able to provide appropriate responses to this and similar exercises. The only times their answers could be said to be ‘incorrect’ was when they either did not answer at all, or misread or misunderstood a question, e.g. when asked to offer a *preceding* situation that might lead to a particular appraisal, they instead offered a future situation. However, such responses would not necessarily have reflected a faulty understanding of the material (i.e. the emotion model) -- since the responses were correct with regard to the valence of the appraisal -- and thus score differences based on such errors would not be useful in determining practice effects in relation to the mastery of the emotion model. Rather, they might be indicative of other factors such as level of attention, motivation, or cognitive ability.

Practice exercise scores did not differ by condition overall (MML=.94 +/- .05 vs M_M+PFL=.93 +/- .1), nor by gender within condition, nor by condition within gender (all ps > .05). However, the correlation patterns of practice scores for the two genders in the M+PFL condition, shown in Table 3.8, offer some interesting insights.
As can be seen from table 3.9, for females, practice scores were strongly correlated to PFL scores (r=.52, p<.001) and moderately correlated with quiz scores (r=.27, p=.04), but not with blame scores (ps > .05 for both Other-blame and Self-blame). On the other hand, quiz scores were marginally negatively correlated with Other-blame scores (r=-.23, p=.08) and
Self-blame scores ($r=-.22$, $p=.09$). This is consistent with the idea that practice scores might be reflective of some mix of cognitive ability and motivation, while quiz scores would reflect the quality of learning of the emotion model, and would consequently have a correlation to blame scores.

On the other hand, for males, the pattern was quite different. Practice scores were significantly and negatively correlated to overall duration ($r=-.46$, $p=.016$) and PFL time ($r=-.53$, $p=.004$), and at the same time strongly and positively correlated to Self-blame scores ($p=.49$, $p=.01$). That is, higher practice scores were associated with less time spent on task and higher self-blame scores. Meanwhile, practice scores were not correlated to either quiz scores or PFL scores, and quiz scores were not correlated to blame scores (all $ps > .05$). This hints at a particular kind of participation profile of some male participants: ones who were relatively high on some aspects of cognitive ability, such as attention and decision-making, but also motivated to complete the study quickly (evidenced by high practice scores, which required quick evaluations, coupled with high speed of completion), and who also were relatively resistant to the effects of model learning (no quiz-blame correlations), especially when it came to self-blame (high self-blame scores). The latter may well have been related to these male participants’ rapid study completion and their capacity for and emphasis on rapid decision-making (rather than e.g. absorbing new material, as evidenced by no practice-quiz correlation). In sum, it may be that some of the males in the M+PFL group were able and motivated to complete the study activities quickly and accurately, but also somewhat superficially, and as such they were less susceptible to the emotional model learning.

This does not negate the possibility that practice effects were at play, such that fewer practice exercises coupled with a PFL activity, which allowed for an open response and thus could be completed very quickly, diminished these participants’ absorption of the material
and subsequent blame score effects. Nevertheless, such practice effects, if any, would still appear to have been more pronounced for males than females.

**Discussion**

In the present study, I asked whether knowledge acquired in learning the HES core model would spontaneously transfer to a novel set of problems and affect aspects of emotional awareness. As in the pilot study, participants in the experimental groups learned about the role of appraisal in emotion generation, and the largely automatic nature of that process. This knowledge was expected to influence participants’ perceptions of the level of control one has over emotional reactions. This, in turn, was expected affect how blameworthy one judges others and oneself to be for exhibiting such reactions.

With respect to other-blame, I expected to reproduce the results of the pilot, such that there were reduced blameworthiness scores in the experimental groups compared to the control group. More specifically, I expected socially undesirable emotional reactions to be rated as significantly less blameworthy by the model learning groups than the control group. That is, the experimental groups could be said to be more tolerant and empathic when they perceived someone “reacting badly.” The results were largely in line with expectations. Both experimental groups rated others’ socially undesirable emotional reactions as significantly less blameworthy than did the control group. The ML group’s blame scores were more than 15% lower than the control group’s, and the M+PFL group’s scores were more than 12% lower. These results supported the hypothesis that conceptual emotion knowledge would transfer to novel problems and impact social awareness. However, they went counter to the expectation that the M+PFL group would show the lowest blameworthiness scores, as this group’s scores were not significantly different from the ML group, and were in fact slightly higher.
Similar results were observed for self-blame. The ML group’s self-blame scores were significantly lower than the control’s, with a reduction of nearly 15%, providing an indication that learning the emotion model also had an impact on self-awareness, as expected. On the other hand, the M+PFL group’s scores, while somewhat lower than the control’s, were not significantly different. They were, however, significantly higher than the ML group’s.

Overall, these results bolstered the proposition that learning a core, appraisal-based model of the emotion system would transfer to a novel set of problems and influence aspects of self and other awareness in a positive way. Moreover, this was accomplished with a sample of 18 to 25 year olds, an age range which includes late adolescence, which has proven itself to be a difficult target for SEL interventions (Yeager, 2017a). The results are arguably made more compelling by the fact that the intervention was quite short, and that the control group read literary fiction, which would be expected to have a short-term positive impact on aspects of theory of mind (Kidd & Castano, 2013). Additionally, given that the intervention was run online, the results are an indication that this SEL methodology can be delivered using modern technologies, increasing its potential scalability and accessibility.

Furthermore, the findings highlight the importance of a more nuanced and comprehensive approach to teaching students about emotions than, for example, simply communicating the idea that personality or emotions can change, as has been done in interventions focusing on incremental theories (e.g. Yeager et al., 2013). Instead, the study results indicate that, as suggested by Stegge and Meerum Terwogt (2007), there is value in developing a two-level theory of emotions, recognizing that some aspects of the emotion system cannot be controlled (Flavell and Green, 1999), while also learning that some emotion regulation is both possible and desirable.

At the same time, the results largely failed to back the hypothesis that engaging in a PFL activity as part of the learning process would produce better outcomes. The M+PFL
condition performed essentially the same as the ML condition in the case of Other-blame, while producing significantly higher Self-blame scores than the ML condition. An exploratory analysis revealed that unlike in the other two conditions, the males in the M+PFL group tended to produce higher other-blame scores and self-blame score than females, while exhibiting no difference in performance on the PFL activity. This suggests that males may have been more likely than females to fail to assimilate the new information about emotions, and that the PFL activity may have factored in this disparity. One possibility is that the PFL activity primed participants with respect to their existing theory of emotions, bringing it to the fore. This in turn may have made them resistant to the ‘expert’ explanation of emotion generation provided as part of the intervention. Alternatively, the problem may have been that the PFL activity targeted an aspect of appraisal (evaluation of events in relation to one’s concerns) that wasn’t central to producing the effect of blame reduction, i.e. understanding appraisal’s automaticity. In either case, males and females seemed to be affected to a different degree, which is in keeping with findings suggesting differences in the way the two genders process emotion information (Wager, Phan, Liberzon, & Taylor, 2003).

Another possibility was that the ML group benefited from practice effects, having had the opportunity to complete more practice exercises compared to the M+PFL group. While there was no easy way to determine definitively if this was so, correlation patterns of the genders’ performance on the practice exercises suggest that some males in the M+PFL condition had a particular participation profile--tending to have fast completion rates and good performance on the practice exercises, but higher self-blame scores--reflective of characteristics and/or a mode of engagement that may have made them less susceptible to the intervention, e.g. being motivated to complete the study quickly, and focusing on speed and accuracy of performance over learning, especially when it came to their own self-concept.
It is worth noting that the study was conducted entirely online, with MTurk recruits rather than TC students. This sample and this mode of content delivery may have resulted in the presence of participants who were more eager to finish quickly (since they were getting paid the same amount regardless of participation duration) and less motivated to engage in the arguably more challenging and open-ended PFL activity (there is evidence of the latter in the higher rate of M+PFL participants who did not complete the study). Because such participants were prone to speed through the PFL activity, which allowed them to take as much time as they wished (up to 10 minutes), they might have benefited less from it than from additional practice exercises such as were provided to the ML group.

Follow-up studies would be needed to determine whether the observed gender differences in model learning effects with a PFL are robust, as well as the relative impact of the PFL activity and practice on learning and blame scores. Nevertheless, the results do point to a potentially important consideration in the way PFL activities might be used for SEL. Namely, that because even relatively young people already possess sophisticated (albeit usually implicit) theories and models of emotion—whereas they may not have such models of specialized concepts like density—PFL activities might cause the activation of these extant models, which may result in some detrimental interference or resistance effects. One possible way to mitigate this problem would be to design the activity in such a way as to avoid touching on emotions explicitly, and instead dealing with something structurally analogous but superficially different. A similar approach was taken by Schwartz, Chase et al. (2011) when they asked students to come up with a “crowdedness index” for clown cars in preparation for learning about density. At the same time, there may be situations in which the PFL activity should directly engage with existing emotion theories, e.g. in order to address misconceptions. Additional studies will be needed to determine which circumstances call for which approach.
Furthermore, any PFL activities used in SEL (or elsewhere) should be designed to precisely target the deep structures that will be taught following the activity and that the learners are expected to assimilate. Those designing such activities will likely want to take both these considerations—deliberate obfuscation of PFL focus through superficial differences in task depiction, and precise targeting of underlying deep structure—into account.

It should also be noted that the present intervention was quite brief, and only its short-term effects were measured. It’s possible that the given PFL activity would produce different results as part of a longer intervention.

I had also predicted that the effects of the intervention would be more pronounced on self-awareness than on other-awareness, in part because of the you-focused nature of the training (i.e. the practice exercises asked the participant to imagine that they themselves found themselves in particular hypothetical scenarios), as well as the human tendency to self-exonerate (Bandura, 2002) and the so-called self-serving bias (Myers, 2015), which would presumably cause people to seek to use their knowledge of automaticity of appraisal to justify and excuse socially inappropriate emotions. However, the study results did not support this hypothesis, and the effects were greater for other-blame than for self-blame. These results must be viewed with caution however, because the control group’s blame ratings for the self-blame scenarios were lower than other-blame. That is, these scenarios were seen as less blameworthy to begin with, and thus there was less room for blame reduction. A follow-up study might attempt a comparison of effects on self- and other-blame scenarios whose scores are equivalent. At the same time, the strong disparity in effects for the M+PFL group compared to control (no effect for Self-blame and significant effect for Other-blame) does suggest that the intervention was indeed more effective for Other-blame than for Self-blame. If this was the case, it might be explained by the fact that people found it easier to apply the principles of the HES they had learned to (fictional) others than to themselves. This would fit
in with the finding that most people believe themselves to be above average (Taylor & Brown, 1988), i.e. different from and superior to the majority of other people, and thus may be somewhat resistant to the notion that the universal principles of the HES apply to them no less than to others. As there is evidence that men tend to overestimate their abilities more than women (Ehrlinger & Dunning, 2003), i.e. are less objective and aware of themselves, this hypothesis seems consistent with the study results, given that it was men (in the M+PFL group) who were most resistant to changes in self-blame.

Another unexpected finding of the present study was the relationship between participants’ trait empathy scores and their blame scores. As expected, empathy scores were correlated with blame scores, however, that correlation was the opposite of the one that had been assumed: instead of being associated with lower blame scores, higher empathy was correlated with higher blame. While this seems counterintuitive, evidence from recent studies on empathy provide a plausible explanation for such results, namely that when people feel empathy for someone they are likely to also feel greater animosity toward the person’s perceived antagonist (Buffone & Poulin, 2014), and thus empathizing for a victim may increase the anger (and blame) directed at the aggressor. Bloom (2016) cited this phenomenon as evidence that empathy may sometimes lead to undesirable outcomes. In this case, nearly all of the blame scenarios (3 of the 4 other-blame and 3 of the 4 self-blame) contained what could be perceived as ‘victims’ of those experiencing the undesirable emotional responses, and thus the latter might be more strongly blamed by participants with greater empathy. This result, while unexpected in the context of the present study, provides an illustration of the value of developing a more nuanced model of emotion. According to Bloom (2016) excessive anger at an aggressor due to strong empathy for the victim can lead to overly harsh punishment and retribution aimed at the perpetrator. While it is certainly desirable to be empathetic toward victims, that does not justify being cruel or inhumane
toward others, even if those others have themselves acted cruelly. Having a more elaborate model of emotions can moderate the anger one feels toward a perpetrator, whether actual or alleged, by providing a more flexible framework through which to evaluate social situations, and consequently help behave more equitably toward all parties (Yeager et al., 2013).

**Limitations**

One limitation of the present study is that the participants were aged 18-25, and thus the study results do not necessarily generalize to younger or older groups. Additionally, there were considerably fewer males than females in all conditions (approximately a 2:1 ratio), so that, for example, in the M+PFL group there was a relatively small total number of males (28). Furthermore, a large number of participants was eliminated from the final analysis due to various causes (non-completion, previous exposure to the material, etc). In some cases, this elimination was statistically unbalanced across groups, suggesting the presence of selection bias. Moreover, the elimination of participants who scored poorly on the quiz means that the observed results can only be generalized to those who successfully learn the model, with the possibility that some groups or individuals may not benefit from the present instructional approach.

An additional limitation is that the outcome measures are based on scenario ratings, so that they only captured judgements of emotional reactions depicted in narrative, rather than changes in behavioral responses to ‘real world’ (that is, not narrative-based) events. This might arguably render the results less compelling than a behavioral measure such as allocating hot sauce to a peer (Yeager et al., 2013). At the same time, this form of assessment can be said to more directly reflect actual impact on SEC, such as self and other awareness, which I was interested in capturing, rather than on the behavioral outcomes that are expected to result from changes in SEC.
Another limitation related to the outcome measure used is that blame scores were the only outcome considered as a consequence of the intervention. It is possible that the intervention produced other effects that were not captured in the post-test. For instance, participants might have become better at inferring causes of their own and others’ emotional reactions.

A limitation related to the self-blame outcome measure is that the model learning section of the intervention was also self-focused, thus reducing the transfer distance, so to speak, from learning to post-test. Nevertheless, other factors, such as the different nature of the task and task framing should be sufficient to justify categorizing self-blame rating as an instance of transfer.

Another limitation pertaining to self- vs other-blame scenarios is that the average blame scores for the two sets of scenarios were significantly different in the control condition (self-blame scenarios had lower blame scores), which represents a confound with regard to comparing effect sizes for the two dependent variables (self-blame vs other-blame), since lower baseline blame scores might offer less opportunity for blame reduction.

There is also a potential limitation connected to the fact that the ML group had more practice exercises than the M+PFL group. While this was done to account for the fact that the M+PFL group was asked to engage the PFL activity, and to equalize time spent on the study, it arguably created an imbalance between the conditions in that one group had additional practice that was not equivalent in nature to the additional work done by the other group (i.e. the PFL activity vs additional regular practice exercises). A better approach may have been to have the ML group undertake additional exercises based on the PFL activity content (but with a different task objective).

Finally, only short-term effects of the intervention were measured, and thus the findings cannot tell us anything about the long-term effects of teaching the emotion model on
awareness, empathy or other aspects of SEC, nor about the use of PFL activities as part of such instruction. Similarly, the intervention itself was quite short (under an hour), whereas many SEL interventions last weeks if not months. Therefore, the results can’t speak to the effects of a longer intervention based on teaching a model of the HES.
In my dissertation, I have proposed a novel approach to facilitating transfer in the context of SEL: the direct teaching of the emotion system model, developed on the basis of well-established research findings pertaining to the neurological and physiological functioning of the system. This approach is based on an emphasis on deep learning, where the principles and processes of the emotion system represent deep structures of SEL content, understanding which can help learners develop an accurate mental model of emotional functioning, and enable them to transfer their social emotional knowledge across contexts and situations.

The pilot and follow-up studies described above provide some initial empirical backing for the viability of the proposed instructional methodology. The pilot study results demonstrate that teaching a core model of emotion generation results in the transfer of conceptual emotion knowledge to new problems, and leads to a more tolerant view of others’ emotional reactions. The dissertation study reproduces these results (using a different population), and also provides evidence that the method can lead to a greater acceptance of one’s own emotions. Unlike past interventions that made use of some aspect(s) or versions of a model of the emotion system as part of a multifaceted approach to enhancing SEC (e.g. Berking & Schwartz, 2014; Broderick & Metz, 2014; Kemeny et al., 2011), the present studies focused exclusively on the effects of teaching a core model of the HES, and expressly evaluated the transfer of the taught emotion knowledge. At the same time, the instructional methodology employed in the studies, designed to facilitate mental model formation and featuring emotion system model diagrams, as well as narrative-grounded, varied, and constructive practice, was shown to be successful at enabling learners to acquire the presented content (particularly in the ML condition) and can serve as a prototype for future HES model instruction efforts.
Furthermore, the results were achieved in both an in-person, lab-based experiment (pilot study) as well as in a purely online study (dissertation study). In the first case, the participants were drawn from among graduate students at Columbia Teachers College, who were judged to be a fairly representative sample of the broader US educator population (e.g. teachers, school psychologists, administrators, and policymakers), which suggests that the methodology could be generalized to other educators in the United States. Educator SEC has been shown to be related to student academic and emotional outcomes (Jennings & Greenberg, 2009; Durlak et al., 2015), yet there is a shortage of research on effective methods to develop educators’ social and emotional competencies (Osher et al., 2016). The present research adds to our knowledge in this regard.

In the dissertation study, participants were 18-25 year-old US high school graduates, which offers evidence of the viability of the present SEL methodology with US adolescents and young adults, a population that has often proved resistant to SEL (Yeager, 2017a). Furthermore, the study was carried out as an online intervention, providing additional evidence for the feasibility of technology-based SEL programming, which is a topic of ongoing research and debate (Osher et al., 2016).

The results also shed some new light on the potential for using preparation for future learning activities in the SEL context. Specifically, they suggest that the nature of SEL calls for careful consideration of PFL activity design, such that, for example, the PFL activity does not interfere with learning by activating existing theories of emotion (though it’s important to note that there may be situations in which such activation is desirable, e.g. when seeking to address misconceptions), and that the activity precisely target the concepts being taught. Moreover, they provide preliminary evidence that gender may play a role in the success of HES-based SEL instruction, suggesting that some males may be more resistant to assimilating ‘expert’ models of emotion under some conditions. Further research will be
needed to ascertain the validity of these findings. The results also intimate that teaching the HES model -- on its own and in the short term -- may be more effective at influencing the perception of others’ emotions than of one’s own emotions. It is likely that influencing people’s perceptions of their own emotions more profoundly may require additional time and other forms of practice applying the model to personal emotional experiences, such as journaling. Overall, though exploratory, these findings provide valuable hints to curriculum designers and point to a number of avenues for future research.

Several aspects of the outlined SEL methodology have implications for the field of SEL and SEL research. To begin with, the results point to the shortcomings of interventions that present emotions as a monolithic construct that one is fully capable of changing and controlling. Instead, the present research highlights the value of teaching a more nuanced and comprehensive model of emotion, which acknowledges that there are parts of the emotion system that are largely outside our conscious control, such as appraisal. Such knowledge can have a beneficial effect on social competence, including greater tolerance for others’ emotions and greater acceptance of one’s own, as the results of the present studies illustrate.

A similar implication can be drawn from the finding that higher trait empathy scores were correlated with higher (rather than lower) blame scores, which reproduces past research showing that greater empathy for a victim can lead to excessively harsh retribution aimed at the perceived perpetrator (Bloom, 2016). The results of the present studies suggest that a more elaborate and nuanced understanding of emotion could serve to moderate overly aggressive responses toward e.g. bullies while simultaneously enabling healthier coping on the part of the victims, as was previously demonstrated by Yeager et al. (2013). Put another way, empathy alone is not enough: it works best when informed by an understanding of our emotional functioning.
On the basis of this early evidence, I am hopeful that the proposed instructional approach may offer a blueprint for developing SEL content and interventions that are potentially more effective in that they would be expected to lead to more robust learning and greater capacity and motivation for applying social emotional skills to new contexts and situations, particularly among adolescent learners. These benefits would be expected to arise as the result of a focus on deep learning, whereby students would acquire the deep structures that underpin SEL content in the form of a mental model of the emotion system. The acquisition of the model would allow learners to understand the interconnections between the elements of the emotion system, such as events, desires and goals, beliefs, appraisals, emotions and expressions of emotion, and behavior. Such understanding should bolster learners’ ability to apply socio-emotional knowledge across situations as well as their motivation to do so (Chi & VanLehn, 2012). More generally, the theoretical arguments and empirical evidence presented here provide additional grounds for including the goal of designing for transfer in the SEL program development guidelines produced by organizations like CASEL.

Importantly, HES model learning would be compatible with existing SEL programs, and is not proposed as a replacement for such programs. Rather, because the emotion system represents the universal basis of emotional functioning, the HES model is envisioned as providing common foundational knowledge that would support the efficacy of any SEL curriculum. For example, having a better understanding of the appraisal process may support learners in acquiring self-regulation techniques like reappraisal (Gross, 2015; Wranik et al., 2014). Kemeny et al. (2011) had made a similar argument when incorporating information about aspects of the emotion system together with mindfulness practice. Thus, an instructional HES model such as the one proposed here could provide a set of well-defined, foundational concepts and principles derived from established research that would bolster the
effectiveness of virtually any program aiming to enhance SEC. Furthermore, it can equip learners with a common lexicon, beyond mere emotion vocabulary, for articulating and labeling key aspects of the emotional experience, both when considering private feelings and when dealing with interpersonal relations. Labeling aspects of one’s experience is an important part of self-reflection (Bosoevski & Zelazo, 2008) and regulation (Marcovitch, Jacques, Boseovski, & Zelazo, 2008), but perhaps just as importantly, a shared language of emotion can help improve communication around emotional experiences and associated conflict situations.

At the same time, an empirically-validated HES model would potentially be useful in helping program creators, educators and policy-makers standardize baseline SEL program content and evaluation. The development of content standards for SEL, beyond high level program requirements (such as being developmentally and culturally appropriate), may facilitate broader adoption of SEL curricula in schools as well as the inclusion of SEL coursework in standard teacher training. By the same token, a deep understanding of the principles that underpin SEL could help teachers in modeling these skills, improving the classroom environment, and implementing SEL programs, which would be expected to lead to better student outcomes (Jennings & Greenberg, 2009; Osher et al., 2016; Yeager, 2017a).

**Future Directions**

Building on the present research, several follow-up studies could help answer lingering questions with regard to PFL activity effects on SEL, and self vs other awareness changes. This would involve designing a more precisely targeted and less overtly emotion-related PFL activity, altering the practice exercises in a way that would allow for tests of practice effects, and employing self-blame and other-blame scenarios that have equal baseline (i.e. control group) blameworthiness ratings. Additionally, follow-up studies might consider outcome
measures beyond blame scores, such as evaluating changes in participants’ skills at inferring causes of people’s emotional reactions.

Looking further, it is notable that with a few exception (e.g. Jamieson et al., 2010; Yeager et al., 2013, 2015; Lyashevsky, Cesarano & Black, 2017), it is still largely unknown which aspects of the human emotion system are, when learned, particularly impactful with regard to building social emotional competencies. Thus, a future research goal would be to identify these system principles and components through additional experimental studies, such as the ones described here. For instance, one might look at the usefulness of distinguishing between top-down and bottom-up appraisal processes, or at identifying the ways by which individuals acquire their beliefs, values, and goals, which factor into appraisals. This would help researchers who wish to develop future HES models, as well as interactive HES model simulations for educational purposes.

Once a comprehensive instructional HES model is developed and validated, full scale, longer-term interventions should be evaluated to gather evidence in support of the hypothesis that SEL programs that feature an HES model will lead to stronger results—in terms of social emotional skill acquisition and their transfer as well as more distal outcomes such as academic and behavioral improvements—than those that don’t. Success in these efforts would bolster the argument for updating the SEL program development guidelines to emphasize generalizability and transfer, and provide a springboard for further research efforts. To begin with, it would be valuable to investigate the effectiveness of this approach to SEL with different populations, for instance, groups that regularly face high stress situations and may benefit from greater SEC, such as doctors and police officers. It would also be useful to examine how well such interventions may work with the general adult population, college students, and K-12 students. For all these groups, and for younger students in particular, the
HES model and the accompanying instructional materials and exercises would need to be adapted to suit the group’s developmental and contextual characteristics.

Another exciting future challenge would be the development of an interactive HES simulation, as interactive simulations have been shown to be useful in the formation of accurate mental models of systems (Schwartz, Pilner, Biswas, Leelawong, & Davis, 2007; Kuhn, Black, Kesselman, & Kaplan, 2000; Chan & Black, 2006). Similarly, the HES model could provide a foundation for developing and assessing software-based SEC training programs, which may offer easily accessible and cost-effective ways of improving social emotional skills.

Furthermore, the assessment of procedural HES model mastery may in itself prove to be a useful measure of SEC. One of the challenges of SEL research and program implementation and evaluation is the shortage of highly reliable and easily implemented measures of social emotional skills (Durlak et al., 2011; Osher et al., 2016; Weissberg et al., 2015; Zins et al., 2004). Without adequate measurement tools, social emotional skills can seem nebulous and thus difficult to teach or evaluate in a consistent manner (Salovey, Mayer, Caruso, & Lopes, 2003). Meanwhile, the HES model provides a clear, research-based set of knowledge as well as of associated abilities (i.e. the fluent use of the knowledge beyond the level of declarative recall) that would be measurable with a relatively high level of objectivity. For instance, inference-focused practice exercises based on the HES model would be fairly easy to score and could be used for evaluation purposes. As a person has more practice and grows more comfortable with reasoning on the basis of the model, they would be expected to produce more correct responses more quickly, a metric which could be tracked over time, providing a potentially powerful formative assessment method, if the scores have a meaningful correlation with SEC. The development and validation of such a measure, and its
Comparison to existing alternatives for evaluating SEC, represents a potentially fruitful future research direction.

Finally, an exciting future line of research could include the use of ‘objective’ neurological and autonomic biotechnology such as fMRI and EEG to examine the neural and physiological (Heart rate variability, HR, GSR) changes that may occur as a result of HES model-based training and the associated changes in awareness and regulation ability.

Conclusion

The last two decades have seen an explosion in SEL research, yet numerous questions remain with regard to the optimal way to develop and deliver SEL programming, particularly among adolescents and young adults. These questions include how best to ensure social emotional knowledge transfer, which specific SEL content and activities produce which outcomes, and to what extent can technology be leveraged for SEL instruction. This dissertation expands our knowledge in relation to these questions. First, it articulates a novel approach to facilitating the transfer of social emotional skills: the direct teaching of a model of the human emotion system, which I have argued represents the deep structures of social emotional knowledge. It also offers evidence that teaching a core, appraisal-based model of the emotion system can 1) lead to emotional knowledge transfer 2) produce short-term improvements in self and other awareness, and 3) that this can be achieved via an online platform with young adults and 4) by means of in-person instruction with professional educators. The findings have implications for social emotional learning theory and practice. They bolster the argument that teaching the emotion system can become a useful addition to the repertoire of SEL instruction methodologies. More specifically, they suggest that there is value to teaching a more nuanced model of emotions than one that simply highlights emotions’ ability to be changed and controlled, and suggest that a focus on teaching the underlying principles of the emotion
system may indeed represent a way to develop deep social emotional knowledge, making it more likely to be utilized in novel situations and ultimately to produce greater positive psychological and behavioral effects.
References


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APPENDIX A

Main Study Materials

Online Consent

PLEASE NOTE: IF YOU HAVE PREVIOUSLY DONE AN HIT WITH THE SAME NAME, WE ASK YOU NOT TO PARTICIPATE IN THIS SURVEY. THANK YOU.

By clicking Next you agree to participate in the studies based on the Informed Consent information provided below.

INFORMED CONSENT

Introduction

You will be invited to participate in three short online emotion-related studies. You qualify to take part in these studies because you are between 18 and 25 years of age. Approximately 100 people will take part in these studies. The studies will take approximately 30 minutes to complete.

Why Are These Studies Being Done?

The studies are being done to help us better understand the nature of human emotions.

What Will I Be Asked to Do?

Study 1: You will be invited to answer a questionnaire pertaining to your perception of yourself in relation to other people.
Study 2: You will be provided emotion-related material and asked to respond to questions pertaining to this material.
Study 3: You will be asked to make judgments about fictional scenarios.
Finally, you will be asked to fill out a basic information questionnaire.

What Possible Risks or Discomforts Should I Expect?

Participating in the study involves minimal risk, such as encountering hypothetical scenarios that involve characters exhibiting emotional reactions.

What Possible Benefits Should I Expect?

Participating in this study is not likely to provide any substantive benefits to you, aside from monetary compensation.

Will I Be Paid For Participating?

Yes. As per the terms provided via Amazon Mechanical Turk, your will be compensated for your participation.
When Are the Studies Over? Can I Stop Early?

The studies are over when you have completed all the online activities. However, you can stop at any time even if you haven’t finished. Note, however, that due to the nature of the Amazon Turk platform, you can only be paid if you submit your work.

Protection of Your Confidentiality

Your participation is anonymous. No personally identifiable data will be shared with anyone outside the study team. All data will be password protected and only accessible by the research team.

How Will the Results Be Used?

The results of these studies may be published in journals and presented at academic conferences. Your name or any identifying information about you will not be published. These studies are being conducted as part of the dissertation of the principal investigator.

Who Can Answer My Questions About The Studies?

If you have any questions or concerns you can communicate with the Principal Investigator, Ilya Lyashevsky, at ial2112@tc.columbia.edu.

If you have questions or concerns about your rights as a research subject, you should contact the Institutional Review Board (IRB) (the human research ethics committee) at 212-678-4105 or email IRB@tc.edu. Or you can write to the IRB at Teachers College, Columbia University, 525 W. 120th Street, New York, NY 1002. The IRB is the committee that oversees human research protection for Teachers College, Columbia University.

The IRB-approved Protocol Number for these studies is 17-195.

PARTICIPANT’S RIGHTS

* I have read the above information regarding the studies.

* I understand that my participation is voluntary. I may refuse to participate or withdraw participation at any time without penalty.

* Any information derived from the research studies that personally identifies me will not be voluntarily released or disclosed without my separate consent, except as specifically required by law.

By clicking Next you agree to take part in the studies.
Pre-Test 1: Perspective-taking and Empathic Concern Scales of the Interpersonal Reactivity Index (Davis & Oathout, 1987)

Study I.

In this study, we are interested in learning about people's perceptions of themselves in relation to other people.

Please answer the questions below. There are no right or wrong answers. We are simply interested in your perceptions.

- Before criticizing somebody, I try to imagine how I would feel if I were in their place. (0=does not describe me well, 4=describes me very well)
  0 1 2 3 4

- If I'm sure I'm right about something, I don't waste much time listening to other people's arguments. (0=does not describe me well, 4=describes me very well)
  0 1 2 3 4

- I sometimes try to understand my friends better by imagining how things look from their perspective. (0=does not describe me well, 4=describes me very well)
  0 1 2 3 4

- I believe that there are two sides to every question and try to look at them both. (0=does not describe me well, 4=describes me very well)
  0 1 2 3 4

- I sometimes find it difficult to see things from the "other guy's" (or girl's) point of view. (0=does not describe me well, 4=describes me very well)
  0 1 2 3 4

- I try to look at everybody's side of a disagreement before I make a decision. (0=does not describe me well, 4=describes me very well)
  0 1 2 3 4

- When I'm upset at someone, I usually try to "put myself in his or her shoes" for a while. (0=does not describe me well, 4=describes me very well)
  0 1 2 3 4

- When I see someone being taken advantage of, I feel kind of protective toward them. (0=does not describe me well, 4=describes me very well)
  0 1 2 3 4

- When I see someone being treated unfairly, I sometimes don't feel very much pity for them. (0=does not describe me well, 4=describes me very well)
  0 1 2 3 4

- I often have tender, concerned feelings for people less fortunate than me.
I would describe myself as a pretty soft-hearted person.

Sometimes I don't feel sorry for other people when they are having problems.

Other people's misfortunes do not usually disturb me a great deal.

I am often quite touched by things that I see happen.

Nice going! You've completed the first study.
PFL Activity 1

Study 2.

This study is designed to investigate the effectiveness of specific instruction methodologies for conveying psychological material. Two groups will be compared to see how different instructional methodologies compare when learning about emotions.

For this study, you will be asked to do the following activities: an emotion exercise, a learning activity followed by practice exercises, and a short quiz.

Activity I: Emotion Explanation Exercise

Below, three characters are shown having emotional reactions to various events. Using the scenes below as a starting point, your task is to come up with a general explanation for how different emotions arise.

Your explanation should be generally predictive, that is, you should be able to use it to predict what type of emotion will arise given a specific situation. The type of emotion does not need to be totally exact, like frustration or contempt. A broad emotional category would be sufficient. Your explanation should work for all the scenarios below, and any other hypothetical situation.

This can be a challenging task, so do not worry if you don't come up with a perfect explanation. Just do your best!
Mrs. Sellers hopes her friends don't forget about her on Christmas.

Christmas Eve...

Mrs. Sellers is a staunch (loyal) Democrat.

Election Results: “Republicans Win the White House!”
Jenny is allergic to dogs.

Being good at math is important to Jenny.

Math Test

A+
Write your explanation here (make sure to read the instructions above). Take about 10 minutes to think about and complete your answer.

Great! You've completed the first part of the current study. Now onto the next activity.
Presentation 1

SCREEN 1:

Activity II: Emotion Info

On the following screen(s) you will be presented with information about emotion based on research findings in psychology, sociology, and neuroscience.

SCREEN 2:

The following diagram provides a simple model of experiencing emotion.

SCREEN 3:

Event occurs and is perceived. The event may be external, like someone speaking, or internal, for example a thought or memory.

Ex: You open a piece of mail. You learn that the landlord is increasing your rent beyond what you can pay.

The event produces an emotional reaction. The resulting emotion may be positive, like joy, or negative, like fear or anger.

Ex: You are very upset and angry at the landlord.
In fact, research indicates that the process is more complicated. There is a crucial step that occurs between event perception and emotion generation. The following diagram provides a more complete picture.

**SCREEN 5:**

Event occurs and is perceived.

The event may be external, like someone speaking, or internal, for example a thought or memory.

Event is automatically (i.e. very quickly and without conscious awareness) evaluated in the mind with respect to one’s goals and desires.

If the event is judged to be a threat to one’s goals or desires, the appraisal is negative. If it supports one’s goals, the appraisal is positive. The event’s significance is also evaluated, as well as one’s possible response.

Put another way, the appraisal quickly determines: is this good or bad for me, and what should I do about it.

Multiple brain regions, including parts of the Prefrontal Cortex, are involved in this process.

Ex: You open a piece of mail.

Ex: You learn that the landlord is increasing your rent beyond what you can pay. You like your apartment and want to keep living there. Your automatic appraisal of the event is highly negative.

The appraisal produces an emotional reaction.

A positive appraisal will give rise to a positive emotion, like joy; a negative appraisal to a negative emotion, like anger or fear. The specific emotion will depend on the particular characteristics of the appraisal.

The appraisal also determines the intensity of the emotion: higher event significance leads to greater intensity.

Ex: You are very upset and angry at the landlord.
To recap: when an event occurs, multiple brain regions work very quickly and without your conscious control to evaluate the nature of the event (good or bad for me, what should I do about it). The evaluation, or appraisal, then gives rise to a corresponding emotion. Thus, full-fledged emotions are products of appraisal. Yet we have no conscious control of much of the appraisal process. Consequently, our initial emotional reactions are also largely outside our control.

Great! You've reached the end of this activity. Next, you'll be asked to do some practice exercises based on the information you just received. Afterward, there will be a short quiz.
Activity III: Practice Exercises

In the following 5 questions, you will be asked to select or suggest an event that would be most likely to produce a positive or negative appraisal, given an initial situation.

1.i. You come home after work/school, wanting to relax and expecting to be alone. Given the above, select an event that is most likely to produce a *negative* appraisal.
   - a) You find that the apartment is empty and quiet.
   - b) You find that your roommate has brought back a group of loud friends.
   - c) You find that you got no mail.
   - d) You find that your neighbor got a package delivered.
   - e) All of the above.

Suggested response: b)

1.ii. In a word or two, describe the emotional reaction you might have to the event above.

2.i. You have put a lot of effort into an essay. Given the above, select an event that is most likely to produce a *positive* appraisal.
   - a) You computer crashes and the essay is lost.
   - b) You get the essay back a week after you turn it in.
   - c) You learn that your instructor won't count the essay toward the final grade.
   - d) Your professor praises you for the essay's quality.
   - e) None of the above.

Suggested response: d)

2.ii. In a word or two, describe the emotional reaction you might have to the event above.

3.i. You are at a cafe and looking forward to having a particular pastry. Given the above, select an event that is most likely to produce a *negative* appraisal.
   - a) You see that you have plenty of cash in your wallet.
   - b) You note that the cafe is full of people.
   - c) The customer in line in front of you asks for the last of the pastries.
   - d) The pastries look particularly fresh.
   - e) a and b only

Suggested response: c)

3.ii. In a word or two, describe the emotional reaction you might have to the event above.

4.i. You are taking an important final exam. Given the above, suggest an event that is likely to produce a *positive* appraisal.

4.ii. In a word or two, describe the emotional reaction you might have to the event above.
5.i. You go to move your brand new car. Given the above, suggest an event that is likely to produce a *negative* appraisal.

5.ii. In a word or two, describe the emotional reaction you might have to the event above.
In the 5 questions below you will be asked to select or suggest a situation, in which the given event is most likely to produce a positive or negative appraisal.

1.i. Your boss tells you that your company will implement a particular idea. Which situation, if true, would be most likely to cause you to have a *positive* appraisal of the above event.

❍ a) The idea is one you had openly opposed in the past.
❍ b) The idea is one that you had proposed to your boss as something the company should do.
❍ c) Your boss is dressed casually when he gives you the news.
❍ d) The idea was originally proposed by a coworker whom you dislike.
❍ e) None of the above.

Suggested response: b)

1.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.

2.i. You are talking with friends in the school parking lot, when you hear the second bell, announcing that class has just started. Which situation, if true, would be most likely to cause you to have a *negative* appraisal of the above event.

❍ a) This is your lunch period, and you don't have to be in class.
❍ b) You are an alum, visiting the school for the day.
❍ c) You and your buddies are planning to skip class and go to the mall.
❍ d) You care about doing well in school and are supposed to be in class.
❍ e) All of the above.

Suggested response: d)

2.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.

3.i. Your mother, who is very good with money, calls and begins to ask you questions about your finances. Which situation, if true, would be most likely to cause you to have a *negative* appraisal of the above event.

❑ a) You have been worrying about your credit card debt.
❑ b) You have a high paying job.
❑ c) You have high confidence in your money management abilities.
❑ d) Your apartment is very clean.
❑ e) All of the above.

Suggested response: a)

3.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.

4.i. You happen on an affordable apartment listing in your neighborhood. Suggest a *preceding* situation which, if true, would be likely to cause you to have a *positive* appraisal of the above event.
4.ii. In a word or two, describe the emotional reaction to the event above, given the situation you have suggested.

5.i For this question, use the same event as in question 9. Suggest a *preceding* situation which, if true, would be likely to cause you to have a *negative* appraisal of the event.

5.ii. In a word or two, describe the emotional reaction to the event above, given the situation you have suggested.

Review

Take a moment to reflect on how you were able to answer the questions above.

Notice that you did not have to do calculations, as with a math problem. Nor was your answer merely a guess, as when trying to make a prediction about something like a sports match. Given a scenario, you were able to know with a high degree of certainty how you would feel, and this just "happened." That is appraisal at work. Given an event or situation, even a hypothetical one, the appraisal is performed by the mind automatically. One cannot prevent this from happening, and the appraisal will generate an emotional response, even if only a mild one (as when considering a fictional situation).

Great! You've completed the section. In the next section you will be asked to take a short quiz.
Activity III: Practice Exercises

In the following 8 questions, you will be asked to select or suggest an event that would be most likely to produce a positive or negative appraisal, given an initial situation.

1.i. You come home after work/school, wanting to relax and expecting to be alone. Given the above, select an event that is most likely to produce a *negative* appraisal.
   - a) You find that the apartment is empty and quiet.
   - b) You find that your roommate has brought back a group of loud friends.
   - c) You find that you got no mail.
   - d) You find that your neighbor got a package delivered.
   - e) All of the above.

Suggested response: b)

1.ii. In a word or two, describe the emotional reaction you might have to the event above.

2.i. You have put a lot of effort into an essay. Given the above, select an event that is most likely to produce a *positive* appraisal.
   - a) You computer crashes and the essay is lost.
   - b) You get the essay back a week after you turn it in.
   - c) You learn that your instructor won't count the essay toward the final grade.
   - d) Your professor praises you for the essay's quality.
   - e) None of the above.

Suggested response: d)

2.ii. In a word or two, describe the emotional reaction you might have to the event above.

3.i. You are at a cafe and looking forward to having a particular pastry. Given the above, select an event that is most likely to produce a *negative* appraisal.
   - a) You see that you have plenty of cash in your wallet.
   - b) You note that the cafe is full of people.
   - c) The customer in line in front of you asks for the last of the pastries.
   - d) The pastries look particularly fresh.
   - e) a and b only

Suggested response: c)

3.ii. In a word or two, describe the emotional reaction you might have to the event above.
4.i. You are single, and while at a party you spot an attractive person with whom you might want to talk. Given the above, select an event that is most likely to produce a *positive* appraisal.

- a) You notice that the person is wearing a wedding ring.
- b) Someone else comes up to the person and starts flirting with them.
- c) The person looks your way but does not seem to show any interest.
- d) The person is of average height.
- e) The person catches your eye and gives you a friendly smile.

Suggested response: e)

4.ii. In a word or two, describe the emotional reaction you might have to the event above.

5.i. You call one of your parents on the phone. Given the above, select an event that is most likely to produce a *negative* appraisal.

- a) Your parent tells you they are having trouble paying the mortgage.
- b) Your parent is interested in the stories you share with them.
- c) Your parent tells you they are proud of you.
- d) The phone connection is of high quality.
- e) Your parent tells you they have been in good health.

Suggested response: a)

5.ii. In a word or two, describe the emotional reaction you might have to the event above.

6.i. You are taking an important final exam. Given the above, suggest an event that is likely to produce a *positive* appraisal.

6.ii. In a word or two, describe the emotional reaction you might have to the event above.

7.i. You go to move your brand new car. Given the above, suggest an event that is likely to produce a *negative* appraisal.

7.ii. In a word or two, describe the emotional reaction you might have to the event above.

8.i. You are having a conversation with someone you just met. Given the above, suggest an event that is likely to produce a *negative* appraisal.

8.ii. In a word or two, describe the emotional reaction you might have to the event above.

In the 8 questions below you will be asked to select or suggest a situation, in which the given event is most likely to produce a positive or negative appraisal.
1.i. Your boss tells you that your company will implement a particular idea. Which situation, if true, would be most likely to cause you to have a *positive* appraisal of the above event.

- a) The idea is one you had openly opposed in the past.
- b) The idea is one that you had proposed to your boss as something the company should do.
- c) Your boss is dressed casually when he gives you the news.
- d) The idea was originally proposed by a coworker whom you dislike.
- e) None of the above.

Suggested response: b)

1.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.

2.i. You are talking with friends in the school parking lot, when you hear the second bell, announcing that class has just started. Which situation, if true, would be most likely to cause you to have a *negative* appraisal of the above event.

- a) This is your lunch period, and you don't have to be in class.
- b) You are an alum, visiting the school for the day.
- c) You and your buddies are planning to skip class and go to the mall.
- d) You care about doing well in school and are supposed to be in class.
- e) All of the above.

Suggested response: d)

2.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.

3.i. Your mother, who is very good with money, calls and begins to ask you questions about your finances. Which situation, if true, would be most likely to cause you to have a *negative* appraisal of the above event.

- a) You have been worrying about your credit card debt.
- b) You have a high paying job.
- c) You have high confidence in your money management abilities.
- d) Your apartment is very clean.
- e) All of the above.

Suggested response: a)

3.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.

4.i. You get on a scale and see that you have gained weight. Which situation, if true, would be most likely to cause you to have a *positive* appraisal of the above event.

- a) You have recently been eating a lot of junk food.
- b) You have been exercising and eating healthy in order to slim down.
- c) You have been exercising and eating a diet heavy in protein in order to bulk up.
- d) You have been having problems at work.
- e) None of the above.

4.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.
Suggested response: c)

4.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.

5.i. You see that you have received an email from an ex-girlfriend or boyfriend. Which situation, if true, would be most likely to cause you to have a *positive* appraisal of the above event.
   - a) Your relationship ended with a lot of bitterness on both sides.
   - b) Every time you and the ex reconnected in the past, it resulted in unpleasant drama.
   - c) The ex is someone whom it is always fun to be around.
   - d) All of the above.
   - e) a & b only

Suggested response: e)

5.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.

6.i You run into a neighbor in the hallway. Suggest a *preceding* situation which, if true, would be likely to cause you to have a *negative* appraisal of the event.

6.ii. In a word or two, describe the emotional reaction to the event above, given the situation you have suggested.

7.i. You happen on an affordable apartment listing in your neighborhood. Suggest a *preceding* situation which, if true, would be likely to cause you to have a *positive* appraisal of the above event.

7.ii. In a word or two, describe the emotional reaction to the event above, given the situation you have suggested.

8.i For this question, use the same event as in question 7. Suggest a *preceding* situation which, if true, would be likely to cause you to have a *negative* appraisal of the event.
8.ii. In a word or two, describe the emotional reaction to the event above, given the situation you have suggested.

Review

Take a moment to reflect on how you were able to answer the questions above when faced with a particular scenario.

Notice that you did not have to do calculations, as with a math problem. Nor was your answer merely a guess, as when trying to make a prediction about something like a sports match. Given a scenario, you were able to know with a high degree of certainty how you would feel, and this just "happened." That is appraisal at work. Given an event or situation, even a hypothetical one, the appraisal is performed by the mind automatically. One cannot prevent this from happening, and the appraisal will generate an emotional response, even if only a mild one (as when considering a fictional situation).

Great! You've completed the section. In the next section you will be asked to take a short quiz.
Quiz 1

Quiz

1. If a person is exhibiting signs of anger, e.g. in their voice or facial expression, which of the following is likely:
   ○ a) something occurred that the person has interpreted as threatening to their desires
   ○ b) the person is mean
   ○ c) the person is probably blowing things out of proportion
   ○ d) the situation they are in is their fault

Response Feedback:
[If a] -> Correct! The suggested response was a) something occurred that the person has interpreted as threatening to their desires.
[If not a] -> Sorry, the suggested response was a) something occurred that the person has interpreted as threatening to their desires.

2. If a person perceives an event, for example someone speaking to them
   ○ a) they’ll remember the event ONLY if it’s important
   ○ b) their mind will automatically evaluate the event to determine if it is harmful or beneficial to them
   ○ c) they may be expected to have an emotional response to the event, even if only a mild one
   ○ d) b and c only
   ○ e) a, b and c

Response Feedback:
[If d] -> Correct! The suggested response was d) b and c only.
[If b or c] -> That's partially correct. The suggested answer was d) b and c only. That is, b) their mind will automatically evaluate the event to determine if it is harmful or beneficial to them, and c) they may be expected to have an emotional response to the event, even if only a mild one.
[If a or e] -> Sorry, the suggested answer is d) b and c only. That is, b) their mind will automatically evaluate the event to determine if it is harmful or beneficial to them, and c) they may be expected to have an emotional response to the event, even if only a mild one.

People often think that a) they’ll remember the event ONLY if it’s important, is also a valid answer. But note the ONLY in the text of option a). While important details are more likely to be remembered, it is certainly also possible to remember details of an event that might not be considered particularly important, which is why this option was not included as part of the suggested answer.

3. Based on the emotion model you have been provided with, if two similar individuals have different goals or desires within the same domain (for example, supporting different political candidates), they may be expected to
   ○ a) dislike each other
   ○ b) behave the same way regardless of the difference
   ○ c) have different emotional reactions to the same event
   ○ d) pursue those goals or desires with different intensities

Response Feedback:
[If c] -> Correct! The suggested answer is c) have different emotional reactions to the same event.
4. A person can learn to control their initial appraisals
   - a) True
   - b) False

Response Feedback:
If b] -> Correct! The suggested answer is b) False. Initial appraisals generally aren't believed to be consciously controllable.
If a] -> Sorry, the suggested answer is b) False. Initial appraisals generally aren't believed to be consciously controllable.

5. Before an emotion is experienced
   - a) a person has to become sensitive
   - b) a person must learn what emotions are
   - c) an event must be evaluated in the mind to determine if it’s good or bad for the person
   - d) a person should begin leading a dramatic life
   - e) a person must consciously decide what emotion they want to feel

Response Feedback:
If c] -> Correct! The suggested answer is c) an event must be evaluated in the mind to determine if it’s good or bad for the person.
If not c] -> Sorry, the suggested answer is c) an event must be evaluated in the mind to determine if it’s good or bad for the person.

6. An emotion can arise from both an external event, like someone saying something, and an internal one, for example a memory or a thought.
   - a) True
   - b) False

Response Feedback:
If a] -> Correct! The suggested answer is a) True.
If b] -> Sorry, the suggested answer is a) True. An emotion can indeed arise from both an external event, like someone saying something, and an internal one, for example a memory or a thought.

7. The more intense an emotion is the more you can expect
   - a) that a person is going to suppress it
   - b) that it will be a positive emotion
   - c) that the event that triggered it was interpreted as being highly important to the person
   - d) none of the above

Response Feedback:
If c] -> Correct! The suggested answer is c) that the event that triggered it was interpreted as being highly important to the person.
If not c] -> Sorry, the suggested answer is c) that the event that triggered it was interpreted as being highly important to the person. If an event is interpreted as being very significant (by the appraisal process), then it is likely to trigger an more intense emotional response.
8. Each event a person perceives, whether it’s as minor as someone’s passing comment or as significant as their country going to war, is automatically evaluated in the mind as being either positive or negative with regard to the person’s goals, needs and desires.

- a) True
- b) False

Response Feedback:
[If a] -> Correct! The suggested answer is a) True.
[If b] -> Sorry, the suggested answer is a) True. Each event a person perceives is evaluated in the mind to determine if it has significance for the person and if it is good or bad for them in relation to their goals and needs.

9. The initial appraisal process, and resulting emotion impulse, occur without conscious control or awareness.

- a) True
- b) False

Response Feedback:
[If a] -> Correct! The suggested answer is a) True. The initial appraisal of an event is a rapid process that is believed to occur in the mind largely without conscious awareness, resulting in an initial emotional response that is essentially involuntary.
[If b] -> Sorry, the suggested answer is a) True. The initial appraisal of an event is a rapid process that is believed to occur in the mind largely without conscious awareness, resulting in an initial emotional response that is essentially involuntary.

Great! You've finished this section of the study.

There will be another, delayed assessment (quiz) later in the survey, so do your best to remember the information you've been presented.

For now you will go on to the next study. The delayed assessment will take place after you are done with this last study.
Outcome Measure 1

Study III. In this study, you will be helping build a scenario database. These scenarios will be used for conducting future experiments.

In the following fictional scenarios, people are depicted reacting to various hypothetical situations. In some cases, you are asked to imagine yourself in the hypothetical situation. For each scenario, please provide a rating of how blameworthy you think the person is for their reaction.

When we say how blameworthy a person is, we mean to what extent does the person deserve blame for their reaction.

There are no right or wrong answers. We are just interested in your perceptions.

[Other-blame scenarios -- this text was not present in the version see by study participants]

- At a company meeting, a young office worker presents a report to their team. One of their colleagues points out an error in the report calculations. The presenter starts to get angry at the colleague for highlighting the mistake.

How blameworthy is the presenter for their reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)

- An instructor is teaching a large class during fall semester. One day, a student sitting in the back row asks a great deal of questions in class, raising his hand every few minutes. After a while, the instructor starts to feel impatient with the student.

How blameworthy is the instructor for their reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)

- Late in the semester, a student gets a bad grade on an assignment she hadn’t put a lot of time into. Walking home after school, and remembering the grade, the student feels angry about how hard the instructor has been grading.

How blameworthy is the student for his reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)
On a fall afternoon, a woman overhears some people at a restaurant expressing political views very different from her own. The woman feels a growing disgust.

How blameworthy is the woman for her action?  
(0 = not at all blameworthy, 10 = completely blameworthy)  
0  1  2  3  4  5  6  7  8  9  10

[Self-blame scenarios -- this text was not present in the version see by study participants]

You and a friend are working on two similar important projects. One night, both of you stay late at the office. The friend, with whom you have a somewhat competitive relationship, tells you that he'd had a setback and that he's worried about completing his project on time. To an extent, you are pleased to hear about your friend's troubles and concerns.

How blameworthy are you for your reaction?  
(0 = not at all blameworthy, 10 = completely blameworthy)  
0  1  2  3  4  5  6  7  8  9  10

One evening you hear on the news that a person of about the same age as you, and with the same background, has recently achieved considerable success and fame. You feel a surge of envy on hearing the story.

How blameworthy are you for your reaction?  
(0 = not at all blameworthy, 10 = completely blameworthy)  
0  1  2  3  4  5  6  7  8  9  10

You and your boyfriend/girlfriend are discussing where you want to go on vacation. You suggest one destination, but your partner prefers another. You agree to go to the place they like, but you feel some resentment toward them.

How blameworthy are you for your reaction?  
(0 = not at all blameworthy, 10 = completely blameworthy)  
0  1  2  3  4  5  6  7  8  9  10

One Spring afternoon, a friend asks for your help on an assignment. You have helped the friend before, and know they are counting on you, but you have work to do, and you feel exasperated by their request.

How blameworthy are you for your reaction?  
(0 = not at all blameworthy, 10 = completely blameworthy)  
0  1  2  3  4  5  6  7  8  9  10
A woman sits alone in an office. It is after 10pm. She is concentrating on her work. She gets a phone call, glances to see who it is, but does not pick up.

How blameworthy is the woman for her reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)

0 1 2 3 4 5 6 7 8 9 10

Sitting on a park bench in early spring, a woman is reading the paper. Small birds skip around nearby, looking for crumbs. The woman realizes that she is cold, but does not put on her jacket.

How blameworthy is the woman for her reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)

0 1 2 3 4 5 6 7 8 9 10

A jogger is making his way through a park at an easy pace. It is dusk. Families are gathering at the picnic areas with food and music. The jogger notices that the shoelaces on his left sneaker are untied, but does not stop to tie them.

How blameworthy is the jogger for his reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)

0 1 2 3 4 5 6 7 8 9 10

On a brisk, sunny morning a man gets out of his car and heads toward an office building. He is in a hurry to get to the tenth floor. But though the elevator is working, he takes the stairs instead.

How blameworthy is the man for his action?
(0 = not at all blameworthy, 10 = completely blameworthy)

0 1 2 3 4 5 6 7 8 9 10

On a Sunday afternoon, a woman strolls down the street of his urban neighborhood. She begins to feel hungry, checks her watch, and steps into an inexpensive restaurant for a bite to eat.

How blameworthy is the woman for her action?
(0 = not at all blameworthy, 10 = completely blameworthy)

0 1 2 3 4 5 6 7 8 9 10
Great! You are done with the last section of the study.
Exit Questionnaire 1

Participant Questionnaire

- Have you previously participated in MTurk studies that are very similar to any of the studies you just completed?  
  You will be paid for completing the studies regardless of past participation.
  Yes/No

- Gender
  Male/Female

- Age
  Short Answer

- What is your highest level of education?
  High School
  Some College
  College Graduate
  Some Graduate School
  Graduate Degree (such as Masters)
  Doctoral Degree (PhD, EdD, JD, MD, etc)

- Please briefly describe the research question of interest (in other words, the main purpose) for each of the studies you have participated in today, as you understand them.
  Short Answer

- Please provide any other thoughts or comments you may have.
  Short Answer

- MTurkCode
  Short Answer
Debrief

Now we can explain the true purpose of the preceding studies. In fact, all preceding activities were part of a single study. There is also NO delayed final assessment :). We were interested in seeing whether providing information about emotions may influence the way people rated the emotional reactions in the hypothetical scenarios provided near the study’s end. We theorized that getting information about emotions would cause people to rate the emotional reactions in the scenarios more tolerantly.
APPENDIX B

Pilot Study Materials

Researcher Script 1.

Experimental Group

Today you’ll be participating in two short studies. Altogether they should take about an hour.

Part 1: Model Learning

In this study we’re investigating the effectiveness of specific instruction methodologies for conveying psychological material. We will be comparing two groups to see how different instructional methodologies compare when learning about emotions. [Describe study activities.] A week from today we will send you a link to a short online assessment to evaluate your retention and understanding of the material you see today. Then we’ll compare the results to see which approach was more effective.

Part 2: Post-test

In this study, you will be helping us build a scenario database. Such databases exist for images, and we’re working to develop one for text narratives. The idea is to use the scenarios for conducting future experiments: it’s useful to know ahead of time how people tend to respond to them.

So in this last study you will be presented with a number of scenarios and asked to rate the reactions of the people in those scenarios. There are no right or wrong answers. We are just interested in your perceptions. You don’t need to spend too long thinking about your response, just go with what seems right to you.

For this study you’ll just be using pen and paper.

Control Group

Today you’ll be participating in two short studies. Altogether they should take about an hour.

Part 1: Fiction Reading

This study’s purpose is to investigate how reading emotionally affecting content such as literary fiction is influenced by the reading medium. In this case, whether reading on the computer affects the recall of emotional content. [Describe study activities.] A week from today we will send you a link to a short online assessment to evaluate your retention of the material you see today. Then we’ll compare the results to the other group, which is reading on paper, to see how they compare.

Part 2: Post-test

In this study, you will be helping us build a scenario database. Such databases exist for images, and we’re working to develop one for text narratives. The idea is to use the scenarios for conducting future experiments: it’s useful to know ahead of time how people tend to respond to them.

So in this last study you will be presented with a number of scenarios and asked to rate the reactions of the people in those scenarios. There are no right or wrong answers. We are just interested in your perceptions. You don’t need to spend too long thinking about your response, just go with what seems right to you.
For this study you’ll just be using pen and paper.
PFL Activity 1

Below, three characters are shown having emotional reactions to various events. Using the scenes below as a starting point, your task is to come up with a general explanation for how different emotions arise. This may involve a principle or set of principles. Your explanation should be generally predictive, that is, you should be able to use it to predict what type of emotion will arise given a specific situation. The type of emotion does not need to be totally exact, e.g. frustration or contempt. A broad emotional category would be sufficient. Your explanation should work for all the scenarios below, and any other hypothetical situation.

This can be a challenging task, so do not worry if you don't come up with a perfect explanation. Just do your best!
Mrs. Sellers hopes her friends don't forget about her on Christmas.

Christmas Eve...

Mrs. Sellers is a staunch (loyal) Democrat.

Election Results: “Republicans Win the White House!”

Jack Peterson
Jack is a die-hard Yankees fan.

@#$%^& the Yankees!

Jack wants to get ahead in life.

You're being promoted.
Jenny Smith

Jenny is allergic to dogs.

Being good at math is important to Jenny.

Math Test

A+

Please write your explanation here:
Presentation 1

SCREEN 1:

On the following screen(s) you will be presented with information about emotion based on research findings in psychology, sociology, and neuroscience.

SCREEN 2:

Please review the information on the following screens. You will have 5-10 minutes to do so.

You can let the study administrator know if you feel you are ready before the time is up.

SCREEN 3:

The following diagram provides a simple model of experiencing emotion.

SCREEN 4:
In fact, research indicates that the process is more complicated.

There is a crucial step that occurs between event perception and emotion generation.
The following diagram provides a more complete picture.

SCREEN 6:

Event occurs and is perceived.
The event may be external, like someone speaking, or internal, for example a thought or memory.

Event is automatically (i.e. very quickly and without conscious awareness) evaluated in the mind with respect to one's goals and desires. Multiple brain regions, including parts of the Prefrontal Cortex, are involved in this process.

If the event is judged to be a threat to a goal or desire, the appraisal is negative. If it supports a goal or desire, the appraisal is positive. The event's significance is also evaluated.

Put another way, the appraisal quickly determines: is this good or bad for me, and what should I do about it.

Ex1: You get back an exam.
Ex2: You open a piece of mail.

Ex1: You see that you received a high grade, and doing well in school is important to you. Your automatic appraisal of the event is positive.
Ex2: You see that the landlord is increasing your rent beyond what you can pay. Your automatic appraisal of the event is highly negative.

The appraisal produces an emotional reaction.
A positive appraisal will give rise to a positive emotion, like joy; a negative appraisal to a negative emotion, like anger or fear.

The appraisal also determines the intensity of the reaction: higher event significance leads to greater intensity.

Ex1: You are proud and relieved.
Ex2: You are very upset.

SCREEN 7:

To recap: when an event occurs, multiple brain regions work very quickly and without your conscious control to evaluate the nature of the event (good or bad for me). This
appraisal then gives rise to a corresponding emotion. Without the appraisal process, full-fledged emotions could not occur. Yet we have neither conscious awareness nor control of this process.

SCREEN 8:

END SECTION
Practice Exercises 1

In the following 5 questions, you will be asked to select or suggest an event that would be most likely to produce a positive or negative appraisal, given an initial situation.

1.i. You come home after work/school, wanting to relax and expecting to be alone. Given the above, select an event that is most likely to produce a *negative* appraisal.
- a) You find that the apartment is empty and quiet.
- b) You find that your roommate has brought back a group of loud friends.
- c) You find that you got no mail.
- d) You find that your neighbor got a package delivered.
- e) All of the above.

Suggested response: b)

1.ii. In a word or two, describe the emotional reaction you might have to the event above.

2.i. You have put a lot of effort into an essay. Given the above, select an event that is most likely to produce a *positive* appraisal.
- a) You computer crashes and the essay is lost.
- b) You get the essay back a week after you turn it in.
- c) You learn that your instructor won't count the essay toward the final grade.
- d) Your professor praises you for the essay's quality.
- e) None of the above.

Suggested response: d)

2.ii. In a word or two, describe the emotional reaction you might have to the event above.

3.i. You are at a cafe and looking forward to having a particular pastry. Given the above, select an event that is most likely to produce a *negative* appraisal.
- a) You see that you have plenty of cash in your wallet.
- b) You note that the cafe is full of people.
- c) The customer in line in front of you asks for the last of the pastries.
- d) The pastries look particularly fresh.
- e) a and b only

Suggested response: c)

3.ii. In a word or two, describe the emotional reaction you might have to the event above.

4.i. You are taking an important final exam. Given the above, suggest an event that is likely to produce a *positive* appraisal.

4.ii. In a word or two, describe the emotional reaction you might have to the event above.

5.i. You go to move your brand new car. Given the above, suggest an event that is likely to produce a *negative* appraisal.
5.ii. In a word or two, describe the emotional reaction you might have to the event above.
In the 5 questions below you will be asked to select or suggest a situation, in which the given event is most likely to produce a positive or negative appraisal.

1.i. Your boss tells you that your company will implement a particular idea. Which situation, if true, would be most likely to cause you to have a *positive* appraisal of the above event.
   ○ a) The idea is one you had openly opposed in the past.
   ○ b) The idea is one that you had proposed to your boss as something the company should do.
   ○ c) Your boss is dressed casually when he gives you the news.
   ○ d) The idea was originally proposed by a coworker whom you dislike.
   ○ e) None of the above.

Suggested response: b)

1.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.

2.i. You are talking with friends in the school parking lot, when you hear the second bell, announcing that class has just started. Which situation, if true, would be most likely to cause you to have a *negative* appraisal of the above event.
   ○ a) This is your lunch period, and you don't have to be in class.
   ○ b) You are an alum, visiting the school for the day.
   ○ c) You and your buddies are planning to skip class and go to the mall.
   ○ d) You care about doing well in school and are supposed to be in class.
   ○ e) All of the above.

Suggested response: d)

2.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.

3.i. Your mother, who is very good with money, calls and begins to ask you questions about your finances. Which situation, if true, would be most likely to cause you to have a *negative* appraisal of the above event.
   ○ a) You have been worrying about your credit card debt.
   ○ b) You have a high paying job.
   ○ c) You have high confidence in your money management abilities.
   ○ d) Your apartment is very clean.
   ○ e) All of the above.

Suggested response: a)

3.ii. In a word or two, describe the emotional reaction to the event above, given the response you have selected.

4.i. You happen on an affordable apartment listing in your neighborhood. Suggest a *preceding* situation which, if true, would be likely to cause you to have a *positive* appraisal of the above event.
4.ii. In a word or two, describe the emotional reaction to the event above, given the situation you have suggested.

5.i For this question, use the same event as in question 9. Suggest a *preceding* situation which, if true, would be likely to cause you to have a *negative* appraisal of the event.

5.ii. In a word or two, describe the emotional reaction to the event above, given the situation you have suggested.

Review

Take a moment to reflect on how you were able to identify the answers to the questions above. Notice you did not have to do calculations, as with a math problem. Nor was your answer merely a guess, as when trying to make a prediction about something like a sports match or an election. Given a scenario, you were able to know with a high degree of certainty how you would feel, and this happened "automatically." That is appraisal at work. It is performed by the mind so quickly, that one can neither prevent appraisal from happening, nor have conscious awareness of it, except in hindsight, when considering one's emotional responses to an event after the fact.
Quiz 1

Self-Quiz

1. If a person is exhibiting signs of anger, e.g. in their voice or facial expression, which of the following is likely:
   - a) something occurred that the person has interpreted as threatening to their desires
   - b) the person is mean
   - c) the person is probably blowing things out of proportion
   - d) the situation they are in is their fault

Suggested Response: a)

2. If a person perceives an event, for example someone speaking to them
   - a) they’ll remember the event ONLY if it’s important
   - b) their mind will automatically evaluate the event to determine if it is harmful or beneficial to them
   - c) they may be expected to have an emotional response to the event, even if only a mild one
   - d) b and c only
   - e) a, b and c

Suggested Response: d)

3. Based on the emotion model you have been provided with, if two similar individuals have different goals or desires within the same domain (for example, supporting different political candidates), they may be expected to
   - a) dislike each other
   - b) behave the same way regardless of the difference
   - c) have different emotional reactions to the same event
   - d) pursue those goals or desires with different intensities

Suggested Response: c)

4. A person can learn to control their initial appraisals
   - a) True
   - b) False

Suggested Response: b)

5. Before an emotion is experienced
   - a) a person has to become sensitive
   - b) a person must learn what emotions are
   - c) an event must be evaluated in the mind to determine if it’s good or bad for the person
   - d) a person should begin leading a dramatic life
   - e) a person must consciously decide what emotion they want to feel

Suggested Response: c)
6. An emotion can arise from both an external event, like someone saying something, and an internal one, for example a memory or a thought.
   - a) True
   - b) False

Suggested Response: a)

7. The more intense an emotion is the more you can expect
   - a) that a person is going to suppress it
   - b) that it will be a positive emotion
   - c) that the event that triggered it was interpreted as being highly important to the person
   - d) none of the above

Suggested Response: c)

8. Each event a person perceives, whether it’s as minor as someone’s passing comment or as significant as their country going to war, is automatically evaluated in the mind as being either positive or negative with regard to the person’s goals, needs and desires.
   - a) True
   - b) False

Suggested Response: a)

9. The initial appraisal process, and resulting emotion impulse, occur without conscious control or awareness.
   - a) True
   - b) False

Suggested Response: a)
Outcome Measure 1

ID_______

Below, you will be presented with scenarios, and asked to rate the reactions of the people in the scenarios based on how blameworthy you think the people are for their reactions.

When we say how blameworthy a person is, we mean to what extent does the person deserve blame for their reaction.

1. An elderly woman lives in a large old house in the suburbs. Her eyesight is deteriorating. Her daughter, visiting on a warm fall afternoon, suggests that she go to a doctor to get an eye exam. But the woman refuses.

How blameworthy do you think is the woman for her reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)

0 1 2 3 4 5 6 7 8 9 10

2. A woman sits alone in an office. It is after 10pm. She is concentrating on her work. She gets a phone call, glances to see who it is, but does not pick up.

How blameworthy do you think is the woman for her reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)

0 1 2 3 4 5 6 7 8 9 10

3. On a brisk, sunny morning a man gets out of his car and heads toward an office building. He is in a hurry to get to the tenth floor. But though the elevator is working, he takes the stairs instead.

How blameworthy do you think is the man for his action?
(0 = not at all blameworthy, 10 = completely blameworthy)

0 1 2 3 4 5 6 7 8 9 10

4. Coming to the DMV on a cloudless summer day, a young man fails at his second attempt to get a driver’s license. Going back home with his father, he feels ashamed and frustrated.

How blameworthy do you think is the young man for his reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)

0 1 2 3 4 5 6 7 8 9 10

5. At a summer dinner thrown by a wealthy friend, a poet gets praised by the host for a poem most of which was written by someone else. Relaxed by the wine, a number of guests add their own compliments. The poet is pleased with the attention.
6. An instructor is teaching a large class during fall semester. One day, a student sitting in the back row asks a great deal of questions in class, raising his hand every few minutes. After a while, the instructor starts to feel impatient with the student.

How blameworthy do you think is the instructor for their reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)

7. Coming in for his annual checkup, a man is told by his doctor that he should quit smoking cigarettes. Afterward, on the walk home through the twilit neighborhood, he stops by the bodega to buy one last pack.

How blameworthy do you think is the man for his action?
(0 = not at all blameworthy, 10 = completely blameworthy)

8. Having risen extra early so as not to miss an important appointment, for which he will have to drive across town, a man misplaces his keys just as he is about to leave. He is very annoyed and ready to turn his apartment upside down to find the keys.

How blameworthy do you think is the man for his reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)

9. Sitting on a park bench in early spring, a woman is reading the paper. Small birds skip around nearby, looking for crumbs. The woman realizes that she is cold, but does not put on her jacket.

How blameworthy do you think is the woman for her reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)

10. A jogger is making his way through a park at an easy pace. It is dusk. Families are gathering at the picnic areas with food and music. The jogger notices that the shoelaces on his left sneaker are untied, but does not stop to tie them.

How blameworthy do you think is the jogger for his reaction?
(0 = not at all blameworthy, 10 = completely blameworthy)
11. Late in the semester, a student gets a bad grade on an assignment she hadn’t put a lot of time into. Walking home after school, and remembering the grade, the student feels angry about how hard the instructor has been grading.

How blameworthy do you think is the student for her reaction? (0 = not at all blameworthy, 10 = completely blameworthy)

0 1 2 3 4 5 6 7 8 9 10
Exit Questionnaire 1

Participant Questionnaire

SECTION 1:
Basic Participant Info

- Gender
  1. Female
  2. Male

- Age
  Short Answer

- English is my primary (native/dominant) language
  1. Yes
  2. No

- If you've answered 'No' above, what is your primary language?
  Short Answer

- Ethnicity/race
  Short Answer

- Previous degree(s)/area(s) of study
  Short Answer

- Occupation (if other than or in addition to Student)
  Short Answer

- Have you previously participated in one or more of the studies conducted by the same researchers?
  1. Yes
  2. No

SECTION 2:

- For which class will you be getting credit for participating in this experiment? (If you are participating for monetary compensation, enter "Compensation")
  Short Answer

- Please briefly describe the research question of interest for each of the studies you have participated in today, as you understand them.
  Short Answer

- To what extent would you agree with the following statement: "As I performed the tasks in these studies, I came to believe that they were part of a single study."
  (1=completely disagree, 5=completely agree)
  1  2  3  4  5
● Please provide any other thoughts or comments you may have.
  Short Answer
APPENDIX C

2nd Pre-Dissertation Pilot Select Materials (remaining materials identical to 1st pilot)

PFL Activity 1.

Activity I: Emotion Exercise

Below, three characters are shown having emotional reactions to different events. Using the scenes below as a starting point, your task is to come up with a general explanation for how different emotions arise. This may involve a principle or set of principles.

Your explanation should be generally predictive, that is, you should be able to use it to predict what type of emotion will arise given a specific situation. The type of emotion does not need to be totally exact, e.g. frustration or contempt. A broad emotional category would be sufficient. Your explanation should work for all the scenarios below, and any other hypothetical situation.

This can be a challenging task, so do not worry if you don't come up with a perfect explanation. Just do your best!

Spend no more than 10 minutes on devising your explanation.
Mrs. Sellers hopes her friends don't forget about her on Christmas.

Christmas Eve...

Mrs. Sellers believes all dogs have fleas and are generally dirty.

Fido comes near her...
Jenny is severely allergic to dogs.

Fido comes near her...

Jenny has been waiting impatiently for her Christmas gift.

Christmas Eve...
Jack hates Christmas and has told his friends repeatedly not to get him gifts.

Christmas Eve...

Jack enjoys petting dogs, and has not petted one in a while.

Fido comes near him...

Write your explanation here. Take about 10 minutes to think about and complete your answer.