ALIGNMENT IS NOT JUST FOR TIRES: THE IMPACT OF LEADER-FOLLOWER CLIMATE PERCEPTIONS ON LEARNING AND SAFETY BEHAVIORS

A Dissertation in Psychology

by

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ABSTRACT
Organizational climate has been found responsible for numerous group and individual outcomes, ranging from job satisfaction, to company profits, to injury and death. However, the research literature on organizational climate has not sufficiently explored nuances beyond climate level (i.e., the aggregated average of climate ratings). This dissertation extended existing research by investigating non-linear interactions in an attempt to resolve inconsistencies on the moderating effect of climate strength (i.e., variability of climate ratings) on outcomes, as well as by investigating the alignment (i.e., similarity) of leader and follower climate perceptions instead of solely relying on follower ratings. Two specific climate facets (climate for learning and climate for safety) in two separate studies were investigated. Study 1 consisted of learning climate perceptions from 41 instructors and 1,232 students in 69 university classes, while Study 2 examined safety climate perceptions from 395 managers and 5,232 nurses in 254 hospitals. Support was found for a linear interaction between learning climate level and strength, but not for safety climate level and strength. A curvilinear interaction was not found in either study, and thus was unable to explain the conflicting results. Finally, the data tentatively suggested that alignment of leader and follower climate perceptions could predict relevant outcomes for both climate types, but data restrictions prevented more definitive conclusions. Practical implications, limitations, and suggestions for future research on curvilinear interactions and leader-follow alignment are discussed.
TABLE OF CONTENTS

List of Tables ........................................................................................................... v
List of Figures ........................................................................................................... vii
Acknowledgements ..................................................................................................... viii

CHAPTER 1. INTRODUCTION .................................................................................. 1
   Organizational Culture and Climate ................................................................. 7
   Molar versus Faceted Climate ......................................................................... 9
   Climate Level .................................................................................................... 14
   Climate Strength ............................................................................................. 21
   Climate Alignment ............................................................................................ 27

CHAPTER 2. STUDY 1: LEARNING CLIMATE IN CLASSROOMS ......................... 42
   Method .............................................................................................................. 42
   Results ............................................................................................................. 48
   Discussion ....................................................................................................... 63

CHAPTER 3. STUDY 2: SAFETY CLIMATE IN HOSPITALS .................................. 74
   Method .............................................................................................................. 74
   Results ............................................................................................................. 79
   Discussion ....................................................................................................... 90

CHAPTER 4. OVERALL DISCUSSION .................................................................... 100

REFERENCES ....................................................................................................... 110

TABLES .................................................................................................................. 129

FIGURES ............................................................................................................... 152

APPENDIX A. Study 1: Learning Climate and Behavior Items ............................ 161
APPENDIX B. Study 2: Hospital Safety Climate and Behavior Items .................. 163
LIST OF TABLES

1. T-test Results Comparing Online versus Paper Ratings (Study 1) ........................................ 129
2. Pattern Matrix for Final Three-Factor EFA of Learning Climate Dimensions (Study 1) .... 130
3. Pattern Matrix for Final Three-Factor EFA of Learning Behavior Dimensions (Study 1)... 131
4. CFA Results and Model Comparisons for Study 1 Measures ............................................. 131
5. Means, Standard Deviations, and Correlations Amongst Study 1 Variables (Class Level) . 132
6. Summary of All Study 1 Hypotheses and Associated Variables ........................................... 133
7. Summary of All Study 1 Hypothesis Conclusions ................................................................. 134
8. Study 1 Regression Results for Participation Climate Predicting Student-Rated Participation Behaviors ........................................................................................................... 135
9. Study 1 Regression Results for Participation Climate Predicting Instructor-Rated Participation Behaviors (Scale) ........................................................................................................... 136
10. Study 1 Regression Results for Participation Climate Predicting Instructor-Rated Participation Behaviors (Single-Item) ................................................................................................ 137
11. Study 1 Regression Results for Mistake Climate Predicting Student-Rated Participation Behaviors ........................................................................................................................... 138
12. Study 1 Regression Results for Mistake Climate Predicting Instructor-Rated Participation Behaviors (Scale) ........................................................................................................... 139
13. Study 1 Regression Results for Mistake Climate Predicting Instructor-Rated Participation Behaviors (Single-Item) ................................................................................................ 140
14. Study 1 Regression Results for Learning Orientation Climate Predicting Reflection Behaviors ............................................................................................................................... 141
15. Study 1 Polynomial Regression and Response Surface Methodology Results for Testing Alignment Hypotheses ........................................................................................................... 142
16. CFA Results and Model Comparisons for Study 2 Measures (Nurses) .............................. 143
17. CFA Results and Model Comparisons for Study 2 Measures (Managers) .......................... 143
18. Means, Standard Deviations, and Correlations Amongst Study 2 Variables (Hospital Level) ......................................................................................................................... 144
19. Summary of Study 2 Hypotheses and Associated Variables .................................................. 145
20. Summary of Study 2 Hypothesis Conclusions ................................................................. 146

21. Study 2 Regression Results for Overall Safety Perceptions Climate Predicting Error Reporting (Nurse-Rated) ................................................................. 147

22. Study 2 Regression Results for Overall Safety Perceptions Climate Predicting Error Reporting (Manager-Rated) ................................................................. 147

23. Study 2 Regression Results for Communication Openness Climate Predicting Error Reporting (Nurse-Rated) ................................................................. 148

24. Study 2 Regression Results for Communication Openness Climate Predicting Error Reporting (Manager-Rated) ................................................................. 148

25. Study 2 Regression Results for Nonpunitive Response to Error Climate Predicting Error Reporting (Nurse-Rated) ................................................................. 149

26. Study 2 Regression Results for Nonpunitive Response to Error Climate Predicting Error Reporting (Manager-Rated) ................................................................. 149

27. Study 2 Polynomial Regression and Response Surface Methodology Results for Testing Alignment Hypotheses ................................................................. 150

28. Study 2 Regression Results for Testing the Influence of Communication Openness Climate Alignment Beyond Climate Level and Strength ........................................ 151
LIST OF FIGURES

1. Theorized relationship between climate level and climate strength ........................................ 152
2. Hypothesized curvilinear interaction between climate level and strength ............................ 152
3. Visual representation of the possible combinations of climate strength and uniformity .... 153
4. Visual representation of Hypotheses 4 and 5 ................................................................. 153
5. Linear interaction of mistake climate level and strength predicting instructor-rated participation behaviors (scale score) ............................................................... 154
6. Linear interaction of participation climate level and strength predicting student-rated participation behaviors ........................................................................................................ 154
7. Linear interaction of participation climate level and strength predicting instructor-rated participation behaviors (single-item measure) ................................................ 155
8. Linear interaction of mistake climate level and strength predicting student-rated participation behaviors ........................................................................................................ 155
9. Linear interaction of learning orientation climate level and strength predicting student-rated reflection behaviors .................................................................................................... 156
10. Response surface plot for student and instructor participation climate ratings predicting student-rated participation behaviors .............................................................................. 157
11. Response surface plot for student and instructor mistake climate ratings predicting student-rated participation behaviors ................................................................................................ 157
12. Response surface plot for student and instructor mistake climate ratings predicting instructor-rated participation behaviors (scale score) ................................................................. 158
13. Response surface plot for student and instructor learning orientation climate ratings predicting student-rated reflection behaviors ................................................................................................ 158
14. Response surface plot for nurse and manager overall safety perceptions climate ratings predicting nurse-rated error reporting ........................................................................................................ 159
15. Response surface plot for nurse and manager nonpunitive response to error climate ratings predicting nurse-rated error reporting ................................................................................................... 159
16. Response surface plot for nurse and manager communication openness climate ratings predicting nurse-rated error reporting ........................................................................................................ 160
17. Response surface plot for nurse and manager overall safety perceptions climate ratings predicting manager-rated error reporting ........................................................................................................ 160
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CHAPTER 1
INTRODUCTION

As many as 98,000 deaths in medical facilities each year are due to avoidable error, according to an estimate by the Institute of Medicine (Kohn, Corrigan, & Donaldson, 1999). Furthermore, in 2011 there were approximately 3 million non-fatal reported injuries and illnesses in the U.S. private sector (Bureau of Labor Statistics, 2011). Organizational climate, or “shared perceptions of the way things are around here” (Reichers & Schneider, 1990, p. 22), is at least partially to blame (e.g., Christian, Bradley, Wallace, & Burke, 2009; Nahrgang, Morgeson, & Hofmann, 2008). For instance, it has been linked to accidental needle sticks (Hofmann & Mark, 2006); unsafe behaviors and accidents (Hofmann & Stetzer, 1996), postoperative complications (Mardon, Khanna, Sorra, Dyer, & Famolaro, 2010), and medication errors (Hofmann & Mark, 2006). Beyond safety concerns, organizational climate is responsible for numerous outcomes at the organizational and individual level, such as department store sales (McKay, Avery, & Morris, 2009), customer satisfaction and organizational citizenship behaviors in banks (Naumann & Bennett, 2000; Schneider, Salvaggio, & Subirats, 2002), team performance and absenteeism in automobile manufacturing (Colquitt, Noe, & Jackson, 2002), and job satisfaction in engineering units (Tesluk, Vance, & Mathieu, 1999). When climate clearly has such a widespread impact on many outcomes across numerous work domains, it is critical to understand the exact nature of how it functions so that organizations can leverage the power of climate to effect valued outcomes.

Although there are varying definitions, overall, organizational climate refers to shared perceptions by group members about which behaviors are valued and expected in the workplace (Schneider, 1990). The conceptualization of organizational climate started out as a broad,
generic one, but it then was carved into dozens of more specific facets, which Schneider (1975; Schneider, Ehrhart, & Macey, 2011b) categorized as either process or strategic (i.e., outcome) oriented. For instance, learning climate (process) refers to a common understanding of whether behaviors promoting knowledge gathering, synthesizing, and sharing are valued and encouraged (Zaccaro, Ely, & Shuffler, 2008), while safety climate (strategic) is “shared perceptions with regard to [the importance of] safety policies, procedures and practices” (Zohar, 2003, p. 125). These two types of climate will be the focus of this dissertation. They were chosen in part because they each represent one of Schneider’s (1975; Schneider et al., 2011b) typologies of climate (i.e., process and strategic climates), so studying both of them can assist in determining the extent of the generalizability of findings across climate types.

Climate has typically been investigated in regard to its level, or the average rating given by group members. Higher/more positive climate levels have been linked to job satisfaction (Tesluk et al., 1999), sales (McKay et al., 2009), and team performance (Colquitt et al., 2002), among others. Two meta-analyses (Carr, Schmidt, Ford, & DeShon, 2003; Parker, Baltes, Young, Huff, Altmann, Lacost, & Roberts, 2003) have further supported this positive link between climate level and outcomes.

In an effort to better understand the full impact of climate, some researchers have also studied climate strength, which represents the amount of variance in climate ratings given by group members (e.g., Colquitt et al., 2002; Gonzalez-Roma, Fortes-Ferreira, & Peiro, 2009; Schneider et al., 2002; Zohar & Luria, 2004). This is important because the impact of climate level on outcomes could depend on whether the group members’ ratings are very similar to each other or very diverse. Either situation could lead to the same average climate level, but very different amounts of climate variability, or strength. If group members are not on the same page with each other in their perceptions, then they may not behave in similar ways, even if the
average perception level is high (Mischel, 1976). Some researchers have found that indeed, high climate levels are most beneficial when climate strength is also high (i.e., low variability; Colquitt et al., 2002; Schneider et al., 2002), while interestingly, others have found no significant interaction (e.g., Bliese & Halverson, 1998a; Lindell & Brandt, 2000). Thus, it is important to conduct further research to resolve these inconsistent findings in an effort to discover the true impact of climate strength.

In addition to inconsistent findings on the role of climate strength in the climate level-outcome relationship, climate perceptions tend to only be measured by subordinates, even though climate is theorized to be perpetuated by the actions of leaders (e.g., Dragoni, 2005; Schein, 2010). In fact, this dependence on subordinate responses is a problem that extends beyond climate to the majority of leadership-related studies (Hunter, Bedell-Avers, & Mumford, 2007). If leaders and followers have similar perceptions of the organizational climate, then collecting leader ratings may not matter. But if they are not aligned/similar in their perceptions, then this could question the theory of climate as flowing down from leaders to followers. Furthermore, there could be implications for whose perceptions are more predictive of organizational outcomes. In fact, the few who have investigated leader-follower climate alignment have found that misaligned climate perceptions can be more detrimental than aligned climate perceptions, even when leaders and followers agree that climate levels are low (e.g., Bashshur, Hernandez, & Gonzalez-Roma, 2011; McKay et al., 2009). Furthermore, when there is misalignment, outcomes are better when followers’ climate perceptions are higher than leaders’ (Bashshur et al., 2011; McKay et al., 2009).

Given the opportunities for further clarification and expansion of our understanding of organizational climate, the purpose of this dissertation is two-fold: first, to address the inconsistencies in past research on climate strength moderating the climate level-performance
relationship by proposing non-linear effects, and second, to investigate the alignment (i.e., the similarity) of leader and follower perceptions of climate to determine if misaligned perceptions are of consequence to organizational outcomes (in other words, to determine if it is valuable to study leader climate perceptions in addition to follower climate perceptions). These goals were addressed in two studies. The first involved learning climate perceptions in university classrooms, while the second attempted to address methodological limitations of the first and test the generalizability of findings to another climate type and setting (i.e., climate for safety in hospitals).

Four main contributions can be derived from these two studies. First, they addressed prior inconsistent and/or weak effects of climate strength as a moderator of climate level on outcomes (e.g., Colquitt et al., 2002; Schneider et al., 2002; Zohar & Luria, 2004). Like most interaction studies, past research on climate strength has tended to investigate linear interactions only (Ostroff, Kinicki, & Muhammad, 2012). However, for mathematical and conceptual reasons, the two predictors tend to have a curvilinear relationship, such that climate strength is higher (i.e., less variability) when climate level is high or low, and lower (i.e., more variability) when climate level is moderate (Dickson, Hanges, & Resick, 2006; Lindell & Brandt, 2000; see Figure 1). Thus, stronger and more consistent effects may be found when curvilinear interactions are studied instead of linear ones. In other words, the true relationship of climate level and strength with outcomes may in reality not be inconsistent or weak, but the extant method of analyzing the interaction has yielded misleading results because it does not take into account the curvilinear relationship between climate level and strength. If a curvilinear interaction is successful where a linear one is not, then it is possible similar results could have been found if the prior studies had applied this analytical approach as well. To my knowledge, the study of curvilinear interactions has never been attempted with climate. Thus, the proposed
studies not only addressed prior inconsistencies, but also implemented a methodological approach that is underutilized in the climate literature.

The second contribution is that the two studies measured the climate perceptions of both leaders and followers, thereby addressing a need that extends beyond the climate literature to the leadership research domain at large. For instance, Hunter and colleagues (2007) lamented that mainly self-reported subordinate perceptions are utilized in leadership research. The relative paucity of leader perspectives (in addition to other outside, objective data) has been shown to be an important omission, for leader and follower perceptions often do not match (e.g., leader-member exchange perceptions; Gerstner & Day, 1997). Similarly, in the climate literature, subordinates are usually the source of climate ratings. But what if subordinates perceive the climate differently from their leaders? This could potentially impact the subsequent actions that the leader does or does not take to improve the organization’s climate, as well as subordinate reactions.

For example, if followers think the climate is great but their leader does not, the leader might take actions to improve the climate that are seen as unnecessary or even burdensome by his/her followers (Gibson, Cooper, & Conger, 2009). On the other hand, if followers have poor climate perceptions but the leader does not, he/she might not take any actions to improve the climate, leaving followers frustrated and dissatisfied. Thus, the importance of studying both leader and follower ratings extends beyond traditional leadership research to other areas as well, such as climate. The studies in this dissertation not only addressed the call for collecting data from both types of participants (e.g., Hunter et al., 2007), but also actively investigated the consequences of perceptual alignment versus misalignment, which constitutes the third contribution.
Further expanding upon this third contribution, not only is it important to acknowledge the perceptions of leaders, but doing so helps establish if leaders and followers are truly “on the same page” with respect to the climate that the leader is espousing. These two studies addressed whether leader or follower perceptions matter more in predicting outcomes, as well as questioned an existing theoretical assumption that climate is a top-down phenomenon. In other words, if followers do not perceive the same climate as leaders and their perceptions “trump” the leader’s in predicting outcomes, then it would suggest that leaders may not be as integral to cultivating organizational climate as previously assumed. To my knowledge, very few studies have addressed leader-follower perceptual alignment as a predictor of outcomes (cf. Bashshur et al., 2011; de Jong & Dirks, 2012; Gibson et al., 2009; McKay et al., 2009), and even fewer specifically have dealt with organizational climate (cf. Bashshur et al., 2001; McKay et al., 2009).

The fourth major contribution of my dissertation is that it increased the scope of research that has been performed in the areas of learning and safety climates. Specifically, while climate levels have been more extensively researched, very little, if any (to my knowledge), research has been conducted on climate strength or perceptual alignment in these specific domains. Since continuous learning is critical for organizational success, particularly in today’s fast-paced world (e.g., Kozlowski & Ilgen, 2006), further understanding of the influence learning climate can have on actual learning behaviors is essential. Furthermore, since safety-related outcomes can pose high risks to employees (and patients when in medical settings), including injury or death, it is particularly important to have a more thorough understanding of how and when safety climate impacts outcomes.

This dissertation is organized as follows: First, a brief overview of organizational culture and how it differs from organizational climate is presented, followed by a more detailed
description of organizational climate and how it has evolved from a molar construct to a multifaceted one. Then, I introduce the two types of climate to be addressed in my studies, climate for learning and climate for safety, and conduct a literature review of research pertaining to climate level, strength, and alignment in those two areas. Hypotheses are then presented, followed by detailed descriptions, results, and discussions of the two studies.

**Organizational Culture and Climate**

**Organizational Culture**

Although the terms “culture” and “climate” are often used interchangeably in organizational research, they in fact represent distinct constructs (Ostroff et al., 2012). Organizational culture is not something that can be readily measured with a quantitative measure such as a survey (Denison, 1996). Rather, it is the collection of deep-seated values, ideologies, and goals that permeate an organization and subsequently influence norms, policies, and procedures (Schein, 2010). Culture also tends to be very stable and is not easily changed (Denison, 1996).

Cultural stability may be explained by Schneider’s (1987) Attraction-Selection-Attrition (ASA) model. People are theorized to be attracted to organizations that espouse similar values as their own. Once they are judged to be a good fit and are hired, the culture will be more thoroughly experienced and learned via newcomer socialization processes (Schein, 2010). Those who realize that their values and goals are not congruent with those of the organization will tend to leave, while others with more congruent values and goals will tend to stay. Thus, the culture remains strong and primarily unaltered.

While culture is expected to permeate an entire organization or work unit, the specific direction of cultural dissemination is theorized to be top-down (e.g., Dragoni, 2005; Schein, 2010). That is, upper management is assumed to shape and maintain unit leaders’ understanding
of the culture, and those leaders in turn create cultural meaning for their followers (Schneider, Ehrhart, & Macey, 2011a). To do this, leaders engage in behaviors and practices that represent the organizational culture. Those behaviors and practices subsequently influence followers’ perceptions of their environment, or the organizational climate.

**Organizational Climate**

While culture represents the underlying, stable beliefs, values, and goals of an organization, the manner in which culture is manifested impacts organizational climate (Schneider, 1990; Schneider et al., 2011a). Specifically, climate is “incumbents’ perceptions of the events, practices, and procedures and the kinds of behaviors that get rewarded, supported, and expected in a setting” (Schneider, 1990, p. 384), or more simply, “shared perceptions of the way things are around here” (Reichers & Schneider, 1990, p. 22). Thus, while culture can be thought of as a latent construct that cannot directly be observed, climate is more transparent, measuring employees’ subjective impressions of their work environment, which are created in large part by the actions stemming from the organization’s culture. In other words, climate represents the “what”, while culture represents the “why” (Ostroff, Kinicki, & Tamkins, 2003).

It is important to understand that organizational climate is a unit-level construct, representing some degree of consensus of opinion across employees. On the other hand, any individual’s personal perception of their work environment is termed psychological climate (James & Jones, 1974). The collective (and similar) perceptions of individuals (i.e., psychological climate) can be aggregated to form organizational climate.

Because both psychological and organizational climate deal with the same underlying construct (i.e., climate), but have different qualitative meanings at these two levels of analysis, climate can be considered compositional (Chan, 1998; James, 1982). In other words,
organizational climate is an emergent property, a higher-order construct reflecting the interaction of the individual psychological climate components that comprise it (Kozlowski & Klein, 2000).

**Integrating Culture and Climate**

Organizational scholars have long touted the importance of leader actions in developing and maintaining organizational climate. Leaders have been termed “meaning managers” (Rentsch, 1990) and “climate engineers” (Naumann & Bennett, 2000), because it is their role to engage in behaviors and practices that exemplify the company’s culture, thereby creating meaning for followers about what is valued (Schein, 1992; Schneider et al., 2011a). This can be further exemplified by Ostroff et al.’s (2012) integrated model of culture and climate, which proposed that organizational structure, practices, policies, and routines are the linking mechanism between organizational culture and climate. Leader decisions and behaviors must reflect the underlying culture in a way that is clear and unambiguous (Mischel, 1976; Schein, 2010). In turn, followers will interpret those behaviors in similar ways that are reflective of the underlying culture, leading to strong and high level climates and subsequent positive organizational outcomes (Bowen & Ostroff, 2004).

Although culture and climate are conceptualized as being distinct, the distinction is often blurry, and organizational climate scholars have called for more integration between the two (Schneider et al., 2011b). Thus, for the purposes of consistency and clarity, and because this dissertation is not measuring culture directly, I will mainly use the term “climate” going forward.

**Molar versus Faceted Climate**

Early studies of climate have been criticized for measuring the antecedents of climate, such as leader behavior, rather than the climate itself that was created (Schneider et al., 2011a). As a result, climate itself was not sufficiently dissected, but rather was conceptualized as a broad, molar construct- something akin to a Gestalt perspective, whereby all different types of climate
(e.g., service, justice, learning, safety) came together to form a higher-order construct. Schneider et al. (2011a) termed this molar climate a “climate for well-being” (p. 30).

This molar approach to climate led to measures that, even if no longer measuring climate antecedents, varied wildly across studies and did not consistently measure the same construct or find stable results. Therefore, Schneider (1975) proposed that climate measures needed to become narrower, focusing on specific climate facets, which led to a wide variety of “climate for” constructs being developed and measured.

Schneider et al. (2011a) gave an example of the difference between a molar climate item and a more specific climate facet such as safety. He compared “My supervisor says a good word whenever he sees a job well done” (molar) versus “My supervisor says a good word whenever he sees a job done according to the safety rules” (facet; Zohar, 2000, p. 591). The former could refer to any number of things, depending on how the respondent interprets what a job well done is. For example, in a medical setting, would a job well done refer to treating a patient with kindness and compassion, recording thorough notes in a patient’s chart, or successfully diagnosing a rare disease? In many cases, these three actions do not occur in tandem, and thus each employee could be rating their supervisor based on something different. This would quite potentially lead to an inconsistency in responses and lack of rater agreement about a common supervisor. More narrowly focused climate facets help to avoid this issue of ambiguous interpretation.

**Process and Strategic Climates**

Recently, Schneider et al. (2011b) acknowledged that much research on climate facets has dealt with organizational processes that are “deemed to be important for organizational functioning” (p. 383), or process climates. Previously, Schneider (1975) had only considered strategic climates, which focus on policies and behaviors that allow an organization to achieve
valued outcomes. Thus, process climates focus on whether certain practices (e.g., justice, learning) that could enable positive organizational outcomes are encouraged in the workplace, while strategic climates describe an environment that promotes achieving certain outcomes of interest or value to the organization (e.g., workplace safety, good customer service). The two types of climate discussed in this dissertation, climate for learning and climate for safety, therefore not only represent two different climate facets, but also these two theorized higher-order categories of climate outlined by Schneider. The two climates are explained in more detail below.

Climate for Learning: A Process Climate

Sessa and London (2008) view groups as living systems that learn in three ways: adaptive (adjustment of interpersonal interactions), generative (seeking mastery of new information), and transformative (changing the group’s structure and/or goals). For this dissertation, I focused on generative learning, or “seeking new knowledge and information, learning new skills, and then finding new ways to apply it” (Sessa & London, 2008, p. 8). Group members who engage in generative learning seek a more thorough understanding of information, which is triggered in part by a climate for learning (e.g., Dragoni, 2005; Zaccaro et al., 2008).

Climate for learning can be conceptualized as shared perceptions that the “team’s environment will be conducive to [learning]” (Zaccaro et al., 2008, p. 201). In other words, team members have a common understanding of whether behaviors promoting learning are valued and encouraged. The nature of work in the 21st century is fast-paced, complex, and often changing (Kozlowski & Ilgen, 2006), which means that the ability to regurgitate basic information is often insufficient, as it can quickly become obsolete (Zaccaro et al., 2008). On the other hand, when team members engage in continuous learning, both proactively seeking out new information and exploring existing knowledge to understand it in a more thorough way, they are better able to
engage in adaptive problem-solving, applying their knowledge in unique and innovative ways (Ford, Smith, Weissbein, Gully & Salas, 1998; Kim & Wilemon, 2007; Smith, Ford, & Kozlowski, 1997). Thus, a climate for learning can help encourage learning behaviors, which in turn can lead to better team performance (e.g., Bunderson & Sutcliffe, 2003; Edmondson, 1999; van Dyck, Frese, Baer, & Sonnentag, 2005).

Learning climates are created when team members feel safe to ask questions, share information, or speak up in general without being rebuked (i.e., psychological or participative safety; Edmondson, 1999; West, 1990). Furthermore, team members must have similar perceptions that a learning goal orientation (also known as mastery goal orientation; Ames & Archer, 1988) is expected and valued (Zaccaro et al., 2008). Stemming from the education literature and extended to the work domain, those with a learning goal orientation have a desire to increase understanding and abilities, as opposed to solely being concerned with achieving an acceptable performance level to improve one’s image (i.e., performance goal orientation; Dweck, 2002). That is, when groups perceive that they are encouraged to proactively seek new knowledge, critically analyze and apply information to tasks, and share their ideas with others, a high level of learning climate exists (Jeppesen, 2002).

Empirical studies have found that learning climate predicts learning behaviors (Edmondson, 1999; Edmondson, Bohmer, & Pisano, 2001; Porter, 2005), team performance (Bunderson & Sutcliffe, 2003), greater task efficacy and commitment (Porter, 2005), and creative achievement (Hunter, Bedell, & Mumford, 2007), among others. Unfortunately, there has not been enough attention given to the moderating role of climate strength, or whether leaders and followers have similar learning climate perceptions. Because of the pervasive need for adaptive problem-solving in today’s work world (Kozlowski & Ilgen, 2006), it is important to understand the nuances of how learning climate can improve learning processes and prevent
potential employee apathy toward knowledge acquisition. Thus, Study 1 of this dissertation focused on learning climate level, strength, and alignment in a setting where learning is key: university classrooms.

**Climate for Safety: A Strategic Climate**

Safety climate was first formally introduced in 1980 by Zohar, who was interested in reducing accidents and improving production in industrial jobs. His definition mirrors Schneider’s (1990), except with a specific emphasis on safety: “shared perceptions with regard to safety policies, procedures and practices” (Zohar, 2003, p. 125). Attention to safety climate spiked after the International Atomic Energy Agency’s report on the Chernobyl disaster (IAEA, 1986). From that point, research on safety climate began to span numerous fields, including nuclear (Carroll, 1998), manufacturing (Zohar, 2000), railways (Clarke, 1998), and construction (Dedobbeleer & Beland, 1991). Various components of safety climate were conceptualized and measured, including supervisory support for safe behavior, human resource practices, and work pressures (Neal & Griffin, 2004).

Interestingly, safety climate was not heavily addressed in the healthcare industry until the turn of the century, when the Institute of Medicine estimated that as many as 98,000 deaths in medical facilities are due to avoidable medical error (Kohn et al., 1999). After that, the U.S. government allocated 50 million dollars to the Agency for Healthcare Quality and Research to investigate safety climate and errors (Fagan, 2012), and various other agencies such as the Joint Commission on Accreditation of Healthcare Organizations (now known as the “The Joint Commission”) and Centers for Medicare and Medicaid Services became involved as well. In fact, since 2007, The Joint Commission has required safety climate assessments be performed in accredited hospitals in the U.S. (Lyon, 2007). In addition, numerous research articles have been published, ranging from primarily describing safety climate levels and how they vary across
hospitals, work areas, and positions (e.g., Singer, Falwell, Gaba, & Baker, 2008), to predicting safety-related outcomes such as errors and accidents (e.g., Hofmann & Mark, 2006).

Empirical studies have consistently found that higher levels of safety climate predict more desirable outcomes, such as fewer medication errors, fewer nurse injuries, and fewer post-operative complications (e.g., Hofmann & Mark, 2006; Mardon et al., 2010). Unfortunately, there has not been enough attention given to the more nuanced complexities of predicting safety outcomes in the literature. More specifically, to my knowledge there have been few studies addressing climate strength (cf. Zohar & Luria, 2004, 2005), and none addressing whether all employees, including leaders and followers, have similar/aligned climate perceptions, as moderators in the safety climate level-safety outcome relationship. Even fewer, if any, studies have been conducted in the healthcare industry specifically. Because safety climate is typically most pertinent in high reliability organizations, where the potential consequences for safety errors could be catastrophic (e.g., nuclear meltdowns, plane crashes, patient death; Weick, Sutcliffe, & Obstfeld, 1999), it is particularly urgent to fill this gap in the research literature in an effort to mitigate the occurrence of such losses. Thus, Study 2 of this dissertation focused on safety climate level, strength, and alignment in U.S. hospitals.

**Climate Level**

As a unit-level construct, most studies on organizational climate have focused on the average level of individual respondents’ perceptions/psychological climates. That is, calculating the arithmetic mean of all participants’ numerical responses on a climate measurement scale. However, because organizational climate represents an emergent shared group property (Kozlowski & Klein, 2000), one cannot just average the responses of any group of people and call it climate level. In order to truly be a reflection of the organizational environment, perceptions must be shared by the people who work in that setting (Glick, 1985).
In addition, it is important to understand that while the relationship between psychological climate measures and their aggregated unit-level counterpart represent a composition model, Chan (1998) further classified composition models into five types. With respect to climate level, one can either follow a direct consensus model or a referent-shift model. Direct consensus items are worded in a manner that focuses on the individual respondent: what are his/her perceptions of the environment he/she is in? Items are worded to be inclusive of the individual, as opposed to the respondent being a third-party observer of the policies and practices occurring around him/her (represented by the referent-shift model; Chan, 1998). For example, a question on psychological safety could ask the respondent to rate “I am encouraged to express my ideas to the group” (direct consensus) versus “Members of this team are encouraged to express their ideas to the group” (referent-shift).

There has been some debate about whether mentally removing oneself from one’s situation substantially affects the manner in which one responds, although more recent arguments suggest that since measuring psychological climate is only a means to an end (i.e., assessing organizational climate), it is more appropriate (and often results in more within-group agreement) to keep the unit/organization as the focal referent, even when taking measurements at the individual level (e.g., Klein, Conn, Smith, & Sorra, 2001; Klein & Kozlowski, 2000; Schneider et al., 2011b). In either case, it is important to remember that direct consensus and referent-shift models both depend on sufficient agreement between individuals to justify aggregation to the unit/organizational level via an arithmetic mean, thus measuring organizational climate level.

Once climate levels have been established, the question then becomes whether climate levels affect any given outcomes. The findings seem to strongly support that there is indeed a positive relationship, based on comprehensive literature reviews (e.g., James & Jones, 1974;
Kuenzi & Schminke, 2009) and meta-analyses (e.g., Carr et al., 2003; Parker et al., 2003). For example, when looking at individual-level outcomes, there tends to be a positive relationship between climate levels for justice (Liao & Rupp, 2005) and empowerment (Maynard, Mathieu, Marsh, & Ruddy, 2007), and job satisfaction. When looking at unit-level outcomes, there tends to be a positive relationship between service climate and organizational sales performance (Gelade & Young, 2005), and between procedural justice climate and team performance (Colquitt et al., 2002). These are just a few specific examples, but in their meta-analysis, Carr and colleagues (2003) found that overall, when climate facets were organized into higher-level affective, cognitive, and instrumental factors (based on Ostroff’s (2003) taxonomy), they improved employees’ psychological well-being and job performance and decreased job withdrawal, via their positive impact on organizational commitment and job satisfaction. Thus, it is commonly accepted that more positive (i.e., higher) average climate levels have beneficial outcomes for both individuals and the team or organization.

Kuenzi and Schminke (2009) noted that just as climate can be divided into molar and facet (see the earlier section in this document), climate outcomes can be divided in the same way. In their review, they found that climate levels not only predict more broadly conceptualized outcomes such as the ones in the above-mentioned studies (e.g., organizational commitment, job withdrawal), but that they also predict more focused outcomes that are more closely tied to specific climate facets. For example, climate for innovation is positively linked to organizational innovation (Jung, Chow, & Wu, 2003) and group affective climate positively predicts workplace friendships (Tse, Dasborough, & Ashkanasy, 2008). In this spirit, the next two sections focus on the facet-specific outcomes that can occur from learning climate and safety climate levels.
Climate for Learning: Level

Unfortunately, there have not been many studies of learning climate in organizations (cf. Bunderson & Sutcliffe, 2003; Porter, 2005; Edmondson 1999; Edmondson et al., 2001). There has been research on team learning behaviors and their outcomes (e.g., Argote, Insko, Yovetich, & Romero, 1995; Ellis, Hollenbeck, Ilgen, Porter, West, & Moon, 2003), as well as individual-level learning goal orientation’s effect on outcomes such as feedback-seeking (VandeWalle, Ganesan, Challagalla, & Brown, 2000), training attitudes (Brown, 2005; Narayan & Steele-Johnson, 2007), and training transfer (Bell & Kozlowski, 2002), but less attention has been given to antecedents of team learning (Kozlowski & Ilgen, 2006), such as climate for learning.

As discussed, two key components for leaders to create a learning climate are psychological safety (i.e., feeling safe to speak up and take interpersonal risks; Edmondson, 1999) and group learning goal orientation (i.e., desire to proactively acquire, analyze, and share information; Bunderson & Sutcliffe, 2003). Edmondson (1999) found that work teams with high levels of psychological safety engaged in more learning behaviors such as feedback-seeking and discussing errors, which in turn led to better team performance. In a study involving implementing a new surgical procedure in hospitals, Edmondson et al. (2001) again found that teams with high levels of psychological safety engaged in more learning behaviors, which in turn led to successful implementation of the new procedure. In addition, Baer and Frese (2003) discovered a positive relationship between psychological safety climate and both financial firm performance and return on assets. One final example is a study by Carmeli, Brueller, and Dutton (2009), who determined that psychological safety levels positively predicted learning behaviors in a variety of industries. Overall, there appear to be consistent results supporting the idea that psychological safety allows group members to feel comfortable asking questions without
appearing incompetent and seeking feedback without feeling judged, which in turn allows learning to occur.

Unlike psychological safety, learning goal orientation has mainly been investigated at the individual level (e.g., Ames & Archer, 1988; Button, Mathieu, & Zajac, 1996; Roedel, Schraw, & Plake, 1994; VandeWalle & Cummings, 1997). However, various researchers have suggested that by encouraging participation, rewarding feedback-seeking behaviors, and not judging or penalizing those who speak up (even if they are wrong), leaders can create a learning goal climate that overcomes individual level attributes in that particular group setting (e.g., Ames & Archer, 1988; Dragoni, 2005; Zaccaro et al., 2008). Kozlowski and Bell (2008) further explain that although learning fundamentally occurs at the individual level, the work environment (e.g., group learning climate) can shape what and how things are learned. For example, although studying learning orientation at the individual level and not team climate explicitly, Turner, Midgley, Meyer, Gheen, Anderman, Kang, and Patrick (2002) discovered that students’ learning goal orientations were similar within classes but varied between classes, suggesting the presence of a learning climate. Furthermore, they found that group-level learning goal orientation perceptions consistently predicted learning behaviors in the classroom.

Bunderson and Sutcliffe (2002), in one of the few studies (to my knowledge) to explicitly conceptualize and measure climate for learning goal orientation, found that higher climate levels were associated with more learning behaviors focused on innovative business processes, such as experimenting with new package designs. In addition, Bunderson & Sutcliffe (2003) determined that when business unit teams in a consumer products company had higher levels of learning goal orientation, they had better performance (up to a certain point). This could be explained by the fact that teams need to be able to pursue new ideas and information without sacrificing their focus on current work duties. Finally, Porter (2005) found that mean learning goal orientation
level positively predicted backing up behavior, team efficacy, and team commitment (although it should be noted that Porter used a short laboratory study and did not conceptualize team goal orientation as an emergent, shared property). It is also worth noting that van Dyck and colleagues’ (2005) study of error management culture (as opposed to error aversive culture) found a positive relationship with company goal achievement and survivability.

Although there has been limited research investigating learning goal orientation climate, as opposed to individual learning goal orientations or the compilation of individual orientations to the team level, existing research and rationale suggest that when people feel supported in exploring new information and finding ways to better understand and apply it, they will engage in more behaviors that promote learning (although the subsequent effect of learning behaviors on performance may depend on the work context, as seen in Bunderson & Sutcliffe, 2003). Thus, I proposed the following:

*Hypothesis 1a:* Learning climate levels are positively related to learning behaviors.

**Climate for Safety: Level**

Parallel to the findings for other types of climate, studies have consistently found that high levels of safety climate in a variety of contexts predict positive outcomes, ranging from more error reporting- not to be confused with error occurrences- in semiconductor plants (Probst, Brubaker, & Barsotti, 2008) to fewer soldier injuries in the military (Zohar & Luria, 2004). Furthermore, Sorra, Khanna, Dyer, Mardon, and Famolaro (2012) found that safety climate in hospitals was positively correlated with patients’ assessments of hospital care, while Neal, Griffin, and Hart (2000) discovered that safety climate positively predicted safety knowledge and motivation. In fact, two separate meta-analyses have demonstrated that safety climate level predicts safety behaviors and outcomes (Christian et al., 2009; Nahrgang et al., 2008).
It is important to note that many of these studies measured perceived safety outcomes via self-report measures. However, a few hospital studies have also measured outcomes using more objective sources. For example, Hofmann and Mark (2006) found that higher safety climate levels in hospitals resulted in fewer nurse back injuries, medication errors, and patient urinary tract infections. In addition, Mardon et al. (2010) found that safety climates were negatively correlated with adverse patient health outcomes such as postoperative sepsis and accidental puncture or laceration. Finally, Katz-Navon, Naveh, and Stern (2005) used archival hospital data to link safety climate levels with accidents occurring due to treatment errors.

Although not as common, there have also been some studies and theoretical papers attempting to explain the mechanisms by which safety climate levels lead to positive outcomes. Neal and Griffin (2004) explained that a positive safety climate increases workers’ knowledge and motivation with regard to safety procedures, which in turn makes them more likely to actually follow those procedures, thus avoiding errors and adverse outcomes. Zohar (2003) also explained the climate-outcome linkage via worker motivation—specifically, via expectancy theory (Vroom, 1964). Expectancy theory states that workers will be motivated to perform a given action (e.g., follow safety procedures, report errors) if they believe that they are capable of doing so, that their actions will result in a certain outcome, and that they will be rewarded (or not be punished) for their actions. Most likely, workers feel that they are capable of behaving in a safe manner, which can certainly save lives or prevent injury. However, that third condition, receiving rewards, is crucial. If an organization clearly prioritizes production or protecting its reputation over safety, then employees will learn that if a choice between the two arises, ensuring the former goals do not suffer will be less likely to result in punishment.

For example, imagine a nurse accidentally administered the wrong dosage of a medicine to a patient, but his/her supervisor has been telling the staff that reporting errors increases the
likelihood of a lawsuit, and that treating as many patients as possible is more important than wasting precious time in seminars addressing how to prevent future errors. Based on this, the nurse will likely perceive a low hospital safety climate level, and then he/she may be afraid that reporting the error will lead to punitive action instead of an opportunity to educate employees on how to avoid such accidents in the future. Conversely, if the supervisor repeatedly tells staff that it is very important to report errors, thanks nurses who do so, and uses the errors as learning experiences, then that same nurse may feel more motivated to report the error. Considering the almost 100,000 estimated avoidable deaths each year in U.S. medical institutions (Kohn et al., 1999), confirming how safety climate is related to safety outcomes is crucial. With the above theoretical rationale, as well as past empirical evidence in mind, I proposed the following replication of results:

_Hypothesis 1b:_ Safety climate levels are positively related to safety behaviors.

**Climate Strength**

As previously described, climate level measures the average ratings across respondents, aggregated to the unit level. Climate levels by definition imply consensus among respondents, thus requiring sufficient interrater agreement to justify such aggregation. Climate strength, on the other hand, represents a different composition model from within Chan’s (1998) typology: dispersion. That is, while agreement serves as a _prerequisite_ for climate level measurement, agreement (or lack thereof) _is_ the nature of climate strength. Climate strength has only received explicit attention in the climate literature in the past decade or so, and it is rooted in the notion that climate perceptions will vary across respondents, such that complete agreement may not always occur. More specifically, when group members all have similar climate perceptions (low variability), they are demonstrating a strong climate, and when they have dissimilar perceptions
(high variability), they are demonstrating a weak climate. This variability among respondents is typically calculated using the standard deviation statistic.

The concept of climate strength runs parallel to the concept of culture strength, which has been labeled as a deviance or dissensus model (Martin, 1992; Trice & Beyer, 1993). Trice and Beyer (1993) and Martin (1992) have questioned whether culture strength, which by its nature depends on (dis)agreement, can be reconciled with the paradoxical fact that culture is supposed to represent a pervasive set of norms and values in an organization. A similar question can therefore be raised with respect to organizational climate: how can there be variance in workplace impressions across individuals, when the concept of climate depends on consensus? My opinion is that in reality, never will every single member of a group have the exact same perceptions of their environment, since our interpretations are subject to our own individual experiences and biases. Thus, even if there is enough interrater agreement to justify aggregation for various organizations, those organizations can still vary in just how much agreement there actually is.

**Main Effects of Climate Strength**

The concept of climate strength can be understood by considering Mischel’s (1976) strong situation theory. This theory proposes that when situations are strong and unambiguous, a clear message about expectations and how things should be done will be present, such that everyone will perceive that message similarly. In contrast, when a situation is weak, that message will become more ambiguous, such that different people will interpret it in different ways. Thus, in strong situations where everyone has a similar understanding, the behavior resulting from that understanding will be more uniform than in weak situations where there is no consistent understanding of those expectations. Extending this theory to an organizational setting, if leaders enact the organizational norms and expectations in a clear manner through their
unambiguous communications and actions, then it is more likely that their followers will interpret these behaviors in a similar fashion, leading to similar climate perceptions (and subsequent behaviors), and hence a strong climate.

Climate strength has not often been hypothesized as having a direct effect on organizational or individual outcomes, but has rather been investigated mainly as a moderator. When climate strength has been examined for its main effects, the results have either been nonsignificant (e.g., Schneider et al., 2002; Zohar & Luria, 2004) or weak (e.g., Lindell & Brandt, 2000; Sowinski, Fortmann, & Lezotte, 2008). Conceptually, it seems plausible that similar interpretations of an organization’s climate will lead to similar behaviors promoting desired results (Ostroff & Bowen, 2000). However, statistically speaking, when one is dealing with a bounded measurement scale, higher variability in climate perceptions will be more likely when the average climate level is more mid-range as opposed to high or low, resulting in a curvilinear relationship between climate strength and level (Dickson et al., 2006; Lindell & Brandt, 2000; see Figure 1 for a visual representation). Because climates tend to be stronger when levels are high or low, this could help explain why climate strength does not explain any substantial incremental variance in organizational outcomes beyond that explained by climate level.

**Moderator Effects of Climate Strength**

Researchers have conceptualized climate strength as enhancing the positive effects of climate level on outcomes (e.g., Colquitt et al., 2002; Lindell & Brandt, 2000; Schneider et al., 2002). For instance, if the average climate level is high, but there is variability around that value when considering the spread of individual scores (i.e., low climate strength), then that lack of consistency of climate perceptions could lead to less consistency in behavior than if everyone has similarly high climate perceptions. On the other hand, if the average climate level is low, but
climate strength is also low, then some individuals could actually have higher climate perceptions and engage in more productive behaviors, unlike their peers, which could improve organizational outcomes at least a little. This would not be the case if the climate level was low with high strength. Thus, high and strong climates are hypothesized to be the most beneficial for organizational outcomes, while low and strong climates are hypothesized to be the most detrimental.

These hypotheses have found some support in the literature. For example, Schneider and colleagues (2002) found that the positive relationship between customer service climate level and service quality in banks was enhanced when climate was also strong (albeit significant findings were only found for one of the four hypothesized dimensions of service climate). Colquitt and colleagues (2002) also found the same pattern of relationships for procedural justice climate and team performance, as well as absenteeism, in automobile manufacturing teams. Interestingly, Gonzalez-Roma et al. (2009) found an interaction effect for team climate level and strength on team financial performance in banks where the relationship actually became negative when climate strength was low.

On the other hand, some studies have found no moderator effects (Bliese & Halverson, 1998a; Lindell & Brandt, 2000; Zohar & Luria, 2004), and many of the effect sizes for the interactions described above were somewhat weak. Furthermore, attempts to replicate findings have not always been successful (e.g., Sowinski et al., 2008). This may all be due to multicollinearity issues, since climate level has been theorized and sometimes empirically found to have a U-shaped relationship with climate strength (Bliese & Halverson, 1998a; Dickson et al., 2006; Lindell & Brandt, 2000). When multicollinearity exists, some researchers suggest that curvilinear terms should be added to predictor models (e.g., Ganzach, 1997). Ostroff and colleagues (2012) specifically critiqued climate studies for only testing the climate level-strength
interaction using linear cross-product terms, and recommended testing for curvilinear interactions as well.

**Climate for Learning: Strength**

To my knowledge, no studies have investigated either the direct effect of learning climate strength, or the interaction of learning climate level and strength on any outcomes. However, it is important to pursue, given that continuous learning is so important to organizational success in the ever-changing work environment (e.g., Kozlowski & Ilgen, 2006). Thus, further research to clarify the effects of learning climate strength is warranted, and addressing this need is one of the contributions of this dissertation. Based on Mischel’s (1976) strong situation theory and the rationale presented above, I hypothesized that learning climate strength would improve the positive effects of learning climate level on learning behavior outcomes. In other words, while a high *mean* perception of the value and encouragement to speak up, ask questions, and engage in deeper understanding of a topic will improve learning-related outcomes, the effect will be enhanced if all workers also have *similar* perception levels (i.e., high strength).

*Hypothesis 2a:* Learning climate strength moderates the positive impact of learning climate level on learning behaviors, such that the relationship is more pronounced when the climate is strong than when the climate is weak.

As discussed above, the findings on climate strength moderation have been somewhat weak and inconsistent, and it has been suggested that this may be due to the curvilinear relationship between climate level and strength when using a bounded measurement scale (i.e., when level is very high or low, strength also tends to be higher; Dickson et al., 2006; Ostroff et al., 2012). Thus, it would be prudent to also address Ostroff et al.’s (2012) recommendation of investigating a curvilinear interaction, which would take into account the non-linear relationship between climate level and strength.
Hypothesis 3a: There is a curvilinear interaction between learning climate level and learning climate strength on learning behaviors, such that the relationship between climate level and learning behaviors is more robust when climate strength is high (compared to low), but that this effect becomes less pronounced as climate level becomes extremely high or low.

For a visual representation of Hypothesis 3a, please refer to Figure 2.

Climate for Safety: Strength

To my knowledge, no studies have addressed the direct impact of safety climate strength on general or safety-specific outcomes, and only two studies have addressed the interactive effect of safety climate and strength. First, Zohar and Luria (2004) conducted a study with Israeli soldiers and found that safety climate strength did not moderate the impact of safety climate level on soldiers’ injuries. Second, Lyon (2007) examined the interaction of safety climate level and strength on postoperative outcomes. For some outcomes such as postoperative bleeding, she found no significant effects, but operating rooms that had both high and strong safety climate perceptions had increased rates of postoperative sepsis, a surprising result. In other words, one would expect that when everyone agrees that safety behaviors are important, adverse health outcomes would decrease, but the opposite occurred. Lyon (2007) proposed that operating rooms may depend on additional climates, such as teamwork, to ensure that surgeries are completed successfully.

Given the importance of minimizing adverse outcomes that can be life-threatening, the limited number of climate strength studies in the area of safety climate, and the unexpected and conflicting prior results, further research to clarify the effects of safety climate strength is warranted. Similar to the rationale presented for learning climate, safety climate was expected to yield the most positive outcomes when it is not only high, but when all team members have
similarly high perceptions, thus yielding more consistent safety behaviors across the members
(Mischel, 1976).

**Hypothesis 2b:** Safety climate strength moderates the positive impact of safety climate
level on safety behaviors, such that the relationship is more pronounced when the climate
is strong than when the climate is weak.

In addition, given that learning climate level was expected to have a U-shaped relationship with
cclimate strength, my next hypothesis paralleled Hypothesis 3a with respect to a curvilinear
interaction:

**Hypothesis 3b:** There is a curvilinear interaction between safety climate level and
safety climate strength on safety behaviors, such that the relationship between
cclimate level and safety behaviors is more robust when climate strength is high
(compared to low), but that this effect becomes less pronounced as climate level becomes
extremely high or low.

**Climate Alignment**

As previously described, the construct of organizational climate has most often been
conceptualized as a consensus model, resulting in measurements of average climate level (see
Carr et al. (2003) for a meta-analytic review). More recently, researchers have advocated
considering climate from a dispersion model perspective, resulting in measurements of climate
**strength** via rating variance across individuals (e.g., Colquitt et al., 2002; Gonzalez-Roma et al.,
2009). However, some have argued that the dispersion model has an additional component
beyond strength that is rarely considered: **uniformity** (e.g., Brown & Kozlowski, 1999; Gonzalez-
Roma, 2011).

Uniformity refers to how individuals’ ratings are grouped- do they form just one cluster
of data points, or multiple clusters? In the climate literature, the presence of multiple groupings
could indicate the presence of subclimates within an organization, whereby employees have different perceptions across the groups, but more similar perceptions within the groups (Schneider et al., 2011b). For example, on a 5-point climate rating scale with an average rating level of 3, it could be that the spread of data points represents a single normal distribution, or the data could be bimodal, with 50% of the respondents giving a rating of 2 (i.e., low climate level) and the other 50% giving a rating of 4 (i.e., high climate level). Variance (i.e., strength) statistics can help us detect these subclimates only to a limited extent, especially since each subclimate could be strong or weak. In other words, it is possible to have a strong or weak uniform climate, or a strong or weak non-uniform (e.g., bimodal) climate (Brown & Kozlowski, 1999; see Figure 3 for a visual example). As such, strength alone may not be sufficient for fully describing the nature of dispersion models, hence the importance of empirically investigating whether climate (non)uniformity due to subgroups will predict organizational outcomes beyond climate strength alone.

Various theories and studies have addressed the questions of whether a given variable can explain why subgroups emerge and what is the impact of subgroups on group outcomes. For example, social identity theory states that in-groups and out-groups can form based on either arbitrary or meaningful criteria, and it has been found that this group status can explain positive versus negative treatment by others, as well as conflict (Brewer, 1995; Tajfel, 1970). Realistic conflict theory describes how groups can form based on the presence of incompatible goals, and that can lead to negative out-group stereotypes, but also greater in-group cohesion (Sherif & Sherif, 1953).

One variable that often seems to capture the existence of subgroups is worker position/status. Much research, particularly in the appraisal and feedback literature, has been devoted to exploring how ratings vary by source (i.e., self, colleague, or supervisor), and
approaches to capitalize on (or mitigate) these differences (e.g., 360-degree ratings and feedback; Conway & Huffcutt, 1997; Woehr, Sheehan, & Bennett, 2005). Another example can be found in the leader-member exchange literature (Dansereau, Graen, & Haga, 1975; Graen & Uhl-Bien, 1995). By definition, this theory divides raters into leaders and members (followers), and measures the quality of the leader-member relationship. Interestingly, and similar to what is encountered with multi-source ratings, leaders and followers tend to rate the same construct of interest (i.e., performance and the relationship, respectively) differently. In fact, in a meta-analysis of LMX research, Gerstner and Day (1997) only found a correlation of $r = .29$ between leader and follower ratings, and recommended that leader-follower agreement should be examined as a variable in its own right. Similarly, in their review of the culture and climate literature, Ostroff et al. (2012) recommended that “the conditions under which the existence of subclimates and subcultures is beneficial or detrimental to the organization as a whole” (p. 667) should be studied. Following these suggestions, my dissertation examined the impact of differential climate perceptions formed by leaders and followers on climate facet-specific outcomes.

Despite the recommendations, there appears to be limited research that uses leader-follower (dis)agreement as a predictor or outcome variable in the climate literature. While some studies have examined whether leader-follower alignment exists (e.g., Boan, Nadzam, & Clapp, 2012; Singer et al., 2008), to my knowledge, there are only a few examples where it has actually been used as a predictor of team/organizational outcomes (Bashshur et al., 2011; Cogliser, Schriesheim, Scandura, & Gardner, 2009; Gibson et al., 2009; McKay et al., 2009). For example, in their study of a large retail organization, McKay and colleagues (2009) found that the greatest sales growth was realized in stores where managers and subordinates had similar, high levels of diversity climate perceptions. Bashshur et al. (2011) discovered similar leader and
follower levels of perceived organizational support led to improved team performance and positive affect. Lastly, Gibson et al. (2009) determined that leader-team alignment, which they termed “low leader-team perceptual distance,” was positively related to team performance.

When there is alignment of leader and follower perceptions, then the fact that researchers usually tend to rely on subordinate ratings would presumably not matter as much. But all of the above studies found that misalignment can be detrimental, with two of them concluding that it is even more detrimental than when climate perceptions are low and aligned (Bashshur et al., 2011; Gibson et al., 2009). Thus, it is crucial to answer two important questions: 1) Why does misalignment occur, and 2) What are the consequences of misalignment?

Why Does Climate Misalignment Occur?

There are several different directions that climate could possibly flow in an organization: top-down, bottom-up, and lateral. Although traditionally, climate has been conceptualized as top-down, flowing from upper management down to subordinates (Schein, 2010), I will explain the theoretical rationale for why it could be expected in all three directions. For each of these three directions, I will also address how misalignment could arise.

Climate as Top-Down. As described earlier, Ostroff et al.’s (2012) integrated model of culture and climate proposed that organizational leaders are the linking mechanism between culture and climate. They express the underlying culture through their decisions and behaviors, which in turn affect followers’ climate perceptions. When the leaders’ actions are clear and unambiguous, followers are expected to have similar interpretations of climate as the leaders (Mischel, 1976), or alignment.

The rationale for climate management being top-down can be found in several additional theoretical approaches/frameworks. First is Bandura’s (1986) social learning theory. Followers will observe leader behaviors, which presumably reflect an organization’s cultural values and
policies. Leaders serve as role models, such that followers will imitate leader behaviors, and the feedback they receive will reinforce which behaviors and corresponding values are prioritized. Second is the socialization perspective, which describes how newcomers are taught about the organization via socialization activities such as rituals (e.g., office birthday parties), orientation sessions, and feedback from more established members (Lester, 1987). Feldman (1981) further specified that if these socialization activities are formalized and systematically implemented by management, that will lead to greater consensus in climate perceptions (Lindell & Brandt, 2000).

Additional support for the top-down approach to climate is found in the trickle-down model, or cascading leadership approach (e.g., Bass, Waldman, Avolio, & Webb, 1987; Mayer, Kuenzi, Greenbaum, Bards, & Salvador, 2009). This model has been utilized in a number of domains, including transformational leadership and ethical climate. It proposes (and has been supported) that upper management creates a climate/engages in activities that influence the climate perceptions and subsequent behaviors of lower level leaders, which in turn communicates that same climate to followers. In fact, a central tenet of the transformational/charismatic leadership approach is that leaders communicate a vision for the organization to their followers and inspire them to challenge their own values and beliefs to become something more, such that followers begin to identify with the leader’s vision and espoused values (Bass & Avolio, 1994; House & Shamir, 1993).

Overall, there has been very strong support for the top-down approach to climate (e.g., Bass et al., 1987; Kozlowski & Doherty, 1989; Mayer et al., 2009; Zohar & Luria, 2005). However, there are numerous reasons why climate perceptions may not be isomorphic between leaders and followers. First, the top-down approaches described above depend on a clear message being sent by the leader. Perhaps the leader thinks he/she is explaining or demonstrating the company’s expectations and policies very clearly, but the message is
perceived as inconsistent or unclear by followers. This could lead to follower interpretations that are not consistent or aligned with the leader, per the strong situation theory (Mischel, 1976).

Second, it is possible that an organization could espouse a value that the leader does not actually share. Thus, while the leader might engage in actions that reinforce the company line, to relieve the resulting cognitive dissonance, he/she might try to convince him/herself that that the climate being created is actually in line with his/her beliefs (Festinger, 1957). But if the followers’ climate perceptions are based on the leader’s observable actions rather than beliefs, then this could lead to a perceptual misalignment.

The next two possible explanations for leader-follower misalignment are tied to a common assumption in leadership research: that the subordinates actually see and are aware of everything that goes on related to what they are rating (Hunter et al., 2007). In reality, subordinates may not be privy to what occurs in higher ranks that could be affecting the leader’s climate perceptions but not their own. Suppose an immediate supervisor has gotten the impression from upper management that a certain behavior is valued, but the supervisor disagrees from a moral standpoint and demonstrates the importance of the opposite behavior to his/her subordinates. The supervisor may base his/her climate perceptions on experiences with upper management, while the subordinates may not even be aware of upper management’s position, since employees tend to be most influenced by supervisors closest to them in the hierarchy (Zohar, 2000). Thus, the subordinates’ ratings would be based on the immediate supervisors’ actions, leading to a difference in climate perceptions compared to the supervisor.

Related to this point, it could be that the supervisor’s beliefs are aligned with the company’s, and he/she does a lot of work “behind the scenes” to create outcomes in line with those beliefs. Since subordinates may not be aware of these actions, they might have less favorable climate impressions than the supervisor.
All of these potential sources of climate perceptual misalignment reflect possible weaknesses with the top-down approach to climate formation. However, there is also theoretical support for followers influencing the leader and each other, which I describe next.

**Climate as Lateral or Bottom-Up.** Many of the theories presented in support of a top-down process of climate could also be used to explain a more lateral perspective, whereby followers’ interactions with each other are a dominant cause of follower climate level. For example, social learning may not only be contingent on the role model having formal position power. According to French and Raven (1959), leaders with personal power (i.e., referent or expert) can be influential as well. That is, if a group of workers of the same status in the organizational hierarchy have a colleague whom they admire, respect, and/or come to for assistance based on exemplary knowledge of a topic, the fact that he/she does not hold a formal leadership title in the company may not matter. That person’s “followers” could still identify him/her as their role model and emulate his/her actions or subscribe to his/her beliefs. Thus, a climate could be established without the influence of a formal leader/supervisor.

The next theory that was presented in support of top-down influence dealt with newcomer socialization. When the organization has formalized socialization policies imbued with its cultural messages, it is quite plausible that follower climates will be influenced and in line with the company’s, or consistent with Schneider’s (1997) ASA model, followers will leave the organization. However, every moment spent in the workplace could be considered a socialization activity. After their first day, or perhaps their first week, newcomers will likely be spending much more time with their colleagues than in formal orientation sessions or ritual activities, or even compared to time spent with their immediate supervisor. Social information processing theory (Salancik & Pfeffer, 1978) states that social information in a worker’s environment can influence his/her perceptions of and attitudes toward that work environment.
Therefore, I believe those social experiences with colleagues, ranging from casual conversations to collaborating on work projects, will be very influential in determining climate perceptions. In fact, Rentsch (1990) found that networks based on informal work connections yielded greater climate consensus than networks based on formal work units.

When subordinate climate is formed via lateral influence processes, there is the potential for alignment or misalignment with leader perceptions. For example, if the informal subordinate leader’s climate perceptions were initially shaped by the formal leader’s actions, then that person would essentially be further promulgating the company’s climate to his/her peers. In this case, climate alignment would likely be present. Another possibility is that the climate originated at the subordinate level and is communicated through subordinate actions; if it is strong enough perhaps that climate could flow upstream, or bottom-up, to influence the leader’s climate perceptions. In that case, alignment would also occur. Thus, reminiscent of the original theoretical underpinnings of transformational leadership, the direction of influence could be reciprocal (Burns, 1978).

But what if the climate remains a lateral influence and does not evolve into a bottom-up process? If it is indeed somewhat independent from the climate that the leader is promoting, then misalignment could occur. As an example, consider a classroom instructor who teaches two sections of the same course. The instructor could be utilizing the exact same teaching strategy in both sections, but in one class the students are very participative and like to share their ideas, and in the other section students are reticent and disengaged. It would seem that the students themselves have created distinct climates independent of the instructor’s actions, and would therefore rate a climate for learning scale differently in each class. But if the instructor believes he/she is enacting the same values and pedagogical procedures in both sections, he/she may have
a consistent perception that he/she has created a high climate for learning in both classes. Thus, misalignment could occur in his/her uncommunicative class.

**What are the Consequences of Misalignment?**

Given all of the potential manners in which leader-follower climate misalignment could occur, it would be prudent to determine whether such misalignment has any consequences for team or organizational outcomes. If it does, then that finding would provide incentive to organizations to assess both leader and follower perceptions, and to take actions to remedy the differences if appropriate. For example, prior studies have suggested that if misalignment occurs, the direction of the difference matters (Bashshur et al., 2011; Gibson et al., 2009). That is, depending on the particular construct of interest, it may be more detrimental for a leader to have higher ratings than his/her followers, or vice-versa.

To illustrate, Bashshur and colleagues (2011) found that when team members had higher perceptions of their team’s organizational support than their managers, team performance and positive affect were *higher* than when managers had higher perceptions than their followers. This could be because if the manager perceives that everything is alright, he/she may have a more hands-off approach to giving the team support even though they may actually feel they need it. Gibson and colleagues (2009), on the other hand, found that when team members had had higher perceptions of their team’s goal accomplishment than their leaders, team performance was *lower* than when leaders had higher perceptions than their followers. In this situation, if the manager has a higher rating then he/she may not feel the need to help the group anymore, but the effects are only temporary until the team encounters an obstacle. But if the manager has a lower rating, then he/she might try to assist the team even though help is deemed unwelcome and unnecessary, leading to longer-lasting negative emotions such as dissatisfaction and frustration.
Although their measure of goal accomplishment was not a climate measure, the impact of leader-follower perceptual misalignment can still be seen. Thus, across these two studies we can see competing results and explanations for misalignment, which may suggest that results depend on which climate facet is used.

Based on the examples and rationale that has been described, two main lessons can be learned. First, it is important to move away from the “typical leadership study” that only uses subordinate measures (Hunter et al., 2007) and to also consider leader perceptions. Whether leaders and followers are aligned can clearly have an impact on team and organizational outcomes. Second, it is not enough to simply study alignment versus misalignment as a whole (cf. de Jong & Dirks, 2012). Outcomes may be differentially affected by the direction of misalignment (i.e., whether the leader or follower has higher ratings). In other words, it is important to determine whose perceptions “matter” more for ensuring positive outcomes.

The studies conducted in this dissertation addressed these two points by utilizing both leader and follower climate perceptions, and specifically measuring the direction of misalignment when it occurred.

**Climate for Learning: Alignment**

Although not often tested (to my knowledge), leaders are expected to be able to create a learning climate that supersedes any individual learning orientations (e.g., Dragoni, 2005; Gully & Phillips, 2005; Zaccaro et al., 2008). If that is the case, then leader and follower learning climate perceptions should be expected to be in alignment. However, as discussed earlier, misalignment can and does occur (e.g., Bashshur et al., 2011; McKay et al., 2009). When that is the case, then if one does not measure both leader and follower perceptions, he/she will not fully comprehend the relationship between learning climate and outcomes. For instance, if Hypothesis
Ia is supported and high follower safety climate level predicts good outcomes, then an organization may think that it is sufficient to just gather follower perceptions as part of their assessment process. But what if a misalignment such as high follower ratings and low leader ratings predicts negative outcomes? If the organization has not measured leader ratings, then it could erroneously think that everything is fine and no interventions are needed.

Following the mantra that higher climate levels are better, I believe that the best learning outcomes will occur when both leader and follower learning climate levels are high. In this case, leaders would likely not attempt to change the climate because they feel it is already good, and followers would feel comfortable and supported in obtaining new knowledge, asking questions, and sharing their findings. On the other hand, if both leaders and followers have low perceptions, then they are probably not engaging in actions that are productive for learning, and have no motivation for making any changes since the other party feels the same way. With neither side feeling that learning is valued or encouraged, I believe that followers are unlikely to exert extra effort to learn beyond what is minimally required of them.

*Hypothesis 4a:* Learning behaviors are higher/better when leader and follower learning climate levels are aligned and high, and lower/worse when leader and follower learning climate levels are aligned and low.

As seen in prior studies (e.g., Bashshur et al., 2009, Gibson et al., 2009), misalignment overall, as well as the direction of misalignment, may also impact outcomes. If follower perceptions are low and leader perceptions are high, then the leader is most likely unaware of how the followers feel, and as such would not take any actions to improve a learning climate that he/she already thinks is satisfactory. This would result in continued low climate perceptions by the followers, and little motivation for engaging in learning behaviors.
On the other hand, if the followers’ perceptions are higher than the leader’s, then despite the leader’s negative outlook, the followers could still be engaging in some learning behaviors. In addition, based on his/her low climate perceptions, the leader could conceivably try to alter the climate to fix something that is not actually broken. One possible outcome is that followers will engage in even more learning behaviors. But another possibility is that if followers already feel they are exerting extra effort to engage in learning behaviors, but the leader, in trying to improve the climate, unintentionally implies that the followers are not engaging in sufficient learning behaviors or becomes excessively intrusive, this could cause frustration and resentment amongst the followers. This resentment could actually lead to a decrease in follower learning behaviors, as Gibson and colleagues (2009) found in their study on team constructive conflict misalignment and performance outcomes. But, even if this occurred, I believe that the decrement would not be large, since clearly something was causing followers to believe that learning was important. As such, the amount of learning behaviors will likely still be greater than when followers have lower learning climate perceptions relative to leaders. Thus, while the magnitude of difference for leader-higher versus follower-higher climate misalignment may not be quite as large as it is for safety climate (as described in the next section), I believe that when misalignment occurs, it would be better for followers to have higher relative levels:

_Hypothesis 5a1:_ Learning behaviors are higher/better when followers have higher learning climate levels than leaders, and lower/worse when followers have lower learning climate levels than leaders.

A visual summary of Hypotheses 4a and 5a1 can be seen in Figure 4.

It is important to note that the strength of the relationship in Hypothesis 5a1 may depend on the actual values of climate level reported. If followers have a maximum climate level and do
not feel there is anything they could do to improve, and the leader has a lower climate level, then leader interventions would be particularly irrelevant. If on the other hand, the followers have a moderate climate level and the leader has a lower level, then leader interventions could still potentially help improve follower safety behaviors.

*Hypothesis 5a*: As followers’ absolute learning climate levels become higher, the relationship between misalignment and learning behaviors becomes weaker.

Given the compelling rationale that leader-follower alignment should impact safety outcomes and that alignment is a separate concept from level and strength (as described previously), it is quite possible that alignment adds explanatory power beyond what has previously been studied. To test this, I hypothesized:

*Hypothesis 6a*: Leader-follower learning climate alignment explains variance in learning behaviors beyond what is explained by climate level and climate strength alone.

**Climate for Safety: Alignment**

As a representative of strategic climate, safety climate is particularly important because of the potential for high-stakes outcomes. If low follower climate levels are not the only thing that leads to negative safety outcomes, then it is crucial to investigate what else does—namely, leader climate levels.

Similar to the rationale for learning climate, I believe that when jointly considering leader and follower perceptions, better outcomes will occur when both leader and follow climate levels are high. Leaders would not feel the need to improve any processes or waste any resources doing so, and followers would feel secure knowing that expectations have been clearly laid out that have everyone’s safety in mind. On the other hand, if both leaders and followers have low perceptions, then they are probably not engaging in actions that are conducive to ensuring safe
outcomes. However, seeing that the other party has just as low perceptions may promote a complacent attitude where neither side wants to take steps to improve their behavior and raise the climate levels. Thus, ignoring safety protocols- or worse yet, engaging in explicitly unsafe activities- is likely to go unchecked, leading to worse outcomes.

**Hypothesis 4b:** Safety behaviors are higher/better when leader and follower safety climate levels are aligned and high, and lower/worse when leader and follower safety climate levels are aligned and low.

The direction of misalignment could impact outcomes as well (e.g., Bashshur et al., 2011, Gibson et al., 2009). In the case of safety climate, we might assume that followers are the ones who mainly do the actual hands-on work that could be deemed safe or unsafe, and as such their perceptions matter more than their leaders in terms of influencing what behaviors the followers will engage in. Furthermore, if followers perceive low safety climate levels and their leader perceives high safety climate levels, then the leader, thinking that everything is fine, may not take action or intervene in an attempt to alter the followers’ behavior, which could increase the likelihood of adverse safety outcomes.

On the other hand, if the followers’ perceptions are higher than the leader’s, then the leader, based on his/her own impressions, may then intervene with well-intended efforts to improve safety behaviors. While this could annoy the follower since they already believe they are doing things well, I do not believe it would cause them to alter their behaviors in a negative fashion. This may not be the case for other climate types (cf. Gibson et al., 2009) or when there are lower stakes involved, but it is doubtful that if someone perceives the importance of preventing accidents or injury to themselves or others, that they would stop engaging in those
behaviors just because they were annoyed by unnecessary interventions by their supervisor. Thus I proposed the following:

*Hypothesis 5b₁*: Safety behaviors are higher/better when followers have higher safety climate levels than leaders, and lower/worse when followers have lower safety climate levels than leaders.

A visual summary of Hypotheses 4b and 5b₁ can be seen in Figure 4.

In addition, as described in the section on learning climate alignment, the extent of misalignment’s effects on safety behaviors may be diminished as climate levels reach their extremes. If followers have a maximum climate level and do not feel there is anything they could do to improve, then leader interventions would be particularly irrelevant.

*Hypothesis 5b₂*: As followers’ absolute safety climate levels become higher, the relationship between misalignment and safety behaviors becomes weaker.

Finally, as described previously, it is possible that alignment adds explanatory power beyond what has previously been studied. To test this, I hypothesized:

*Hypothesis 6b*: Leader-follower climate alignment explains variance in safety behaviors beyond what is explained by climate level and climate strength alone.
CHAPTER 2

STUDY 1: LEARNING CLIMATE IN CLASSROOMS

Method

Although prior studies have utilized scales to measure learning climate in an educational setting (e.g., Ames & Archer, 1988; Button et al., 1996; Midgley et al., 1998), I could not find any one scale containing items that were all relevant to my target sample: university students. Therefore, I first conducted two pilot studies before creating a final measurement instrument to be administered in the main research study.

Pilot Studies

Participants. A total of 268 students from four undergraduate Psychology classes at the Pennsylvania State University participated across two pilot studies. More specifically, 96 students (77% female) and an independent sample of 172 students (75% female) were administered the first and second online pilot surveys, respectively.

Procedure. Items from various psychological safety and learning goal orientation scales were modified to create a learning climate scale with two expected factors based on the results of a literature review on participation and learning orientation. Numerous feedback sessions with undergraduate and graduate students were conducted to modify, eliminate, and create new items to best capture the constructs of interest in a manner that was relevant to a university classroom setting. Furthermore, input during these sessions led to the creation of relevant learning behavior items that would serve as the dependent variable in the study.

The initial pilot survey contained 47 items and was administered online to 96 students in two undergraduate Psychology classes in exchange for extra credit. Based on the restricted range of results (i.e., almost everyone was responding with a 4 or a 5 on a 5-point scale), the
rating scale anchors were adjusted to help expand the range of student responses. Specifically, while the number of scale anchors remained at 5, the scale was switched from a “Strongly Disagree to Strongly Agree” format to a “Not at all true to Extremely true” format.

The second pilot survey with the revised scale anchors was administered online to 172 new students in two additional undergraduate Psychology classes. Based on EFA results (scree plots, eigenvalues, and pattern of loadings), a total of 16 learning climate items and one learning behavior item were discarded, and four tentative climate and two tentative behavior factors were delimited. Furthermore, two new learning climate items were added to the survey in the hope of improving the reliability of one of the factors revealed by the EFA. In total, 31 items were retained for the final survey instrument (see Appendix A for a complete list of these items and their original sources).

**Main Study**

**Participants.** Using the revised survey based on the second pilot study, data were collected in 69 classes (62 undergraduate and 7 graduate) at The Pennsylvania State University’s University Park campus during the Spring 2013 semester. Classes with fewer than 40 students in the College of the Liberal Arts that were also structured to allow for class participation were targeted for recruitment. The total sample consisted of 41 instructors (56% female) and 1,232 students (59% female) in 69 classes. For instructors, 85 percent were Caucasian, and the average number of years taught at the university was nine years. For students, 74 percent were Caucasian, 92 percent received the majority of their pre-university education in the United States, and the average age was 21 years. Students in 29 of the classes were administered the survey online, but paper versus online format yielded no significant differences in any of the student ratings scales (see Table 1 for a summary of t-test results).
**Procedure.** Classes were identified by looking through the University’s course schedule and course descriptions, and then contacting instructors of classes that were small to moderately sized (i.e., fewer than 40 students) and appeared to involve the opportunity for class participation (which was subsequently confirmed by the instructor). To encourage high response rates, undergraduate research assistants visited each class (after obtaining instructor permission) once at the end of its meeting time and made an announcement asking students to fill out a brief, anonymous five-minute survey about class participation. Paper surveys were then distributed to students as well as the class instructor. However, the instructor was asked to leave the room and complete the survey separately from the students to avoid feelings of coercion and to allow students to honestly respond. Students turned in the surveys as they left the room, but were also given the option to mail them if they preferred (no one opted for this option). For classes where instructors did not allow in-person recruitment, emails containing a link to an online version of the study were sent to all enrolled students via the instructor.

Instructor and student surveys were identical on the first page, each containing the learning climate and control measures. However, while the student surveys contained a second page asking them to rate their learning behaviors, instructors were not asked to complete this information until two to three weeks later, at the end of the semester via an online survey. In order to keep the survey brief and ensure instructor participation, and because many scholars argue that group level outcomes are the most appropriate level of analysis for climate studies (e.g., Glick, 1985; Schneider et al., 2011b), instructors were asked to rate learning behaviors of the class as a whole, and not per individual. However, instructors with class sizes of 12 or fewer (n=9) were asked to provide individual ratings. Finally, all instructors were also asked to answer
a few additional questions about their class, such as whether participation was a formal requirement and what percentage of an average class session was spent on student participation.

To maximize the data’s integrity, I eliminated cases where respondents did not appear to be rating truthfully or taking the survey seriously. Specifically, I examined the data for straightliners or other consistent response patterns (e.g., repeating ratings sequentially from one through 5). Furthermore, I examined the timestamps for surveys taken online and eliminated cases where respondents took fewer than three minutes to complete the survey.

**Measures**

All of the learning climate and behavior measures in this section represent new scales, consisting of items that were newly created and/or adapted from multiple other scales. The final choices of scales and items were determined by exploratory and confirmatory factor analyses on data from the main study, as described in the Results section further below. Please refer to Appendix A for a complete list of the final scale items. All measures, with the exception of one of the learning behavior scales (reflection), were administered to both instructors and students.

**Climate for Learning.** Climate for learning was assessed via three factors: participation, mistakes, and learning goal orientation. Students and instructors answered identical items and scales. All items were measured on a 5-point Likert scale ranging from 1 = “Not at all true” to 5 = “Extremely true.”

**Climate for participation.** This measure reflected how comfortable and encouraged students in a class felt with sharing their ideas and speaking up. A four-item scale was used, consisting of items such as “Students in this class are encouraged to participate in in-class discussions” and “Students are encouraged to share their ideas in this class, rather than keeping them to themselves” ($\alpha_{\text{student}} = .81$; $\alpha_{\text{instructor}} = .88$).
Climate for mistakes. This measure captured whether the classroom environment was conducive to asking and answering questions even when a student might be in error. A four-item scale was used, containing items such as “In this class, making mistakes is considered a part of learning” and “Students feel that it is ok to make a mistake when answering a question in this class” ($\alpha_{\text{student}} = .80; \alpha_{\text{instructor}} = .79$).

Climate for learning goal orientation. Respondents were asked to rate whether the general feeling in the class was one of truly understanding the material and expanding one’s knowledge. This was assessed via four items, including “In this class, a thorough understanding of the topics is viewed as very important” and “In this class, critically analyzing the material being learned is valued” ($\alpha_{\text{student}} = .85; \alpha_{\text{instructor}} = .70$).

Learning Behaviors. The learning behavior items represented actual behaviors in which students engaged to improve their learning. Students were given these items in the same survey as the learning climate items, but instructors were given the items at a second time point at the end of the semester. For all of the items, respondents were asked to indicate their responses based on their own individual behaviors (or in the case of the instructors, the class as a whole), compared to other similarly-sized courses he/she had taken (for instructors, taught). All items were measured on a 5-point Likert scale ranging from 1 = “A lot less frequently than my other courses” to 5 = “A lot more frequently than my other courses.” A two-factor solution was indicated.

Participation behaviors. This measure captured in-class behaviors related to participation, such as sharing comments and asking questions. It was assessed with three items, including “How frequently would you say you (for instructors: “students in your class”) voluntarily participate in class discussions?” and “How frequently would you (for instructors:
“students in your class”) say that you (they) ask questions during class to better understand the material being taught?” (α_student = .83; α_instructor = .86).

In addition to the Participation Behaviors scale, instructors were given a single-item measure asking “How frequently do your students participate in any one class session” on a scale from 1 = “Very infrequently” to 5 = “Very frequently.”

**Reflection behaviors.** The four items in this scale represented students’ efforts outside of the classroom to reflect on their understanding of the course material and to evaluate their learning methods. Sample items included “How frequently would you say that you review your graded work to understand why you received the grade you did?” and “How frequently would you say that you take time to reflect on how you could improve your learning methods?” (α_student = .78). Since instructors cannot accurately assess the extent to which students engage in the out-of-class and often internal cognitive activities, these items were not included on the Instructor version of the survey.

**Control Variables.** Class size, gender (percentage of females in the class), whether students received the majority of their pre-university education in a different culture (percentage with non-U.S. education), the percent of time instructors tend to spend on student participation in the average class, a student’s expected grade in the class, and a single question asking on average how frequently a student tend to participate in all of his/her classes overall were considered as possible control variables. Each of these variables was expected to potentially influence a student’s learning behaviors, but many of these influences resided at the individual level and were also conceptually different from the influence of interest in this study: learning climate.
Results

Exploratory Factor Analysis (EFA)

Due to the fact that the sample size of the second pilot study (N=175) was low for conducting an EFA with 30 items, that two new items were added to the survey after the conclusion of the pilot studies, and that these were new scales that had not previously had their psychometric properties validated, an EFA on the main study data was warranted (Hurley, Scandura, Schriesheim, Brannick, Seers, Vandenberg, & Williams, 1997). However, a sample size of 69 at the class level of analysis was deemed too small, so the analysis was performed at the individual level for students and instructors combined. One-third of the main study data was randomly selected for the EFA (n=434) so that a confirmatory factor analysis (CFA) could be performed on the remaining two-thirds (n=867).

Separate EFAs with principal axis extraction and direct oblimin rotation were conducted on the learning climate and learning behavior items, due to the large number of items in both scales (17 and 14 items, respectively). While this was done to ease the interpretability of the results, the CFA that was performed on the remaining data included all items in the same measurement model to ensure discriminant validity.

The first EFA utilized the 17 learning climate items. Based on the pilot study, a four-factor solution was expected, representing participation, learning orientation, asking questions, and making mistakes. The scree plot did not reveal a clean leveling off point for determining the number of factors, but using a cutoff eigenvalue of 1 yielded a four-factor solution, explaining a total of 62 percent of the items’ variance. For each factor, I checked the loadings for simple structure (i.e., high loadings on the intended factor and low cross-loadings). The end result was four items being dropped due to either high cross-loading or no high loadings at all, and twelve...
of the thirteen remaining items were evenly distributed across each of the first three factors. However, the fourth factor only contained one item. Thus, while the first three factors were judged to represent the constructs of participation, learning orientation, and a combination of asking questions/making mistakes, the fourth factor did not correspond to anything meaningful. Therefore, I re-ran the EFA but specified the number of extracted factors to be three. Results were almost identical to the three factors from the original four-factor solution (see Table 2) and explained 55 percent of the items’ variance, with the factor solution continuing to demonstrate simple structure. The only difference was an additional item was brought back into the “participation” factor. However, it did not appear to have the same qualitative meaning as the other four items on that factor, so it was dropped. In sum, the three-factor solution was retained, with a total of five dropped items from the main study survey, and the “asking questions” factor being absorbed into the “making mistakes” factor.

A second EFA was conducted on the 14 dependent variable items representing learning behaviors. Based on the results of the pilot study, I expected a two-factor model representing learning behaviors performed inside and outside of the classroom. The scree plot suggested a 3 or 4 factor solution, but since the fourth factor only explained an additional six percent of the items’ variance, and had an eigenvalue much lower than the third factor, I decided to investigate a 3-factor model, which explained a total of 59 percent of the items’ variance. For each factor, I again checked for simple structure and found that seven items needed to be dropped, leaving three items on the first factor, one item on the second factor, and three items on the third factor (see Table 3). Because of the undesirability of a single-item factor, I also specified a two-factor model, but the results did not yield qualitatively meaningful factors. Therefore, I retained the solution indicated by the three-factor model, but without using the one-item factor (“Inside 5”).
One of the items, “Outside 4”, had a high loading (.67) on Factor 1 and was qualitatively similar to the other Factor 1 items, but also had a cross-loading of .32 on Factor 2. Since Factor 2 was not going to be utilized, I retained this item in my scale.

Interestingly, while a two-factor solution was indeed retained as expected (with four and three items), the meaning and content of the two factors was somewhat different than expected. While the two factors did still represent in and out of class activities, they could more narrowly be focused on participation in class (“participation”) and reflection on class material and learning strategies outside of class (“reflection”).

**Confirmatory Factor Analysis (CFA)**

A CFA utilizing the 19 climate and behavior items indicated by the EFAs above was performed on the remaining two-thirds of the study data (n=867). The purpose of the CFA was to confirm the five-factor structure (3 climate and 2 behavior factors) suggested by the EFAs and to establish discriminant validity between the various measures. Since the climate measures represented team-level constructs, it would have been preferable to conduct a team-level CFA, but the team-level sample size (N= 69) was well below recommended guidelines (MacCallum, Widaman, Zhang, & Hong, 1999). In addition, there was a possibility that instructors and students conceptualized these constructs in a different manner, and that the factor structure for each group was not the same. However, with only 69 instructors, testing measurement equivalence was not possible. Therefore, the instructor data was added to the student data and a single CFA was performed using Mplus software (Muthén & Muthén, 2012).

Model fit was evaluated using the chi-square statistic. However, because the chi-square is known to be sensitive to sample size, four additional fit indices were used to assess the quality of model fit to the data. Specifically, RMSEA (Browne & Cudeck, 1993), CFI (Bentler, 1990),
TLI (Tucker & Lewis, 1973; also known as NNFI, Bentler & Bonett, 1980), and SRMR (Hu & Bentler, 1999) were used. According to Hu and Bentler (1999), recommended criteria for acceptable to good model fit are .06 or lower for RMSEA, .95 or higher for CFI and TLI, and .08 or lower for SRMR.

The CFA results (summarized in Table 4) showed that a five-factor model (as suggested by the EFA results; Model 1) fit the data well, ($\chi^2$(142)= 438, $p < .01$; RMSEA = .05; CFI = .96; TLI = .95; SRMR = .04). However, there were somewhat high correlations between the three learning climate factors, ranging from .52 to .62. Therefore, a three-factor model (Model 2) was tested in which the three climate factors were combined into one, but the two learning behavior factors were left separate. Next, a two-factor model (Model 3), where the three climate factors were combined into one and the two learning behavior factors were combined into one was tested. Last, an overall one-factor model was tested (Model 4). Each model appeared to have a progressively worse fit, and since the models were nested, a chi-square difference test was utilized to formally compare each model’s fit to Model 1. Results confirmed that Model 1 had a significantly better fit to the data than any of the other models. Thus, a five-factor model was retained.

**Justification for Aggregation**

The three climate for learning measures (participation, mistakes, and learning orientation) each represent an emergent shared group property (Kozlowski & Klein, 2000). Thus, it was critical to confirm that perceptions were shared amongst students in each class before aggregating the individual ratings to the class level. Following the guidance of LeBreton and Senter (2008), both interrater agreement (rwg; James, DeMaree, and Wolf, 1993) and interrater reliability, measured by intraclass correlations (ICC1 and ICC2) were assessed for each climate
scale. These analyses were only performed on student data, since there was only one instructor per class.

**Rwg values.** The interrater agreement for each item within a climate measure was calculated, and then averaged to compute a rwg value. Prior to calculating any average, negative individual rwg values were converted to zero, since there was no theoretical or conceptual reason for expecting a bimodal distribution of rating scores due to the presence of subgroups (James et al., 1984; LeBreton & Senter, 2008). When compared to a null uniform distribution, average interrater agreement was .83 (with a median value of .84) for participation climate, .67 (with a median of .69) for mistake climate, and .77 (with a median of .79) for learning orientation climate, all representing moderate to strong agreement (LeBreton & Senter, 2008).

**ICC values.** ICC values are intended to confirm that there is sufficient within-group agreement in the ratings and that an adequate amount of individual-level variance can be explained at the group-level (Bliese, 2000). ICC(1) and ICC(2) values were computed using a one-way analysis of variance (ANOVA) on the individual student-level data with class as the independent variable and the three climate scale scores as the dependent variable. All of the resulting F values were statistically significant at the p< .01 level, indicating that the variance between classes was greater than the variance within classes for all three learning climates. More specifically, ICC(1) calculations revealed that 7 to 19 percent of the variability in students’ climate perceptions could be explained by class membership (ICC(1)participation=.19; ICC(1)mistake=.07; ICC(1)learning orientation=.16). Furthermore, the group means on each scale mostly had reliable internal consistency (ICC(2)participation=.81; ICC(2)mistake=.57; ICC(2)learning orientation=.78) (ICC(2)=.92), although the reliability of the mistake climate scale was lower than
the other two. Taking all analyses as a whole into account, there was strong support for aggregating all three learning climates scales to the class level.

**Correlations**

The means, standard deviations, reliabilities, and intercorrelations of the study variables at the class level appear in Table 5. None of the control variables had significant intercorrelations except for course size and average participation in all PSU classes \(r=.52, p<.01\), but the variance inflation factor values (VIF; 1.54 and 1.37, respectively) were not high enough to justify dropping either of them from further analyses. As expected, some of the control variables also correlated with the dependent variables. Specifically, course size was negatively related to student-rated participation behaviors, classes with a higher proportion of females tended to have higher student and instructor-rated participation behaviors, expected grade in the course was negatively related to student-rated reflection behaviors, classes with a greater proportion of foreign-educated students tended to have lower levels of instructor-rated participation, and classes that were structured to devote more time to student participation tended to have higher student and instructor ratings of participation behaviors.

For the main predictor variables of interest, student-rated learning orientation climate was positively correlated with reflection behaviors. In addition, all student-rated learning climates were positively related to student-rated participation behaviors and the single-item instructor-rated participation measure. However, there were no significant correlations between any of the student-rated climate measures and the instructor-rated participation scale. In sum, with a few exceptions, the majority of the zero-order relationships involved student-rated predictor and outcome measures.
**Hypothesis Testing**

Based on the preliminary analyses that revealed three learning climate factors (participation, mistake, and learning orientation) and two learning behavior factors (participation and reflection), more specific iterations of the hypotheses were formulated and tested. For instance, it was expected that a classroom environment where students felt safe to participate in class discussions, as well as ask questions and make mistakes, would lead to increased instances of actually speaking up in class. On the other hand, in a class where truly understanding and critically thinking about the material was emphasized, reflection and seeking feedback on one’s work was anticipated. A visual summary of the variables utilized to test all hypotheses, and whether the hypotheses were supported, is presented in Tables 6 and 7, respectively.

**Climate Level and Strength.** Hypotheses 1a through 3a dealt with the effect of learning climate levels on behavioral outcomes, and how climate strength (i.e., variability amongst individual ratings) moderates that relationship. To test these three hypotheses, all variables were first centered to enhance interpretability by reducing non-essential collinearity (Dalal & Zickar, 2012), and then moderated hierarchical regression was performed. Control variables were entered in Step 1, main effects of student climate level and climate strength were entered in Steps 2 and 3, and the linear and quadratic products of climate level and strength were entered in subsequent steps (please refer to Tables 8 through 14 for summaries of all regression results).

**Hypothesis 1a.** Hypothesis 1a predicted that learning climate levels would be positively related to learning behaviors. Results revealed a significant main effect of participation ($B=.56$, $p<.01$) and mistake ($B=.48$, $p<.01$) climates on student-rated participation behaviors, but neither had a significant main effect on the instructor-rated participation scale ($B=.13$, $ns$, and $B=.00$, $ns$). However, mistake climate did have a main effect on the single instructor-rated participation
item \((B =1.22, p<.05)\). Thus, it appears that Hypothesis 1a was supported for participation and mistake learning climates, but more so when the outcomes were student-rated. Finally, learning orientation climate did not have a significant main effect on student reflection behaviors \((B =.09, ns)\). Overall, Hypothesis 1a was moderately supported.

**Hypothesis 2a.** Hypothesis 2a predicted that learning climate level would interact with learning climate strength, such that the positive relationship between climate level and behavioral outcomes would be enhanced when climate strength was also high (i.e., low variability). Indeed, a significant linear interaction was found for participation climate on student-rated participation \((B= -1.51, p<.05)\) as well as the single instructor-rated participation item \((B= -6.02, p<.01)\), although not the instructor-rated participation scale \((B= -1.83, ns)\). In contrast, a significant interaction was found for mistakes climate on the instructor-rated participation scale \((B= -4.69, p<.05)\), but not the other two outcome measures, although marginal significance was achieved for the student-rated participation scale \((B= -1.71, p<.10)\).

Graphical depictions of the significant and marginal interactions are presented in Figures 5 through 8. A simple slope analysis of the interaction of mistake climate level and strength on instructor-rated participation (Figure 5) revealed that neither line was significant, precluding any interpretation of that interaction. However, for the two interactions involving participation climate (Figures 6 and 7), there was a significant positive slope when climate strength was high, and a non-significant slope when climate strength was low. The marginally significant interaction involving mistake climate and student-rated participation behaviors also followed the same pattern (Figure 8), including a significant simple slope when climate strength was high. In sum, the results for participation and mistake climate suggest that not only was there a more pronounced relationship between climate level and outcomes when climate strength was high
(i.e., low variability in ratings), as predicted, but there was also no significant relationship at all when climate strength was low.

On the other hand, while learning orientation climate level and strength also had a significant interaction predicting student reflection ($B = .73, p < .05$), the pattern of results was the opposite of my prediction (see Figure 9). A positive significant slope of climate level predicting reflection behavior was present when climate strength was low, and a non-significant slope was present when climate strength was high. Thus, overall Hypothesis 2a was supported for the participation and mistakes dimensions of learning climate (although there were a few inconsistencies depending on the source of the outcome ratings), and Hypothesis 2a was not supported for learning orientation climate.

**Hypothesis 3a.** Hypothesis 3a predicted that a curvilinear interaction between climate level and strength would better predict student learning behaviors than a linear interaction, such that climate level squared and then the product of climate level squared and climate strength were entered into Steps 5 and 6 of the regression model. However, no significant results were found, so the hypothesis was not supported.

A visual summary of all hypotheses tested and whether they were supported is provided in Tables 6 and 7.

**Student-Instructor Perceptual Alignment.** Hypotheses 4a through 6a dealt with the alignment (and misalignment) between student and instructor climate perceptions in each class. To test Hypotheses 4a, 5a1, and 5a2, polynomial regression and response surface methodology were utilized (Edwards & Parry, 1993). Historically, when assessing the extent of (mis)alignment between two targets, such as pre- and post-intervention measurements or person-environment fit, difference scores were often used, which tends to increase the amount of error in
predictions and decrease the reliability of the measure (Edwards, 1994). That is, the two constructs are assumed to be dependent, such that when one score is subtracted from the other, both are constrained to have equal regression coefficients, and error variances are assumed to be dependent and added together. Polynomial regression has been proposed as a better alternative because it assumes construct independence and treats error variances as such (Edwards & Parry, 1993). It also allows the researcher to examine outcomes in a multidimensional framework, based on the direction, magnitude, and relative component levels, as opposed to simply measuring the difference as a single value.

In this dissertation, polynomial regression was better suited to allow me to measure the magnitude of the leader-follower difference, consider who had the higher/lower score, and examine whether outcomes changed depending on whether climate levels tended to be high or low. For example, was there a change in outcomes based on whether leaders had a climate level of three and followers had a level of one, versus leaders having a level of one and followers having a level of three, versus leaders having a level of five and followers having a level of three? Each of these scenarios would have yielded a difference score of two, which clearly does not fully capture the distinctions amongst them. Polynomial regression was designed to allow analyses of those nuanced differences, and response surface methodology would allow me to examine these effects visually to obtain a more complete interpretation of the statistical results (Edwards & Parry, 1993).

Using polynomial regression entailed regressing learning behaviors on the control variables, followed by scale-centered student and instructor ratings of learning climate, as well as three quadratic terms constructed from these ratings (student ratings squared, the product of
student and instructor ratings, and instructor ratings squared). Doing so yielded the following general equation, control variables notwithstanding:

$$Z = b_0 + b_1X + b_2Y + b_3X^2 + b_4XY + b_4Y^2 + e$$  

(1)

$Z$ represented learning behaviors, $X$ represented student climate ratings, and $Y$ represented instructor climate ratings. Furthermore, the student and instructor climate scores were scale-centered, such that a value of zero represented the midpoint of the scale.

The three-dimensional graphical surfaces created by the polynomial regression equations were then further analyzed using response surface methodology (Edwards & Parry, 1993). Since my hypotheses dealt with alignment and misalignment, I focused my analyses on the shape of the surfaces along the $Y=X$ line (aligned ratings - Hypothesis 4a) and the $Y=-X$ line (misaligned ratings - Hypotheses 5a$_1$ and 5a$_2$). These lines can be seen on the floor of the graphs presented in Figures 10 through 13, with the $Y=X$ line running from the front bottom corner (aligned, low ratings) to the back top corner (aligned, high ratings), and the $Y=-X$ line running from the far left corner (instructor ratings higher than student ratings) to the far right corner (student ratings higher than instructor ratings).

The results of all analyses of the graphical surfaces related to Hypotheses 4a, 5a$_1$, and 5a$_2$ are reported in Table 15. Furthermore, due to the numerous measures of learning climate and learning behavior and their possible combinations, a summary of all hypothesis conclusions is provided in Table 7. However, it is crucial to note that all of the data suffered from severe range restriction, precluding me from testing the full extent of student-instructor alignment/misalignment. Thus, while support (or lack thereof) for the hypotheses will be stated based on statistical results, the data restrictions precluded definitive conclusions.
Hypothesis 4a. Hypothesis 4a predicted that when student and instructor climate perceptions were aligned and high, students would engage in more learning behaviors than when climate perceptions were aligned and low. To test this, I set \( Y \) to equal \( X \) in Equation 1:

\[
Z = b_0 + b_1X + b_2X + b_3X^2 + b_4X^2 + b_5X^2 + e
\]

\[
= b_0 + (b_1 + b_2)X + (b_3 + b_4 + b_5)X^2 + e
\]

(2)

Thus, \( b_1 + b_2 \) represented the slope of the surface along the \( Y=X \) line (the maximum alignment line) at the point where \( X = 0 \), and \( b_3 + b_4 + b_5 \) represented the curvature of the surface along the \( Y=X \) line. To support Hypothesis 4a, \( b_1 + b_2 \) was expected to be positive, and \( b_3 + b_4 + b_5 \) was expected to be 0. This would represent a plane with a positive linear slope and no curvature, indicating that the \( Z \) values (learning behaviors) linearly increase as \( X \) and \( Y \) (student and instructor climate ratings) aligned values increase. To test these linear combinations of dependent regression coefficients, I utilized procedures recommended by Cohen and Cohen (1983) and Edwards and Parry (1993).

Analyses revealed that the slope along the \( Y=X \) line was not positive for either participation or mistake climate alignment predicting any of the student or instructor-rated participation outcomes, nor was the slope positive for learning orientation climate alignment predicting student reflection behaviors. However, \( b_1 + b_2 \) only represents the slope at the point where \( X=0 \). The surface of the graph had a significant positive curvature \( (p<.05) \), represented by \( b_3 + b_4 + b_5 \), along the \( Y=X \) line for participation climate alignment predicting student-rated participation behaviors (see Figure 10), and a marginally significant positive curvature for mistake climate alignment predicting instructor-rated participation behaviors \( (p<.10) \); see Figure 11).
A positive curvature paired with zero slope at the origin of the graph suggests that as alignment scores increased beyond the midpoint of the scale, learning behaviors increased, supporting my hypothesis, but as alignment scores decreased beyond the midpoint of the scale, participation behaviors also increased, disputing my hypothesis. Before giving too much credence to these results, it is important to note that Figures 10 through 13 also display the actual X,Y data points on the floors of the graphs. One can see that the data seemed to cluster mainly in the upper right quadrant (high-high ratings), and the shapes of the graphs along the Y=X line there do support Hypothesis 4a. However, because of the severe range restriction of data, the shapes of the graphs should not be interpreted beyond this area. Thus, Hypothesis 4a was partially supported statistically (due to the curvature instead of a plane) for participation climate alignment predicting student-rated participation, with mistake climate alignment predicting instructor-rated participation demonstrating a similar pattern. However, since there was no statistical support involving any of the other combinations of predictor and outcome variables, Hypothesis 4a was largely unsupported.

**Hypothesis 5a**. This hypothesis predicted that when student and instructor climate perceptions were misaligned, students would engage in more learning behaviors when their ratings were higher than their instructor’s ratings, and fewer learning behaviors when their ratings were lower than their instructor’s ratings. To test this, I set Y to equal \(-X\) in Equation 1:

\[
Z = b_0 + b_1 X - b_2 X + b_3 X^2 - b_4 X^2 + b_5 X^2 + e
\]

\[
= b_0 + (b_1 - b_2)X + (b_3 - b_4 + b_5)X^2 + e
\]

Thus, \(b_1 - b_2\) represented the slope of the surface along the \(Y=-X\) line (the maximum misalignment line) at the point where \(X = 0\), and \(b_3 - b_4 + b_5\) represented the curvature of the surface along the \(Y=-X\) line. To support Hypothesis 5a, \(b_1 - b_2\) was expected to be positive.
This would indicate that the Z values (learning behaviors) linearly increased as student ratings became increasingly larger than instructor ratings.

Again utilizing the procedures recommended by Cohen and Cohen (1983) and Edwards and Parry (1993), I found that in support of Hypothesis 5a₂, the slope along the Y = -X line at X=0 was positive for learning orientation climate misalignment predicting student reflection behaviors (p<.05; see Figure 12). However, the slope was not significantly different from zero when predicting student or instructor-rated participation behaviors with participation climate, nor when predicting student-rated participation behaviors with mistake climate. Furthermore, the slope was significantly negative (p<.05) when predicting instructor-rated participation behaviors with mistake climate (see Figure 11). At first glance this would seem in complete opposition to Hypothesis 5a₂, but further inspection revealed that this graph’s surface also had a significant positive curvature (p<.05). Combined with a negative slope at x=0, this suggests that at some point past the midpoint of the student-rated mistake climate scale, student ratings being higher than instructor ratings was better for participation behaviors (supporting Hypothesis 5a₁), but below that point, instructor ratings being higher than student ratings was better (not supporting Hypothesis 5a₁). Similarly, for mistake climate predicting student-rated participation, there was significant positive curvature (p<.05; see Figure 13).

Once again, range restriction makes it difficult to interpret these results. Statistically there was support for Hypothesis 5a₁ with learning orientation climate predicting reflection behaviors, and partial support with mistake climate predicting student and instructor-rated participation behaviors (due to the positive curvature rather than a plane). However, the fact that data points were not even present along most parts of the Y = -X line for any of the climate measures (or at all for learning orientation climate) limits interpretability. Thus, while there was
some statistical support overall, I concluded that practically-speaking, support for Hypothesis 5a1 was inconclusive.

**Hypothesis 5a2.** Hypothesis 5a2 predicted that as student ratings of learning climate neared the upper end of the rating scale, the effect of student-instructor misalignment would decrease. That is, once students had maximum ratings of learning climate, the extent of their misalignment with instructor ratings would be of less consequence. Graphically, this can be equated to a shape with a positive slope that begins to level off as X nears the value of 2 (the highest point on the centered scale). As described above, $b_3 - b_4 + b_5$ represents the curvature of the surface along the $Y = -X$ line. To support Hypothesis 5a2, this curve was expected to be negative, with its ridge line positively offset from the $Y=X$ line. However, there was no significant curvature present except for when mistake climate was predicting student (p<.05) and instructor-rated (p<.05) participation behaviors, and those curves were positive (the implications of which were explained immediately above when discussing Hypothesis 5a1; see also Figures 11 and 13). Visually, one can see that the graph for learning orientation climate predicting student reflection appears to level off as it moves up along the $Y = -X$ line, but there was no statistical significance for this curvature. Furthermore, there were very few to no data points in this quadrant of the graph for any of the climate measures, so any results, good or bad, were non-interpretable. Thus, Hypothesis 5a2 was not supported statistically, and practically speaking was inconclusive.

**Hypothesis 6a.** This hypothesis posited that student-instructor alignment/misalignment in climate perceptions would predict student learning behaviors beyond the influence of climate level and strength. However, the overall lack of support for Hypotheses 4a, 5a1, and 5a2, as well as the severe range restriction issues, precluded Hypothesis 6a from being tested.
Ancillary Analyses. Given the often lack of congruent results when using student ratings versus instructor ratings for the dependent variable of participation behaviors, I investigated how similar or different the student and instructor ratings were. With respect to the climate variables, instructor and student ratings were only significantly related for participation climate ($r=.50$, $p<.01$). For the outcome variables, there was a small to moderate correlation ($r=.26$, $p<.05$) between the student and instructor-rated participation scales. Although the student ($M=3.29$, $SD=.39$) and instructor ($M=3.23$, $SD=.78$) scale values were often similar and the mean values were not significantly different from each other ($t(64)=.29$, $ns$), one set of values was not always consistently higher or lower than the other. On the other hand, instructor single-item participation ratings ($M=3.74$, $SD=1.05$) tended to be higher than the student participation scale ratings ($t(64)=4.07$, $p<.01$), and there was also a moderately high correlation as well ($r=.41$, $p<.01$).

To address concerns of same-source bias, I also analyzed the relationships between all instructor-rated climate perceptions and instructor-rated outcomes. If same-source bias from student ratings were driving the main study findings for Hypotheses 1a through 3a, then a relationship between instructor-rated climate and instructor-rated outcomes would have also been expected. However, partial correlations (utilizing the same covariates as all the main analyses) revealed no significant relationships between these variables.

Discussion

Preliminary analyses of the study data allowed me to divide the overarching construct of learning climate into three dimensions: climates for participation, making mistakes, and learning goal orientation. Similarly, the construct of student learning behaviors was divided into participation and reflection behaviors. As a result, I was able to test more specific iterations of
my hypotheses than originally expected. In addition, I was able to test my hypotheses with dependent variables from both student and instructor sources. Interestingly, the results often were not consistent across the more nuanced hypotheses. Furthermore, the results also varied across the various outcome rating sources and measures. Since the statistical tests were not independent of each other, it should be noted that the possibility of Type I errors causing these inconsistencies cannot be ruled out. These results will be discussed in more depth in the context of Hypotheses 1a through 3a, and then Hypotheses 4a through 6a.

**Hypotheses 1a-3a: Student Learning Climate Level and Strength**

In testing the main effects of participation and mistake climate levels on participation behaviors, I expected a consistent positive relationship based on prior research findings (Edmondson, 1999; Carmeli et al., 2009). However, while main effects in the anticipated direction were found in both cases when predicting student-rated participation, such results were mainly absent on the instructor side, with the only significant relationship being mistake climate predicting the single-item instructor measure. Furthermore, when testing the relationship of learning orientation climate and student reflection behaviors, contrary to expectations, there was no significant result. Overall, the support for Hypothesis 1a was limited.

While there were inconsistent results for testing Hypothesis 1a, more attention was given to whether there were significant interactions between climate level and strength measures (Hypothesis 2a). In support of the hypothesis, a significant linear interaction was found for participation climate level and strength predicting the student-rated and single-item instructor-rated participation outcomes, while for mistake climate a marginal interaction predicting the student participation outcome and a significant interaction predicting the instructor-rated participation scale were found. In every case (even the marginal interaction) a graphical
depiction of the interaction conformed to the predicted pattern, whereby higher climate levels, when paired with high climate strength, yielded more student participation behaviors, but climate level did not matter if strength was not high. In other words, if students feel that speaking up in class is encouraged, and that it is a safe place to take chances and make mistakes when dealing with the material, then they will actually participate more in class, but only if most people in the class feel the same way they do. If some students feel that it is a safe environment and some do not, then the mean climate level is inconsequential. Thus, to ensure maximum learning via class participation, instructors should endeavor to create a learning climate that is felt by all students in the class.

Practically speaking, this suggests that instructors should not only encourage and reinforce students who already tend to speak up, but should also pay attention to the quieter students and find ways to help them feel comfortable prior to their ever speaking up in class. For instance, instructors should not only show their support of a learning climate by praising individual students, but also by addressing their intent/learning philosophy to the class as a whole.

It is important to note that a significant interaction for learning orientation climate and strength predicting student reflection behaviors was also found. Surprisingly, this interaction was not in the anticipated direction. When students all had similar ratings about whether there was support for critically analyzing and understanding the material being learned, it did not matter whether those ratings were high or low (i.e., whether they thought such support was or was not present in the class). On the other hand, if students did not have consistent ratings but the overall average was high, then students tended on average to reflect on what they were learning more often outside of class.
Although the pattern of this interaction is contrary to expectations, there is a possible explanation. If all students in a class tend to feel that there is no atmosphere of deeper learning and understanding (i.e., low level and high strength), then they may not feel like there is a point to reflecting on anything. On the other hand, if all students tend to feel that there is a very potent atmosphere for higher-level learning (i.e., high level and high strength), then they may engage in a lot of reflection in class as they are learning the material, to such an extent that they do not feel the need to reflect any more outside of class. Thus, as long as learning orientation climate is strong, reflection levels outside of the classroom will stay stable and relatively low. However, if the average learning orientation climate rating is high but not everyone is in agreement (i.e., high level and low strength), then while some students will likely reflect on the material in class, there are others who may not feel they have had enough of an opportunity. These people may reflect on the material outside of class to a greater extent than if the class as a whole has no interest in deeper learning, and to a greater extent than if everyone in the class has already had the opportunity to satisfy their reflection needs in class.

These learning orientation results suggest that unlike participation and mistake climate, learning behaviors are not always greatest when both learning orientation climate level and strength are high. Instead, more reflection behaviors will occur outside of class when level is high but strength is low. It is important to consider though that reflection outside of class is not indicative of all reflection behaviors. If students have ample opportunities to reflect during a class session (as suggested in my explanation of the high level, high strength category), then a lower level of reflection later may not necessarily signify that less meaningful learning has occurred. To better draw any conclusions, future research should not only continue to investigate learning orientation climate (as opposed to solely individual level orientations;
Bunderson & Sutcliffe, 2003), but also include a measure of reflection activities inside the classroom.

In sum, Hypothesis 2a was supported for participation and mistake climate, but further research is needed to better understand the nature of learning orientation climate level and strength. Interestingly, these preliminary results do tentatively suggest that the impact of climate level and strength on learning outcomes can vary across different climate types. Although there has not been any exploration of this interaction in the learning climate literature (to my knowledge), prior debates have focused on whether a significant interaction between climate level and strength in general exists (e.g., Colquitt et al. 2002; Schneider et al., 2002) or not (e.g., Bliese & Halverson, 1998a; Lindell & Brandt, 2000). In every case, all interactions that have been discovered have displayed a similar pattern (to my knowledge): the relationship between climate level and outcomes was better when climate strength was high. The interaction results for learning orientation climate were indeed significant, but in the opposite direction, such that results were better when climate strength was low. This would suggest that not only is it important to continue to address the debate about why a linear interaction does not always exist (as discussed in the next paragraph), but also to raise the question of whether the pattern of such an interaction should always be expected to be the same across different types of climate.

In addressing why linear interactions are sometimes not detected, it is worth noting that no curvilinear interaction was found for any of the study’s learning climates, lending no support for Hypothesis 3a. It appears that in this study, linear interactions were sufficient for explaining how climate level and strength impact learning behaviors, or that greater power is required to detect any such interactions. Given that this is the first attempt (to my knowledge) to address Ostroff et al.’s (2012) recommendation for investigating curvilinear interactions of climate level
and strength, it is too soon to make any definitive conclusions. Further research is needed to better assess whether curvilinear interactions are a viable explanation for the inconsistent linear interaction results in the climate literature (e.g., Bliese & Halverson, 1998a; Colquitt et al., 2002).

Finally, while there was no instructor-rated reflection measure to compare to, overall, the inconsistent results across student and instructor outcome ratings for Hypotheses 1a and 2a suggest that students and instructors had different perceptions of how much students participated in their classes, as confirmed by their low scale correlation score. The higher correlation between the instructor single item and the student scale score could help explain why the single-item instructor dependent variable had more similar results with the student-rated participation scale results. In any case, the inconsistent results could indicate that students and instructors were rating two qualitatively different constructs or had their own personal biases. For instance, perhaps because instructors hold their students to different standards for participation than students themselves do. It is also possible that this was a statistical power issue. With a small sample size of 69 teams, perhaps the relationships were there but just not always detectable.

**Hypotheses 4a-6a: Alignment of Student and Instructor Climate Ratings**

Hypotheses 4a through 6a dealt with whether students and instructors had similar climate ratings, and whether perceptual alignment (or misalignment) could predict learning behavior outcomes. To my knowledge, this marks the first time a test of perceptual alignment has been performed utilizing learning climate specifically.

With respect to participation behaviors, the same pattern emerged as with Hypotheses 1a and 2a, whereby the results were not consistent statistically across student and instructor-rated outcomes. For instance, Hypothesis 4a posited that ratings that were aligned and high would
yield better outcomes than ratings that were aligned and low. Indeed, the statistical results somewhat supported this for participation climate predicting student-rated participation when \( X>0 \), since the surface plot formed a convex parabola with the base/lowest point at \( X=0 \). In other words, students rated themselves as participating in class more when both they and their instructor rated the participation climate as high, and less when they and their instructor rated the climate as low, although in this case “low” refers to the midpoint of the climate scale. On the other hand, when either instructor-rated measure was utilized as a dependent variable, there was no significant slope or curvature in the corresponding graph, suggesting that as student participation climate ratings went up, participation was not affected by instructors’ perceptions.

With respect to mistake climate alignment, a different pattern of results was found. In contrast with participation climate, alignment was of no consequence when predicting student-rated participation behaviors, but was marginally significant when predicting the instructor-rated participation scale, such that aligned and high was better than aligned and low ratings (but once again, “low” does not refer to the bottom end of the rating scale).

In reference to learning orientation climate, no significant results along the \( Y=X \) line were found, suggesting statistically that the alignment status of student and instructor ratings is not of importance to learning behaviors.

When inspecting the actual response surface graphs for all of the study variables, one can see more consistent results visually than what was found statistically, such that aligned and high ratings appeared to be better than aligned and low, at least in the quadrant where actual data existed. However, this whole data set suffered from severe range restriction. To best evaluate questions of alignment, there needed to be data points all along the \( Y=X \) line. For mistake climate, data points were mainly located in the student high/instructor high quadrant of the
graph, and the data were even more tightly clustered in that quadrant for the participation climate ratings. Learning orientation climate had the tightest clustering of them all, with absolutely no data points further down near the Y= -X line or beyond. Thus, while visually the slope of each graph’s surface in that quadrant along the Y=X line tended to support Hypothesis 4a, and there was also some tentative support statistically, the practical significance is dubious, as one cannot extrapolate the results to portions of the graph where no data exist. In fact, if data indeed existed at the student low/instructor low quadrant of the graph and the shape remained a parabola (as it is currently in all of the graphs with significant results), then this would indicate that aligned and low ratings are just as beneficial as aligned and high readings, which would be at odds with Hypothesis 4a.

In sum, although the visual pattern within the field of existing data was consistent with Hypothesis 4a, statistically and practically speaking, these results must be regarded with extreme caution, and support for Hypothesis 4a cannot be claimed.

The same caution should be applied to conclusions about Hypotheses 5a1 and 5a2. Hypothesis 5a1 predicted that when student and instructor ratings are misaligned, better outcomes result when student ratings are higher, which would be indicated by a positive slope along the Y= -X line. This was not found for participation climate predicting any of the three participation behavior outcomes, nor was there significant curvature in any graph. This suggests that statistically, misalignment on participation climate is of no consequence to outcomes, so instructor ratings do not really matter (based on students providing the outcome ratings).

A significant positive linear slope was not found for mistake climate either when predicting student and instructor-rated participation scales, but there was significant positive curvature, indicating a convex parabola. Similar to the results for Hypothesis 4a, this suggests
that Hypothesis 5a was supported, but only starting at a point higher than the scale’s midpoint (i.e., the bottom right quadrant of the graph), and certainly not along the whole length of the $Y = -X$ line.

Visually expanding upon the statistical results (but only where data existed), Hypothesis 5a was supported for mistake climate misalignment predicting student and instructor-rated participation behaviors, again only in the bottom right quadrant of the graphs. However, as mentioned previously, when plotting the data points on the floors of the graphs, one can see that while there are a few data points along the $X = -Y$ line, particularly in the bottom right quadrant where student ratings are higher than instructors’, the majority of the data are all clustered in the upper right quadrant (aligned and high). Therefore, practically speaking, interpreting any results anywhere along the $Y = -X$ line was not advisable, and Hypothesis 5a could not be evaluated properly.

Hypothesis 5a suggested that as student climate ratings reached the upper limit of the scale along the $Y = -X$ line, a negative curve would appear, such that the increase in learning behaviors would level off. Statistically, this was not supported for any climate or outcome measure. Visually, this was only supported when looking at the graph for learning orientation climate misalignment predicting student reflection behaviors. However, practically speaking, the lack of data points anywhere along the $Y = -X$ line once again precluded any definitive conclusion about support for the hypothesis.

Since there were no statistically significant results that also had any practical significance, Hypothesis 6a could not be tested. Thus, this study offers no suggestion of whether the alignment of climate ratings between students and instructors predicts learning behaviors beyond the influence of student climate level and strength alone.
Limitations and Future Research

The three largest drawbacks of this study were the low sample size, high potential for same-source bias, and high restriction of range. With only 69 teams, it is possible that there were relationships I simply did not have the power to detect, especially for linear and curvilinear interactions. This could have also played a role in the inconsistent results across student- and instructor-rated outcomes. In addition, students rated the independent and dependent variables at the same time in the same survey. This could have artificially inflated main effect relationships (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), thus explaining why more results were found for student-rated outcomes. If that were the case, any biasing effects of same-source ratings should have been dampened in the polynomial regression analyses for testing the alignment hypotheses, since both student and instructor ratings were taken into consideration. The fact that there were still some significant polynomial regression results when predicting student-rated participation behaviors suggests that same-source bias cannot completely explain the incongruous findings across student- and instructor-rated outcomes. In addition, no significant relationships were found between instructor-rated climate perceptions and instructor-rated outcomes, which presumably would have also been susceptible to same-source bias. Thus, while concerns regarding same-source bias in this study cannot be fully mollified, there is some basis for questioning the extent of its influence.

Future research should utilize a larger sample size to better detect any relationships with instructor-rated outcomes that could better refute or support the same-source bias explanation. Of course, if possible, students should also be given the outcome measures at a different time from the predictor measures to proactively eliminate the potential for same-source bias. In addition, it would be advantageous to include more measurement items to better assess whether
students and instructors were rating qualitatively different concepts (even though the item wording was identical).

The problem of range restriction is quite possibly the largest limitation of the three, as it precluded the ability to effectively test Hypotheses 4a through 6a. In order to test the effects of the alignment/misalignment of student and instructor climate ratings on learning behaviors, paired ratings in all four quadrants of the instructor ratings by student ratings graphs were necessary. The fact that most data points were restricted to one quadrant (high, high) made it extremely difficult to assess the meaning of the surface plots. While the fact that both students and instructors all tended to rate all learning climates fairly highly could perhaps be indicative of the high quality of the classes surveyed on campus (or alternatively, social desirability bias), this was not beneficial for testing my hypotheses.

To help address the problems of sample size and range restriction, as well as extend this research to another climate domain, a second study was performed on safety climate in hospitals, which will be described in Chapter 3.
CHAPTER 3

STUDY 2: SAFETY CLIMATE IN HOSPITALS

Method

Participants

Study 2 used an archival data set to test all seven hypotheses concerning safety climate. The dataset utilized was completely de-identified and is available free of charge from the Agency for Healthcare Quality and Research. Data were originally collected from 526,645 employees in 1,081 U.S. hospitals between 2007 and 2011. The final subset of data used for this study consisted of 5,232 employees (4,837 nurses and 395 managers) from the Medicine units of 254 hospitals. Each hospital unit in the final dataset contained between five and 40 nurses, as well as between one and three managers.

Survey Background Information

The Data. In 2004, Westat, a company contracted with the Agency for Healthcare Quality and Research, designed and validated the Hospital Survey on Patient Safety Culture (HSOPS). The survey was made free and open to the public for hospitals to assess safety climates (despite the title containing the word “culture,” the survey measures perceptions and is therefore a measure of climate). In 2007, Westat created a database where hospitals could submit their data to contribute to a report that presented an aggregated view of the current status of safety climate in U.S. hospitals, as well as a more personalized benchmarking report that compared a hospital’s climate ratings to other hospitals. This became a yearly process, such that a “Comparative Database Report” has been published every year since 2008. Hospitals may submit their data no more than once per year, and while some hospitals submit every year, others submit more erratically or only once.
The dataset used for this dissertation contained data for every hospital that had submitted to the database since 2007. Hospitals that had submitted more than once only had their most recent submission year’s data included. All hospital identifying information was replaced with random identifier codes. Knowledge of which codes correspond to which individuals/hospitals is only available to Westat employees.

Twelve different hospital units were surveyed. However, some traditionally have a very small presence in the data (e.g., Anesthesiology, Pediatrics, and Psychiatry each comprised less than 4% of the overall data for the 2007 database submissions; Sorra & Dyer, 2010). Thus, I focused my analyses on one of the largest units (Medicine) to ensure that I would have an adequate sample of nurses (followers) and managers (leaders). In addition, since there was a wide range in the number of respondents with any given unit for nurses (1-728 respondents) and managers (1-149 respondents), the decision was made to keep the group sizes close to what was utilized in Study 1 by selecting units where between five and 40 nurses, as well as between one and three managers, had responded. This would also assist in interpretability of the results, since there are likely to be many subclimates, and hence low interrater agreement, in very large groups.

**Survey Development.** The Westat researchers created the HSOPS instrument in 2004, as described in their technical report to the Agency for Healthcare Research and Quality (Sorra & Nieva, 2004). They began by conducting a literature review in areas pertaining to safety management in various industries such as nuclear, manufacturing, and health. They also collected and examined existing instruments measuring safety climate. From this review, specific safety dimensions were identified, and corresponding items were written.
Next, the researchers conducted cognitive interviews with various hospital staff members, where the staff would answer the items and describe their thoughts or reactions out loud as they did so. Furthermore, the researchers solicited input from other researchers involved in the safety climate arena, as well as members of the Joint Commission on Accreditation of Healthcare Organizations.

Based on the feedback received, the Westat researchers created a pilot survey and administered it to 21 hospitals in six U.S. states, with 1,437 individual responses. The hospitals varied by region, size, and teaching status. These data were then analyzed for the purpose of validating the instrument.

**Instrument Validation.** Due to the *a priori* postulation of a factor structure, exploratory and confirmatory factor analyses (EFA and CFA) were both conducted (Sorra & Nieva, 2004). The EFA yielded output supporting many of the conjectured item groupings, and the CFA, after dropping a few items indicated by the EFA, yielded results suggesting an acceptable fit to the data, with fit indices such as the CFI, GFI, and NNFI index all having values above .90, and the RMSEA equaling .04.

The final instrument consisted of 12 dimensions with three or four items each. All of the dimensions were found to have marginal to acceptable reliability, ranging from $\alpha = .63$ to .84. The dimensions ranged in their inter-correlations, with the highest being between Overall Perceptions of Safety and Patient Safety Grade ($r = .66$, $p<.001$). The highest correlation with the outcome variable of interest in this study, Frequency of Event Reporting, was with Feedback and Communication About Error ($r = .48$, $p<.001$).

Finally, a one-way analysis of variance (ANOVA) was conducted for each of the safety climate dimensions. Results indicated that dimension variability was greater across hospitals
than within hospitals, supporting the assertion that the instrument could detect different safety climates in different hospitals (Sorra & Nieva, 2004).

In addition to the initial validation study, Sorra and Dyer (2010) conducted analyses investigating the psychometric properties of the instrument using new data from 331 hospitals, comprising 50,513 individuals. Multilevel confirmatory factor analyses were conducted to assess the fit of the HSOPS safety dimensions at the unit and hospital level. Internal consistency reliability analyses were also conducted. Results indicated that all of the safety climate dimensions had acceptable fit to the data, with the exception of Supervisor/Manager Expectations and Actions Promoting Patient Safety at the unit level ($\chi^2(4) = 4731.02$, $p<.05$, CFI = .88, SRMR = .07) and hospital level ($\chi^2(4) = 5967.35$, $p<.05$, CFI = .82, SRMR = .07).

Furthermore, similar to the initial study in 2004, all of the dimensions had acceptable reliability except for Staffing ($\alpha = .62$). Interestingly, while the researchers reported the factor correlations of the twelve dimensions, they did not report testing a 12-factor measurement model against more parsimonious models. Rather, they appear to have tested the fit of each dimension individually. Therefore, as described further below in the Results section, I conducted a CFA of my own to verify that the dimensions I had chosen to use (i.e., Overall Safety Perceptions, Communication Openness, and Nonpunitive Response to Error) were indeed empirically distinct.

In addition to assessing the instrument’s psychometric properties, the researchers at Westat also investigated the instrument’s predictive validity. Almost every dimension was found to predict patients’ ratings of their hospital experiences, such as communication about medicines and responsiveness of hospital staff (Sorra et al., 2012). Furthermore, nearly every safety climate dimension, including the outcome variable of interest in this study (Frequency of Error...
Reporting), was significantly negatively correlated with adverse patient health outcomes, such as infections and postoperative sepsis (Mardon et al., 2010).

**Measures**

**Climate for Safety.** Of the twelve dimensions measured in the HSOPS, one was utilized as the outcome variable (see below), some others addressed constructs that did not seem to specifically address safety (e.g., the Teamwork Within Units dimension contained items such as “Staff support one another” and “Staff treat each other with respect”), and some were highly intercorrelated (e.g., Hospital Management Support for Patient Safety, Feedback and Communication About Errors, Organizational Learning-Continuous Improvement, and Overall Perceptions about Safety all had intercorrelations greater than .70). Therefore, my analyses only focused on the three dimensions described below. All of the items were measured on a 5-point Likert scale, ranging from 1 = “Strongly Disagree” to 5 = “Strongly Agree.” For a complete list of items, please refer to Appendix B.

**Overall Perceptions about Safety.** This safety climate dimension assessed overall perceptions of whether safety is emphasized and whether errors are effectively prevented. It was measured with four items such as “Patient safety is never sacrificed to get more work done” and “Our procedures and systems are good at preventing errors from happening” ($\alpha_{nurse}=.74$; $\alpha_{manager}=.77$).

**Communication Openness.** This measure, similar to van Dyck et al.’s (2005) concept of error management culture, consisted of three items that addressed whether staff felt comfortable talking about patient safety and errors (e.g., “Staff will freely speak up if they see something that may negatively affect patient care” and “Staff are afraid to ask questions when something does not seem right” (reverse worded); $\alpha_{nurse}= .75$; $\alpha_{manager}= .72$).
Nonpunitive Response to Error. This three-item measured reflected whether staff felt like they would be punished for reporting safety errors. Sample items included “Staff feel like their mistakes are held against them” (reverse worded) and “When an event is reported, it feels like the person is being written up, not the problem” (reverse worded; \( \alpha_{\text{nurse}} = .80; \alpha_{\text{manager}} = .72 \)).

Self-Reported Safety Behaviors. An objective measure of safety behaviors that could be linked to the hospitals in this dataset was not available, so the safety climate dimension Frequency of Event Reporting was used. This measure assessed a respondent’s perception of whether employees (and not just the respondent him/herself) in the hospital unit tend to report their errors (e.g., “When a mistake is made that could harm the patient, but does not, how often is this reported?”). The three items comprising this scale were rated using a 5-point itemized rating scale, ranging from 1= “Never” to 5= “Always” (see Appendix B; \( \alpha_{\text{nurse}} = .86; \alpha_{\text{manager}} = .85 \)).

Control Variables. Certain hospital or hospital unit characteristics that were not of interest in this study could have potentially influenced error reporting. These included whether or not a hospital was government- or privately- owned, whether it was a teaching hospital or not, and the number of respondents in a given unit. For example, if one unit had only 5 nurses respond, while another unit had 30 nurses respond, an outlier in the former unit would have greater influence on climate level and strength calculations than an outlier in the latter unit.

Results

Confirmatory Factor Analysis (CFA)

Although the HSOPS instrument has already been validated, I performed a confirmatory factor analysis on the three specific safety climate dimensions and one outcome measure chosen for this study, employing the same respondent subsample utilized for all of my analyses. This allowed me to confirm that the four dimensions were indeed distinct and that a different
grouping of the measurement items did not yield a better fit to the data. Analyses were performed at the hospital level of analysis for nurses and managers separately. Results are summarized in Tables 16 and 17.

**Nurses.** The CFA results showed that a four-factor model (Model 1) fit the nurse data well, \((\chi^2(59) = 156, p < .01; \text{RMSEA} = .08; \text{CFI} = .96; \text{TLI} = .95; \text{SRMR} = .04)\). Next, a two-factor model (Model 2), where the three safety climate factors were combined into one and the one error reporting outcome measure was left separate was tested. Last, an overall one-factor model was tested (Model 3). Each model appeared to have a progressively worse fit, and since the models were nested, a chi-square difference test was utilized to formally compare each model’s fit to Model 1. Results confirmed that Model 1 had a significantly better fit to the data than any of the other models. Thus, a four-factor model was retained.

**Managers.** Similar to the CFA results for nurses, a four-factor model (Model 1) fit the manager data well, \((\chi^2(59) = 92, p < .01; \text{RMSEA} = .05; \text{CFI} = .97; \text{TLI} = .96; \text{SRMR} = .05)\). The two-factor (Model 2) and one-factor (Model 3) models appeared to have a progressively worse fit, and chi-square difference tests confirmed that Model 1 had a significantly better fit to the data than any of the other models. Thus, a four-factor model was retained.

**Justification for Aggregation**

Rwg and ICC analyses were conducted to confirm that there was sufficient within-group agreement and that within-group variance was significantly lower than between-group variance. These analyses were conducted separately for nurses and managers (when there was more than 1 manager in a group). Prior to calculating any rwg averages, negative individual rwg values were converted to zero, since there was no theoretical or conceptual reason for expecting a bimodal
distribution of rating scores due to the presence of subgroups (James et al., 1984; LeBreton & Senter, 2008).

**Nurses.** For nurses, when compared to a null uniform distribution, average interrater agreement (rwg) was .63 (with a median value of .65) for overall perceptions of safety, .72 (with a median of .75) for communication openness, .61 (with a median of .65) for nonpunitive response to error, and .70 (with a median of .74) for error reporting (the outcome variable), all representing moderate to strong agreement (LeBreton & Senter, 2008).

To calculate ICC values, a one-way ANOVA was run on the four scales at the individual nurse level, with hospital as the independent variable. All four analyses yielded significant F values at the p<.01 level, indicating that the variance between hospitals was greater than the variance within hospitals for all measures. More specifically, ICC(1) calculations revealed that 7 to 14 percent of the variability in nurse ratings could be explained by hospital membership (ICC(1)overall perceptions=.14; ICC(1)communication openness=.08; ICC(1)nonpunitive=.09; ICC(1)error reporting=.07). Furthermore, the group means on each scale had marginal to adequate reliable internal consistency (ICC(2)overall perceptions=.75; ICC(2)communication openness=.61; ICC(2)nonpunitive=.66; ICC(2)error reporting=.57). Given that all F values were significant, and that all rwg values were moderate to strong, I concluded that it was appropriate to aggregate the individual nurse data to the hospital level.

**Managers.** For managers (when there was more than one in a hospital unit), when compared to a null uniform distribution, average interrater agreement (rwg) was .62 (with a median value of .74) for overall perceptions of safety, .86 (with a median of .86) for communication openness, .77 (with a median of .84) for nonpunitive response to error, and .85
(with a median of .86) for error reporting (the outcome variable), all representing moderate to strong agreement (LeBreton & Senter, 2008).

To calculate ICC values, a one-way ANOVA was run on the four scales at the individual manager level, with hospital as the independent variable. Only two of the four analyses yielded significant F values, indicating that the variance between hospitals was greater than the variance within hospitals for overall safety perceptions and nonpunitive safety climates, but not for communication openness safety climate or error reporting perceptions. ICC(1) calculations revealed that similar to nurses, 6 to 17 percent of the variability in managers' ratings could be explained by hospital membership (ICC(1)overall perceptions = .15; ICC(1)communication openness = .06; ICC(1)nonpunitive = .17; ICC(1)error reporting = .08). However, unlike with nurses, the group means on each scale had inadequate internal consistency (ICC(2)overall perceptions = .31; ICC(2)communication openness = .15; ICC(2)nonpunitive = .34; ICC(2)error reporting = .18, although this may be attributable to the fact that group size for these analyses consisted of only two or three managers, and the sample size was not large (n = 94; Bliese & Halverson, 1998b).

Overall, the rwg values for all four manager scales were acceptable, and although the value was slightly lower for overall safety perceptions, this measure did have a significant ICC(1) value. Thus, despite the nonsignificant ICC values for communication openness and error reporting, I concluded that overall, there was sufficient justification to aggregate all manager data to the hospital level. However, some caution must be observed when interpreting results involving manager-rated error reporting (Hypotheses 4b-6b) and manager-rated communication openness (ancillary analyses).
Correlations

The means, standard deviations, reliabilities, and intercorrelations of the study variables at the hospital level appear in Table 18. None of the control variables had significant intercorrelations. One control variable (whether the hospital was government-owned) was significantly and positively related with nurse error reporting (r=.18, p<.01), meaning that hospitals that were government-owned tended to report errors more frequently.

With respect to the main study variables, a somewhat similar pattern to Study 1 emerged, whereby there were more significant relationships when utilizing subordinate-rated measures. In this case, all three nurse-rated safety climate measures had significant positive relationships with nurse-rated error reporting, with correlations ranging from .35 to .57, but no significant relationships with manager-rated error reporting.

Hypothesis Testing

**Climate Level and Strength.** Hypotheses 1b through 3b dealt with the effect of climate levels on safety outcomes, and how climate strength (i.e., variability amongst individual ratings) moderates that relationship. Identical to Study 1, to test these three hypotheses all variables were first centered to enhance interpretability, and then moderated hierarchical regression was performed. Control variables were entered in Step 1, main effects of nurse safety climate level and climate strength were entered in Steps 2 and 3, and the linear and quadratic products of climate level and strength were entered in subsequent steps (please refer to Table 19 for a summary of Study 2 hypotheses and variables, Table 20 for summarizing conclusions for Hypotheses 1b through 3b, and Tables 21-26 for all regression results).

**Hypothesis 1b.** Hypothesis 1b predicted that safety climate levels would be positively related to safety outcomes/error reporting. Results revealed a significant positive main effect of
overall safety perceptions \((B=.46, p<.01)\), communication openness \((B = .58, p<.01)\), and nonpunitive response to error \((B=.29, p<.01)\) climates on nurse-rated error reporting, but no significant main effects on manager-rated error reporting. All regression coefficients were positive, indicating that higher climate levels were associated with more error reporting. Thus, Hypothesis 1b was supported, but only when the outcome was rated by nurses.

**Hypothesis 2b.** Hypothesis 2b predicted that safety climate level would interact with safety climate strength, such that the positive relationship between climate level and safety outcomes would be more pronounced when climate strength was also high (i.e., low variability). However, a significant linear interaction was not found for any of the three safety climate dimensions, regardless of whether error reporting was rated by nurses or managers. In other words, while higher perceptions of safety climate predicted higher amounts of nurse-rated error reporting, this relationship was not contingent on the extent to which all raters agreed or disagreed in their perceptions. Thus, Hypothesis 2b was not supported.

**Hypothesis 3b.** Hypothesis 3b predicted that a curvilinear interaction between climate level and strength would better predict safety outcomes than a linear interaction, such that climate level squared and then the product of climate level squared and climate strength were entered into Steps 5 and 6 of the regression model, respectively. No significant curvilinear interactions were found, however, lending no support for Hypothesis 3b.

**Nurse-Manager Perceptual Alignment.** Hypotheses 4b through 6b dealt with the alignment (and misalignment) between nurse and manager safety climate perceptions. To test these hypotheses, polynomial regression and response surface methodology were utilized (Edwards & Parry, 1993).
Parallel to what was done in Study 1, error reporting was regressed onto the control variables, followed by scale-centered nurse and manager ratings of safety climate, as well as three quadratic terms constructed from these ratings (nurse ratings squared, the product of nurse and manager ratings, and manager ratings squared). The three-dimensional graphical surfaces created by the polynomial regression equations were then further analyzed using response surface methodology (Edwards & Parry, 1993). Since my hypotheses dealt with alignment and misalignment, I focused my analyses on the shape of the surfaces along the Y=X line (aligned ratings; Hypothesis 4b) and the Y= -X line (misaligned ratings; Hypotheses 5b₁ and 5b₂). The results of all analyses of the graphical surfaces related to Hypotheses 4b, 5b₁, and 5b₂ are reported in Table 27, and a summary of hypothesis conclusions can be found in Table 20.

**Hypothesis 4b.** Hypothesis 4b predicted that when nurse and manager climate perceptions were aligned and high, more medical errors would be reported than when climate perceptions were aligned and low. To support Hypothesis 4a, b₁ + b₂ (from Equation 2) was expected to be positive, and b₃ + b₄ + b₅ was expected to be 0. This would represent a plane along the Y=X line with a positive linear slope and no curvature, indicating that the Z values (error reporting) linearly increase as X and Y (nurse and manager climate ratings) aligned values increase. To test these linear combinations of dependent regression coefficients, I utilized procedures recommended by Cohen and Cohen (1983) and Edwards and Parry (1993).

In support of Hypothesis 4b, analyses revealed that the slope along the Y=X line was indeed positive at X=0 for overall safety perceptions (p<.01; see Figure 14) and nonpunitive response to error (p<.05; see Figure 15), when the outcome was nurse-rated error reporting (there were no significant results when the outcome was manager-rated). In addition, while there was no significant slope at X=0 for communication openness climate, there was positive curvature
along the Y=X line (p<.05; see Figure 16). This indicated that as alignment scores increased beyond the midpoint of the scale, error reporting increased, supporting my hypothesis, but as alignment scores decreased beyond the midpoint of the scale, error reporting also increased, disputing my hypothesis. However, since the vast majority of data points for Communication Openness were in the upper right quadrant (high-high ratings), that portion of the surface was the most interpretable, and also the portion that supported Hypothesis 4b.

It is important to also note that there was some range restriction for all of the safety climate variables of interest, although not as severe as the restriction in Study 1. Thus, Hypothesis 4b was statistically supported when predicting nurse-rated outcomes, particularly for ratings that were at the midpoint of the rating scale or higher. However, the overall practical implications of the results are consequently more limited.

**Hypothesis 5b.** This hypothesis predicted that when nurse and manager climate perceptions were misaligned, error reporting would be greater when nurse ratings were higher than the manager ratings, and error reporting would be reduced when nurse ratings were lower than the manager ratings. Based on Equation 3, \( b_1 - b_2 \) represents the slope of the surface along the Y= -X line (the maximum misalignment line) at the point where \( X = 0 \), and \( b_3 - b_4 + b_5 \) represented the curvature of the surface along the Y= -X line. To support Hypothesis 5b, \( b_1 - b_2 \) was expected to be positive. This would indicate that the Z values (error reporting) increased as nurse ratings became increasingly larger than manager ratings.

Again utilizing the procedures recommended by Cohen and Cohen (1983) and Edwards and Parry (1993), I found that in support of Hypothesis 5b, the slope along the Y= -X line at \( X=0 \) was positive for all three safety climate dimensions (p<.05), but only when predicting nurse-rated error reporting (see Figures 14-16). The only significant slope when predicting
manager-rated error reporting was for overall safety perceptions (p<.05; see Figure 17) but it was in the opposite (negative) direction, suggesting that error reporting increased when manager ratings were higher than nurse ratings. Unlike the Study 1 results for mistake climate predicting participation behaviors, this negative slope was not accompanied by a positive curvature along the Y= -X line, therefore lending no support for Hypothesis 5b₁ when utilizing manager-rated outcomes.

Once again, range restriction made it more difficult to interpret these results, particularly for communication openness, which had the fewest data points along the Y= -X line. Although statistically and visually there was support for Hypothesis 5b₁ for all safety climate measures predicting nurse-rated error reporting, conclusions could not be drawn along the full length of the misalignment spectrum where no data point were not present. Thus, I concluded that Hypothesis 5b₁ was statistically supported when predicting nurse-rated outcomes, but that the data range issues preclude definitive practical conclusions.

Hypothesis 5b₂. Hypothesis 5b₂ predicted that as nurse ratings of safety climate neared the upper end of the rating scale, the effect of nurse-manager misalignment would decrease. That is, once nurses had maximum ratings of safety climate, their misalignment with manager ratings would be of less consequence. Graphically, this can be equated to a shape with a positive slope that begins to level off as X nears the value of 2 (the highest point on the centered scale). As described previously, b₃ - b₄ + b₅ represents the curvature of the surface along the Y= -X line. To support Hypothesis 5b₂, this curve was expected to be negative, with its ridge line positively offset from the Y=X line. However, there was no significant curvature present except for when communication openness was predicting nurse-rated error reporting (p<.05). While the curve was negative as expected, a visual inspection of the surface plot (see Figure 16) revealed that the
ridge line was negatively offset from the Y=X line. In other words, the slope began to level off when manager ratings were higher than nurse ratings. However, due to the limited data points along the Y= -X line for communication openness, these results must be interpreted with caution. Thus, there was statistical support for Hypothesis 5b when communication openness was predicting nurse-rated error reporting, but not for any other safety climate measures, and little visual support as well. Furthermore, severe range restriction precluded the formation of any practical conclusions.

**Hypothesis 6b.** This hypothesis posited that nurse-manager alignment/misalignment in safety climate perceptions would predict safety outcomes/error reporting beyond the influence of climate level and strength. When the polynomial terms were entered as the last step into a hierarchical regression equation that included climate level, strength, and their interaction, a marginally significant change in variance explained was identified for communication openness predicting nurse-rated error reporting \( (F(3, 243)=2.17, p<.10; \text{see Table 28}), \) but not for any other variables. Thus, bearing in mind the data restriction caveats discussed for Hypothesis 4b and 5b, particularly for communication openness, Hypothesis 6b was supported statistically, but not practically.

**Ancillary Analyses.** Unlike Study 1, where there was only one significant correlation, nurse and manager climate ratings were moderately correlated for all three sub-dimensions, with values in the .20s. Surprisingly, nurse and manager error reporting responses were not significantly correlated at all \( (r=.06, ns) \), although overall, managers \( (M=3.84, SD=.71) \) had slightly higher ratings than nurses \( (M=3.73, SD=.31; t(251)=-2.31, p<.05) \).

To address concerns regarding same-source bias, I analyzed the relationships between all manager-rated climate perceptions and nurse- and manager-rated outcomes. If same-source bias
from nurse ratings were driving the main study findings for Hypotheses 1b through 3b, then a relationship between manager-rated climate and manager-rated outcomes would have also been expected. Partial correlations (utilizing the same covariates as all the main analyses) revealed significant relationships between manager-rated error reporting and all three manager-rated safety climates, ranging from .22 to .42 (p<.01), yet with respect to nurse-rated error reporting, there was only a significant relationship with overall safety perceptions (r=.15, p<.05).

Unfortunately, these results were not able to allay same-source bias concerns.

Due to the limited amount of data along the Y= -X line, definitive conclusions for Hypotheses 5b₁ and 5b₂ (and therefore Hypothesis 6b) were elusive. However, the distribution of data points along the floor of the surface plots for overall safety perceptions and nonpunitive response to error revealed that while nurse ratings hovered near the scale midpoint, manager ratings had a much greater range. This resulted in a vertical “line” of data points that could still represent nurse-manager misalignment, though not the maximum values of misalignment. Since neither the Y=X nor Y= -X lines fully captured this line of data, I tested the intercept and slope of the first and second principal axes to see if either corresponded with the line of data. Principal axes help to further explain the positioning of a surface plot in the two-dimensional X,Y plane, representing the lines along which the response surface has the greatest and least amount of curvature. Since principal axis intercepts and slopes represent nonlinear combinations of regression coefficients, resulting in a non-normal distribution of coefficients, significance tests were conducted using the bootstrap approach (Mooney & Duval, 1993; Stine, 1989). Confidence intervals were constructed from coefficients from 10,000 bootstrap samples, using the bias-corrected percentile method (Edwards, 2002). For both overall safety perceptions and nonpunitive response to errors, the intercepts of the principal axes did not significantly differ
from 0, and the slopes did not significantly differ from 1 or -1. This indicated that the principal axes did not significantly differ from the $Y=X$ and $Y=-X$ lines. Thus, I was not able to test the shape of the response surface along the vertical “line” of misalignment data.

**Discussion**

Climate for safety is critical in a medical setting where lives hang in the balance, so it is essential to understand how employee climate perceptions affect safety outcomes. Furthermore, a better awareness of how supervisor and subordinate perceptions may differ, and the impact of that difference on outcomes, can assist hospitals in understanding and changing their safety outcomes.

Using the Hospital Survey on Patient Safety Culture data provided by the Agency for Healthcare Quality and Research, I was able to measure safety climate from three different angles: whether employees feel that safety issues in their hospital unit are openly discussed and analyzed, whether employees feel they will be punished if they make a mistake and report it, and whether overall employees feel that safety is emphasized in their working environment. These were all expected to have an impact on how frequently errors were actually reported. In addition, I was able to test my hypotheses with both nurse and manager ratings of the outcome variable. Interestingly, and similar to Study 1, the results often were not consistent across the different rating sources. However, unlike Study 1, the results were similar across the three safety climate sub-dimensions, which is not surprising considering the high intercorrelations amongst them. The results will be discussed in the context of Hypotheses 1b through 3b, and then Hypotheses 4b through 6b.
**Hypotheses 1b-3b: Safety Climate Level and Strength**

Hypothesis 1b dealt with safety climate levels predicting safety outcomes, as indicated by frequency of error reporting. Confirming my expectations based on the numerous studies that have investigated safety climate (e.g., Hofmann & Mark, 2006; Probst et al., 2008), all three types of safety climate (as perceived by nurses) positively predicted nurse-rated error reporting. In other words, when nurses tend to feel that their unit encourages a supportive safety-oriented environment, errors will be reported more frequently. It is important to understand that this most likely does not reflect an increase in the actual number of errors that are committed, but rather that employees feel more comfortable disclosing their mistakes. This enables employees to learn from the mistakes of others, and for hospital management to subsequently create policies to help prevent future such errors from ever occurring.

It is interesting to note that no significant main effects were found when predicting manager-rated outcomes. While there is a chance this could be attributed to same-source bias, nurses and managers may just have had a different frame of reference when responding to the survey. For instance, managers may not be as connected to what occurs “in the trenches” in a hospital, and thus have unrealistic perceptions of what the true climate is or how often errors are truly being reporting. Or, managers may have simply succumbed to social desirability bias and therefore always rated their hospital unit’s error reporting frequency in a positive fashion (in fact, if there was not a lot of variability between hospitals for manager ratings of error reporting, this could help explain the non-significant ICC results that were found). This frame of reference argument is supported by the fact that there were only moderately low correlations between manager and nurse climate ratings, and no significant correlation between manager and nurse ratings of error reporting.
Tests of the interaction between safety climate level and strength revealed no significant results for any of the safety climate dimensions, suggesting that positive perceptions of safety climate yield a greater amount of error reporting in hospitals regardless of whether those perceptions are uniform across individual nurses. Only two prior studies (to my knowledge) have tested the interaction of safety climate level and strength on any outcome (Lyon, 2007; Zohar & Luria, 2004), and both also largely failed to find any significant interactions. The consistent nonsignificant results found across these studies suggest that the type of outcome measured may not be the cause, as the aforementioned studies dealt with objective safety outcomes such as soldier injuries and patient infections, while the current study utilized self-reported safety behaviors (i.e., error reporting). Rather, the social norms surrounding the safety climate construct itself may be the source of these null findings.

Safety climate is typically measured in high reliability organizations, where the cost of error is high (e.g., injury or death; Weick et al., 1999). If one assumes that workers in such positions have sufficient moral development (Kohlberg, 1969), then they presumably would not eagerly engage in actions that would cause harm to others (or themselves). Although such actions (or in the case of error reporting, inaction) could still occur when employees feel that safety is not emphasized in the workplace (as evidenced by the support of Hypothesis 1b), it would probably be easier for them to alter their actions if they see that others are engaging in safety-oriented behaviors, for two reasons. First, the employees could actually care about outcomes for others, but have been prioritizing their own possible negative consequences for reporting an error. However, seeing others reporting errors is enough to influence them to do the same, particularly if they respect or admire the individuals engaging in those behaviors (Kelman, 1958). Second, even if some employees did not care about safety outcomes, if others do care and
are engaging in error reporting, normative social influence could cause him/her to conform to
those error reporting behaviors, in order to be socially accepted (Deutch & Gerard, 1955). Thus,
as long as our society maintains ethical standards valuing human life, and at least some
employees perceive a higher level of climate for safety in the workplace relative to their peers, it
may not matter if others perceive a low level of climate for safety. This could be particularly
true if the employees with high perceptions are seen as influential or respected.

Practically speaking, the results suggest that not only is establishing a work environment
where employees feel safe to discuss errors and where the management cares about safety
important for improving safety-related behaviors such as error reporting, but that there are two
potential courses of action to take when creating uniformly high safety climate perceptions is not
possible. First, managers should target their safety climate efforts at subordinates who are
considered the most visible, influential, and respected amongst their peers. If those employees
perceive a high safety climate and subsequently engage in error reporting behaviors, then this
could influence the behaviors of others who do not share those climate perceptions. Second,
managers should remind all employees of the Hippocratic Oath they took to do no harm.
Reminders such as these could help reinforce social norms and basic deontic values, resulting in
increased compliance with error-reporting behaviors.

**Hypotheses 4b – 6b: Alignment of Nurse and Manager Climate Ratings**

Hypotheses 4b through 6b dealt with whether nurses and managers had similar safety
climate ratings, and whether alignment (or misalignment) could predict error reporting outcomes.
Although climate alignment studies have been conducted a couple of times (Bashshur et al.,
2001; McKay et al., 2009), they have never been performed using safety climate dimensions.
Similar to Hypotheses 1b through 3b, significant results were primarily found when predicting nurse-rated outcomes, and the results themselves were very consistent. For instance, Hypothesis 4b stated that safety climate ratings that were aligned and high would yield more error reporting than safety climate ratings that were aligned and low. This was clearly supported statistically, with a positive linear slope along the Y=X line for the safety climate dimensions of overall safety perceptions and nonpunitive response to error.

In the case of communication openness, a convex parabola was indicated, such that when aligned ratings were higher than the midpoint of the scale, there was a positive relationship between climate ratings and error reporting, but that the same held true when aligned ratings were lower than the scale midpoint (which contradicted Hypothesis 4b). However, there were no data points in the aligned and low portion of the graph (i.e., the lower left quadrant), so I focused on the aligned and high portion of the graph (i.e., the upper right quadrant), and the surface of the graph indeed supported my hypothesis in that area. Thus, overall there was consistent statistical and visual support for Hypothesis 4b across all three safety climate measures predicting nurse-rated error reporting, but results must be treated with caution, since the full range of aligned values could not be studied.

If one were to interpret the practical implications of the Hypothesis 4b results (within the range of actual data), the conclusion would be that it is best to have both managers and nurses have the highest safety climate perceptions possible. Since this was a cross-sectional data set, the process by which these high climate levels come about cannot be determined. However, there is theoretical support for a top-down effect from managers to nurses (e.g., Dragoni, 2005; Schein, 2010), a bottom-up effect from nurses to managers (e.g., Burns, 1978), and a lateral effect amongst nurses (e.g., Salancik & Pfeffer, 1978). Given the multiple directions of
influence that are possible, it is important for all employees to promote a positive safety climate. If managers create policies to address the causes of errors rather than penalizing the offenders, and encourage discussion of errors and how to prevent them, then this could influence how nurses (and perhaps other managers) perceive their hospital unit. Likewise, nurses should be responsible for maintaining such a climate and should not expect managers to carry all of the responsibility. Managers could put forth their best effort, but if nurses do not take their managers seriously, or they demonstrate to impressionable colleagues that safety policies are a hassle rather than essential, then that is the climate that could spread laterally amongst the nurses. Eventually, the managers could even give up and let themselves be negatively affected as well. Thus, it is important for upper hospital management to make all employees understand that they play a role in creating (or breaking) the safety climate, and that the best results occur when everyone perceives a high level of that climate.

Hypothesis 5b₁ predicted that when nurse and manager ratings are misaligned, better outcomes result when nurse ratings are higher, which would be indicated by a positive slope along the Y= -X line. Positive slopes were indeed found for all three safety climate dimensions predicting nurse-rated error reporting, indicating statistical support for this hypothesis. A visual inspection of the plotted surfaces revealed that while overall the shapes were consistent with the hypothesis, there was a limited number of actual data points along the Y= -X line (particularly for communication openness), especially at the line’s extremities. Rather, all the data near the Y= -X line were closer to the origin (0,0) of the graph. Thus, Hypothesis 5b₁ was statistically supported when predicting nurse-rated error reporting, but the interpretability cannot be extended to the extreme ends of nurse-manager rating misalignment.
The only misalignment test yielding significant results when predicting manager-rated error reporting was for overall safety perceptions misalignment. Contrary to expectations, the slope along the $Y = -X$ line was negative, indicating that when manager perceptions of overall safety climate were higher than nurse perceptions, errors were reported more frequently than when nurse perceptions were higher than manager perceptions. However, as discussed previously, it is likely that nurses have more accurate perceptions of how often errors are reported, since they would be the ones actually committing the errors and then electing whether to report them or not. Therefore, these results may not have the same meaning as when using nurse-rated outcomes. For instance, if managers feel compelled to make their unit look good by rating everything highly instead of realistically, then nurse ratings will be inconsequential. However, regardless of the exact explanation, Hypothesis 5b$_1$ was not supported when predicting manager-rated error reporting.

The results of Hypothesis 5b$_1$, when using a nurse-rated outcome, suggest that if it is not possible for managers and nurses to both perceive high safety climate levels, then it may be better for nurses to have higher ratings than managers (however, conclusions can only be made about nurses having slightly higher or lower ratings than managers, due to the current data’s range restriction). Since nurses are the front-line workers interacting with patients and engaging in more of the day-to-day activities that could become dangerous, this seems to make sense, assuming similar results could be found when there is a greater range in the data. If nurses have higher climate perceptions than managers, it may not be a result of the manager’s actions. Rather, a subclimate may exist within the nurses, reinforced by how the nurses interact with each other and the meaning they attach to safety practices (Salancik & Pfeffer, 1978). Thus, hospitals should hire nurses who are conscientious and safety-oriented even in the absence of strong...
managerial guidance. In addition, if these nurses are extraverted and seem to have referent power (French & Raven, 1959), then it is possible they will be able to promulgate a safety climate by serving as a role model. By incorporating these criteria into hiring practices, perhaps nurses would be able to overcome any bad climate created by managers.

Hypothesis 5b2 suggested that as nurse climate ratings reached the upper limit of the scale along the Y= -X line, a negative curve would appear, such that the increase in learning behaviors would level off. The response surface along the Y= -X line for communication openness predicting nurse-rated error reporting did have a significant negative curvature, and a visual inspection did reveal a shape similar to that indicated by the hypothesis. However, the curve was negatively offset from the Y=X line, meaning that error reporting began leveling off even when manager ratings of communication openness were higher than nurse ratings. In other words, statistically the shape of the surface conformed to Hypothesis 5b2, but a visual inspection revealed that the shape was displaced to the left more than what was expected. Regardless, there were very few data points along the Y= -X line for communication openness, and even fewer in the portion where manager ratings were higher than nurse ratings (i.e., to the left of the Y=X line). Therefore, it is extremely difficult to draw any practical conclusions from these results, as the shape may take on a different form when more extreme misaligned ratings are present between nurses and managers.

In testing Hypothesis 6b, the only statistically relevant results were the marginally significant results for alignment/misalignment of communication openness climate ratings predicting nurse-rated error reporting beyond the influence of communication openness climate level and strength. However, the alignment/misalignment results for all of the safety climate dimensions in Hypotheses 5a1 and 5a2 were fairly uninterpretable due to data range restriction,
particularly for communication openness. Thus, the results for Hypothesis 6b do not hold much meaning. Overall, I cannot conclude at this time whether climate alignment/misalignment predicts outcomes beyond the influence of climate level and strength.

**Limitations of Study 2**

Study 2 was an attempt to repeat the tests performed in Study 1 in a different environment with a larger sample size and fewer data range restrictions. While the first two goals were achieved, there were still range restriction problems. The spread of data was better in this study for managers, but seemed to cluster around the scale midpoint for nurses. Thus, slightly more confidence can be placed in this study’s alignment results compared to Study 1, but the extreme ratings that assist in interpreting alignment results were still not present.

There were a few other key weaknesses as well. First, all of the data involved self-reported ratings of a perceptual nature. That is, there were no objective outcome data. However, it is important to note that the outcome variable in this study, (perceived) frequency of error reporting, has been correlated with substantive objective data. For example, Sorra and colleagues (2012) found that it had a significant relationship with patient ratings of their hospital experiences, such as whether the facilities were kept clean ($r = .25, p< .05$). Perhaps more importantly, Mardon and colleagues (2010) discovered that frequency of error reporting has a negative relationship with adverse health outcomes ($r = -.33, p< .05$). That is, the more errors are (perceived to be) reported, the lower the occurrence of infections, postoperative hemorrhaging, postoperative sepsis, and accidental puncture or laceration, among others. Thus, while the outcome of interest in this study was perceptual in nature, it has also been linked to both patient experiences and objective safety outcomes.
Second, the data were all collected in the same survey, contributing to the possibility of same-source bias (Podsakoff et al., 2003). It could be the case that how respondents answered the predictor items primed them to answer the outcome items in a certain way that was not necessarily representative of the construct of interest. To avoid this, I also tested the effect of nurses’ climate ratings on managers’ outcome ratings, but the results were mostly non-significant and uninformative. Therefore, it is unclear whether same-source bias was driving my findings, or if nurses and managers were rating qualitatively different concepts for the outcome measures. I attempted to measure the relationship of manager climate ratings with manager outcome ratings, but the numerous significant correlations did not provide much evidence disputing the presence of the bias.

The third, and perhaps largest, limitation is that unlike in Study 1, where students were clearly enrolled in a given class/instructor, nurse data were not nested within specific managers. Rather, scores were aggregated across all nurses and all managers in their Medicine unit in any given hospital. Without a better understanding of each hospital’s employment practices, including shift rotations, it is unclear whether subclimates should have been expected within each hospital’s Medicine unit. The acceptable interrater agreement and reliability statistics helped alleviate this concern to an extent, but some of the richness of this data may still simply be inaccessible.
CHAPTER 4: OVERALL DISCUSSION

The purpose of this dissertation was two-fold: to expand research on the linear and nonlinear interactions of climate level and strength, and to investigate the impact of leader-follower alignment/misalignment of climate perceptions on organizational outcomes. Data were collected from two different studies measuring two different climate types: learning and safety. Not only did this approach allow limitations of one study to be addressed by the other study (as discussed in the Discussion sections of Chapters 2 and 3), but the opportunity to compare results for consistency across settings and climate types was also facilitated.

Study 1 involved instructor and student perceptions of classroom learning climate at a public university. Learning climate was divided into three separate dimensions (participation, mistakes, and learning orientation) but overall can be defined as a common understanding of whether behaviors promoting learning are valued and encouraged (Zaccarro et al., 2008). Study 2 was conducted using an archival dataset measuring manager and nurse perceptions of safety climate in hospitals across the United States. Safety climate was divided into three separate dimensions as well (overall perceptions of safety, communication openness, and nonpunitive response to error), but overall is defined as shared perceptions about safety policies and procedures (Zohar, 2003). In both studies, follower climate perceptions were used to predict both follower- and leader-rated outcomes.

Hypotheses 1 - 3: Climate Level and Strength

Hypotheses 1 through 3 dealt with the first purpose of the dissertation: expanding research on the linear and nonlinear interactions of climate level and strength. Overall, the pattern of results were similar across the two studies in the sense that significant results were
found more often for follower-rated outcomes than leader-rated outcomes. However, the results for Study 2 tended to be more consistent across the predictors (most likely due to high intercorrelations), and yielded different outcomes than Study 1 with respect to Hypothesis 2.

For Hypothesis 1, positive main effects of safety climate on error reporting were consistently found, and while such effects were also found for participation and mistake learning climates on learning behaviors, they were not present for learning orientation climate. Overall though, it appears that both learning and safety climate are positively related to their respective outcomes, supporting Hypothesis 1 and confirming the results of numerous prior studies and meta-analyses (e.g., Carr et al., 2003; Colquitt et al., 2002; Kuenzi & Schminke, 2009).

Hypothesis 2 posited that the positive relationship between climate level and outcomes would be enhanced when climate strength was high (i.e., low variability in ratings). This is where the results differed across the two studies. With respect to Study 1, results were again inconsistent across learning climate facets, such that Hypothesis 2 was supported for participation and mistake learning climates, but not for learning orientation. In fact, while learning orientation had a significant interaction, it was in the opposite direction, such that the positive relationship between climate level and outcomes was stronger when climate strength was low (i.e., high variability in ratings). This surprising finding is discussed in greater detail in Chapter 2, but suggests that results may not always be the same, depending on which type of climate and/or outcome measure is utilized.

With respect to Study 2, results were consistent across all three safety climate facets, although they were all nonsignificant and unsupportive of Hypothesis 2. Contrary to the results from Study 1, this suggests that the variability in safety climate perceptions is irrelevant, and that only mean climate perceptions are of consequence. These results reiterate the inconsistent
findings across the extant climate literature with respect to a linear interaction between climate level and strength. Some have found interactions (e.g., Colquitt et al., 2002; Schneider et al., 2002), while others have not (e.g., Lindell & Brandt, 2000; Zohar & Luria, 2004). As discussed in Chapter 3, the nonsignificant interaction for safety climate could be due to the inherent moral implications of neglecting safety behaviors, making social influence more likely to successfully occur (Deutsch & Gerard, 1955). Thus, while the conflicting Hypothesis 2 results across Studies 1 and 2 could reflect differences between the process and strategic climate typologies, it is also possible that results depend upon the moral relativism of the climate type. In other words, does the specific climate type reflect conventional social norms or deontic perspectives about what is considered acceptable, appropriate, or ethical behavior? If so, then social pressure from colleagues could be enough to encourage all employees to improve their safety behaviors, even if only by a little. If the moral implications of the climate in question are weak or unclear, then employees may be more reluctant to alter their behaviors, and unified employee perceptions may therefore be more important for eliciting subsequent positive behaviors.

If this possible explanation proves correct, then the practical implications should vary across climate types. For climates with less substantial or clear moral implications, such as learning climate, the results indicate that it is important for all members of a work unit to be on the same page with respect to their climate perceptions. It is not enough to expect members with high ratings to compensate for members with lower ratings. To ensure the best outcomes, such as increased learning behaviors, leaders must promote a work environment where no one’s perspective is neglected. They should stress that their policies and philosophies apply to everyone equally, and encourage followers to promote those policies and philosophies amongst their peers. On the other hand, for climates with more considerable or evident moral
implications, such as safety climate, it may not matter whether leaders consistently implement safety policies or not. Although ideally, equal treatment may be best from an organizational justice perspective, if leaders focus their message on followers who are particularly influential and admired amongst their peers, then that message could have a lateral influence on subsequent behaviors. Furthermore, leaders should emphasize deontic statements that are hard to dismiss, (such as the importance of saving a human life in the case of safety climate). This will allow even those who perceive a negative climate to be persuaded, if only to a small extent, to engage in more positive behaviors that are better aligned with those values.

The above recommendations notwithstanding, another possible explanation for the different interaction results across Studies 1 and 2 was presented by Ostroff and colleagues (2012). They suggested that the inconsistencies may not actually be due to substantive differences in interaction relationships for various climate types, but rather may be due to statistical artifacts related to bounded measurement scales. As such, they recommended investigating curvilinear interactions of climate level and strength instead, which was indeed done in testing Hypothesis 3.

Significant results for Hypothesis 3 were consistently absent across all climate measures in the two studies. Since this is the first study (to my knowledge) to investigate curvilinear interactions of climate level and strength, it is difficult to definitively conclude whether the null results were due to the nature of the studies themselves, the climate types investigated, or because curvilinear interactions do not exist for any climate types. Thus, further research is required to better ascertain the extent to which curvilinear interactions are or are not present in the climate domain. For now, although I have offered some explanations (and accompanying recommendations) to account for the differences in Hypothesis 2 results across Studies 1 and 2,
reconciliation between the opposing camps on the climate level-strength interaction debate cannot yet be achieved.

**Hypotheses 4 – 6: Leader-Follower Climate Alignment**

Hypotheses 4 through 6 dealt with the second purpose of the dissertation: investigating the alignment/misalignment of leader and follower climate perceptions to determine if relative levels impact outcomes. Hypotheses 1 and 2 established that follower climate perceptions impact outcomes, but they did not address whether that effect is moderated by the relative standing of supervisor climate perceptions. Most leadership studies tend to rely on follower ratings (Hunter et al., 2007), assuming that climate represents a top-down passage from leader to follower (e.g., Dragoni, 2005; Schein, 2010). However, leaders may not always translate their climate perceptions into actions that are interpreted by followers in a similar manner, or followers may create their own climate independent of a leader’s actions, resulting in differing ratings between leaders and followers. It is therefore important to determine if measuring leader climate ratings helps us to better understand the impact of follower climate ratings. If climate misalignment has any consequences for team or organizational outcomes (e.g., Bashshur et al., 2011; Gibson et al., 2009), then recognizing this would provide the impetus for organizations to assess both leader and follower perceptions, and to take actions to remedy the differences if appropriate.

Similar to the results for Hypotheses 1 and 2, Study 2 results for Hypotheses 4 and 5 tended to be more consistent across the predictors, with significant findings for all three safety climate dimensions, while the results for Study 1 sometimes differed across the three learning climate dimensions. In addition, significant results were again more often found when utilizing follower-rated outcomes.
Hypothesis 4 investigated the results when leaders and followers have similar/aligned climate perceptions. Aligned and high safety climate perceptions (compared to aligned and low) consistently predicted higher amounts of follower-rated error reporting, while the results were more variable for learning climate perceptions. However, when visually inspecting the portion of the graphs where actual data points lay, aligned and high ratings appeared to consistently have higher outcomes than aligned and low ratings in both studies. It is very important to note that in both studies, the majority of data along the line of leader-follower alignment \((Y=X)\) was in the upper right quadrant, representing aligned and high ratings. Thus, any conclusions referring to “aligned and low” ratings are actually referring to scores closer to the midpoint of the climate scales. Since there were no data points truly representing aligned and low ratings, conclusions cannot be made regarding what would happen if leader-follower ratings were in that quadrant, and how it would change the overall shape of the response surfaces. In sum, the results across the two studies tentatively suggest that it is better for leaders and followers to have similar climate perceptions that are “high” as opposed to similar climate perceptions that are “medium.”

Hypotheses 5\(_1\) and 5\(_2\) dealt with the perhaps more interesting question of what happens when leaders and followers do not have similar climate perceptions. While there was some statistical support for Hypothesis 5\(_1\) from Study 1, the results were not interpretable since there were very few to no data points along the line of misalignment \((Y= -X)\). Study 2 also suffered from range restriction issues, but there were enough data points along the \(Y= -X\) line, clustered near the midpoint of the scale, to make limited conclusions. For follower-rated outcomes, all three facets of safety climate yielded identical results: when there is misalignment, it is more beneficial for follower ratings to be higher than leader ratings (bearing in mind that this relationship is contingent on utilizing follower-rated outcomes as well). This suggests that since
followers are often the front-line workers who determine the quality of the work performed, it is crucial to ensure that they perceive a positive climate. Depending on a leader to promote a certain climate may not be sufficient, since that leader him/herself may have a negative view of the climate. Therefore, in addition to training leaders on how to promote a positive climate, it may be advisable to hire employees who have qualities that lend themselves to creating a positive climate independent of the leader (i.e., promoting a climate based on lateral influence as opposed to solely top-down influence). For example, hiring conscientious employees who have an innate desire to learn or to follow safety regulations, and who are well-spoken or extraverted enough to influence their colleagues to do the same.

Hypothesis 5 posited that the effects of follower ratings being higher than leader ratings (Hypothesis 5) would taper off as followers reached the highest possible climate levels. However, not only was there practically no support for this statistically, but in both studies there were no data points on the extreme positive end of the Y= -X line, rendering any findings meaningless anyhow. Based on these two studies, the most that can be concluded at this point regarding misalignment is based on the results of Hypothesis 5b: when follower climate ratings are at a moderate level, it is better for them to be a little higher than leader climate ratings, as opposed to a little lower. Any differences of a larger magnitude would need to be investigated in a future study.

Hypothesis 6 predicted that the effects of climate alignment/misalignment would affect outcomes beyond the combined influence of climate level and strength. Overall, no statistically significant results were found. However, there are so many caveats attached to all of the alignment/misalignment findings due to data range restriction that any significant results would not have had much practical significance anyway. Therefore, the conclusion should not be that
studying leader-follower climate alignment/misalignment is uninformative, but rather that more research needs to be conducted on data that span the full range of the alignment and misalignment spectrum in order to achieve more meaningful conclusions.

In sum, the data restrictions in both data sets precluded any strong, definitive conclusions about the effects of leader-follower climate alignment on outcomes. However, the data in Study 2 were not quite as limited as in Study 1, which may help explain why they more consistently showed support for Hypotheses 4 and 51 (albeit within a narrow range of the possible rated values) across all safety climate dimensions. Therefore, while I can tentatively conclude that it is better for both leaders and followers to have high climate ratings, and if there is misalignment, it is preferable that followers have the higher ratings, replication of these findings with less restricted data is strongly encouraged.

**Leader versus Follower Outcome Ratings**

The majority of the findings that led to the conclusions discussed here dealt with follower-rated outcomes (i.e., students rating the frequency of their learning behaviors and nurses rating the frequency of their error reporting). A few significant results were found for leader-rated outcomes in Study 1, and only one was found in Study 2. This raises the question of whether same-source bias (e.g., Podsakoff et al., 2003) was driving the findings when followers were providing ratings for both the predictor and outcome variables. Since both studies involved cross-sectional data, this concern cannot be allayed definitively.

Consistent with prior studies involving leaders and followers (e.g., Conway & Huffcutt, 1997; Gerstner & Day, 1997), the correlations between leader and follower ratings were rather low, and sometimes not significant at all. This raises the question of whether leaders and followers had drastically different interpretations of the constructs being measured, or if their
outcome ratings were contingent on how they rated the predictor variables (i.e., same-source bias), and therefore not truly reflective of the construct of interest. To help address this, I tested the relationship between instructor-rated climate and instructor-rated outcomes. If same-source bias was affecting follower ratings, then it is reasonable to assume that it would have also been affecting leader ratings.

For Study 1, there were no significant correlations between instructor-rated learning climate and instructor-rated learning behaviors. However, analyses of Study 2 data revealed multiple, moderately sized correlations between manager-rated safety climate dimensions and manager-rated error reporting, and fewer correlations between manager-rated climate and nurse-rated error reporting. It is still possible that these results could be due to leaders and followers rating qualitatively different constructs, or their being influenced by the desire to look good for others (social desirability bias). This explanation is supported by the fact that there were moderately low intercorrelations between the manager- and nurse-rated climate measures as well. However, the results of the analyses conducted are not compelling enough to completely negate the possibility that same-source bias was a contributor to the results found in this dissertation. Therefore, although Study 1 did collect outcome data from instructors at a second time point, future research should aim to collect outcome data from both leaders and followers at a time separate from when climate perceptions were measured.

Conclusions and Future Research

The results of this dissertation confirmed prior conclusions about the positive effect of climate level on outcomes, and also extended research on the interaction of climate level and strength to two facets of climate where this had not often been explored: climate for learning and climate for safety. Furthermore, this dissertation endeavored to expand the breadth of climate
research overall by investigating curvilinear interactions of climate level and stress, as well as the alignment of leader and follower climate ratings. To my knowledge, no studies have ever examined curvilinear interactions, and very few have handled climate alignment analyses.

Although no significant curvilinear interactions were found in either study, and data range restrictions precluded a thorough examination of all the possible combinations of leader-follower climate (mis)alignment, this dissertation laid the foundation for future exploration of these relationships. Currently, it is unclear whether the limited results are due to statistical and/or methodological artifacts, if curvilinear interactions and alignment analyses are not applicable to learning and safety climate but may be relevant for other climate facets, or if these analyses are truly inconsequential in the climate domain as a whole. The only way to determine this is to conduct additional studies focusing on various climate facets, and to design those studies in a more longitudinal manner so as to avoid same-source biases. Furthermore, it would be prudent to collect data in settings where there is likely to be a wide range of climate perceptions across both leaders and followers, to facilitate alignment analyses. This may require preliminary investigations of an organization before determining whether to utilize it for a study.

In sum, this dissertation not only contributed to the cumulative evidence provided by prior climate studies, but also introduced new methods for expanding climate research while simultaneously addressing common concerns in the field of leadership research, such as relying too heavily on subordinate ratings. Future research will hopefully continue to explore these new avenues of climate research, helping us to better understand the role of climate in the workplace.
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Table 1: T-test Results Comparing Online versus Paper Ratings (Study 1)

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<td>.28</td>
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<tr>
<td>Climate for Mistakes</td>
<td>.20</td>
<td>67</td>
<td>.84</td>
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<tr>
<td>Climate for Learning Orientation</td>
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<td>(student-rated)</td>
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<tr>
<td>Reflection Behaviors</td>
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<tr>
<td>(student-rated)</td>
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*Equal variances between the online and paper groups could not be assumed
Table 2: Pattern Matrix for Final Three-Factor EFA of Learning Climate Dimensions (Study 1)

<table>
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<tr>
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<th>Factor 2</th>
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<td>.151</td>
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<tr>
<td>Asking Questions 2</td>
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Note. Results indicated that Asking Questions 1 and 2, Mistakes 1, and Learning Orientation 1 should be discarded. Participation 4 was also discarded for conceptual reasons. The remaining Asking Questions and Mistakes items, though originally conceptualized as two distinct factors, loaded together onto Factor 2.
Table 3: Pattern Matrix for Final Three-Factor EFA of Learning Behavior Dimensions (Study 1)

<table>
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</thead>
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<tr>
<td>Inside 2</td>
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<td>Inside 3</td>
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<td>.054</td>
<td>-.801</td>
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<td>.524</td>
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<td>Inside 5</td>
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<td>Inside 6</td>
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<td>.390</td>
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<td>Inside 7</td>
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<td>-.493</td>
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<td>Inside 8</td>
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<td>-.237</td>
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<td>Outside 3</td>
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<td>.141</td>
<td>.128</td>
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<td>Outside 4</td>
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<td>.323</td>
<td>.053</td>
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<td>Outside 5</td>
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<td>.001</td>
<td>-.063</td>
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<tr>
<td>Outside 6</td>
<td>.524</td>
<td>.080</td>
<td>-.201</td>
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Note: Results indicated that Inside 4-8 and Outside 1 and 2 should be discarded.

Table 4: CFA Results and Model Comparisons for Study 1 Measures

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<tr>
<th>Structure</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\Delta \chi^2$</th>
<th>$\Delta$ df</th>
<th>RMSEA</th>
<th>CFI</th>
<th>TLI</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1 (5-factor)</td>
<td>438**</td>
<td>142</td>
<td>0</td>
<td>0</td>
<td>.05</td>
<td>0.96</td>
<td>0.95</td>
<td>0.04</td>
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<tr>
<td>Model 2 (3-factor)</td>
<td>1525**</td>
<td>149</td>
<td>1087**</td>
<td>7</td>
<td>.10</td>
<td>0.79</td>
<td>0.76</td>
<td>0.07</td>
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<tr>
<td>Model 3 (2-factor)</td>
<td>2115**</td>
<td>151</td>
<td>1677**</td>
<td>9</td>
<td>.12</td>
<td>0.7</td>
<td>0.66</td>
<td>0.09</td>
</tr>
<tr>
<td>Model 4 (1-factor)</td>
<td>3142**</td>
<td>152</td>
<td>2704**</td>
<td>10</td>
<td>.15</td>
<td>0.54</td>
<td>0.48</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Note. All comparisons were made against the 5-factor model. The 3-factor model was created by combining the three climate measures into one factor, and leaving the behavior measures as two factors. The 2-factor model was created by combining the three climate measures into one factor, and combining the two behavior measures into one factor. Due to sample size restrictions, student and instructor individual-level data were combined for these analyses.

**p<.01
| Variables                                                                 | M    | SD   | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   |
|--------------------------------------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|      |
| 1. Gender (% female)                                                     | .59  | .20  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2. Expected Grade                                                       | 1.47 | .31  | -14  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 3. Pre-university education location (% non-U.S.)                        | 1.06 | .09  | -17  | .17  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 4. Class size                                                           | 24.13| 8.76 | .02  | -07  | -17  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 5. Proportion of class time devoted to student participation             | .42  | .23  | .07  | .18  | -05  | -14  |      |      |      |      |      |      |      |      |      |      |      |      |
| 6. Average participation across all enrolled classes                     | 3.29 | .43  | .09  | -08  | .06  | -52  | .06  |      |      |      |      |      |      |      |      |      |      |      |
| 7. Participation Climate                                                | 4.42 | .33  | .47  | .06  | -06  | -15  | .46  | .26  |      |      |      |      |      |      |      |      |      |      |
| 8. Mistake Climate                                                       | 3.93 | .31  | .46  | .06  | .09  | -22  | -01  | .11  | .53  |      |      |      |      |      |      |      |      |      |
| 9. Learning Orientation Climate                                         | 4.21 | .36  | .36  | .18  | -01  | -15  | .07  | .24  | .52  | .51  |      |      |      |      |      |      |      |      |
| 10. Participation Climate (Instructor)                                   | 4.52 | .61  | .21  | .17  | -15  | -08  | .64  | .03  | .50  | -01  | .07  |      |      |      |      |      |      |      |
| 11. Mistake Climate (Instructor)                                         | 3.74 | .89  | .08  | -.41 | -.09 | .14  | .03  | .07  | .11  | .11  | .05  | .10  |      |      |      |      |      |      |
| 12. Learning Orientation Climate (Instructor)                           | 4.39 | .52  | .12  | -.09 | -.05 | .01  | .44  | -.09 | .36  | .05  | .15  | .45  | .16  |      |      |      |      |      |
| 13. Participation Behaviors (Student-rated)                             | 3.29 | .39  | .42  | -.16 | -.22 | -.25 | .32  | .23  | .62  | .48  | .30  | .26  | .18  | .19  |      |      |      |      |
| 14. Participation Behaviors (Instructor-rated)                          | 3.23 | .78  | .36  | -.23 | -.34 | .04  | .04  | -.18 | .18  | .11  | .15  | .20  | .03  | .18  | .26  |      |      |      |
| 15. Participation Behaviors (single-item, Instructor-rated)             | 3.74 | 1.05 | .21  | -.12 | -.09 | -.09 | .46  | .00  | .38  | .28  | .20  | .39  | .17  | .35  | .41  | .43  | .43  |      |
| 16. Reflection Behaviors (Student-rated)                                | 3.05 | .26  | .17  | .27  | -.08 | -.16 | -.17 | .12  | .17  | .15  | .38  | -.03 | -.07 | -.19 | .41  | .03  | -.07 |      |

*p<.01
**p<.01
Table 6: Summary of All Study 1 Hypotheses and Associated Variables

<table>
<thead>
<tr>
<th>Overall Hypothesis</th>
<th>Learning Climate Facets (IV)</th>
<th>Learning Behaviors (DV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a Learning climate levels are positively related to learning behaviors.</td>
<td>1. Participation climate</td>
<td>1. Participation behaviors</td>
</tr>
<tr>
<td></td>
<td>2. Mistake climate</td>
<td></td>
</tr>
<tr>
<td>H2a Learning climate strength moderates the positive impact of learning climate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>level on learning behaviors, such that the relationship is more pronounced when</td>
<td></td>
<td></td>
</tr>
<tr>
<td>the climate is strong than when the climate is weak.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3a There is a curvilinear interaction between learning climate level and learning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>climate strength on learning behaviors, such that the relationship between climate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>level and learning behaviors is more robust when climate strength is high (compared</td>
<td></td>
<td></td>
</tr>
<tr>
<td>to low), but that this effect becomes less pronounced as climate level becomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>extremely high or low.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4a Learning behaviors are higher/better when leader and follower learning climate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>levels are aligned and high, and lower/worse when leader and follower learning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>climate levels are aligned and low.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H5a1 Learning behaviors are higher/better when followers have higher learning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>climate levels than leaders, and lower/worse when followers have lower learning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>climate levels than leaders.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H5a2 As followers’ absolute learning climate levels become higher, the</td>
<td></td>
<td></td>
</tr>
<tr>
<td>relationship between misalignment and learning behaviors will become weaker.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H6a Leader-follower learning climate alignment explains variance in learning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>behaviors beyond what is explained by climate level and climate strength alone.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 7: Summary of All Study 1 Hypothesis Conclusions

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate for Participation</td>
<td>H1a: Supported</td>
<td></td>
<td>H2a: Supported</td>
<td></td>
<td></td>
<td>H3a: Supported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate for Mistakes</td>
<td>H1a: Marginally Supported</td>
<td></td>
<td>H2a: Supported</td>
<td></td>
<td></td>
<td>H3a:: Supported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate for Learning Orientation</td>
<td>H1a:</td>
<td></td>
<td>H2a:</td>
<td></td>
<td></td>
<td>H3a:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Shaded cells represent relationships not specified by the hypotheses. Results are only reported when there was statistical support. Partial statistical support for Hypotheses 4a and 5a, indicates that the surface shape only conformed to the hypotheses when X>0, as evidence by the presence of curvature along the Y=X or Y= -X lines. Visual assessments were only conducted when full or partial statistical support was also evidenced, and they were limited to assessing areas of the plots with actual data.
Table 8: Study 1 Regression Results for Participation Climate Predicting Student-Rated Participation Behaviors

<table>
<thead>
<tr>
<th>Participation Climate</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Controls</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>0.66**</td>
<td>0.26</td>
<td>0.17</td>
<td>0.16</td>
<td>0.18</td>
<td>0.17</td>
</tr>
<tr>
<td>Expected class grade</td>
<td>-0.09</td>
<td>-0.17</td>
<td>-0.13</td>
<td>-0.18</td>
<td>-0.17</td>
<td>-0.19</td>
</tr>
<tr>
<td>Pre-university education location (% non-U.S.)</td>
<td>-0.44</td>
<td>-0.47</td>
<td>-0.62</td>
<td>-0.48</td>
<td>-0.46</td>
<td>-0.48</td>
</tr>
<tr>
<td>Class size</td>
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<td>-0.01</td>
<td>-0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Proportion of class time dedicated to participation</td>
<td>0.43*</td>
<td>0.10</td>
<td>0.10</td>
<td>0.11</td>
<td>0.11</td>
<td>0.14</td>
</tr>
<tr>
<td>Average participation across all enrolled classes</td>
<td>0.07</td>
<td>-0.06</td>
<td>-0.03</td>
<td>-0.07</td>
<td>-0.08</td>
<td>-0.07</td>
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<tr>
<td><strong>Predictors</strong></td>
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<td></td>
</tr>
<tr>
<td>Climate Level</td>
<td>0.56**</td>
<td>0.22</td>
<td>0.41</td>
<td>0.33</td>
<td>0.31</td>
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<tr>
<td>Climate Strength</td>
<td>-0.78</td>
<td>-0.67</td>
<td>-0.77</td>
<td>-0.56</td>
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</tr>
<tr>
<td>Climate Level*Strength</td>
<td>-1.51*</td>
<td>-1.86</td>
<td>-1.67</td>
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</tr>
<tr>
<td>Climate Level^2</td>
<td>-0.19</td>
<td>0.12</td>
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<tr>
<td>Climate Level^2*Climate Strength</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>∆R^2</td>
<td>.28*</td>
<td>.15**</td>
<td>.04</td>
<td>.06*</td>
<td>.00</td>
<td>.01</td>
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*p<.01

**p<.01
### Table 9: Study 1 Regression Results for Participation Climate Predicting Instructor-Rated Participation Behaviors (Scale)

<table>
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<tr>
<th>Participation Climate</th>
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<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
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<tr>
<td>Controls</td>
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<td></td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>1.53**</td>
<td>1.43*</td>
<td>1.41*</td>
<td>1.4*</td>
<td>1.6**</td>
<td>1.61**</td>
</tr>
<tr>
<td>Expected class grade</td>
<td>-0.61</td>
<td>-0.63</td>
<td>-0.62</td>
<td>-0.69*</td>
<td>-0.60</td>
<td>-0.60</td>
</tr>
<tr>
<td>Pre-university education</td>
<td>-2.67*</td>
<td>-2.67*</td>
<td>-2.71*</td>
<td>-2.54*</td>
<td>-2.33*</td>
<td>-2.33*</td>
</tr>
<tr>
<td>Class size</td>
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<td>-0.03*</td>
<td>-0.03*</td>
<td>-0.03*</td>
<td>-0.03*</td>
<td>-0.03*</td>
</tr>
<tr>
<td>Proportion of class time dedicated to participation</td>
<td>0.03</td>
<td>-0.04</td>
<td>-0.04</td>
<td>-0.03</td>
<td>-0.04</td>
<td>-0.04</td>
</tr>
<tr>
<td>Average participation across all enrolled classes</td>
<td>-0.61*</td>
<td>-0.64*</td>
<td>-0.64*</td>
<td>-0.68*</td>
<td>-0.75**</td>
<td>-0.75**</td>
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</tr>
<tr>
<td>Climate Level</td>
<td>0.13</td>
<td>0.06</td>
<td>0.28</td>
<td>-0.49</td>
<td>-0.49</td>
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<tr>
<td>Climate Strength</td>
<td>-0.17</td>
<td>-0.04</td>
<td>-1.02</td>
<td>-1.05</td>
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<tr>
<td>Climate Level*Strength</td>
<td>-1.83</td>
<td>-5.34</td>
<td>-5.36</td>
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<tr>
<td>Climate Level²</td>
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<td>-1.88</td>
<td>-1.92</td>
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<tr>
<td>Climate Level²*Climate Strength</td>
<td>0.15</td>
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<tr>
<td>ΔR²</td>
<td>.35**</td>
<td>.00</td>
<td>.00</td>
<td>.02</td>
<td>.03</td>
<td>.00</td>
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</table>

*p<.01

**p<.01
Table 10: Study 1 Regression Results for Participation Climate Predicting Instructor-Rated Participation Behaviors (Single-Item)

<table>
<thead>
<tr>
<th>Participation Climate</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>0.75</td>
<td>0.26</td>
<td>0.29</td>
<td>0.25</td>
<td>0.30</td>
<td>0.32</td>
</tr>
<tr>
<td>Expected class grade</td>
<td>-0.37</td>
<td>-0.47</td>
<td>-0.49</td>
<td>-0.71</td>
<td>-0.68</td>
<td>-0.65</td>
</tr>
<tr>
<td>Pre-university education location (% non-U.S.)</td>
<td>-0.78</td>
<td>-0.81</td>
<td>-0.75</td>
<td>-0.20</td>
<td>-0.14</td>
<td>-0.10</td>
</tr>
<tr>
<td>Class size</td>
<td>-0.02</td>
<td>-0.02</td>
<td>-0.02</td>
<td>-0.01</td>
<td>-0.01</td>
<td>-0.01</td>
</tr>
<tr>
<td>Proportion of class time dedicated to participation</td>
<td>2.12**</td>
<td>1.71*</td>
<td>1.71*</td>
<td>1.76**</td>
<td>1.76**</td>
<td>1.70*</td>
</tr>
<tr>
<td>Average participation across all enrolled classes</td>
<td>-0.30</td>
<td>-0.46</td>
<td>-0.47</td>
<td>-0.62</td>
<td>-0.64</td>
<td>-0.66</td>
</tr>
<tr>
<td>Predictors</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level</td>
<td>0.69</td>
<td>0.82</td>
<td>1.56</td>
<td>1.36</td>
<td>1.41</td>
<td></td>
</tr>
<tr>
<td>Climate Strength</td>
<td>0.32</td>
<td>0.73</td>
<td>0.47</td>
<td>-0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level*Strength</td>
<td>-6.02**</td>
<td>-6.93</td>
<td>-7.43</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Climate Level^2</td>
<td>-0.48</td>
<td>-1.31</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level^2*Climate Strength</td>
<td>3.48</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

\[ \Delta R^2 = \begin{array}{ccccccc}
0.35** & 0.00 & 0.00 & 0.02 & 0.03 & 0.00 \\
\end{array} \]

*p<.01

**p<.01
## Table 11: Study 1 Regression Results for Mistake Climate Predicting Student-Rated Participation Behaviors

<table>
<thead>
<tr>
<th>Mistake Climate</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Controls</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>0.66**</td>
<td>0.33</td>
<td>0.34</td>
<td>0.26</td>
<td>0.21</td>
<td>0.18</td>
</tr>
<tr>
<td>Expected class grade</td>
<td>-0.09</td>
<td>-0.19</td>
<td>-0.19</td>
<td>-0.18</td>
<td>-0.2</td>
<td>-0.22</td>
</tr>
<tr>
<td>Pre-university education location (% non-U.S.)</td>
<td>-0.44</td>
<td>-0.69</td>
<td>-0.65</td>
<td>-0.86</td>
<td>-0.80</td>
<td>-0.92</td>
</tr>
<tr>
<td>Class size</td>
<td>-0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Proportion of class time dedicated to participation</td>
<td>0.43*</td>
<td>0.48*</td>
<td>0.5**</td>
<td>0.47*</td>
<td>0.43*</td>
<td>0.46*</td>
</tr>
<tr>
<td>Average participation across all enrolled classes</td>
<td>0.07</td>
<td>0.03</td>
<td>0.02</td>
<td>0.03</td>
<td>0.03</td>
<td>0.07</td>
</tr>
<tr>
<td><strong>Predictors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level</td>
<td>0.48**</td>
<td>0.53**</td>
<td>0.44*</td>
<td>0.56**</td>
<td>0.41</td>
<td></td>
</tr>
<tr>
<td>Climate Strength</td>
<td>0.21</td>
<td>0.19</td>
<td>0.38</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level*Strength</td>
<td>-1.71</td>
<td>-0.16</td>
<td>-0.46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level²</td>
<td>0.93</td>
<td>0.49</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level²*Climate Strength</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.83</td>
<td></td>
</tr>
<tr>
<td>ΔR²</td>
<td>.28*</td>
<td>.12*</td>
<td>.01</td>
<td>.04</td>
<td>.03</td>
<td>.01</td>
</tr>
</tbody>
</table>

*p<.01
**p<.01
Table 12: Study 1 Regression Results for Mistake Climate Predicting Instructor-Rated Participation Behaviors (Scale)

<table>
<thead>
<tr>
<th>Mistake Climate</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Controls</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>1.53**</td>
<td>1.53**</td>
<td>1.52**</td>
<td>1.31*</td>
<td>1.22*</td>
<td>1.32*</td>
</tr>
<tr>
<td>Expected class grade</td>
<td>-0.61</td>
<td>-0.61</td>
<td>-0.61</td>
<td>-0.60</td>
<td>-0.61</td>
<td>-0.52</td>
</tr>
<tr>
<td>Pre-university education location (% non-U.S.)</td>
<td>-2.67*</td>
<td>-2.67*</td>
<td>-2.67*</td>
<td>-3.25**</td>
<td>-3.16**</td>
<td>-2.70*</td>
</tr>
<tr>
<td>Class size</td>
<td>-0.04*</td>
<td>-0.03*</td>
<td>-0.04*</td>
<td>-0.03</td>
<td>-0.02</td>
<td>-0.03</td>
</tr>
<tr>
<td>Proportion of class time dedicated to participation</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>-0.03</td>
<td>-0.10</td>
<td>-0.19</td>
</tr>
<tr>
<td>Average participation across all enrolled classes</td>
<td>-0.61*</td>
<td>-0.61*</td>
<td>-0.61*</td>
<td>-0.60*</td>
<td>-0.58*</td>
<td>-0.74*</td>
</tr>
<tr>
<td><strong>Predictors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level</td>
<td>0.00</td>
<td>-0.01</td>
<td>-0.26</td>
<td>-0.07</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Climate Strength</td>
<td>-0.03</td>
<td>-0.07</td>
<td>0.25</td>
<td>-0.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level*Strength</td>
<td>-4.69*</td>
<td>-2.15</td>
<td>-0.97</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level^2</td>
<td>1.53</td>
<td>3.23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level^2*Climate Strength</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10.98</td>
</tr>
<tr>
<td>∆R^2</td>
<td>.35**</td>
<td>.00</td>
<td>.00</td>
<td>.06*</td>
<td>.02</td>
<td>.02</td>
</tr>
</tbody>
</table>

*p<.01
**p<.01
Table 13: Study 1 Regression Results for Mistake Climate Predicting Instructor-Rated Participation Behaviors (Single-Item)

<table>
<thead>
<tr>
<th>Mistake Climate</th>
<th>Participation Behaviors (Instructor-Rated Single-Item)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Step 1</td>
</tr>
<tr>
<td>Controls</td>
<td></td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>0.75</td>
</tr>
<tr>
<td>Expected class grade</td>
<td>-0.37</td>
</tr>
<tr>
<td>Pre-university education location (% non-U.S.)</td>
<td>-0.78</td>
</tr>
<tr>
<td>Class size</td>
<td>-0.02</td>
</tr>
<tr>
<td>Proportion of class time dedicated to participation</td>
<td>2.12**</td>
</tr>
<tr>
<td>Average participation across all enrolled classes</td>
<td>-0.30</td>
</tr>
<tr>
<td>Predictors</td>
<td></td>
</tr>
<tr>
<td>Climate Level</td>
<td>1.22*</td>
</tr>
<tr>
<td>Climate Strength</td>
<td>1.01</td>
</tr>
<tr>
<td>Climate Level*Strength</td>
<td>-1.78</td>
</tr>
<tr>
<td>Climate Level(^2)</td>
<td>0.67</td>
</tr>
<tr>
<td>Climate Level(^2)*Climate Strength</td>
<td></td>
</tr>
<tr>
<td>(\Delta R^2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.25*</td>
</tr>
</tbody>
</table>

\*p<.01
\**p<.01
Table 14: Study 1 Regression Results for Learning Orientation Climate Predicting Reflection Behaviors

<table>
<thead>
<tr>
<th>Learning Orientation Climate</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>0.24</td>
<td>0.19</td>
<td>0.16</td>
<td>0.06</td>
<td>0.06</td>
<td>0.05</td>
</tr>
<tr>
<td>Expected class grade</td>
<td>0.15</td>
<td>0.13</td>
<td>0.13</td>
<td>0.12</td>
<td>0.12</td>
<td>0.13</td>
</tr>
<tr>
<td>Pre-university education location (% non-U.S.)</td>
<td>-0.48</td>
<td>-0.47</td>
<td>-0.39</td>
<td>-0.31</td>
<td>-0.30</td>
<td>-0.36</td>
</tr>
<tr>
<td>Class size</td>
<td>-0.01</td>
<td>-0.01</td>
<td>-0.01</td>
<td>-0.01*</td>
<td>-0.01*</td>
<td>-0.01*</td>
</tr>
<tr>
<td>Proportion of class time dedicated to participation</td>
<td>-0.23*</td>
<td>-0.23*</td>
<td>-0.23*</td>
<td>-0.17</td>
<td>-0.17</td>
<td>-0.18</td>
</tr>
<tr>
<td>Average participation across all enrolled classes</td>
<td>-0.01</td>
<td>-0.02</td>
<td>-0.04</td>
<td>-0.07</td>
<td>-0.07</td>
<td>-0.06</td>
</tr>
<tr>
<td>Predictors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level</td>
<td>0.09</td>
<td>0.24</td>
<td>0.26</td>
<td>0.28</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>Climate Strength</td>
<td>0.30</td>
<td>0.30</td>
<td>0.32</td>
<td>0.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level*Strength</td>
<td>0.73*</td>
<td>0.85</td>
<td>0.68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level(^2)</td>
<td>0.08</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Level(^2)*Climate Strength</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.38</td>
</tr>
</tbody>
</table>

\(\Delta R^2\): .23* .02 .02 .09* .00 .00

*p<.01
**p<.01
### Table 15: Study 1 Polynomial Regression and Response Surface Methodology Results for Testing Alignment Hypotheses

<table>
<thead>
<tr>
<th></th>
<th>Polynomial Regression Results</th>
<th>Shape Along Y=X line</th>
<th>Shape Along Y=-X line</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>X²</td>
</tr>
<tr>
<td><strong>Student-Rated Participation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation climate</td>
<td>-1.23</td>
<td>0.06</td>
<td>0.85*</td>
</tr>
<tr>
<td>Mistake climate</td>
<td>-1.09</td>
<td>0.19</td>
<td>0.86*</td>
</tr>
<tr>
<td><strong>Instructor-Rated Participation (scale)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation climate</td>
<td>-0.19</td>
<td>-0.41</td>
<td>-0.13</td>
</tr>
<tr>
<td>Mistake climate</td>
<td>-3.40*</td>
<td>0.11</td>
<td>1.84*</td>
</tr>
<tr>
<td><strong>Instructor-Rated Participation (single-item)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation climate</td>
<td>-2.32</td>
<td>-1.70</td>
<td>0.36</td>
</tr>
<tr>
<td>Mistake climate</td>
<td>0.38</td>
<td>0.04</td>
<td>0.38</td>
</tr>
<tr>
<td><strong>Reflection</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning Orientation climate</td>
<td>1.07*</td>
<td>-0.16</td>
<td>-0.41*</td>
</tr>
</tbody>
</table>

*Note. For columns labeled X, Y, X², XY, and Y², table entries are unstandardized regression coefficients for equations with all predictors, including control variables, entered simultaneously. X = student ratings, Y = instructor ratings. Control variables, though not listed above, are gender (percentage female), expected class grade, pre-university education location (percentage non-U.S.), class size, proportion of class time dedicated to participation, and average participation across all enrolled classes. The column labeled ∆R² indicates the variance explained when the three quadratic terms (X², XY, and Y²) were added as a set to the other predictors. Columns labeled b1+b2 and b3+b4+b5 represent the slope (at X=0) and curvature of each surface along the X=Y line, and columns labeled b1-b2 and b3-b4+b5 represent the slope (at X=0) and curvature of each surface along the Y=-X line (b1, b2, b3, b4, and b5 are the coefficients on X, Y, X², XY, and Y², respectively).
Table 16: CFA Results and Model Comparisons for Study 2 Measures (Nurses)

<table>
<thead>
<tr>
<th>Structure</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\Delta \chi^2$</th>
<th>$\Delta$ df</th>
<th>RMSEA</th>
<th>CFI</th>
<th>TLI</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1 (4-factor)</td>
<td>155.91**</td>
<td>59</td>
<td>0.08</td>
<td>0.08</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 2 (2-factor)</td>
<td>532.40**</td>
<td>64</td>
<td>376.49**</td>
<td>5</td>
<td>0.17</td>
<td>0.80</td>
<td>0.76</td>
<td>0.09</td>
</tr>
<tr>
<td>Model 3 (1-factor)</td>
<td>836.64**</td>
<td>65</td>
<td>680.73**</td>
<td>6</td>
<td>0.22</td>
<td>0.67</td>
<td>0.6</td>
<td>0.10</td>
</tr>
</tbody>
</table>

*Note.* All comparisons were made against the 4-factor model. The 2-factor model was created by combining the three safety climate measures into one factor, and then comparing to the one outcome measure.  
**p<.01

Table 17: CFA Results and Model Comparisons for Study 2 Measures (Managers)

<table>
<thead>
<tr>
<th>Structure</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\Delta \chi^2$</th>
<th>$\Delta$ df</th>
<th>RMSEA</th>
<th>CFI</th>
<th>TLI</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1 (4-factor)</td>
<td>91.70**</td>
<td>59</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 2 (2-factor)</td>
<td>229.62**</td>
<td>64</td>
<td>137.92**</td>
<td>5</td>
<td>0.10</td>
<td>0.84</td>
<td>0.81</td>
<td>0.08</td>
</tr>
<tr>
<td>Model 3 (1-factor)</td>
<td>468.41**</td>
<td>65</td>
<td>376.71**</td>
<td>6</td>
<td>0.16</td>
<td>0.61</td>
<td>0.53</td>
<td>0.11</td>
</tr>
</tbody>
</table>

*Note.* All comparisons were made against the 4-factor model. The 2-factor model was created by combining the three safety climate measures into one factor, and then comparing to the one outcome measure.  
**p<.01
<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of Nurses</td>
<td>19.04</td>
<td>9.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Government-owned hospital</td>
<td>0.20</td>
<td>0.40</td>
<td>-0.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Teaching hospital</td>
<td>0.31</td>
<td>0.46</td>
<td>-0.01</td>
<td>-0.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Overall safety perceptions (nurse)</td>
<td>3.36</td>
<td>0.37</td>
<td>-0.05</td>
<td>0.16*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Communication openness (nurse)</td>
<td>3.53</td>
<td>0.30</td>
<td>0.06</td>
<td>0.06</td>
<td>0.08</td>
<td></td>
<td>0.66**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Nonpunitive response to error (nurse)</td>
<td>3.07</td>
<td>0.38</td>
<td>0.02</td>
<td>0.01</td>
<td>0.00</td>
<td>0.53*</td>
<td>0.65**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Overall safety perceptions (manager)</td>
<td>3.79</td>
<td>0.73</td>
<td>-0.06</td>
<td>0.02</td>
<td>-0.14**</td>
<td>0.28**</td>
<td>0.19**</td>
<td>0.18**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Communication openness (manager)</td>
<td>4.02</td>
<td>0.61</td>
<td>0.06</td>
<td>-0.05</td>
<td>0.02</td>
<td>0.10</td>
<td>0.20**</td>
<td>0.10</td>
<td>0.39**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Nonpunitive response to error (manager)</td>
<td>3.70</td>
<td>0.78</td>
<td>0.14*</td>
<td>0.00</td>
<td>-0.05</td>
<td>0.09</td>
<td>0.14*</td>
<td>0.21**</td>
<td>0.47**</td>
<td>0.42**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Error Reporting (nurse)</td>
<td>3.73</td>
<td>0.31</td>
<td>0.06</td>
<td>0.18**</td>
<td>-0.07</td>
<td>0.57**</td>
<td>0.56**</td>
<td>0.35**</td>
<td>0.15</td>
<td>0.05</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>11. Error reporting (manager)</td>
<td>3.84</td>
<td>0.71</td>
<td>0.00</td>
<td>-0.08</td>
<td>-0.08</td>
<td>0.06</td>
<td>0.05</td>
<td>0.01</td>
<td>0.30**</td>
<td>0.42**</td>
<td>0.22**</td>
<td>0.06</td>
</tr>
</tbody>
</table>

*Note. Means and standard deviations for variables 2 and 3 represent the percent of hospitals that were government owned and certified as teaching hospitals, respectively.
*p<.05
**p<.01
<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Overall Hypothesis</th>
<th>Safety Climate Facets (IV)</th>
<th>Safety Behaviors (DV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1b</td>
<td>Safety climate levels are positively related to safety behaviors.</td>
<td>1. Overall Safety Perceptions</td>
<td>1. Error Reporting (self-reported)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H2b</td>
<td>Safety climate strength moderates the positive impact of safety climate level on safety behaviors, such that the relationship is more pronounced when the climate is strong than when the climate is weak.</td>
<td>2. Communication Openness</td>
<td></td>
</tr>
<tr>
<td>H3b</td>
<td>There is a curvilinear interaction between safety climate level and safety climate strength on safety behaviors, such that the relationship between climate level and safety behaviors is more robust when climate strength is high (compared to low), but that this effect becomes less pronounced as climate level becomes extremely high or low.</td>
<td>3. Nonpunitive Response to Error</td>
<td></td>
</tr>
<tr>
<td>H4b</td>
<td>Safety behaviors are higher/better when leader and follower safety climate levels are aligned and high, and lower/worse when leader and follower safety climate levels are aligned and low.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H5b₁</td>
<td>Safety behaviors are higher/better when followers have higher safety climate levels than leaders, and lower/worse when followers have lower safety climate levels than leaders.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H5b₂</td>
<td>As followers’ absolute safety climate levels become higher, the relationship between misalignment and safety behaviors will become weaker.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H6b</td>
<td>Leader-follower safety climate alignment explains variance in safety behaviors beyond what is explained by climate level and climate strength alone.</td>
<td></td>
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</tr>
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</table>
Table 20: Summary of Study 2 Hypothesis Conclusions

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Nurse-Rated Error Reporting</th>
<th>Manager-Rated Error Reporting</th>
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<tbody>
<tr>
<td>Overall Safety Perceptions</td>
<td>H1b: Supported</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H2b: Supported</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H3b: Supported</td>
<td></td>
</tr>
<tr>
<td>Communication Openness</td>
<td>H1b: Supported</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H2b: Supported</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H3b: Supported</td>
<td></td>
</tr>
<tr>
<td>Nonpunitive Response to Error</td>
<td>H1b: Supported</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H2b: Supported</td>
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<tr>
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<td>H3b: Supported</td>
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<table>
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<td>H4b: Supported</td>
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<tr>
<td>H5b1: Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>H5b2: Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>H6b: Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Communication Openness</td>
<td></td>
</tr>
<tr>
<td>H4b: Partially Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>H5b1: Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>H5b2: Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>H6b: Marginally Supported</td>
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</tr>
<tr>
<td>Nonpunitive Response to Error</td>
<td></td>
</tr>
<tr>
<td>H4b: Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>H5b1: Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>H5b2: Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>H6b: Supported</td>
<td>Supported</td>
</tr>
</tbody>
</table>

Note. Results are only reported when there was statistical support. Partial statistical support for Hypothesis 4b indicates that the surface shape only conformed to the hypotheses when X>0, as evidence by the presence of curvature along the Y=X line. Visual assessments were only conducted when full or partial statistical support was also evidenced, and they were limited to assessing areas with actual data.
Table 21: Study 2 Regression Results for Overall Safety Perceptions Climate Predicting Error Reporting (Nurse-Rated)

<table>
<thead>
<tr>
<th>Overall Safety Perceptions</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controls</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Government-owned</td>
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<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
<td>0.07</td>
</tr>
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<td>-0.03</td>
<td>-0.03</td>
<td>-0.04</td>
<td>-0.04</td>
<td>-0.04</td>
</tr>
<tr>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Predictors</td>
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<tr>
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<td>0.46**</td>
<td>0.46**</td>
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</table>

*p<.01
**p<.01

Table 22: Study 2 Regression Results for Overall Safety Perceptions Climate Predicting Error Reporting (Manager-Rated)

<table>
<thead>
<tr>
<th>Overall Safety Perceptions</th>
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<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
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<tbody>
<tr>
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<tr>
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<td>0.00</td>
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<tr>
<td>Predictors</td>
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*p<.01
**p<.01
### Table 23: Study 2 Regression Results for Communication Openness Climate Predicting Error Reporting (Nurse-Rated)

<table>
<thead>
<tr>
<th>Communication Openness</th>
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<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
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</thead>
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<td>0.11**</td>
<td>0.11**</td>
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<td>-0.07*</td>
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<td>-0.07*</td>
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<td>0.00</td>
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<td>Predictors</td>
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<td></td>
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</tr>
<tr>
<td>Climate Level</td>
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<tr>
<td>Climate Strength</td>
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<tr>
<td>Climate Level(^2)</td>
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<td></td>
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</tr>
<tr>
<td>Climate Level(^2)*Climate Strength</td>
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<td></td>
</tr>
<tr>
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<td>.31**</td>
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<td>.01</td>
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</table>

*p<.01  
**p<.01

### Table 24: Study 2 Regression Results for Communication Openness Climate Predicting Error Reporting (Manager-Rated)

<table>
<thead>
<tr>
<th>Communication Openness</th>
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<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
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<td>-0.17</td>
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<td>-0.17</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Predictors</td>
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<td>0.20</td>
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<tr>
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<td>Climate Level(^2)</td>
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<td>Climate Level(^2)*Climate Strength</td>
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*p<.01  
**p<.01
Table 25: Study 2 Regression Results for Nonpunitive Response to Error Climate Predicting Error Reporting (Nurse-Rated)

<table>
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<tr>
<th>Nonpunitive Response to Error</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
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</thead>
<tbody>
<tr>
<td>Controls</td>
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<td></td>
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<td>0.14**</td>
<td>0.14**</td>
<td>0.14**</td>
<td>0.14**</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Predictors</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>0.29**</td>
<td>0.30**</td>
<td>0.30**</td>
<td>0.31**</td>
<td></td>
</tr>
<tr>
<td>Climate Strength</td>
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<td>0.00</td>
<td>0.00</td>
<td>-0.03</td>
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<tr>
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<td>0.25</td>
<td>0.24</td>
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*p<.01
**p<.01

Table 26: Study 2 Regression Results for Nonpunitive Response to Error Climate Predicting Error Reporting (Manager-Rated)

<table>
<thead>
<tr>
<th>Nonpunitive Response to Error</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
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</thead>
<tbody>
<tr>
<td>Controls</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government-owned</td>
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<td>-0.16</td>
<td>-0.16</td>
<td>-0.16</td>
<td>-0.16</td>
<td>-0.17</td>
</tr>
<tr>
<td>Teaching</td>
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<td>-0.13</td>
<td>-0.13</td>
<td>-0.13</td>
<td>-0.13</td>
<td>-0.13</td>
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</tr>
<tr>
<td>Predictors</td>
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<td></td>
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<tr>
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<td>0.53</td>
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<tr>
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<td>0.15</td>
<td>0.19</td>
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</tr>
<tr>
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<td>-0.27</td>
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</table>

*p<.01
**p<.01
Table 27: Study 2 Polynomial Regression and Response Surface Methodology Results for Testing Alignment Hypotheses

<table>
<thead>
<tr>
<th>Error Reporting (Nurse-Rated)</th>
<th>Polynomial Regression Results</th>
<th>Shape Along Y=X line</th>
<th>Shape Along Y= -X line</th>
</tr>
</thead>
<tbody>
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<td>Y</td>
<td>X²</td>
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<td>Communication openness</td>
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<td>0.05</td>
</tr>
<tr>
<td>Nonpunitive response to error</td>
<td>0.24**</td>
<td>-0.06</td>
<td>-0.03</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Error Reporting (Manager-Rated)</th>
<th>Polynomial Regression Results</th>
<th>Shape Along Y=X line</th>
<th>Shape Along Y= -X line</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>X²</td>
</tr>
<tr>
<td>Overall safety perceptions</td>
<td>-0.16</td>
<td>0.36**</td>
<td>0.10</td>
</tr>
<tr>
<td>Communication openness</td>
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<td>0.45**</td>
<td>0.19</td>
</tr>
<tr>
<td>Nonpunitive response to error</td>
<td>-0.08</td>
<td>0.18</td>
<td>-0.08</td>
</tr>
</tbody>
</table>

Note. For columns labeled X, Y, X², XY, and Y², table entries are unstandardized regression coefficients for equations with all predictors, including control variables, entered simultaneously. X= student ratings, Y= instructor ratings. Control variables, though not listed above, are government ownership, teaching status, and number of respondents. The column labeled ΔR² indicates the variance explained when the three quadratic terms (X², XY, and Y²) were added as a set to the other predictors. Columns labeled b1+b2 and b3+b4+b5 represent the slope (at X=0) and curvature of each surface along the X=Y line, and columns labeled b1-b2 and b3-b4+b5 represent the slope (at X=0) and curvature of each surface along the Y= -X line (b1, b2, b3, b4, and b5 are the coefficients on X, Y, X², XY, and Y², respectively).
Table 2: Study 2 Regression Results for Testing the Influence of Communication Openness Climate Alignment Beyond Climate Level and Strength

<table>
<thead>
<tr>
<th>Communication Openness</th>
<th>Error Reporting (Nurse-Rated)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Step 1</td>
</tr>
<tr>
<td>Controls</td>
<td></td>
</tr>
<tr>
<td>Government-owned</td>
<td>0.15**</td>
</tr>
<tr>
<td>Teaching</td>
<td>-0.04</td>
</tr>
<tr>
<td># Respondents</td>
<td>0.00</td>
</tr>
<tr>
<td>Predictors</td>
<td></td>
</tr>
<tr>
<td>Climate Level (Manager)</td>
<td>-0.02</td>
</tr>
<tr>
<td>Climate Level (Nurse)</td>
<td>0.58**</td>
</tr>
<tr>
<td>Climate Strength (Nurse)</td>
<td>0.05</td>
</tr>
<tr>
<td>Climate Level*Strength (Nurse)</td>
<td>-0.74*</td>
</tr>
<tr>
<td>Climate Level(^2) (Nurse)</td>
<td>0.00</td>
</tr>
<tr>
<td>Climate Level (Nurse*Manager)</td>
<td>0.22*</td>
</tr>
<tr>
<td>Climate Level(^2) (Manager)</td>
<td>-0.05</td>
</tr>
<tr>
<td>(\Delta R^2)</td>
<td>0.04*</td>
</tr>
</tbody>
</table>

*p<.01

**p<.01
Figure 1. Theorized relationship between climate level and climate strength

Figure 2. Hypothesized curvilinear interaction between climate level and strength (Hypothesis 3). The impact of high climate strength lessens as climate level reaches its extremes in a bounded measurement scale.
**Figure 3.** Visual representation of the possible combinations of climate strength and uniformity.

**Figure 4.** Visual representation of Hypotheses 4 and 5. Comparisons are made on the diagonals. Leader-follower climate alignment is represented by the shaded italicized cells, and leader-follower climate misalignment is represented by the non-shaded cells.
**Figure 5.** Linear interaction of mistake climate level and strength predicting instructor-rated participation behaviors (scale score). Neither simple slope was significant.

**Figure 6.** Linear interaction of participation climate level and strength predicting student-rated participation behaviors. The simple slope for the “High Strength” line was significant.
Figure 7. Linear interaction of participation climate level and strength predicting instructor-rated participation behaviors (single-item measure). The simple slope for the “High Strength” line was significant.

Figure 8. Linear interaction of mistake climate level and strength predicting student-rated participation behaviors. The overall interaction had marginal significance, but simple slope analyses revealed the slope of the “High Strength” line to be significant.
Figure 9. Linear interaction of learning orientation climate level and strength predicting student-rated reflection behaviors. The simple slope for the “Low Strength” line was significant.
Figure 10. Response surface plot for student and instructor participation climate ratings predicting student-rated participation behaviors.

Figure 11. Response surface plot for student and instructor mistake climate ratings predicting instructor-rated participation behaviors (scale score).
Figure 12. Response surface plot for student and instructor learning orientation climate ratings predicting student-rated reflection behaviors.

Figure 13. Response surface plot for student and instructor mistake climate ratings predicting student-rated participation behaviors.
Figure 14. Response surface plot for nurse and manager overall safety perceptions climate ratings predicting nurse-rated error reporting.

Figure 15. Response surface plot for nurse and manager nonpunitive response to error climate ratings predicting nurse-rated error reporting.
Figure 16. Response surface plot for nurse and manager communication openness climate ratings predicting nurse-rated error reporting.

Figure 17. Response surface plot for nurse and manager overall safety perceptions climate ratings predicting manager-rated error reporting.
APPENDIX A

Study 1: Learning Climate and Behavior Items

The list below represents all learning climate and behavior items from the final survey that were entered into the exploratory factor analysis (EFA). Some items were modified from existing scales (as indicated) to be applicable to a team learning climate in a university classroom. Within each final learning climate and behavior factor, items are organized according to their original source. Items that were retained for final analyses are indicated with an asterisk.

I. Participation Climate

Anderson & West (1998):
- Students are encouraged to share their ideas in this class, rather than keeping them to themselves*
- Students in this class are encouraged to build on each other’s’ ideas*
- In this class, sharing opposing views is encouraged*

Edmondson (1999):
- The students in our class value others’ unique contributions to the class

New Items (created by author):
- Students in this class are encouraged to participate in in-class discussions*

II. Making Mistakes Climate (combined with Asking Questions climate)

Ames & Archer (1988):
- In this class, making mistakes is considered a part of learning*

Edmondson (1999):
- When someone makes a mistake during this class, it is often held against them
- It is difficult for students to ask for help during class
- During class time, students feel free to take learning risks, such as answering a question even if unsure whether they’re right*

New Items (created by author):
- Students feel free to ask questions during class if they don’t understand something
- Students feel comfortable asking questions during class when the material is confusing*
- Students feel that it is ok to make a mistake when answering a question in this class*
III. Learning Orientation Climate

Ames & Archer (1988):
- Overall, in this class, students feel it is important to truly understand what they are studying*

Bunderson & Sutcliffe (2003):
- Students in this class are expected to continuously improve their knowledge*

Midgley et al. (1998):
- In this class, course work is viewed as best when it really makes students think

Roedel et al. (1994):
- In this class, a thorough understanding of the topics is viewed as very important.*

New Items (created by author):
- In this class, critically analyzing the material being learned is valued*

IV. Learning Behaviors (all new items)

Participation:
- Compared to the other courses you have taken (for instructor, taught) at Penn State that are similar in size to this one, in this course how frequently would you say that you:
  - Ask questions during class to better understand the material being taught?*
  - Voluntarily participate in class discussions?*
  - Make comments that build off of the comments of other students?*
  - Actively listen to other students’ viewpoints?
  - Show respect for other students while they’re talking?
  - Engage in critical thinking about the material being taught?
  - Ask for more information or ask questions that go beyond what is being taught in the class?
  - Attend class?

Reflection:
- Compared to the other courses you have taken (for instructor, taught) at Penn State that are similar in size to this one, in this course how frequently would you say that you:
  - Take time to reflect on how you could improve your learning methods?*
  - Seek feedback from the instructor or TA on your graded work to better understand how to improve your performance in the future?*
  - Experiment with different methods of studying to determine which will work best for this class?*
  - Take the time to review your graded work to understand why you received the grade you did?*
  - Email the instructor or TA with questions about the material being taught (this does NOT include questions about grade status, absences, etc.)?
  - Come to office hours?
APPENDIX B

Study 2: Hospital Safety Climate and Behavior Items

Only the scales used for this study are reported below (the full instruments can be found at http://www.ahrq.gov/legacy/qual/patientsafetyculture/hospsurvindex.htm). All items were retained for each scale.

I. Safety Climate Dimensions

Nonpunitive Response to Error:

A8r. Staff feel like their mistakes are held against them (reverse worded).
A12r. When an event is reported, it feels like the person is being written up, not the problem (reverse worded).
A16r. Staff worry that mistakes they make are kept in their personnel file (reverse worded).

Overall Perceptions of Safety:

A15. Patient safety is never sacrificed to get more work done.
A18. Our procedures and systems are good at preventing errors from happening.
A10r. It is just by chance that more serious mistakes don't happen around here (reverse worded).
A17r. We have patient safety problems in this unit (reverse worded).

Communication Openness:

C2. Staff will freely speak up if they see something that may negatively affect patient care.
C4. Staff feel free to question the decisions or actions of those with more authority.
C6r. Staff are afraid to ask questions when something does not seem right (reverse worded).

II. Outcome Measure

Frequency of Event Reporting:

D1. When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported?
D2. When a mistake is made, but has no potential to harm the patient, how often is this reported?
D3. When a mistake is made that could harm the patient, but does not, how often is this reported?
VITA
Rachel Tesler

EDUCATION

Ph.D. The Pennsylvania State University, Industrial-Organizational Psychology, Minor in Statistics (Dec, 2013)

M.S. The Pennsylvania State University, Industrial-Organizational Psychology (May, 2011)

B.S. The University of Maryland, Psychology with Honors, Summa Cum Laude (May, 2006)

SELECTED PUBLICATIONS AND PRESENTATIONS


SELECTED APPLIED EXPERIENCES

RAND Corporation (Arlington, VA; Summer 2012)
Graduate Student Summer Associate
- Served as the team’s subject matter expert on a project to create an Earned Value Management (EVM) competency model for the Department of Defense’s Program Management Offices.

Schreyer Honor College Leadership Assessment Center (University Park, PA; 2008-2013)
Assessor
- Assisted in the creation of assessment center exercises and background materials.
- Served as both a written and visual assessor in over half a dozen assessment center sessions.

Penn State Practicum Student Consulting Group (University Park, PA; 2009-2011)
Project Leader
- Performed statistical analyses, including structural equation modeling, for a teachers’ union opinion survey.
- Wrote and presented two reports for client, interpreting results and making recommendations.