TOXIC SCHOOLS? TEACHER PERCEPTIONS OF INDOOR AIR QUALITY AND NEGATIVE PLACE ATTACHMENT

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by

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The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

TOXIC SCHOOLS? TEACHER PERCEPTIONS OF INDOOR AIR QUALITY AND NEGATIVE PLACE ATTACHMENT

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and hereby certify that, in their opinion, it is worthy of acceptance.

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For those who embrace courage, and those who support the courage of others.

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TOXIC SCHOOLS? TEACHER PERCEPTIONS OF INDOOR AIR QUALITY AND NEGATIVE PLACE ATTACHMENT

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ABSTRACT

The perception of indoor air quality (IAQ) in school buildings has garnered much attention. The self-reported experiences of teachers regarding the phenomenon of suffering from toxic IAQ was missing from scholarly work before the onset of the coronavirus. Toxic IAQ can be defined as the presence of toxic chemicals or compounds (including biological) in the air at levels that pose health risks and can affect a person's health, comfort, and performance (Environmental Protection Agency [EPA], 2018a).

Since the onset of the pandemic, teachers are leaving the workforce in unprecedented numbers due to poor working conditions, unreasonable demands, and unrealistic expectations (Steiner & Woo, 2021). Addressing teacher retention is critical to stymie continuing teacher shortages and the adverse impact on students.

This sequential mixed-methods study confronts the gap between place theory, specifically the negative emotional person-place bond, and perceived IAQ in public school buildings. Little research has been presented on the role the physical workplace has on teacher well-being and whether psychosociological environmental relationships can predict place attachment outcomes. The question of how teacher perceptions of IAQ relate to negative place attachment

was explored using survey research of 242 educators in four public school districts in the Midwest. Survey data was collected April-May of 2021, with 13 follow-up purposive interviews, with the criteria of teachers' presenting negative place attachment feelings, during August 2021. The research revealed the more teachers realize their health concerns about toxic IAQ in their workplace, the more negative place attachment they feel. This involves the process of grieving, and feeling frustrated, angry, exhausted, and confused, like separation and divorce. When a teacher has crossed a threshold of divorced feelings toward the school building, they make choices: to stay employed, assigned to their building, feeling negative place attachment, ask to be reassigned, or leave.

The two significant predictors of negative place attachment revealed through stepwise linear regression, were physical "healthy building" attributes and health concerns about the IEQ/IAQ in the school environment. Teachers' perceptions of aged buildings as being unhealthy, including the inoperability of classroom windows, aged carpet, and lack of ventilation were better understood by understanding what it means to occupy a workplace teachers perceive to have toxic IAQ. Employees with health conditions experienced feelings of being misunderstood, not taken seriously, and additionally faced a host of complicated social interactions with their administrators, co-workers, and family because of health ailments they attributed to their workplace. The study resulted in the creation of two new theoretic models: a revisiting of Tripartite Model of Place Attachment to include place detachment, the threshold crossed in absentia of any place attachment feelings, and an epidemiological model for addressing

indoor air quality in schools and suggested interventions for practice. While these models help to develop methods, redress, and identification for negative place attachment due to indoor air quality, it was not possible to identify a consistent predictor of negative place attachment. This suggests that the themes identified in the interview process alongside a predictor model can help identify schools where intervention is essential.

CHAPTER 1 INTRODUCTION

"…when you commit your life, it feels like, to this profession, it's hard to think about leaving. Right? And I think many different professions do this, as teachers we put our students first and ourselves and our health second." – Mary, a public-school teacher

Background and Setting

School buildings are commonly studied as learning environments for youth but rarely examined as workplaces for teachers. This is important, as the U.S. is currently experiencing severe challenges attracting and retaining talented teachers (Ahearn et al., 2006; Camp, 2019; Dell'Angelo & Richardson, 2019). According to a September 2021 survey conducted by MissionSquare Research Institute (2021b), an independent, nonpartisan research organization that informs local and state governments, 48% of teachers admitted that they had or were considering quitting. This percentage rose to 55% in a survey completed just months later (MissionSquare Research Institute, 2021a). Whether teachers decide to leave school for just a few hours, or days, or decide to leave the profession entirely, it has an exponential effect on students, co-workers, and the district. Lack of adequate, qualified teachers, and the staff instability that accompanies turnover or absenteeism, threaten students' ability to learn and reduces teachers' effectiveness (Evans et al., 2001).

School districts dealing with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), commonly known as COVID-19, alongside teacher exit could greatly benefit from in-depth examinations of teachers' social

relationships as a psychosocial construct and attributes of the physical building that could deter them from the building. One dimension of teachers' social relationships relates to the physical buildings in which teachers spend most of their careers (Lorain, n.d.; Skovholt & Trotter-Mathison, 2014), including the quality of the indoor air they are subjected to (Chithra & Shiva Nagendra, 2018), their perceptions of it, and what goes through the teachers' minds as they consider using sick days or resigning.

The trend for teachers leaving the profession is not new, and not just tied to the pandemic. According to a 2015 report, titled "Teacher Turnover: Stayers, Movers, and Leavers," 70% of the public-school teachers who moved to other schools between 2011–12 and 2012–13 did so voluntarily, and 5% of those teachers cited classroom factors as the reason for moving (Kena, 2016). In 2018, there were 91,280 traditional public-school buildings and 7,190 public charter school buildings, and in 2000, approximately 3.5 million public school teachers. Before the pandemic, teachers were communicating that they felt stressed, anxious, and burned out (Friedman, 2000). Because of the pandemic and the extra work involved with moving classes to on-line and hybrid formats, they were experiencing an unprecedented extra workload (Hascher et al., 2021). The workforce of teaching in public K-12 schools has been dominated by a primarily female demographic. The scarcity of childcare, and the unequal household burdens of caring for the sick and other family members, has brought the issue to light for educators (MissionSquare Research Institute, 2021b). Many workers were able to work from home during the pandemic or had the option for hybrid

work when stay-at-home orders were lifted. However, for teachers in the public school system, the option for returning to work was decided by school boards. One of the ways teachers could avoid the order to report to their school building as mandated was the use of sick leave. Built into their contract are the terms for how many and the constraints around the decision not to report physically to the school building.

Investigations of IAQ in the workplace involve studying ways in which inside air can affect a person's health, comfort, and ability to work. Biological, chemical, and physical factors such as building equipment, furnishings, and heating, ventilation, and air conditioning (HVAC) systems are significant sources of indoor air pollution (Adams et al., 2016; Ahmed et al., 2019). As an example, dust on the upper trim of a standard interior door trim of a typical American house contains over 7,000 different types of bacteria and over 2,000 different fungi (Adams et al., 2016). Volatile organic compounds (VOCs), microbial volatile organic compounds (MVOCs), pollens, viruses, and other microorganisms have demonstrated adverse effects on employee productivity, absenteeism, and presenteeism (Centre for Mental Health, 2011; Lukcso et al., 2016). Educators indicate that they have been negatively impacted by the pandemic in many ways, including financially, with employee morale, and wellness (Goldberg, 2021). They are working longer hours, are concerned about exposure to COVID-19 and other pathogens, and are worried about keeping their family safe from contracting viruses (MissionSquare Research Institute, 2021b).

Indoor air contains microbes that are fundamentally vital to ecosystems but can cause harm to humans, such as influenza and coronaviruses, e.g., COVID-19 (Flood et al., 2020). The perception of indoor air includes odor perceptions and sensory irritation. Odor perception can be positive or negative. As Bae & Asojo (2020) note in a recent study, the built environment may not have a significant relationship with the impact of ambient scent on the improvement in mood but found that positive distraction in the built environment was beneficial for patient's moods in long-term health care facilities. Sensory irritation can be noticed and tested as local inflammatory response, such as voice problems (Claudio et al., 2016) and/or tissue damage (Bos et al., 1991).

Many U.S. school buildings have outdated building systems with mechanical ventilation that prioritize energy savings over healthy indoor air quality (Alexander & Lewis, 2014; Nowicki, 2020). Poor workplace IAQ can pose a severe threat to teachers' health, especially regarding general respiratory health and work-related asthma (Henneberger et al., 2011; Whelan et al., 2003). Architecture has historically relied on mechanical ventilation and artificial environmental conditions to prevent chronic diseases, allergies, and sick building syndrome. The inclusion of human-centered approaches, as studied here, learned from the pandemic, can enhance the built environment in ways that effect the wellbeing of the building occupants (Megahed & Ghoneim, 2021). The use of interdisciplinary research aims to protect occupants and can serve as a permanent design strategy to avoid future health epidemics (Bolashikov & Melikov, 2009). In a recent article by Rassia (2020), titled "How architecture fails

in conditions of crisis: A discussion on the value of interior design over the COVID-19 outbreak," the interior of a built environment might be failing to protect and shelter its occupants. One of the primary functions of a space is the health of occupants, as Joseph G. Allen of Harvard's T.H. Chan School of Public Health proclaims: "I don't think business-people realize the power of buildings to not only keep people safe from disease, but to lead to better performance" (Caminiti, 2021).

Physical health outcomes have been the focus of most occupational health studies on IAQ in the workplace. However, there are significantly fewer studies looking at the perception of IAQ and the workplace regarding physical and mental well-being. The emotional bond that one has with a building, the person-place bond, has been studied extensively. However, what Chawla calls the "shadow-side" (1982), or the negative aspect of that bond, is less considered. Positive psychological well-being has been shown to increase longevity and people with better psychological well-being are associated with having fewer social problems (Huppert, 2009). Well-being comprises physical, economic, social, developmental, psychological, emotional, and domain specific satisfaction (Post et al., 1999).

Understanding what may contribute to the mental and physical detachment from the school buildings enables educators, administrators, and the design community to apply limited resources to address educators' underlying concerns and improve the wellbeing of all occupants, which exponentially increases students' performance and quality of life. This study seeks to

complement and enhance previous work by exploring what it means to occupy public school buildings with perceived toxic IAQ in the upper Midwest.

Statement of the Problem

It has been shown that poor indoor air quality in buildings can decrease productivity and cause occupants to express dissatisfaction with the physical workplace environment (Wyon, 2004). During the pandemic, school buildings were closed for varying amounts of time, regulated by each state (Flood et al., 2020; Gaffney et al., 2020; Viner et al., 2020). Place attachment is an important construct upon which administrators could focus to improve well-being and quality of life of building occupants (Junot et al., 2018). This period of re-entry after school closure has highlighted for many their relationships with the built environment. By examining teacher perceptions of IAQ and negative place attachment, and consequently, place detachment, a new angle of investigation becomes possible. The complexity and potential harm surrounding toxic IAQ has been the topic of much research and debate for decades but has resurfaced during the pandemic of 2020.

Contributions

This study contributes to the development of place attachment theory by creating a metric of positive to negative place attachment. “Sense-of-place” theory was the guiding framework for understanding meaning through the phenomenological lens of teacher experiences. The tripartite model of place attachment was the organizing theory for the initial survey and coding and interpretation of place attachment. The epidemiologic triad will be used to frame

adverse indoor air quality as the agent of place where place attachment is tested. The adequacy of the theories will be tested and then built upon (Sebastien, 2020). Place attachment has often been used as an independent variable as a predictor; however, here, place attachment will be the outcome variable, as dimensions from the tripartite model and other demographic factors will be the independent variables used to determine prediction on negative place attachment through the lens of perceived indoor air quality.

Empirical place literature has focused on a variety of places by asking participants what places have meaning for them. However, buildings, in general, are lacking from literature, including school buildings as places. Other theoretical contributions include the use of a sequential mixed-methods approach to integrating IAQ and building satisfaction data, and the total body of public health and educational literature that largely overlooks the process-oriented dimensions of poor IAQ. These empirical results will, therefore, be of interest to an interdisciplinary audience. That audience includes The American Public Health Association (environmental branch), U.S. Department of Education, state boards of education, teachers' unions, practice-based centers such as the Center for Green Schools within the U.S. Green Building Council, Devos' Well-Building initiative, the National Institute of Environmental Health Sciences (NIEHS), AIHA—the association for scientists and professionals committed to preserving and ensuring occupational and environmental health and safety (OEHS) in the workplace and community—and NORA, the National Occupational Research Agenda.

Additionally, the outcomes of this study can have an impact on school policy and were particularly illuminating for school districts in the upper Midwest that struggle to maintain healthy indoor air in aging school buildings. School administrators and participating teachers will also be given access to the research findings, which can assist with teacher retention.

Need for the Study

The occupational health of teachers in school buildings has not garnered as much research as student health (Claudio et al., 2016; Ebbehøj et al., 2005; Ervasti et al., 2012). Sanoff (1994) brought the attention of problems in school building design to light over 25 years ago and stated that the learning environment should be shaped by the building's participants. A poor-quality school building has been associated with increased teacher dissatisfaction (Issa et al., 2011; Tye & O'brien, 2002) and dissatisfaction with the school building can lead to teachers leaving their positions; however, improving school facility conditions can be one of the reasons teachers stay (Brill & McCartney, 2008; Buckley et al., 2005; Schneider, 2003). The idea of teachers detaching themselves from their school building physically and emotionally is not new but exploring it from both the occupational health perspective and from the lens of place attachment and constructivist theory is novel.

This study will focus on teachers in four specific school districts in the Midwest. I have lived in the Midwest my entire life and have spent my entire design career working here. I have worked with public school districts as a designer and project manager and have developed connections with a union and

teachers. The state in which this study takes place has public school systems that have long-standing reputations for providing quality education. In this state, the school districts operate about 175 million square feet of building space; however, the local districts decide when and how to invest in these buildings, and when to replace them entirely. State law provides that school districts must provide information to the Department of Education for the review and comment process of remodeling or requesting new buildings. Included in this information is a list of deficiencies that demonstrate the need for a new or renovated facility. Further, a school board proposing to construct (expand or remodel) a facility is required to provide a proposal including, but not limited to, certified plans and design for heating, ventilation, air-conditioning, and air filtration for an extensively renovated or new facility that meets or exceeds current code standards, including ASHRAE air filtration standard 52.1 ("Review and comment for school district construction," 2021).

This state has a history of progressive and sustainable educational initiatives and spent more than 20% of its total budget on K-12 education during fiscal year 2013 compared to the national average of 19.8% (National Governors Association, 2012-2014) and about 80% of spending goes toward teacher salaries and benefits (Lopez & Webster, 2015). According to the 2021 Biennial report on the supply and demand of teachers in this Midwestern state, many districts reported being “somewhat significantly” or “very significantly” impacted by the teacher shortage (70%) and substitute teacher shortage (88%), and the demand for teachers is evenly distributed among economic development regions

within the state. More than half of the teachers in this state who hold a Tier 3 or Tier 4 license are currently not teaching in a public-school classroom (the [state] professional educator licensing and standards board [PELSB], 2021). Therefore, the state presents a favorable context for sharing research related to teachers' psychosocial outcomes and the adoption of future progressive workplace practices related to IAQ. Further, the study of IAQ is particularly important for buildings in the upper Midwest, where weather extremes result in increased amounts of time spent indoors compared to other regions of the U.S.

Purpose of the Study

The purpose of this study is to determine if negative place attachment is significantly higher for teachers who perceive toxic IEQ/IAQ in their school building. This explanatory, sequential study, investigates the social relationships from the employee perspective, focusing on teachers in public school buildings. This study is not focusing on teacher-student relationships, or places with meaning for teachers, this study is focused on how teachers feel about a specific place, their workspace.

Place detachment is a different construct than place attachment. I argue that detachment occurs after attachment to place has ended, and that detachment itself can be a factor that leads teachers to career exiting. Place attachment is a measurement of the spectrum of strong, positive attachment to weak, negative attachment. The effects of person-person attachment in marriage and divorce presents numerous studies of decline and detachment with far-reaching effects on physical health (Burman & Margolin, 1992), psychological

problems (Richards et al., 1997), well-being, and productivity (Forthofer et al. 1996). This study proposes that teachers experience feelings similar to those experienced in divorce decisions, when teachers stop being attached to their physical workspace. When discussion to remedy perceived indoor air quality by teachers stops, and the feelings of grieving and loss occur, that is when place detachment starts, and that's when conversations about career exits regarding workspace become an issue. It is at the weakest end of place attachment, where the decreasing physical and mental presence of teachers, increased level of absenteeism, and oftentimes decreased level of teacher access, has an exponential effect on learning outcomes and teacher well-being. Dissociation from place could be a predictor for decreasing quality of instruction. The need to identify the level of attachment, especially weak attachment, concerning perceived indoor air quality and other environmental exposures, before a teacher gets to detachment, can help administrators stymie career exit. Because of the pandemic and the media exposure of the SARS-CoV-2 virus, adverse indoor air quality has become a renewed and emerging area of concern that has been addressed in several recent critiques by epidemiologists and engineers.

This dissertation acknowledges the empirical knowledge gained from previous studies on perceived IAQ, place theory, workplace attachment, affect, cognition, satisfaction with the workspace, and behavior of employees. This dissertation applies the blending of place theory and environmental epidemiology to explore psychosociological environmental relationships to examine changes to negative place attachment outcomes due to perceived IAQ in public school

buildings. The philosophic lens through which the study was designed is social and individualistic constructivism and phenomenology.

The current study design is influenced by a 2016 study, published in the *Journal of School Health*, where Claudio et al. found that self-reported classroom conditions were a marker for adverse health outcomes for teachers. Results indicated that respiratory ailments such as asthma, respiratory infections, and irritations were associated with physical classroom environments. Claudio's study determined the quality of indoor air is an important occupational health issue for teachers (Angelon-Gaetz et al., 2016; Dangman et al., 2005; Kielb et al., 2015). For this study, in looking at the perceptions of toxic IAQ by teachers in the school building, items of concern regarding classroom and building conditions were used as markers for negative place attachment and place detachment. The statistical model created here allowed the degrees of positive and negative attachment to be better understood as affect, behavior, cognition, physical and social place, and person as individual and group constructs. The qualitative phase allowed for the exploration of the concept of place detachment alongside the statistical model. The third phase was the integration of the statistical and qualitative models alongside school building data to see the impact of sensory experiences and non-sensory experiences on place detachment versus negative attachments.

Research Objective

The objective was to examine the potential links between perceived indoor air quality (IAQ) and teachers' attachment and/or detachment to place. A second

objective was to understand in more depth the experiences of teachers who rated their school IAQ poorly. A third objective was to develop a better metric for assessing risk of workspace detachment, or of identifying buildings at risk of higher workspace detachment.

Theoretical Framework

Because the literature on “place” is composed of multiple research traditions and encompasses many epistemological paradigms, there is no one-size-fits-all approach to studying what place means to building occupants. There have been researchers and disciplines that subscribe to a philosophy that the attachment to place is best measured quantitatively (Hidalgo & Hernandez, 2001; Jorgensen & Stedman, 2001; Kaltenborn & Williams, 2002; Williams et al., 1992), while others believe that the attachment to place is too complex to generalize through measurement and believe that the qualitative nature of study is the best way to understand the psychology surrounding person-place bonding (Scannell & Gifford, 2017). This study subscribes to what Patterson and Williams (2005) describe as a “pluralist framework,” which sees the limits of each camp and chooses to incorporate the best approaches from each.

The mixed-methods approach, used here, engages the unique theoretical lens of sense of place as conceptualized by Canter (1977) and later modified by Punter (1991). The Canter model was then overlaid with Scannell and Gifford’s (2010) tripartite model of place attachment to measure the process-oriented place outcomes.

Phase I of the research features an online survey of 242 members of four teachers' unions in the Midwest that highlight the potential relationships between perceived IAQ, building satisfaction, and various place attachment dimensions. The findings from the survey identified teachers who were currently struggling with poor IAQ for the second phase of the study.

Phase II of this study explored those perspectives in depth through qualitative interviews. The results of this study have the potential to expand employer understanding of IAQ impacts beyond physiological health and into a richer conceptualization of how poor IAQ impacts teachers' attachment or detachment to the school buildings they occupy. Reaching a better understanding that could have implications for changes to administrative policies could further underline the critical importance of addressing IAQ and other environmental exposure issues in the school environment.

Phase III was a mixed-methods analysis integrating Phases I and II alongside external data regarding the built environment, cultural attitudes, and historical context of the four school districts, addressing HVAC and remodeling efforts as noted in news articles and school board meeting minutes. This phase culminated with a pillar display identifying central themes common to both phases that illuminated the relationship between phenomenological experience, place detachment, and the built environment.

Organization of the Dissertation

This dissertation will offer an in-depth view of the social relationships from the teachers' perspectives in public K-12 school districts who perceive toxic IAQ

in their place of work. Empirical evidence will be presented to enhance existing knowledge about place theory and where along the spectrum of place attachment the participants' feelings lie. This work can lead to further directions for investigating the theoretical development of place theory and plans for implementation in the built-school environment.

Chapter 2 is an overview of the areas from the multiple disciplines of education, public health, environmental psychology, and architecture that influence this analysis of place attachment and IAQ and begins with an examination of how “place” is constructed phenomenologically, how place is defined in this study, then followed by attachment and detachment in psychology. The chapter then proceeds to narrow the scope to place attachment and detachment, then examines how workplace attachment differs from place attachment, how satisfaction with place has been explored with the school building, and teachers’ place attachment and detachment in the workplace. Indoor air quality (IAQ) and an operationalized definition of “perception of adverse indoor air quality” is introduced, and the chapter culminates with the scarcity of literature regarding teachers, place detachment, satisfaction with the school building, and IAQ.

The next chapter, Chapter 3, presents the methodology behind the study to examine how teacher perceptions of toxic IEQ/IAQ in the school building relate to place attachment and detachment outcomes. The framework utilized to undertake this three-phase study is the modified tripartite model of place attachment, adapted from the Scannell and Gifford tripartite model of place

attachment (2010). The first phase asks if positive and negative attachment is present, via an on-line survey, which includes open-ended questions, to be incorporated into Phase II. The second phase uses in-depth interviews to ask about this phenomenon of experiencing negative place attachment, and possible detachment. The third phase provides the larger historical picture of how the school districts have addressed IAQ concerns in the last ten years and looks for central themes between Phases I and II to identify sensory and non-sensory experiences that may cause teachers to cease being attached to their workspace, and therefore to be in the state of place detachment. A better understanding of place detachment outcomes can benefit policy making and support the design of healthier school buildings.

Chapter 4 presents the findings and analysis of Phases I, II, and III. This analysis finishes with the first steps in unpacking the theoretical framework of place attachment and the hypotheses. Phase I begins with the data analysis of the survey, constructs, and measures, and participants followed by the statistical analysis of the survey. Phase II is presented through the stories of the participants, using the theoretical framework as a guide. The findings from the thematic analysis are described along with a new way to organize the data in a way that was meaningful for the survey respondents and interview participants.

The fifth and final chapter is subdivided into two sections: discussion and conclusion. The determinants from the findings and analysis spurred yet another organizing model to explain the unexpected outcomes, which depicts the data in a new way by relating the outcomes to the larger discipline of environmental

epidemiology. The discussion goes beyond that and identifies data regarding experiential knowledge as well. The contributions to knowledge, limitations and directions for future research, and implications for practice are disclosed before ending with the conclusion, which brings together the significance of this study as noted in current events.

CHAPTER 2 LITERATURE REVIEW

To understand the relationship between place, indoor air quality, place attachment, and place detachment, Chapter 2 begins with an examination of how place is constructed phenomenologically, then indoor air quality – an element of place – is examined in relation to epidemiological understanding and teachers' phenomenological experiences in the literature. Next, I examine attachment and detachment in psychology. Building on that, the concept of place attachment is fully fleshed out. As Habraken (2000) noted, social processes, difference, power, inequality, and collective action happen through the material forms that we design, build, use, and protest. These social processes will be explored in this study with teachers and the school building. The chapter then proceeds to narrow the scope to the connections between place attachment and detachment, then an examination of how workplace attachment differs from place attachment, satisfaction with place and the school building, place attachment, and teachers in the workplace. The chapter ends with the theoretical framework to organize this study, building on the tripartite model but incorporating my own theoretical interpretations.

Introduction to Place

Place as a material (Habraken, 2000) and symbolic (Monnet, 2011) notion holds a significant spot in human life (Low, 1992). From anthropologists (Basso, 1996) to pioneering environmental engineers, such as the "Mother of Human Ecology" Ellen Swallow Richards (Dyball & Carlsson, 2017), literature has considered the ways that the natural and human-built environment shapes

communities, cultures, and individuals. For this study, much inspiration is taken from the psychological discipline. This includes concepts of place attachment/detachment, relational understandings of place, and the phenomenological experience of being emplaced (Coates & Seamon, 1984; Desjarlais & Throop, 2011). Physical place provides for attachment opportunities because it is the dependence upon this built environment that provides the amenities or resources for people to achieve their goals (Scannell & Gifford, 2010). Places of work have been examined, in general, but teacher health and well-being regarding the school building as a place of work, has not been studied using this lens. This study explores how place detachment is constructed for teachers through the variables of adverse building conditions, specifically perceptions of indoor air quality, personal health, and building satisfaction. In this chapter, I will highlight the key literature that frames this study's assessment of understanding the meaning teachers ascribe to adverse indoor air quality in the school building, as well as identify the gaps and issues that highlight the relevance of these issues.

How Place is Constructed, Phenomenologically

Phenomenology is the direct investigation and description of phenomena as consciously experienced, without theories about their fundamental explanation and as free as possible from unexplored preconceptions and assumptions (Spiegelberg, 1975). Phenomenology is the examination of structures of consciousness as experienced from the first-person point of view (Zahavi, 2002). The central structure of an experience is its intentionality, it being

directed toward something, as it is an experience of or about some object (McIntyre & Smith, 1989). In this study, place is the object.

One contribution of studying place via a phenomenological lens is to gain an accurate, explicit account of what place means as a deeper, more empathetic approach to "listening" and understanding situations as "full of conflict, ambiguity, postering, and differences of culture, class, race, gender, and values" (Forester, 2008). Place, in terms of a phenomenological view, can be indicative of dimensions in the natural world, supportive and reflective dimensions of people's psychological, social, cultural, and spiritual worlds but must be "holistic, joining qualities of nature and physical environment with qualities of humanness and human community" (Coates & Seamon, 1984). Place, in terms of physicality, "is an architecture which is adjusted to place and people environmentally, humanely, and spiritually" (Coates & Seamon, 1984; Sebastien, 2020). Seamon, a phenomenologist who studies the architecture of place (2012), argues that place can also be discussed from three dimensional angles: geographic ensemble (natural and human made elements of a place), people-in-place (individual and group actions, interactions, and meanings in a place), and genius loci (the nature of the spirit of place).

Relph (1976), a geographer, explains place as "…significant centers of our immediate experiences of the world" and the more profoundly inside a place a person feels, the stronger will be their identity with the place. Relph goes on to say that placeless landscapes, the opposite of "place" are those that have no special relationship to the places in which they are located (2009), such as

franchised stores or fast-food restaurants. Relph has posted an essay on his website, www.placeness.com, paying homage to Heidegger as the pre-eminent philosopher of place where Heidegger referred to “homelessness” as not being rooted or authentic, as in a threat to place. Whereas non-place is a term used by Augé (1995) in a specific sense to refer to a space that is not relational, historical, or concerned with identity. Augé goes on to say that non-places are products of super-modernity such as clinics, hospitals, and airports where experiences are contractual (Augé, 1995). In a phenomenological study, Manzo (2005) explored the nature of people’s emotional relationships with places important to them. What is of great magnitude in the findings of the Manzo study is that positive and negative emotions were explored by people as places that are important but could symbolically represent a spectrum of feelings. Therefore, a person could be still attached to a place, yet have positive, ambivalent, or negative feelings about that place.

Lexicographically, place can also be a physical environment, as in a space, tangible, or intangible, or it can be physical surroundings such as the atmosphere, or indefinite region or expanse in a geographical sense. In 1984, Kaplan (Kaplan, 1984) posited that to understand people’s relations to places, research should consider more than economic factors and social relations because they only explain a small portion of the variance of place attachment and should focus on the “intangibles,” the physical features that one becomes attached to. Place is the “what” of the question, “What is attached?” (Malpas, 2018). Malpas, whose work is situated with Heidegger and Gadamer, sees place

as “a complex but unitary structure that encompasses self and other, space and time, subjectivity, and objectivity.” The main principle of Malpas’ definition for this study is the notion of space and time, which is lacking in many other definitions of place (Desjarlais & Throop, 2011).

Place, as defined phenomenologically in this study, uses Coates and Seamon’s (1984) definition of place as a phenomenological concept that integrates natural personal and cultural dimensions of environment into one experiential whole, inclusive of space and time (Malpas, 2018).

The philosophy of phenomenology in relation to place conflicts with positivist views that place can be measured, or predictive factors identified that measure some degree of place attachment (Jorgensen & Stedman, 2001; Lewicka, 2011a; Shamai, 1991, 2018; Shumaker & Taylor, 1983; Williams et al., 1992). Seamon’s (2021) phenomenological stance argues that place attachment is interdependent with other aspects of place, cultural qualities, rootedness in place, degree of personal and social involvement, quality of life, environmental aesthetics, and individual and group identity with place (Manzo & Devine-Wright, 2021; Shumaker & Taylor, 1983).

The School Building

As of 2022, the national average age of K-12 U.S. school buildings is 63 years old (National Center for Education Statistics), meaning the average school was built in 1959. The EPA cites that after 40 years, a school building begins to rapidly deteriorate if it is not properly maintained (Environmental Protection Agency [EPA], 2021b).

Very little research on teachers' judgements about their school buildings exists in the literature (Earthman & Lemasters, 2009). Instead, research focuses on the creation of school culture relative to students in the school environment, not the physical environment. Scales have been developed to measure satisfaction with place, such as measuring residential satisfaction among elders regarding noise in the neighborhood, distance to local shops, and "I enjoy living in this house of flat" (Rioux & Werner, 2011), or sense of place as an attitude, such as Lakeshore owners' attitudes toward their properties (Jorgensen & Stedman, 2001) or visitors to the Appalachian Trail in the United States (Kyle et al., 2005). The measurements designed to measure teacher satisfaction at school typically capture multiple dimensions of school climate (Magzamen et al., 2017). In a 2010 literature review focusing on school climate, five key dimensions were identified: (1) order, domain, and safety; (2) academic outcomes; (3) social relationships; (4) school facilities; and (5) school connectedness (Zullig et al., 2010).

In the literature, there exists a correlation between the technical condition of the school building and student satisfaction (Hopland, 2014), and teacher satisfaction with the school building (Baker, 2011). Regarding specific building properties (e.g., natural and artificial lighting, room temperature, or outdoor areas), Meron and Meir (2017) found varying levels of satisfaction for different items and evident differences between the rating of green and conventional schools; when all parameters were measured, most teaching staff preferred their present green school over the previous conventional one.

Improving building conditions can positively influence teacher retention and satisfaction with the school building (Buckley et al., 2005; Lee et al., 1991). Earthman and Lemasters (2009) investigated the possible relationship between the attitudes teachers have about the condition of their classrooms when the classrooms were independently assessed. In an article from the 1980s, teachers in unsatisfactory classrooms felt frustrated and neglected to such an extent that they sometimes reported they were willing to leave the teaching profession (Farber, 1984). Earthman and Lemaster's (2009) findings indicate the physical condition of the classroom can cause morale problems with teachers and suggest that school authorities need to recognize the importance physical conditions have upon teachers so that negative feelings and attitudes do not pervade the faculty. Uline and Tschannen-Moran (2006) investigated the association between the quality of school facilities, school climate, and student achievement, concentrating on the perceptions teachers had about their school buildings and how those perceptions related to student achievement.

Over a quarter of the teachers in unsatisfactory school buildings in the Earthman and Lemasters (2009) study stated they were unhappy with their physical surroundings in the classroom. Teachers in satisfactory buildings stated the opposite. The feelings of unhappiness on the part of these teachers naturally transfers to how they handle their teaching responsibilities and even how they interact with students.

According to The American Society of Heating, Refrigerating and Air-Conditioning Engineers' (ASHRAE) report on moisture problems, the aging of

materials is one of the most common reasons for moisture damage (Straube, 2002). This implies that attention should be paid to appropriate maintenance and repair of school buildings. The focus of this research is teacher's satisfaction with the school building and the perceptions of the indoor air quality of the building as related to place attachment and place detachment outcomes.

Indoor Air Quality

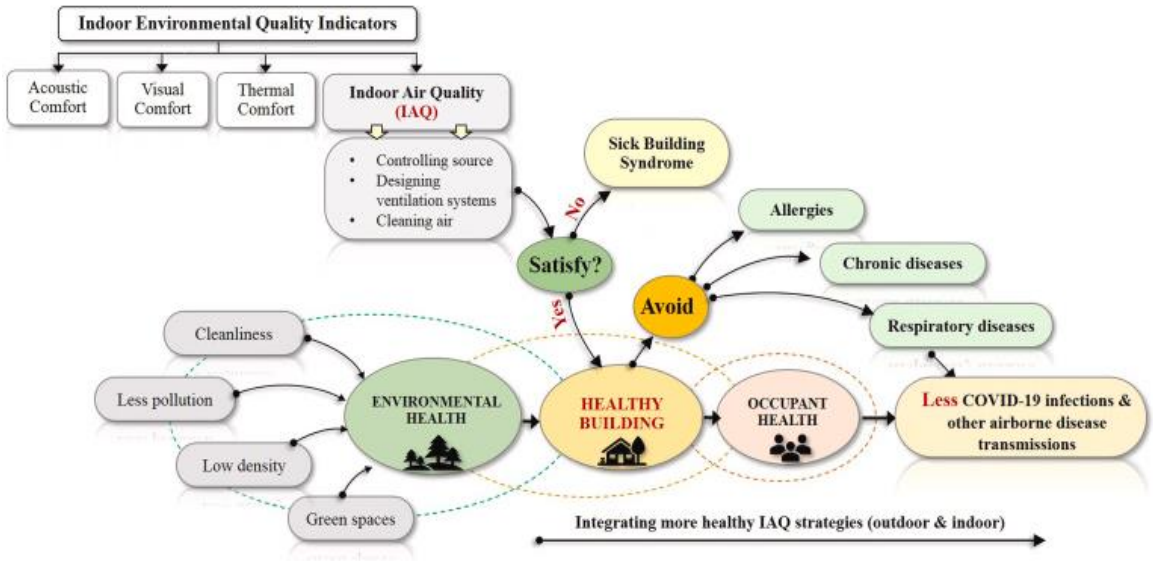
Physical place, in this study, is measured through building occupant subjective assessments of IAQ, a construct in this study that is termed "perceived IAQ" (see Chapter 3) as indoor air quality, under the umbrella phrase indoor environmental quality (IEQ). IEQ comprises four main parameters: thermal comfort (TC), visual comfort (VC), indoor air quality (IAQ), and aural comfort (AC) (Clausen & Wyon, 2008). The terms occupant comfort or satisfaction refer to occupants' satisfaction with four main IEQ factors: thermal comfort, air quality, lighting, and acoustics, and is generally assessed using questionnaire surveys (Sadick & Issa, 2017a). Regarding comfort in the building, akin to satisfaction, occupants are considered the "best source of information regarding their needs and comfort requirements" (Sakellaris et al., 2016), which aligns with the human-centered approach of design. Conventional heating, ventilation, and air-conditioning (HVAC) systems are designed to satisfy the "average" person's needs, where zones of conditioned space traditionally serve dozens of people. Humans are homeostatic, meaning the human body is trying to obtain a stable equilibrium to meet individual needs (Modell et al., 2015). The humanistic needs for thermal conditions, airflow, lighting, and acoustic privacy vary significantly

from person to person and differ throughout the day (Mishra et al., 2016). Individual differences in reactions to environmental conditions can be due to many factors, including but not limited to age, sex, personality, metabolism, allergy, or hypersensitivity (Cui et al., 2013).

New knowledge regarding IAQ and pathogens was developed because of the coronavirus. As a result, emergent empirical literature has assimilated information to assist designers in designing buildings in the post-pandemic world. Megahed and Ghoneim (2021) created a diagram depicting the relationships between environmental health, the healthy building, and the expected impacts on human health. This diagram is useful in categorizing and creating some of the survey questions used as independent variables in this study (see Figure 1).

Figure 1

The Intertwined Relationships Between Environmental Health and the Expected Impacts on Human Health



From “Indoor Air Quality: Rethinking rules of building design strategies in post-pandemic architecture,” Megahed, N.A., & Ghoneim, E.M., 2021, *Environmental*

Research, *193*, 110471-110471, Section 3, Figure 1 (https://doi.org/10.1016/j.envres.2020.110471).

The indoor workspace, as part of the whole built environment, has climate and physical attributes controlled or manipulated by natural or mechanical means (de Dear et al., 2013). Building location, type of construction, and design of the heating, cooling, and ventilation systems are reported as potential factors affecting occupants' comfort (Mujan et al., 2019; Sakellaris et al., 2016). Adding complexity, indoor air quality is ever changing and roughly determined by geographical region, climate, ownership values, maintenance, human activities, mechanical activities, bioaerosols, and individual perceptions (Canadian Centre for Occupational Health and Safety [CCOHS], 2019). Thus, the element of time is important when investigating experiences of indoor air quality.

The impact of indoor environment quality on occupant health has long been a focus of architecture and public health research (Filippini et al., 2020). Recent findings partially support the hypothesis that air pollution can increase susceptibility to SARS-CoV-2 infection. Problems from the indoor environment may include inadequate temperature, poor air circulation, ventilation system issues, and uncomfortable humidity levels (Omer, 2008; Wargocki & Wyon, 2013). The term “occupant well-being,” specifically related to indoor air and comfort, is not explicitly defined in IEQ literature.

The knowledge of generally adverse indoor environmental conditions, as used by the architectural community, has undergone changes over the decades, which includes definitions and name changes (de Dear et al., 2013). The term

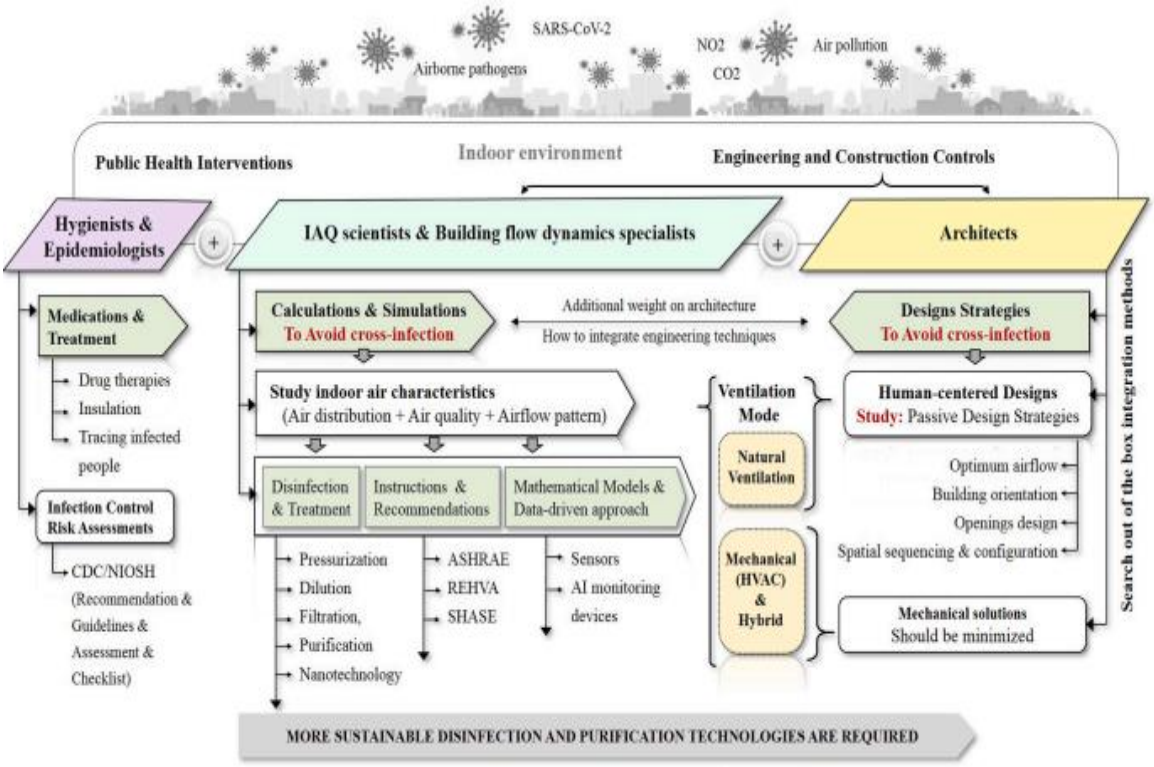
“sick building syndrome” (SBS) was first utilized in the 1970s and describes a situation where reported adverse health symptoms among a population of building occupants can be temporally associated with their presence in that building (CCOHS, 2019; EPA, 2018b). This phrase has now been universally replaced with “building related illness” (EPA, 1991). Sick buildings and the intangible costs to human life are not a new research topic. A study in the early 1990s of Swedish buildings built after the 1970s energy crisis found that over 30% of the building stock was determined to be “sick” (Ryd, 1991). Furthermore, Ryd (1991) suggested that the “cost” of living in “sick” buildings is much higher than accepted if you count the psychological effects.

IAQ problems can result from interactions between building materials, furnishings, activities within the building, climate, and building occupants, and is commonly studied with quantitative methods that determine parts per million of particulates in the air at a physical location at a snapshot in time (Langevin et al., 2016; The United States Department of Labor, n.d.). Tribulations from the indoor environment may include inadequate temperature, poor air circulation, ventilation system issues, and uncomfortable humidity levels (Omer, 2008; Wargocki & Wyon, 2013). Indoor contaminants can include dust, mold, fungi, bacteria, chemicals, gasses, vapors, and odors (Adams et al., 2016). Mold growth can occur in any indoor space and is often caused by several issues including but not limited to heating, ventilation, and air conditioning issues, water intrusion (flooding, roof leaks, and plumbing issues), improper maintenance, and exposure to climatic elements. There is no practical way to eliminate all mold in the built

environment; however, by controlling moisture, the growth of mold can be limited. The medical effects of biological exposure to mold and other hazardous particles are not fully understood, nor are they confidently measurable, but can include allergic illness, asthma, respiratory infection, and general toxic effects (Bush et al., 2006; EPA, 2021a). However, designers of the built environment, including architects and interior designers can greatly contribute to an interdisciplinary effort to make buildings healthier for occupants. Figure 2 shows a conceptual model for reducing air-borne transmission of infection inside buildings that is useful in this study, which depicts the role of architects, IAQ scientists, and public health professionals to work together to create an indoor environment based on human-centered designs (Megahed & Ghoneim, 2021).

Figure 2

Flowchart of the Holistic Engineering Solutions for Enhancing IAQ



From “Indoor Air Quality: Rethinking rules of building design strategies in post-pandemic architecture,” Megahed, N.A., & Ghoneim, E.M., 2021, *Environmental Research*, *193*, 110471-110471, Section 4, Figure 2 (https://doi.org/10.1016/j.envres.2020.110471).

Interactions between building materials, furnishings, activities within the building, climate, and building occupants can cause adverse conditions, which includes indoor and outdoor pollutants and human or animal biologic components (Wolkoff et al., 1997). Common indoor air pollutants that threaten indoor air quality of school buildings include lead, dust mites, mold (Park et al., 2004; Patovirta et al., 2004), radon, pests, carbon monoxide, pet dander, human activities, pathogens, and fomites (EPA, 2018c; Meadow et al., 2014). Volatile organic compounds (VOCs), microbial volatile organic compounds (MVOCs), pollens, viruses, and other microorganisms have demonstrated negative effects on employee outcomes such as productivity, absenteeism, and presenteeism (CCOHS, 2019; Guidotti, 2010; Lukcso et al., 2016).

Integrated pest management programs, second-hand smoke, and pollutants from motor vehicles can also be common sources of poor IAQ in school buildings (EPA, 2019). One of the important sources of concern is some of the materials used in schools. For example, carpets can be a source of

chemical emissions and can also act as a "sink"[1] for chemical and biological pollutants including pesticides, dust mites, and molds (Fanger, 2006; Wargocki & Wyon, 2013). The presence of water-damaged materials and high humidity is also linked to the presence of biocontaminants, especially mold (Adams et al., 2016; Meadow et al., 2013; Spaces, 2004).

Epidemiologic Triad

The epidemiologic triad (Figure 3) is a model developed for studying health problems. The triangle has three corners: the agent (in this study, generally referred to as toxic IEQ/IAQ), the “what” of the triangle; the host (in this case, the teacher), the “who” of the triangle; and the environment, those external factors that cause or allow the transmission of the agent, the “where” of the triangle (in this study, the school building). The goal for optimal health is to break at least one of the sides of the triangle, disrupting the connection between the environment, the host, and the agent.

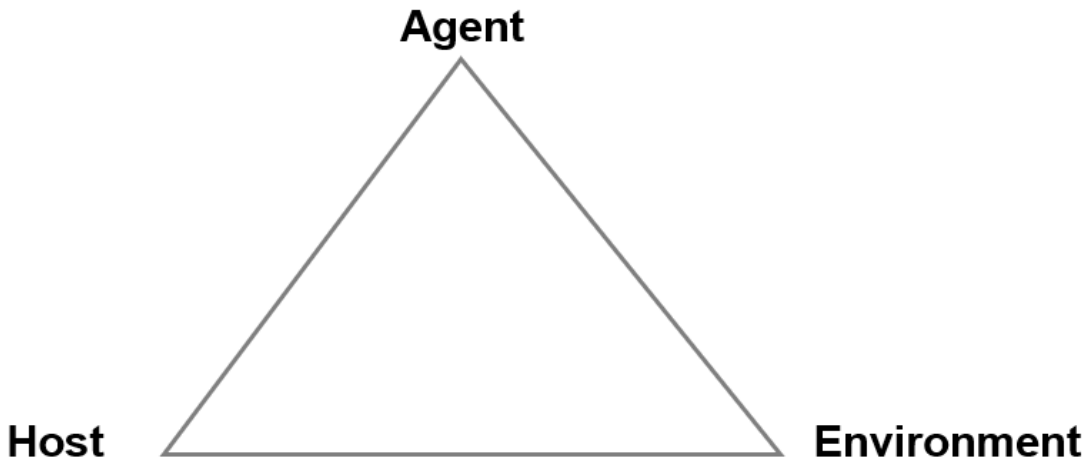
The most frequently reported occupational respiratory disease for all workers in the U.S. is occupational asthma, with an incidence of 2–5 cases per 100,000 population per year, corresponding to about 15–20% of the overall adult-

[1] The sink effect describes the sorption and desorption (re-emission) phenomena of indoor air pollutants on the interior surfaces of building materials and furnishings. An, Y., Zhang, J., & Shaw, C. (1999). Measurements of VOC adsorption/desorption characteristics of typical interior building materials. *HVAC&R Research*, *5*(4), 297-316.

asthma public burden (The Centers for Disease Control and Prevention [CDC], 2014). However, these figures are based on national occupational disease registries and voluntary reporting surveillance schemes, so they could also be underestimates of the true disease burden and reflect a reduction in surveillance or access to healthcare, with workers choosing not to seek advice due to poor job security, or reporter fatigue (De Matteis et al., 2017).

Figure 3

Epidemiologic Triad



Note. By author

Many psychological studies on the physical environment and human interaction have identified that humans respond physically and psychologically to their environments (Maslow et al., 1987). What is missing from the epidemiologic triad is the psychological or physical process the human undertakes when exposed to an agent. Psychological results indicate that environmental stress

reduces the cognitive capacity for work and the rate of work (Diehl et al., 2012), which is an important consideration in this study of teachers as workers.

Increasing the number of individual stress factors is associated with a near-linear reduction in work performance, indicating that environmental stress factors are additive, not multiplicative (Lamb & Kwok, 2016). Environmental stressors reduce occupant well-being (mood, headaches, and feeling “off”), causing indirect reductions in work performance (Lamb & Kwok, 2016). Conceptualizing and measuring worker well-being is a developing field of research (Bartels et al., 2019; Chari et al., 2018). Worker well-being has been measured through concepts as varied as job satisfaction, employee engagement, positive emotions, good physical or mental health, and quality of social relationships, and associations have been made with outcomes such as reduced mortality and improved work performance in the workplace (Chari et al., 2018; Sadick & Issa, 2017b).

Perceived IAQ

The definition of perceived IAQ has not been settled in the literature. Although not defining or operationalizing perceived indoor air quality directly, Kim et al. (2019) identified indicators of perceived IAQ to be stuffy odor, unpleasant odor, pungent odor, moldy odor, tobacco smoke odor, dry air, and humid air. In a similar approach, Maula (2017) used the indicators of perceived IAQ as stuffy (1) to fresh (7) on a 7-point Likert scale. Yet another approach was utilized by Langer et al. (2017) defining indoor air quality by the nature and concentrations of compounds that occur indoors, mainly volatile organic compounds and

particulate matter, and human perception through olfactory and other sensory detection. Dissatisfaction in the Langer et al. study (2017) was determined by humidity, temperature, ventilation (stale or drafty), and odors. Indoor air quality is defined by the EPA as the air quality within and around buildings and structures, especially as it relates to the health and comfort of building occupants (EPA, 2020).

The perception of IAQ is a subjective awareness of air that is determined to pose a risk, constructed by using the five senses. Jansen (2019) determined that a perceived environmental threat might play a role in strengthening the bond with the place. The perception of toxic IEQ/IAQ by building occupants “can cause fatigue, impair work performance, and, via various symptoms, decrease well-being” (Maula et al., 2017).

Kim et al. (2019) conducted a study of perceived IAQ symptoms in six underground Korean shopping malls and concluded that about one to six out of ten workers experienced at least one building-related illness (BRI) symptom at their store in the previous months. Kim’s study concluded that participants who perceived toxic IEQ/IAQ were more likely to have BRI symptoms (odds ratios differed among store type). Bu et al. (2016) analyzed perceptions of odors and dryness and their associations with asthma and allergic symptoms in 1-8-year-old children. Tähtinen et al. (2020a) found that complaints from workers was greater in healthcare environments than in offices, and Wong-Parodi (2018) confirmed the hypothesis that air monitors affect people’s knowledge, attitudes, and behaviors with respect to indoor air pollution and found that people who had

air cleaners were more likely to share knowledge with friends, family, and co-workers.

In determining IEQ satisfaction in the home, Zalejska-Jonsson and Wilhemson (2013) determined that, generally, satisfaction with air quality had the highest impact on occupants' overall satisfaction. The occurrence of problems with indoor environment quality, particularly drafts, dust, and too low indoor temperature, affected occupants' overall satisfaction. However, it was demonstrated that the impact of perceived indoor environment quality on overall satisfaction was affected by individual and building characteristics, gender, age, lifestyle, health, building location, and building construction year.

Teachers and IAQ

Teachers have a unique set of work and indoor environmental conditions (Yin et al., 2016), and generally, school buildings across the U.S. had well-documented IAQ issues before the pandemic (Chithra & Shiva, 2018; Petronella et al., 2005). Millions of students and teachers contend with disparity in their schools daily as some schools have the benefit of quality buildings while others must live with deteriorating facilities (Barrett et al., 2019).

The injurious effects of building quality on academic outcomes were found to hold true in a study with 95 school buildings in New York City. In 2008, Duran-Narucki determined that in dilapidated New York City public school facilities, students attended less days on average and had lower grades in English-language-arts and math standardized tests, and attendance was found to be a mediator for grades on those two tests. Although the New York City study

focused on students and the whole building, this study posits that adverse indoor air quality could be a factor in negative place attachment and place detachment.

The health and comfort of students and teachers are among the many factors that contribute to learning and productivity in the classroom, which in turn affect performance and achievement of students (EPA, 2018a; M. Schneider, 2003; Sisask et al., 2014; Wyon & Wargocki, 2013). Indoor air quality issues may cause a multitude of negative impacts on staff, students, and the community and may reduce teacher and staff performance, as well as strain relationships among school administration, parents, and staff, and cause absenteeism or increase potential for school closings or relocation of occupants (EPA, 2018d; Wargocki & Wyon, 2013).

Understanding the primary causes of IAQ problems and how controllable factors such as proper heating, ventilation, and air-conditioning, suitable system design, allocation of adequate outdoor air, proper filtration, effective humidity control, and routine maintenance can avert problems (Rudblad et al., 2001). Illustrating the complexity of indoor air management, schools in the U.S. have reported experiencing serious microbial and IAQ problems when the space relative humidity is high (Bayer et al., 2000; Menetrez et al., 2004).

According to reports from the United Federation of Teachers (UFT), the most frequent complaint of teachers is poor indoor air quality in the schools where they work (United Federation of Teachers, 2010). As of fall 2019, there are 3.7 million teachers employed; of those, 3.2 million teachers are in public schools and 0.5 million teachers are in private schools (National Center for Education

Statistics [NCES], 2019). The number of teachers in the U.S. workforce is significant, which means this is a significant occupational health issue. To add to the problems school boards face, threatening teacher attrition puts students and the districts at risk of losing experienced teachers and the ability to hire new teachers (Goodwin, 2018; M. Schneider, 2003; Tindowen, 2019).

Previous studies on IAQ in schools revealed that the poor indoor environmental quality at schools may be explained by: (1) insufficient ventilation in schools, especially in winter (Rosbach et al., 2013); (2) infrequently and not thoroughly cleaned indoor surfaces (Quinn et al., 2015); and (3) a large number of students in relation to room area and volume, with constant re-suspension of particles from room surfaces (Janssen et al., 2001; Meadow et al., 2013).

The number of occupants a building houses is a problem many school districts face. The National Center for Education Statistics notes that only when enrollments exceed capacity by more than 25 percent is a school labeled “overcrowded” (NCES, n.d.). School occupancy is generally denser than in homes or office buildings, with the typical school averaging four times as many occupants per square foot as the typical office building (Kinshella et al., 2001). Higher occupancy densities may lead to an increased incidence of infectious diseases as well as odor and comfort complaints (Chao et al., 2003; Joshi, 2008). According to the latest building code for educational facilities, the occupant load factor (a designation of square feet per person based upon the use of a given space) for classrooms within the ISBE Health/Life Safety Code ranges from 18 or 20 ft^2/occupant up to 40 ft^2/occupant for some older schools

(International Code Council [ICC], 2019). Also, for other school use areas, different occupant load factors may be applied (e.g., 15 in cafeterias, 12 in study halls, and 25 in libraries, etc.). Office spaces, on the other hand (which can vary by demand and precinct), can see national averages ranging from 180 to 220 square feet per occupant, with minimum standards set by the National Fire Protection Association (Bigda, 2018; CCIM, 2012).

School buildings with “higher occupant densities, combined with lower ventilation rates, may lead to an increased incidence of infectious diseases, as well as odor and comfort complaints” (Kinshella et al., 2001). The last time information was collected about the condition of public-school facilities was in the 2012–13 school year when the National Center for Education Statistics reported 26% to 37% of schools indicated that the heating/ventilation/air conditioning was fair or poor, whether the building(s) were in suburbs, rural communities, cities, or towns (Alexander & Lewis, 2014). Failure to respond promptly and effectively to poor indoor air quality in schools can lead to a host of problems, including teacher absences (Ervasti et al., 2012). Other related consequences include an increase in short- and long-term health problems (Ebbehøj et al., 2005; Marçal & Peres, 2011), increased healthcare expenses, costly repairs, potential liability problems, and greater risk that schools will need to close and temporarily relocate staff (Annesi-Maesano et al., 2013).

It is not uncommon for teachers to experience illness during the school year. Tak et al. (2011), in a seven-year study of National Health Interview Survey data, found on average, during any 2-week time period, over 1 million teachers

and other workers employed at schools (i.e., 16% of all teachers and other workers employed at schools) were experiencing a head/chest cold. The figures are even higher during months of peak illness incidence (i.e., November through March) compared to all other workers. A 2005 study by Ebbehøj concluded in a study population of 522 Danish teachers, building-related symptoms were reported more frequently by women than men.

Health problems related to poor IAQ can include headache, nausea, eye, nose, and throat problems, chest tightness or shortness of breath, fatigue, chills and fever, dizziness, dry skin, or even collections of more serious health problems (EPA, 2009). Adverse indoor air quality may exacerbate diseases such as asthma and allergies that produce symptoms or absenteeism that impair performance (EPA, 2018d; Girman et al., 2002; Mendell et al., 2002; Sahakian et al., 2008). Pathogens such as SARS coronavirus and influenza are serious threats to the ability of schools to function. Particles shared between occupants have been found to be vectors, or transmitters, of pathogens and correlates with occupants' satisfaction (Qian et al., 2012). Although much research is underway to understand more about how pathogens are transmitted, there is much left to learn, especially concerning the relationship between indoor environment, behavior, and occupant satisfaction (Asojo et al., 2021).

Failure to respond promptly and effectively to poor indoor air quality in schools can lead to a host of problems, including teacher absences (Ervasti et al., 2012; Miller et al., 2008). Other related consequences include an increase in short- and long-term health problems (Dangman et al., 2005), costly repairs,

potential liability problems, and greater risk that schools will need to close and temporarily relocate staff and students (Annesi-Maesano et al., 2013). These conditions can pose a serious threat to the physical and mental occupational health of workers, which includes general respiratory health and work-related asthma (Henneberger et al., 2011). Lack of school resources as measured by pupil-teacher ratio (PTR) (Ervasti et al., 2012) have been associated with teacher sick leave. Moreover, school location, i.e., school urbanicity, low pupil socioeconomic composition, and high PTR have been associated with poor IAQ (Simons et al., 2010). The health and comfort of students and teachers are among the many factors that contribute to learning and productivity in the classroom, which in turn affect performance and achievement of students (EPA, 2018d; M. Schneider, 2003; Wargocki & Wyon, 2013).

In a recent study published in the *International Journal of Building Pathology and Adaptation*, Alzahrani et al. (2020) discovered through post-occupancy performance that IEQ has a strong correlation to teacher performance. School buildings constructed prior to 1975 were reported by Finnish teachers to cause health issues they attributed to indoor environmental quality (Turunen et al., 2014). The teachers also noted their satisfaction with the school building declined as the results of their sensitivities and illnesses.

Sadick and Issa (2017a) researched teachers' satisfaction with IEQ factors between new and renovated schools and non-renovated ones. However, no statistically significant differences were found in teachers' psychological, social, and physical well-being perceptions between all pairs of the three school

categories analyzed. Association analyses suggested a potential indirect impact of schools' renovations on teachers' well-being via their satisfaction with IEQ.

Benka-Coker et al. (2021) cautioned that findings from studies conducted in office buildings may not be generalizable to schools, specifically due to the nature of the building materials and air exchange systems. Further, physiological differences in children and adults may differentially impact children's health risks due to poor IAQ. Also, time-activity patterns of occupants in school buildings may differ substantially from those of office workers, with shifts in classrooms based on activity type or subject. It is plausible that within schools, air quality, noise pollution, and other environmental factors might vary substantially by classroom or location.

Colleague support for teachers who are stressed or anxious serves as a resource for teachers and has a positive influence on their performance (Wolgast & Fischer, 2017). However, Sedivy-Benton and Boden-McGill (2012) found that school-level contextual factors, such as teacher influence on school workings, teacher perception of control, and teacher perceived support, played a significant role in teachers' intentions to leave or remain. The focus of these findings indicates that attention should be paid to the attitudes and the perceptions of teachers' working environments, how teachers perceive their role in the school when it comes to influence and control, and the support that teachers receive in their teaching roles.

Ventilation in the Classroom

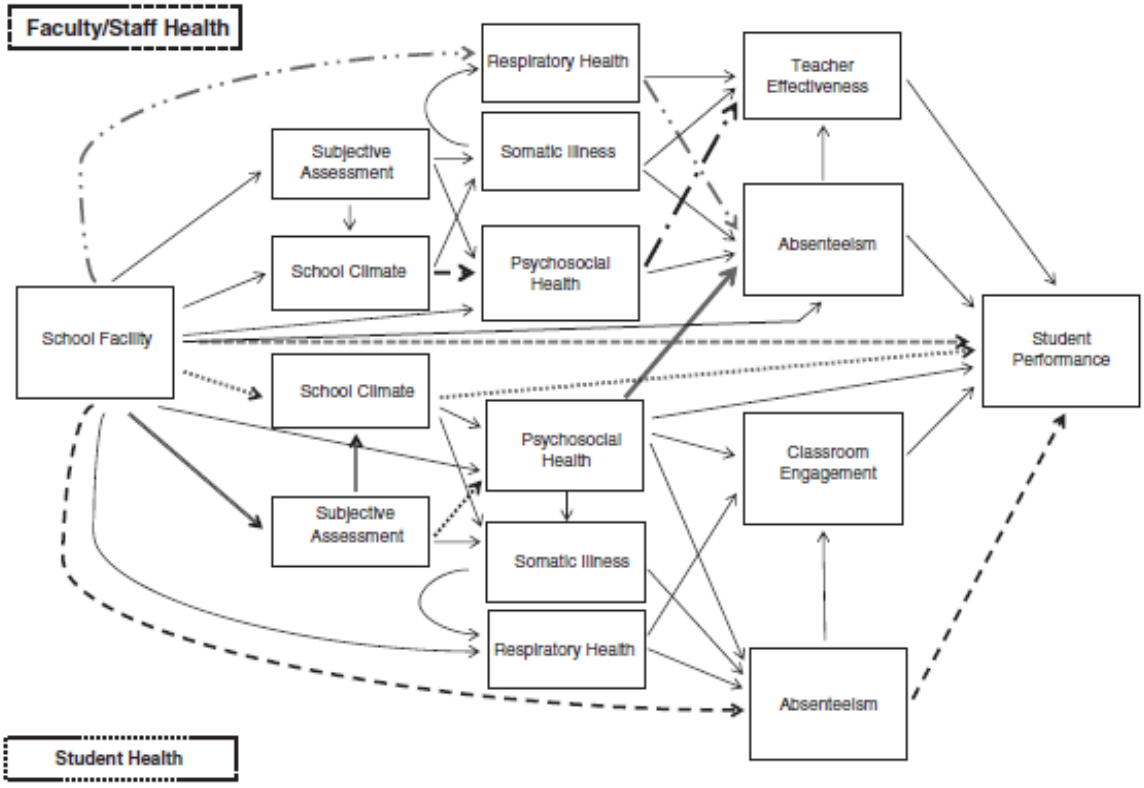
Fisk (2017) performed a literature review on the ventilation problems in schools and determined that classrooms often fall far short of the minimum ventilation rates specified in standards. There was evidence of an association of increased student performance with increased ventilation rates and that reduced respiratory health effects and reduced student absence were associated with increased ventilation rates. One reason that schools may not be achieving the preferred ventilation rates is that increasing ventilation rates imposes energy costs and can increase heating, ventilating, and air-conditioning system capital costs (Fisk, 2017). Mechanical ventilation is not the only option for some classrooms. Schneider (2003) noted that a significant number of teachers expressed dissatisfaction that the windows were inoperable in Washington, D.C. and Chicago schools.

In a systematic literature review of indoor air quality, Magzamen et al. (2017) examined empirical literature on facility quality, school climate, and occupational exposures and determined that given the average age of current school facilities in the U. S., construction of new school facilities or retrofits of older facilities will be a major infrastructure investment for many municipalities over the next several decades. The relationship between school facilities, occupant health, and educational performance is complex and likely involves multiple pathways. Magzamen et al. (2017) created a diagram (see Figure 4) that shows the organization of these two major groups, faculty/staff and students, with regard for the school facility and student performance. The results from their

study indicated that research on the impact of physical environmental factors (air, lighting, and thermal comfort) on health and occupant performance are largely independent of research on the social climate (Magzamen et al., 2017).

Figure 4

Directed Acyclic Graph Illustrating Relation Between School Facility and Student



Dashed arrows represent distinct mediation analyses that have been presented in the literature. Bolded arrow represents student exposure-teacher outcome.

From “A Multidisciplinary Research Framework on Green Schools: Infrastructure, Social Environment, Occupant Health, and Performance”, by Magzamen, S., Mayer, A.P., Barr, S., Bohren, L., Dunbar, B., Manning, D., Reynolds, S.J., Schaeffer, J.W., Suter, J., & Cross, J.E., 2017, *Journal of School Health*, *87*(5), 376-387, Section 1, Figure 1, (https://doi.org/10.1111/josh.12505).

There is scarce empirical research on teacher satisfaction with their physical classroom. Shell (2015) found that occupant surveys presented a key strategy for improving IEQ in classrooms. Satisfaction with the physical environments could not be reduced to measurable variables in the physical environment. Instead, Shell suggested that the way teachers use their classrooms in a social context is the best way to appraise their satisfaction with their classrooms.

Regarding the unique situation of teacher's attachment to the whole school organization, Lee et al. (1991) found that organizational satisfaction mediates satisfaction with some features of the physical environment involving teachers' efficacy and satisfaction. In Schneider's (2003) survey of teachers in Chicago and Washington, D.C., air quality was the top health complaint regarding the school building, with well over half of the teachers having reported a problem. Just under one-third of the teachers reported suffering from ongoing health problems because of poor school conditions. Whelan et al. (2003) found that teachers were significantly more likely to report work related eye, nose, and throat symptoms than were other working women and were more likely to report five or more episodes of cold or flu in the past year than were other working women. School teachers reported a higher prevalence of work related upper respiratory symptoms, chest illness, and cold or flu compared to the general working population.

In a Finish study following up on the remediation of the mold damage in a school building three years after remediation, bronchitis, conjunctivitis, symptoms

of allergic rhinitis and the sum of respiratory infection episodes decreased significantly and was found to have been beneficial for teachers' health. The results established a causal relationship between the onset of asthma and indoor mold exposure (Patovirta et al., 2004).

According to the national teacher's union, National Education Association (NEA), indoor air quality concerns are nothing new. In 2011, teachers, custodians, and other educational service providers from around the country spoke up at the NEA Health Information Network's 8th annual Indoor Air Quality Pre-Symposium. The event provided NEA members strategies from the union and association perspectives on how to organize around the issue of poor indoor environmental air quality. Eighty-seven teachers, ESPs, and administrators representing 16 states attended the event and covered topics such as forming health and safety committees, conducting school walkthroughs, administering health and hazard surveys, building coalitions, and how to deal with difficult or unsupportive administrations (Fuller, 2011). To better understand teacher's experiences at work, a phenomenological understanding of place is necessary.

Attachment and Detachment in Psychology

Attachment theory[2] (Bowlby, 1969, 1973) is recognized as one of the most important frameworks for understanding the process of affect regulation (Mikulincer et al., 2003). This framework outlines three attachment-related strategies for affect regulation: secure (positive), anxious-ambivalent (negative), and disorganized and avoidant (negative) (Bowlby, 1973). As used here, the "attachment-figures'" availability (could be a parent, teacher, family, friends, pets, or a religious figure) is one of the sources of affect regulation. Other empirical studies have focused on a person's attachment style, which is the pattern of relational expectations, emotions, and behavior that results from internalization of one's history of attachment experiences (Fraley & Shaver, 2000; Shaver & Mikulincer, 2002). Attachment styles are usually considered as positive (based on love, caring, compassion, trust, and support). However, attachment can start as positive and gradually develop into a negative bond (resentment, anger, blame, worry, and criticism) or full detachment (Fischer et al., 1990). Sudden, forced geological displacement (upheaval in the environment) and the psychological process that people experience was first explored by Fullilove (1996), who determined that the emotional connections of those occupants was

[2] To note: 'attachment theory' does not explicitly include the significant neuro-scientific foundations of the field. Cassidy, J., Jones, J.D., & Shaver, P.R. (2013). Contributions of attachment theory and research: A framework for future research, translation, and policy. *Development and Psychopathology*, *25*(4 Pt 2), 1415-1434. https://doi.org/10.1017/S0954579413000692. The term attachment theory is used here because it has wide recognition and because it includes those aspects of the field most pertinent to this study, and because it has a complementarity relationship with the term place attachment.

ruptured, ensuing in disorientation, an undermined sense of belonging and detrimental mental health.

Previous research recognizes that emotions and attachment to place are related but separate constructs (e.g., Altman & Low 1992; Hernández et al., 2007; Morgan, 2010). Developmental theory of place attachment attempts to fuse attachment theories in psychology (e.g., Bowlby, 1982) and theories of place (Morgan, 2009). Based on Morgan's (2010) developmental theory of place, this study represents felt emotions as precursors of place attachment. To tie to phenomenology, attachment to place is an integral part of being in the world (Harvey, 1996).

Workplace Attachment

Attachment, positive or negative, to one's organization, exclusive of the physical space itself, can be studied alongside place attachment. Neustadt and Furnham (2006) define "attachment at work" as the relationship between individuals' attachment orientations and how they interact with others in the workplace and organization and is more closely related to Bowlby's (1969) original attachment theory. Workplace attachment has been broadly defined as the emotional bond between a person and the physical work environment(s) of their accompanying organization (e.g., Milligan, 1998, 2003a, 2003b; Rioux, 2006).

The psychometric properties of workplace attachment style have been researched and measured through the efforts of Scrima's Workplace Attachment Scale (WAS), which has three factors: secure, dismissive, and preoccupied

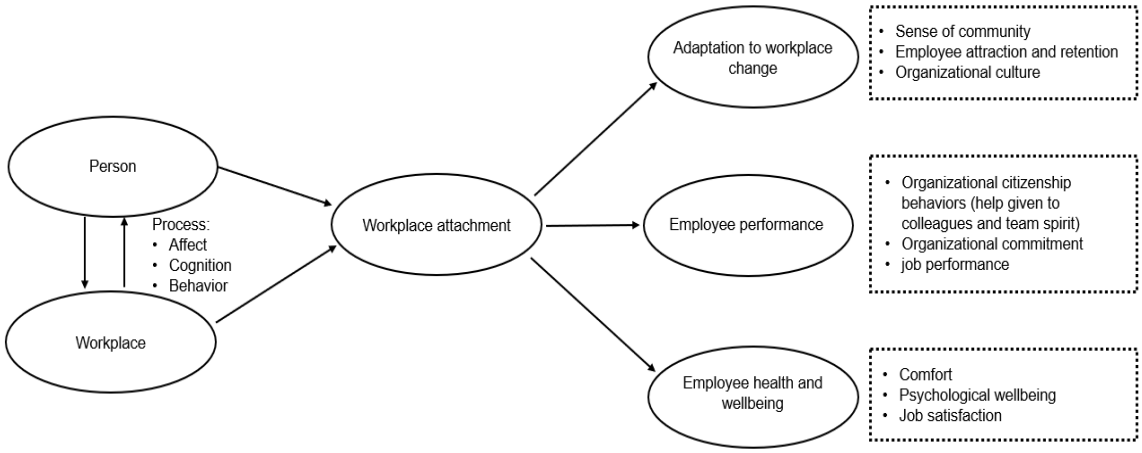
workplace attachment styles in two emotive dimensions, thoughts of self and thoughts of places (Scrima, 2015, 2018). However, Rioux (2006) rephrases the definition to broaden the bond and notes that workplace attachment is the emotional bond resulting from the dynamic interaction between a person and their organizational environment.

Inalhan (2021) created a diagram (see Figure 5) to simplify the constructs of workplace attachment and the role place attachment has in the global understanding of workplace attachment. This framework is useful in explaining workplace attachment as a multidimensional concept involving person, psychological process, and place dimensions (Inalhan et al., 2021). This diagram allows us to trace the constructs of “who” and “what” on the left side of the diagram through attachment to the organization as seen in “adaptation to workplace change” and “employee performance” on the right side. Historically in place literature, health and wellbeing would fall under the “person” construct, which aligns with the tripartite.

Three theoretical models of workplace attachment have been recognized in the literature: (1) a unidimensional model of workplace attachment by Rioux (2006); (2) an adoption of the PPP, tripartite model of place (Scannell & Gifford, 2010) to the workplace by Inalhan (2009); and (3) a model by Inalhan (2009), which emphasizes place loss and resulting emotion, attitudes, and behaviors relevant for workplace change processes.

Figure 5

A Framework of Workplace Attachment: Person, Place, Process, and Desired Outcomes



From “Place attachment theory.” In *A Handbook of Theories on Designing Alignment between People and the Office Environment,” by* Inalhan, G., Yang, E., & Weber, C., 2021, (pp. 181-194). Routledge. Section 2, Figure 16.1, (https://doi.org/10.1201/9781003128830-16).

Shumaker and Taylor’s (1983) unidimensional understanding of place attachment highly influenced Rioux’s (2006) model of workplace attachment. The significance is the affective construct of the person–work environment relationship. The instrument, the Workplace Attachment Scale (WAS)/Echelle d’Attachement au lieu de travail (ÉALT), is a one-dimensional, seven-item scale based on the Neighborhood Attachment Scale by Bonnes, Bonaiuto, Aiello, Perugini, and Ercolani (1997). Several studies (Scrima et al., 2019; Venkataramani et al., 2013) have found that employees who are more attached to their workplace are more satisfied, show a lower tendency to leave their jobs,

and improve their job performance compared with those who are less attached (Dinc, 2017).

The dominant role of affect in person–place bonding at work is an emotional investment in a place or feelings of pride and a general sense of well-being (Inalhan et al., 2021). The memories, beliefs, meaning, and knowledge that individuals associate with their central settings make them personally important in workplaces, and as such, the cognitive process that employees undergo are an important construct of attachment to the organization (Yip et al., 2018). Tran (2019) found that employees who are attached to their workplace (as an organization) have a higher level of job satisfaction. Investigations into workplace attachment by teachers, and empirical evidence of the subtle differences between place attachment to the workplace and workplace attachment, provide an opportunity for exploration. Workplace attachment, as used in this study, was operationalized as the relationship between individuals' attachment orientations and how they interact with others in the workplace and organization (Neustadt & Furnham, 2006). Workplace attachment and workspace attachment are two different things, because place, as seen in this study, is a nuanced component of overall workplace attachment. To provide clarity, in this study, the phrase workplace attachment refers to the emotional bond with the work organization, while "workspace" is reserved for the physical location of the organization.

The empirical work pertaining to the psychology of employees, organizational psychology, and the workplace by Scrima and Rioux (2019), and the facility and real estate research provided by Inalhan (2021), provide assistive

framework for this investigation into the “workspace” of teachers, the school building, and what it means to them regarding their negative place attachment or place detachment to it.

Place Attachment

Place attachment, as a phenomenon, has been debated and explored by researchers since the revolutionary work by Fried (1963), who wrote about grief as experienced by Bostonians displaced from their neighborhood. Seamon (2021) has put forth the question of whether place attachment is a phenomenon unto itself, or only one dimension of a more comprehensive lived structure identified as place and the experience of place (Creswell, 2014; Donohoe, 2014; Gieryn, 2018; Malpas, 2018; Williams, 2014). Hummon (1992) used the phrase “sense of place” from Buttimer (1980) as involving a personal emphasis toward place in which one's understandings of place and one's feelings about place become joined in the context of environmental meaning, and can be thought of as a general attitude toward a spatial setting, represented by a collection of symbolic meanings and attachments with a place, held by an individual or a group (Jorgensen & Stedman, 2001; Trentelman, 2009). The nature of “place attachment” has broad and deep implications within the realm of phenomenological and positivist views (Patterson & Williams, 2005). No single accepted definition, congruence of terminology, or systematic theory of place attachment exists (Low & Altman 1992; Lewicka 2011; Scannell & Gifford 2010). Manzo et al. (2021) illustrate the historical metatheoretical moments starting in the 1960s that have shaped place attachment from place as a material container,

to the center of being, the locus of attachment, the center of meaning and identity, place as an expression of power, place as a scene of embodied practice, and lastly, as a site of social-ecological gatherings.

Because of the varied discourse with the person-place bond, different names for place attachment exist in the literature. For example, terms such as community attachment (Svobodova et al., 2021), sense of community (Sullivan & Young, 2020), place identity (Ramkissoon, 2021; Ratcliffe & Korpela, 2017; Twigger-Ross & Uzzell, 1996), place dependence (Borghini et al., 2021; Stokols & Shumaker, 1981), place dimension (Reese et al., 2019), rootedness (Maricchiolo et al., 2021), territoriality (Taima & Asami, 2019), or sense of place (Ivzori Erel & Cohen, 2021; Shamai, 1991), are all used to describe the concept of place attachment.

Parallel to the work by other disciplines to label the emotional bond to place, applied geographers introduced a phrase that is commonly used in the field of biology, called “home range” (Brown et al., 2015). A biological home range is the area negotiated by an individual (usually mammals) in its normal activities of food gathering, mating, and caring for young (Burt, 1943). The field of geographic information science has been using the phrase as a spatial understanding of human perceptions and behaviors (Goodchild, 2015; Purves et al., 2019). Brown et al. (2015) resourcefully compare home range as a spatial area containing needed resources (material and non-material) as being pertinent to humans in terms of space and time. It is in the research by Powell and Mitchell (2012) that biological home range is examined using the recorded behavior of a

human subject (one of the researchers, himself). They proposed that a home range is the relationship between the physical environment and the understanding of the environment and use the phrase “cognitive map” (O'keefe & Nadel, 1978), which resonates with the framework of this study. According to Tolman (1948), and later Kaplan (1973), a cognitive map is kept current with the status of resources and places to go to meet wants by coding, storing, recalling, and decoding information about the relative locations and characteristics of phenomena with regards to spatial environments. Brown et al. (2015) go on to explain that the places and areas that one can ‘‘visualize’’ become part of the home range where visualization means to have a mental concept of place where home ranges change and adjust over time consistent with changes in behavior.

Knowing that so many disciplines utilize the attributes including but not limited to memory, behaviors, place, emotion, and cognitive processes, it is understandable that an agreed usage of terminology for place attachment is difficult to achieve. Lewicka (2011b), in a literature review of place attachment, notes that each term signifies a slightly different meaning, and that the meanings are not easy to differentiate; however, the concepts partially intersect. It is the phrase “place attachment,” originally used by Altman and Low (1992), that has been used with the most frequency in a recent database query of books (118) and academic journals (1,364), as of the writing of this dissertation, so the term “place attachment” will be used throughout this study.

Jorgensen and Stedman (2001) describe place attachment as an emotional, cognitive, and functional bond with a place. Scannell and Gifford

(2010, 2014, 2016, 2017) utilized a three-dimensional framework of place attachment intended to integrate and structure the variety of definitions (Sebastien, 2020), including the tripartite model of place attachment of person, place, and process as constructs. The person dimension of place attachment refers to “its individually or collectively determined meanings, the psychological dimension includes the affective, cognitive, and behavioral components of attachment and the place dimension emphasizes the place characteristics of attachment, including spatial level, specificity, and the prominence of social or physical relationships.”

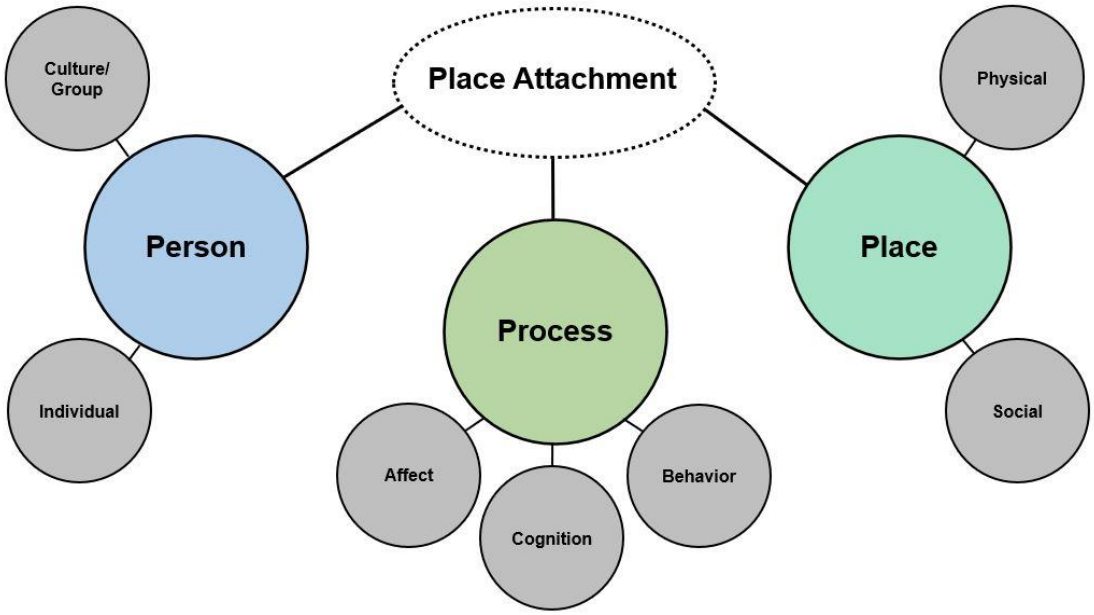
In this study, drawing on Scannell and Gifford’s tripartite framework of person, place, and process (see Figure 6), place attachment is defined as “the positive to negative cognitive-emotional bond that forms between individuals and their important settings and is a common human experience with implications for well-being, over time” (Scannell & Gifford, 2010).

Shared by all definitions is that place attachment denotes the relationship between individuals, or a group of individuals, to their environment. It is widely understood that many researchers emphasize that place attachment relies on physical attachment (Madgin et al., 2016; Waxman, 2006). However, social aspects such as relationships (Dallago et al., 2009 Nisa et al., 2020) and social context (Kyle et al., 2005; Perkins & Long, 2002) have been important to place attachment.

Attributes of Place Attachment

Figure 6

Tripartite Model of Place Attachment



Note. Redrawn by author

From “Defining place attachment: A tripartite organizing framework,” by Scannell, L., & Gifford, R., 2010, *Journal of Environmental Psychology*, *30*(1), 1-10, Section 2, Figure 1 (https://doi.org/10.1016/j.jenvp.2009.09.006).

Physical. According to Scannell and Gifford (2010), physical features of place are items such as density, proximity, and the presence of amenities. Hidalgo and Hernandez (2001) note that there are very few references to the physical dimension of place, and even fewer that have operationalized it. It has been twenty years since Hidalgo and Hernandez noted this gap in place attachment studies, and the incorporation of the built environment is still a gap in the empirical literature. For their study, Scannell and Gifford looked at different

spatial levels—a house, neighborhood, and city—and whether the survey respondent would be “sorry if they moved out.” In this study, the physical aspect of place attachment deals with the attributes, tangible (Cole et al., 2021) or intangible, or natural settings (Hidalgo & Hernandez, 2001). Spatial-design characteristics were found to be important to building occupants, such as proximity to the main entrance, location of functional areas, ease of navigation, openness and visual accessibility, functional pliancy of spaces, flexibility and adjustability of furniture and other interior elements, exterior views, and visual aesthetics and perceived sophistication (McLane & Kozinets, 2019). Little empirical research has included or focused upon the physical, interior building attributes and place attachment theory, thus providing an opportunity for further research (Manzo & Devine-Wright, 2021). Also, no literature has used IAQ or other inert objects such as pathogens, microbiomes, or VOCs in conjunction with place attachment theory as the object of attachment (Manzo & Devine-Wright, 2021).

Social. Hidalgo and Hernández (2001), in a study looking at both social and physical attachment, determined that social attachment is greater than physical attachment, as people frequently develop an attachment to a place because of the people instead of the physical attributes of the place. As used by this study, social relationships are teacher relationships at work with students and colleagues, and the quality of those relationships. Social interactions have achieved increasing prominence, both as an outcome and as a possible predictor in environmental research (Sonnenfeld, 1972). Schüle and Bolte (2015), for

example, reviewed the literature of 22 studies that showed an independent association between characteristics of the built environment and individual health outcomes or health-related behaviors due to social implications.

Positive and negative social relationships at work and home can affect employees' social relations. A recent study by Pauksztat and Salin (2020) found that exposure to bullying in the workplace affected the participant's perceptions of their relationships with colleagues. Work-to-family conflict is a widely studied topic in occupational stress and health research (Van Yperen, 2004). This style of conflict occurs when pressures from work and family are mutually incompatible and interfere with work life (e.g., extensive, irregular, or inflexible work hours; Demerouti et al., 2011). Considering family, Seong (2016) determined that self-efficacy and family-supportive organization perceptions (FSOP) play significant roles in an employee's perception of their organization and the values it promotes with work-life balance. In the workplace, Demerouti et al. (2011) found that relationships with colleagues, relationships with supervisors, participation in decision-making, and developmental possibilities buffered the impact of work-family conflict on absenteeism of female employees.

Teaching engages in professional relationships that involve power and organizational culture (Kõiv et al., 2019). Depending on the role of the teacher within the school district, the age of the students they are teaching, and job roles, cognitive and physical demands will differ (Nislin et al., 2015). Teachers of preschool children must engage in more non-teaching tasks, such as taking care of, playing with, and interacting with children, on top of regular instructional tasks

(Gu et al., 2020). Teachers' work is mentally, physically, and emotionally demanding, and a broad brush cannot be used to understand the stress they may experience and how it affects their work and family relationships (Day & Qing, 2009).

Underlying systems between built environments and health-related behaviors are quite complex. Mediating and interacting systems such as culture, demographics, and group variables for the teacher population were considered in this study (Claudio et al., 2016). An identified gap in empirical knowledge is the unique role those social relationships play when teachers construct place: social relationships.

Emotion (Affect). The emotional aspect is the first component of process. Many definitions accentuate the emotional part that is associated with a specific place. Affect is the emotional connection that occurs because of person-place bonding (Cuba & Hummon, 1993; Hidalgo & Hernandez, 2001; Fried, 1963). Affect, in this study, refers to the emotion of "worry" as operationalized by Watkins (2008): "Repetitive thoughts (RT) that can have constructive or unconstructive consequences." The main unconstructive consequences of RT are (a) depression, (b) anxiety, and (c) difficulties in physical health. And the main constructive consequences of RT are (a) recovery from upsetting and traumatic events, (b) adaptive preparation and anticipatory planning, (c) recovery from depression, and (d) uptake of health-promoting behaviors (Segerstrom et al., 2012). Worry implies repetitive thoughts that are negatively "affect-laden and

relatively uncontrollable, and that signal the potential occurrence of a negative future event" (Watkins, 2008).

Regarding worry and IAQ, in 2019, a Finnish team published findings from five Finnish primary schools with observed IAQ problems and five control schools (Nissilä et al., 2019). The team found associations between observed IAQ problems, worry, and five symptom scores (i.e., respiratory, lower respiratory, eye, skin, and general symptoms) using multivariate logistic regression and mediation analysis. On average, parents were more worried about schools with perceived IAQ problems. Finland has produced the most literature regarding IAQ and affect, including how poorly perceived indoor environmental quality (IEQ) can produce conflicts and occurrences of injustice in workplaces (Finell & Nätti, 2019); perceived indoor air quality and psychosocial work environment in office, school, and health care environments (Tähtinen et al., 2020b); and Savelieva et al.'s recent publication regarding worrying about IEQ and low school satisfaction, and asthma and hay fever reporting (Savelieva et al., 2020).

Behavior*.* Behavior is the second component of process and is actions that one takes when maintaining proximity to the physical place. Hidalgo and Hernandez (2001) maintain that place attachment operates comparable to interpersonal attachment (Bowlby 1969). This behavior typifies proximity-related behaviors such as closeness to a space. However, positive closeness is not always the outcome. Temporal (Hay, 1998) and situational context can influence behavior, as noted by Fried (2000), who studied the strong bond with place even when the probability of risk and personal injury were high.

Place attachment is thought to be the main way to capture affective person–place relationships (Dang & Weiss, 2021). It is important for researchers to follow the evolution of this psychological concept and get new insight into its effects with and on behaviors. Place, for this study, is considered as physical as perceptions of IAQ and satisfaction with building, and as social relationships at work, including workplace attachment to the organization, which includes school culture.

Culture plays a major role in shaping perception of risk and preferences for managing that risk (Douglas & Wildavsky, 1982). As a population, culturally, optimism bias about the likelihood of developing health issues such as cancer, influenza, or food-poisoning were found to vary from nation to nation (Fontaine & Smith, 1995). Not only is this a gap when studying place theory, but it is also relevant to this study because the culture of the Midwest tends to be homogeneous (83% White, 7% Black or African American, 5% Asian, 1% Native American, 3% mixed-race, or other (U.S. Census Bureau, 2021)) and traditional, as residents often return to their region of upbringing when settling. According to a survey, nearly 72% of Americans live in or near the city where they grew up (Pew Research Center, 2018).

Cognition. The third component of process is cognition, which involves the creation of and bonding through memories, meaning, beliefs, and knowledge that individuals associate with the physical place that make them personally important through closeness with that place (Scannell & Gifford, 2010). Cognition is the “how” we find meaning, which forms attachment over time, the cultural

processes, social bonds, feeling and emotions, and shapes cognition to some degree, but not entirely. Cognition is also the embodied aspect of sensory, and proprioception, which is a continuous loop of feedback between sensory receptors throughout your body and your nervous system.

Place attachment can be formed over a variety of settings. As such, researchers have examined place attachment in a multitude of settings, ranging from private homes (Stafford & Tofle, 2016) to public parks (Groshong et al., 2020), where humans travel to explore rivers (Kainzinger et al., 2018), to where green buildings educate (Cole, 2018). However, the literature is scarce when it comes to the study of place attachment in school buildings, especially public K-12 schools (Amir & Bakhtiar, 2019; Ebrahimzadeh et al., 2020; Spooner, 2019).

Time. A common finding throughout many place attachment studies is that place attachment is thought to increase with duration (Hosany et al., 2017; Manzo, 2005; Smaldone, 2007). A person may have a temporary attachment to place, whether it is positive, such as a restaurant where a celebration occurred, or negative, such as the scene of a car accident. When speaking of a workplace, the construct of time is considered in perpetuity until the person is no longer employed there. Sedentarism is commonly associated with the practice of living in one place for a long time but used in this study can be the longevity of working for the same school district or in the same school building for a long time, which is a common practice for K-12 teachers. The sedentarist tactic has applicable implications for the ways in which place attachment research informs reports on place detachment, which happens when teachers no longer experience a

beneficial relationship with their workspace, and thus their attachment ends or is interrupted.

Time is also important when considering the environmental exposure that one may experience or perceive. The epidemiologic triad considers the agent, the host, and the environment as an organizational model, and public health professionals explore the risk or exposure over time, and depending on the disease, the time scale may be as broad as years or decades, or as brief as days or even hours of the day. For some conditions, many chronic diseases, for example, epidemiologists tend to be interested in long-term trends or patterns in the number of cases or the rate (CDC, 2012).

Teachers at Work

Although much research has included the profession of teachers in place attachment exploration as part of a population, very few have focused on the teacher in their place of work, the school building. Koiv (2019), using the word "workplace," determined that [the physical place of work] could be an object of place attachment if a person forms an emotional bond with it and it becomes part of their identity. Curtis and Upchurch (2008) found that employees' place attachment reduces their likelihood of leaving their job and improves their performance. A study of teachers carried out by Rioux and Pignault (2013), focusing on the meaning of work, confirmed that teachers identify the classroom as a place giving meaning to work, whereas extracurricular time spent at school was related to their attachment to the school as an organization. However, teachers are dissatisfied with their school buildings; and in a 2005 study of

Chicago and Washington, D.C. teachers titled “Fix it and they might stay,” teachers in both cities reported facing daily problems with their school buildings (Buckley et al., 2005). In an ironic turn of events, the teachers were asked to grade their school building on an A through F scale. The teachers scored their buildings just above a C, or 2.17. The Washington, D.C. school buildings scored a 1.98 and the Chicago buildings a 2.50. The Buckley study provided the motivation to repeat the graded school building question in this study’s participants, both the survey and in the interviews.

In a 2019 study examining the mediating effect of teacher’s psychological empowerment between school leadership style and teachers’ work-related outcomes, Koiv et al. (2019) utilized a scale to measure workplace attachment, which consisted of dimensions of place attachment, identity, and dependence (Ramkissoon et al., 2013). Although the study was aimed at determining the leadership style of principals’ and teachers’ psychological empowerment, place attachment, as a variable, was labeled “workplace attachment” and had both direct and indirect effects as determined by the predictors of the principal’s empowering behavior and leadership style, teacher’s trust in the principal, psychological empowerment (meaning), and psychological empowerment (impact). The results from the Koiv study (2019) suggest that both psychological empowerment of “meaning” and “impact” were significant regarding teachers’ place attachment within their school building.

Workplace attachment and building satisfaction, being two different constructs, help to clarify the relationships between teachers and their

workplaces and spaces. As of 2022, the national average age of K-12 U.S. school buildings is 63 years old (National Center for Education Statistics), meaning the average school was built in 1959. The measurements designed to measure teacher satisfaction at school typically capture multiple dimensions of school climate (Magzamen et al., 2017). In a 2010 literature review focusing on school climate, five key dimensions were identified: (1) order, domain, and safety; (2) academic outcomes; (3) social relationships; (4) school facilities; and (5) school connectedness (Zullig et al., 2010).

In the literature, there exists a correlation between technical condition of the school building and student satisfaction (Hopland, 2014) and teacher satisfaction with the school building (Baker, 2011). Regarding specific building properties (e.g., natural and artificial lighting, room temperature, or outdoor areas), Meron and Meir (2017) found varying levels of satisfaction for different items and evident differences between the rating of green and conventional schools when all parameters were measured; most teaching staff preferred their present green school over the previous conventional one.

Improving building conditions can positively influence teacher retention and satisfaction with the school building (Buckley et al., 2005; Lee et al., 1991). Earthman and Lemasters (2009) investigated the possible relationship between the attitudes teachers have about the condition of their classrooms when the classrooms were independently assessed. In an article from the 1980s, teachers in unsatisfactory classrooms felt frustrated and neglected to such an extent that they sometimes reported they were willing to leave the teaching profession

(Farber, 1984). The Earthman and Lemasters (2009) findings indicate the physical condition of the classroom can cause morale problems with teachers and suggest that school authorities need to recognize the importance physical conditions have upon teachers so that negative feelings and attitudes do not pervade the faculty. Uline and Tschannen-Moran (2006) investigated the association between the quality of school facilities, school climate, and student achievement, concentrating on the perceptions teachers had about their school buildings and how those perceptions related to student achievement. Over a quarter of the teachers in unsatisfactory school buildings in the Earthman and Lemasters (2009) study stated they were unhappy with their physical surroundings in the classroom. Teachers in satisfactory buildings stated the opposite. The feelings of unhappiness on the part of these teachers naturally transfers to how they handle their teaching responsibilities and even how they interact with students.

Satisfaction with Place

The term satisfaction was initially defined in marketing as a customer's judgment regarding “two constructs, performance-specific expectation and expectancy disconfirmation, [which] play a major role in satisfaction decisions” (Oliver, 1980, p. 460). The addition of place, as the product, was used by Guest and Lee (1983):

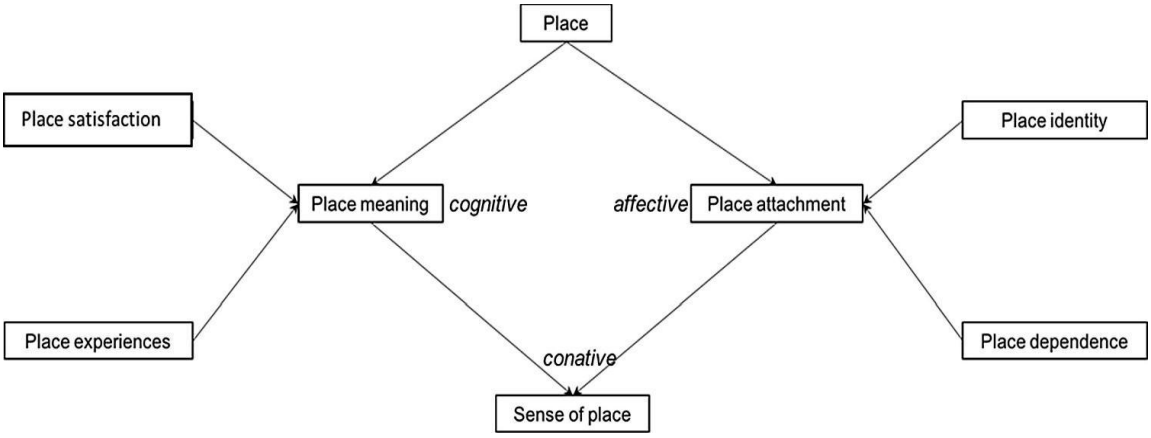
> Satisfaction with community primarily arises from a feeling that environments meet a variety of needs or goals, as defined by cultural beliefs about the "good life." In American society, it seems to arise more

> specifically from recognition of a safe and nonthreatening physical environment. (p. 164)

This is like the phrase “place dependence,” first used by Stokols and Schumaker (1981) as the opportunities a setting provides for goal and activity needs. Fried (1984) considered satisfaction as a moderately “shallow” concept compared to attachment, which is “more symbolically meaningful than satisfaction” (p. 62). Mesch and Manor (1998) added to the definition by including the construct of place attachment: “It is possible to be satisfied with where one lives and to not be particularly attached to place” (p. 509). Modification to the phrase continued by Stedman (2002), who added that summary judgments are multi-dimensional and preceptory, as place satisfaction is an attitude: “Place satisfaction is strongly based on cognitive attributions made about the setting” (p. 576). However, Stedman (2002) made the distinction between satisfaction with place as conceptualized as an attitude toward a setting, which is different from place attachment that is conceptualized as personal identification with a setting. Place satisfaction can be influenced by individuals' perceptions of the attributes or qualities of the place, as shown in Figure 7. Subjective and objective place qualities, expectations (Insch & Florek, 2008), and benefit provided is the definition of place satisfaction to be used for this study.

Figure 7

Framework Proposition for a Spatial Approach to Sense of Place

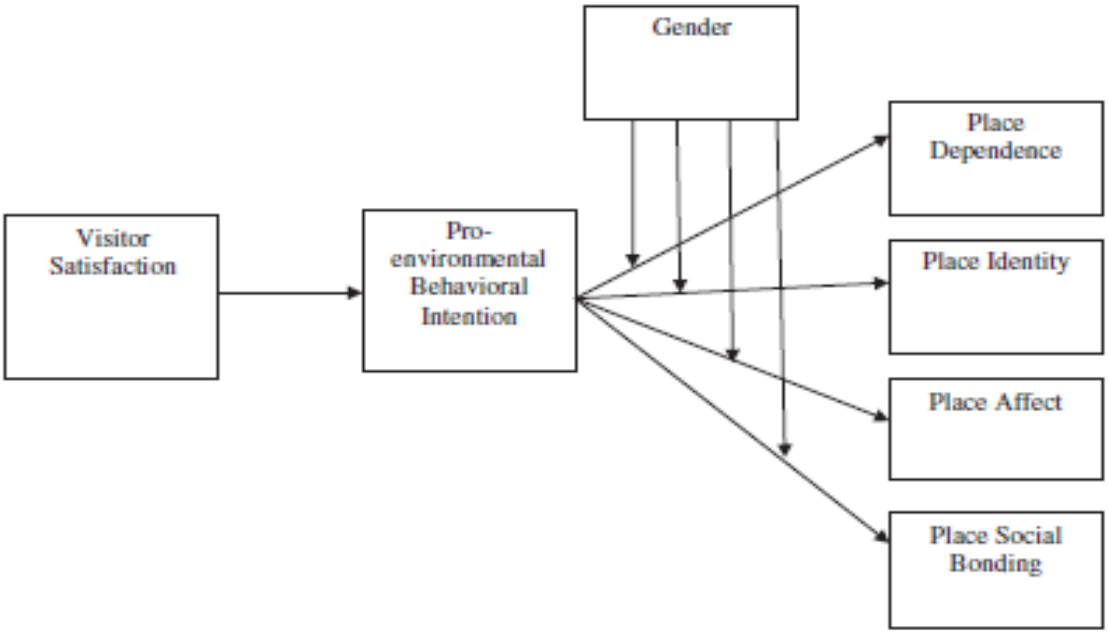


From “The power of place in understanding place attachments and meanings,” by Sebastien, L., 2020, *Geoforum*, *108*, 204-216 Section 2, Figure 1. (https://doi.org/10.1016/j.geoforum.2019.11.001).

Satisfaction with place has often been studied as a variable whose value depends on that of another; however, Ramkissoon and Mavondo (2015) determined that satisfaction with place was an antecedent to place attachment and that gender moderates the relationship in their study of pro-environmental behavior, as shown in Figure 8. This aligns with Stedman’s (2002) conclusion that place satisfaction is strongly based on cognitive attributions made about a place where place attachment is partially based in cognition, but to a lesser degree than satisfaction (Ramkissoon & Mavondo, 2015).

Figure 8

The Conceptual Model of Moderated Mediation



From “The satisfaction–place attachment relationship: Potential mediators and moderators,” by Ramkissoon, H., & Mavondo, F.T., 2015, *Journal of Business Research*, *68*(12), 2593-2602, section 4, Figure 1 (https://doi.org/https://doi.org/10.1016/j.jbusres.2015.05.002).

Place satisfaction is an essential place-related concept, which is related to both attached and unattached people (Chen & Dwyer, 2018). Degradation and threats to places have been shown to lead to loss of well-being (Summers et al., 2012). In a study about the attachment to an object of nature, Marshall et al. (2019) posited that the interactions between ecosystem loss and declining well-being involved both emotional responses associated with grief and with observable impacts on mental health. Universally, people are experiencing increases in physical and mental diseases that have been connected to the persistent impact of development (Cianconi et al., 2020; Daré et al., 2019).

Changes in habitats resulting from development projects, industrial accidents, and warfare have also been determined detrimental to well-being, including grieving (Marshall et al., 2019; Sebastien, 2020; Tulchinsky & Varavikova, 2014).

Positive and Negative Place Attachment

The concept of place attachment is generally seen as a positive (Scannell & Gifford, 2017), neutral, or negative (Manzo, 2005) cognitive-emotional bond that one has with place, through cultures, types of places, and over time (Lewicka, 2011b). Basso, an American ethnographer and anthropologist, reiterates that places, normally perceived as features of the landscape, can come to reference something more profound (Basso, 1996). Devine-Wright (2009), adding to these notions, conceived a framework of place-change encompassing stages of an individual becoming aware, interpreting, evaluating, coping, and acting, with each stage formed at multiple levels of analysis from intrapersonal to socio-cultural. This is of special interest to designers of physical places.

Historically, the literature on place attachment has focused on positive emotions, as negative affect seems antithetical to attachment (G.T. Kyle et al., 2004; Manzo, 2003). Places can be unfavorable, as determined by a lifetime of experiencing feelings, collecting memories, and associating values and emotions (Lamoureux-St-Hilaire & Macrae, 2020; Scannell et al., 2017; Shamai, 2018).

Experiences in a place may create negative feelings or even aversion toward it, if they were traumatic, according to Scannell and Gifford (2010). Negatively valanced bonds can form with important places; however, attachment usually is defined in positive terms (Giuliani, 2003).

Sense of place theory is instinctively more favorable for considering negative, as well as positive, aspects of a relationship with place (Devine-Wright, 2009, 2014; Meskell, 2002). According to Chawla (1992), ‘‘If place forms the circumference of our experience, we are attached to it for better or for worse. Therefore, there is a shadow side...composed of frustrating or frightening places.’’ Relph (1985) also argues that ‘‘relationships to places need not be strong and positive;” sometimes, there is a strong affection for particular places (topophilia), but there may be an aversion for other places, described as topophobia, the fear of places (González, 2005). Klenosky et al. (2010) note places that people intentionally avoid, referring to a different type of psychosocial construct called “place avoidance.”

The study of place attachment considers both positive and negative attachments, implying a sense of attachment to place and the measures of degrees of attachment are culturally rooted. For example, Shamai (2018), in a study of Israeli settlers’ forced migration, identified nationalism as the ultimate sense of place, not physical place. Sacrifice for a place is the ultimate and highest sense of place and is the deepest commitment to one’s nation. Table 1 shows the range of attachment from positive to negative as narrated by the experiences of people displaced from the Gaza strip, explored by Shamai (1991 and 2018) in two studies.

Table 1

Measure of Sense of Place

Scale	-4	-3	-2	-1	0	1	2	3	4	5	6
	Fighting against a dangerous place. Some people may become actively and even violently involved in an effort to eliminate a threatening place	Hatred of the place. Extreme negative feelings toward a place may arise when a group has a very strong negative experience there.	Hostility and alienation toward a place. When relatively high, people may develop hostility and/or alienation toward it.	Detachment and/or dislike for current place —"homelessness." People reside in the place but do not feel that it is their home.	Not having any sense of place-this should be mentioned and examined, although it is often neg-lected in the literature [e.g. Pacione (1980, p. 193) and Rykiel]	Knowledge of being located in a place-when people know that they live in a distinguishable place and can at least recognize symbols of the place, but do not have any kind of feeling that binds them to this place. They may know that they are located in a place, but do not feel that they are part of it. In this stage, there is an awareness of place, but it is limited in that the place is no more than an address or location.	Belonging to a place-in this stage, there is a feeling of belonging to a place. There is not only knowledge of the name of the place and its symbols (as in level 1), but also a feeling of 'togetherness' and common destiny. What is happening in the place is important. The symbols of the place are respected.	Attachment to a place-this stage involves an emotional attachment to a place at a higher level. A place has a meaning; it is a centre of a personal and collective experience and that identity combines with the meaning of the place and its symbols to create a 'personality' of the place. The place is emphasized through its uniqueness and through its difference from other places.	Identifying with the place goals-when the ma-jority of the people of the place recognize the goals of the place and are in conformity with them. This level implies a fusion and blending with the place's inter-ests and needs. It means that there is a devotion, allegiance, and loyalty to a place. People are deeply attached to their place.	Involvement in a place-this level implies that the resident takes an active role in the community be-cause of a commitment to a place [CANTER (1977, p. 178) describes this as taking an "environmental role"]. In contrast to all the previous levels that were based mainly on attitudes, this level (and the next one) is probed mainly through the actual behaviour of the residents. It implies investment of human re-sources, like talent, time, or money, in place-oriented activities or organizations.	Sacrifice for a place-this is the ultimate and highest stage of sense of place. It involves the deepest commitment to a place, and is realized through the sacrifice of important attributes and values such as prosperity, freedom, or, in the most extreme situ-ation, life itself. At this level there is a readiness to give up personal and/or collective interests for the sake of the larger interest of the place.

Note: (rewritten and condensed, by author)

From: "Sense of place: An empirical measurement", by Shamai, S., (1991), *Geoforum*, *22*(3), 347-358, https://doi.org/10.1016/0016-7185(91)90017-K. and "Measuring negative sense of place: Israeli settlers' forced migration", by Shamai, S. (2018), *GeoJournal*, *83*(6), 1349-1359, https://doi.org/10.1007/s10708-017-9842-3.

Physical place is different from social place, and although my study examines both as perceptions of IAQ and social relationships, Shamai is noting that anything on the negative side of attachment is detachment, or worse. In my study, the focus is on place detachment, what happens after the most negative attachment is experienced. Although the present study differs from Shamai's research, by removing the strongest, most negative measure (-4), and the strongest three positive measures (4, 5, 6), and the cultural references in the operationalization, the scale provides inspiration for the measurement of place attachment from negative to positive. A person cannot fight against the physical location; however, one can try to change it, which indicates that one is still attached. When a person stops being attached to place, they have entered the concept of place detachment, similar to the psychological notion of person-person attachment, where if one is detached, they are devoid of emotion toward the object.

In the case of a workplace, a person does not have control over the physical workspace as one would have over one's home. Incremental modifications or workarounds may happen with or without the employer's permission. Existence at a physical workplace may be mandatory, as is the case with teachers; however, ongoing employment with one's employer is controllable. Not all places are personally significant, and if one has the opportunity to exit a place, it is within the rights of a person to do so, including the option to terminate employment.

Different Terms for Place Detachment

Very few studies have examined what Manzo and Devine-Wright (2013) call the “shadow side” of place attachment, as first described by Chawla (1992). Shadow side of place, as defined by Manzo and Devine-Wright (2013), could also be called negative place, as described by Gibbeson (2020), or disruption to place attachment, as described by Devine-Wright and Howes (2010) and Hernandez et al. (2014). However, positive place attachment was found to have occurred at places that were stigmatized or seen as negative (Gibbeson, 2020). Thus, there are several ways one can experience place, and positive and negative processes one can go through to develop attachment or detachment to place (Bailey et al., 2016; Giuliani, 2003; Meskell, 2002; Scannell et al., 2017). It is important to note that attachment, overall, means that the place still has importance to the person. And as with the field of psychology with regard to person-to-person attachment, when one has severed attachment all together, the person becomes devoid of feelings, being freed emotionally from the problem. Therefore, in this study, the ultimate focus is on the pivotal point at which teachers have severed attachment and have moved into the state of detachment. Sonnentag and Kruel (2006) determined that workload, job involvement, and recovery-related self-efficacy were significant predictors of both self-rated and family-rated psychological detachment.

Definition of Place Detachment for this Study

The use of the phrase “place detachment,” as operationalized in this study, is

> A psychosocial construct that describes the state of mind when a person has ceased having an emotional bond with place, where one previously existed, due to an unwanted circumstance, and relates to the complex factors of person, place, and processes, which is different from dissatisfaction with place and place attachment.

This is a marriage of the accepted definitions of “place attachment” by Hernandez et al. (2014), Manzo and Devine-Wright (2013), Scannell et al. (2017, 2010), Shamai (2018), and Thayer’s (1990) description of detachment and negative valence. This is not the first use of the phrase, as Warnaby and Medway (2013) hypothesized that the concept of place detachment was a feeling that causes people to distance themselves from a place as a result of negative experiences, events, or memories.

Some place attachment theorists opine that although negative emotions and experiences can give places meaning, negative emotions are not usually associated with people-place bonding, since place attachment represents individuals’ aspirations to duplicate positive experiences and emotions (Scannell & Gifford, 2010). Happiness, generally, in culture is valued because of the focus on positive psychology. However, understanding the “whole” person-place attachment, which is inclusive of ambivalence (Li et al., 2019; Manzo et al., 2014) and negativity (Backlund & Williams, 2004; Gibbeson, 2020), or even fear (Tuan, 1977), is beneficial because all feelings are part of the human experience (Manzo, 2003). In studies that have explored negative feelings toward place, it has generally been in reference to natural disasters (Zheng et al., 2019),

destruction or modification of place (Brown & Perkins, 1992; Hidalgo & Hernandez, 2001), hostilities (Billig, 2006), displacement (Manzo et al., 2008), or forced migration (Shamai, 2018). Place can fail at serving the needs of the occupants and may encourage escape (Kudryavtsev et al., 2012). Having negative feelings toward a place that is more individually constructed, and when experienced at the extreme, over time, encourages flight (or physical detachment) either intermittently or permanently. This exploration and measurement of negative place attachment and the pivot to place detachment has not been previously studied.

Detachment and Workplaces

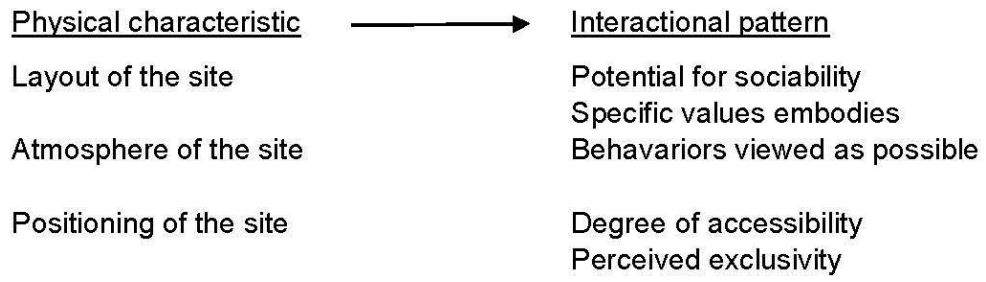
Emotional detachment from the workplace as an organization has garnered much attention, as employees are tasked with productivity demands and "face-time" (Fritz et al., 2010; Olafsen & Bentzen, 2020). However, the pandemic and the work-from-home movement initiated a change in how employees meet work expectations. The Pew Research Center polled Americans and found that 20% of the population worked from home before the coronavirus outbreak, 71% were currently working from home during the pandemic (in 2020), and 54% would want to work from home after the pandemic ends (Parker et al., 2020). To support the notion of preferred flexibility in the mandate to be physically present at work, Goldman Sachs, the investment banking firm, reopened its U.S. offices in February 2022 after closing their offices during the pandemic, and only 50% of the 10,000 employees returned to the New York headquarters, despite having more than two weeks' notice (Colvin, 2022).

Perceived risk can be highly inaccurate, and is influenced by risk tolerance, risk normalization, and memories (Falco et al., 2021). Research on workplaces and place attachment in two case studies found place attachment consists of the memories of interactions associated with a place and the potential or future experiences perceived as possible to occur in a place (Milligan, 1998). The inclusion of the layout, atmosphere, and positioning of the site (place) is important as few place attachment studies refer to the physicality of place in this manner (Milligan, 1998).

Long before the pandemic, researchers proved that involuntary displacement from that workplace could lead to identity discontinuity. However, nostalgia could assist employees in reestablishing identity continuity and recovering from their shared loss (Milligan, 1998, 2003). Figure 9 depicts the physical characteristics of a place (site) and the possible social interactions. This work shows that by altering the physical characteristics of the site, social interactions, previously situated as place attachment, were disrupted. This is important because teachers in the school building may alter their social patterns due to a disrupted site, but there is a possibility that previous traits may be able to be regained.

Figure 9

Influence of Physical Characteristics on Patterns of Interactional Potential



From “Interactional past and potential: The social construction of place attachment,” by Milligan, M.J., 1998, *Symbolic Interaction*, *21*(1), 1-33, Interactional Potential section, Figure 1 (https://doi.org/10.1525/si.1998.21.1.1).

Leading organizations will now have to revisit long-held assumptions about how work should be done and the role of the workplace because of the pandemic. The answer may be different for every organization, which will be based on what talent is needed, which roles are most important, and how much collaboration is necessary (Casey, 2013).

Theorizing Place Attachment

Numerous research methods have been used to operationalize place attachment, each with different epistemological viewpoints (Manzo & Devine-Wright, 2014). For instance, by drawing on phenomenology, Seamon (2014) encourages a dynamic understanding of people-place connections rather than an unmoving, quantitative interpretation of the strength of place bonds. From a positivist perspective, researchers have developed a variety of “self-report” instruments to assess the framing and strength of place bonds (Hammitt et al.,

2006; Jorgensen & Stedman, 2001; Raymond et al., 2010; Williams & Vaske, 2003).

Manzo and Devine-Wright (2021), in their latest place attachment book, urge a critical pluralist viewpoint regarding place attachment, to acknowledge the numerous ways in which it has been conceptualized and measured. However, an important component is missing from current pluralistic perspectives, since every geographical space (e.g., physical space) is different, each needs to be considered on its own merits (Lin & Lockwood, 2014), and careful consideration paid to not generalizing predictors (Manzo & Devine-Wright, 2021).

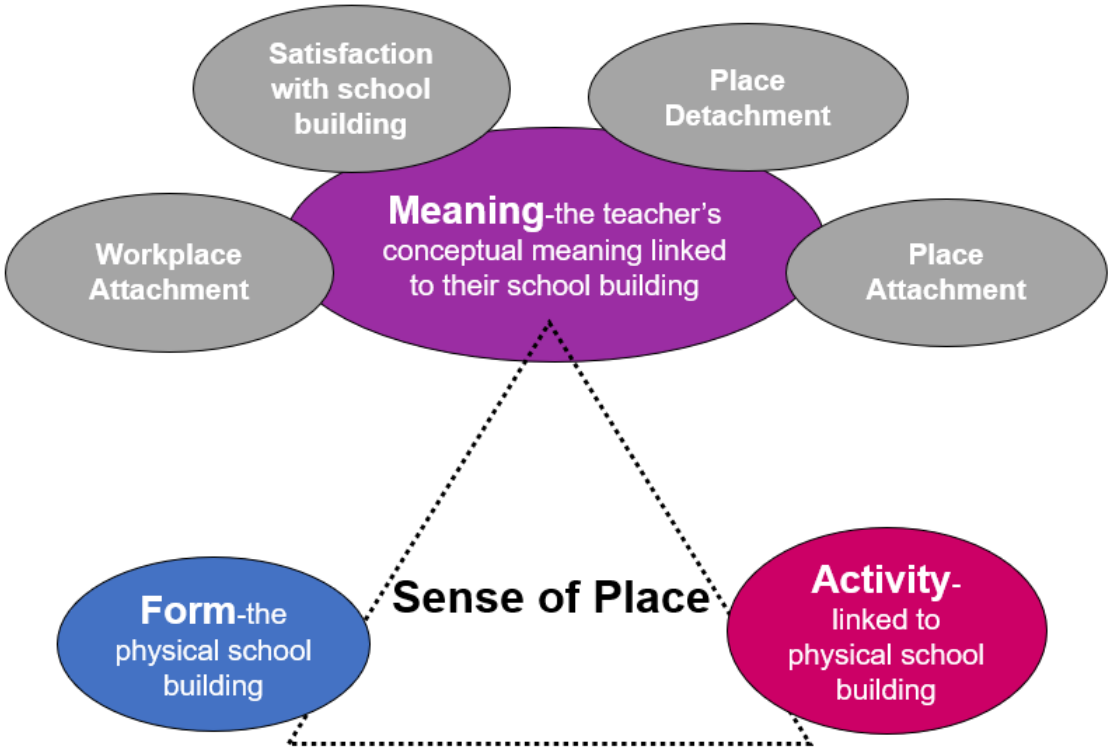
To address the emotional aspect of place, Canter (1991) determined three dimensions: place identity, place dependence, and place attachment. Therefore, the understanding of precedent literature regarding sense of place was considered for this study. The connection of cognitions, emotions, and actions ordered around human agency was first conceptualized by Canter as Sense of Place (see Figure 10). Here, Canter recognized that places could be conceptualized as an integrated system encompassing three attitude realms.

Tripartite Model in the Context of Sense of Place

The theoretical framework for this study adapts the 1977 Canter model of place, later modified by Punter (1991), and overlaid with the Scannell and Gifford (2010) tripartite model of place to examine how teacher experiences of IAQ relate to negative place attachment and place detachment outcomes (Figures 10 and 11).

Figure 10

Sense of Place



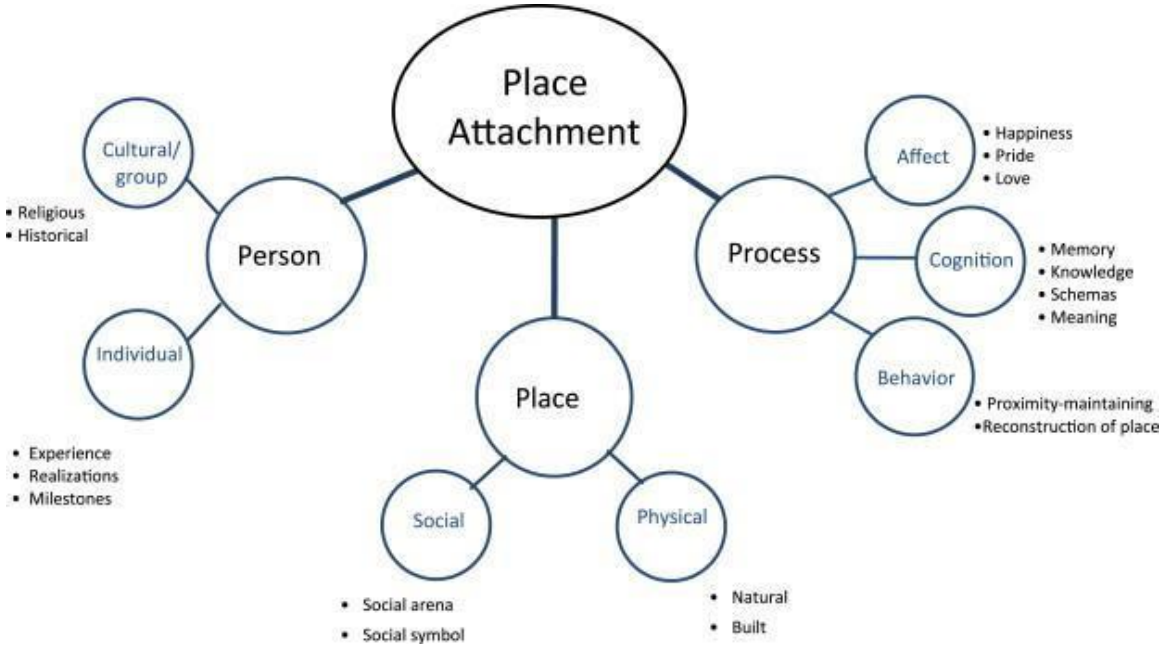
Note. Modified by author, adapted from "The facets of place. In *Toward the integration of theory, methods, research, and utilization" by* Canter, D. 1977, (pp. 109-147). Springer, Boston, MA. And "Participation in the design of urban space" by Punter, J. 1991, *Landscape design*, *200*(1), 24-27.

The difference between place attachment and detachment, as I illustrate above, are recognized as separate elements. Detachment occurs when there's a break from positive and negative attachment entirely. The tripartite model allows for a better analyis of factors impacting place attachment and place detachment.

The diagram below illustrates the ways in which place attachment and place detachment can be operationalized to understand sense of place better.

Figure 11

The Tripartite Model of Place Attachment



From Scannell, L., & Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology, 30*(1), 1-10. https://doi.org/10.1016/j.jenvp.2009.09.006 pp. 22, Section 1, Figure 1, (https://doi.org/10.1016/j.jenvp.2009.09.006).

Tripartite Model: Place

Place is the first of the three constructs in Scannell and Gifford's tripartite model of place attachment and is comprised of social and physical place (Figure 11). As defined by the tripartite model, social place bonding involves attachment to others with whom individuals interact in their physical place. Through this

group, a person can become aligned with and become attached to this unique physical place because it can become part of that person's identity. Physical place provides for attachment opportunities because it is the dependence upon this built environment that provides the amenities or resources for people to achieve their goals (Scannell & Gifford, 2010).

Place as Physical

The indoor workspace, as part of the whole built environment, has climate and physical attributes controlled or manipulated by natural or mechanical means (R. J. de Dear et al., 2013). Building location, type of construction, and design of the heating, cooling, and ventilation systems are reported as potential factors affecting occupants' comfort (Mujan et al., 2019; Sakellaris et al., 2016). Adding complexity, IAQ is ever changing and roughly determined by geographical region, climate, ownership values, maintenance, human activities, mechanical activities, bioaerosols, and individual perceptions (CCOHS, 2019).

Place as Social

Psychosocial is a term that describes the influence of social factors on an individual's mind or behavior, and to the interrelation of behavioral and social factors (Oxford English Dictionary, 2020). When using this phrase in the context of place as the environment, it describes the relationship an individual (in this case, teachers, and their role within the school environment) has concerning social factors (social relationships at work), the physical environment (school building), and the individual's affect, cognition, and/or behavior.

The social group that one belongs to at a workplace consists of social interactions with colleagues (and in this case may also include students and parents) that one identifies with. Through the linking of symbolism, historic experiences, and shared values, one may become attached to the physical place (Scannell & Gifford, 2010). These social identities can be formed in distinct ways and create unique dynamics in terms of identity in the workplace (Clair et al., 2005). According to Ryan and Deci (2017), proximal social contexts, such as families, peer groups, schools, teams, and work organizations, can influence an individual's motivation, development, and wellness.

Tripartite Model: Process

The second construct of the tripartite model of place attachment is psychological process—how affect, cognition, and behavior manifests in the attachment to place. Used here, Scannell and Gifford (2010) describe process as the way that individuals and groups relate to a place, and the nature of the psychological interactions that occur in the environments that are important to them. Affect is the emotional connection that occurs because of person-place bonding (Cuba & Hummon, 1993; Fried, 1963; Hildago & Hernandez, 2001). Cognition involves the creation of and bonding through memories, meaning, beliefs, and knowledge that individuals associate with the physical place that make them personally important through closeness with that place. Behavior is the last of the processes and is the actions that one takes when maintaining proximity to the physical place.

Process as Affect

Affect, in this study, refers to the emotion of "worry" as operationalized by Watkins (2008): "Repetitive thoughts (RT) that can have constructive or unconstructive consequences." The main unconstructive consequences of RT are (a) depression, (b) anxiety, and (c) difficulties in physical health. And the main constructive consequences of RT are (a) recovery from upsetting and traumatic events, (b) adaptive preparation and anticipatory planning, (c) recovery from depression, and (d) uptake of health-promoting behaviors (Segerstrom et al., 2012). Worry entails repetitive thoughts that are negatively "affect-laden and relatively uncontrollable, and that signal the potential occurrence of a negative future event" (Watkins, 2008). McNeill and Dunlop (2016), in their quest to validate constructive and unconstructive worry, devised a two-factor test based upon the operationalized definition provided by Watkins to develop two studies to validate constructive and unconstructive worry. In the first study, they developed a modified instrument to measure individual differences in constructive and unconstructive worry to assess trait-anxiety, punctuality, and unconstructive versus constructive worry. In the second study, they modified multiple instruments: the unconstructive and constructive worry questionnaire as developed in the first study, the Worry Domains Questionnaire (WDQ; Stöber & Joormann, 2001), the Penn State Worry Questionnaire (PSWQ) that measures pathological worry (T.J. Meyer et al., 1990), and the combination of risk and worry with a wildfire preparedness questionnaire (Dunlop et al., 2014). In their conclusion, McNeill and Dunlop (2016) note that humans' tendency to worry

constructively may differ from the tendency to worry unconstructively. By developing an assessment tool to measure these two constructs, researchers like the author can increase the understanding of worry and potentially gain an understanding into constructive and unconstructive worry regarding place as part of the process, place, person approach. Some of McNeill and Dunlop's (2016) validated questions were used in Phases I and II in this study.

Process as Behavior

Scannell and Gifford (2010) describe behavior within the PPP model as how the actor (person) manifests behavior in the attachment to place and expresses behavior through desired actions (Williams & Roggenbuck, 1989). Hildago and Hernandez (2001) maintain that place attachment operates comparable to inter-personal attachment (Bowlby 1969). This behavior typifies proximity-related behaviors such as closeness to a space. However, positive closeness is not always the outcome, and temporal (Hay, 1998) and situational context can influence behavior as noted by Fried (2000), who studied the strong bond with place even when the probability of risk and personal injury where high. Place attachment behaviors may be personal-protective, but can be place-protective (Dunlop et al., 2014). Territoriality was first discussed by Altman (1975) and then by Williams and Roggenbuck (1989), Williams et al. (2013), and Williams & Vaske (2003) as based on ownership, control of space, and the regulation of access to self, but can be expressed without the purpose of control, especially for public spaces such as parks or cafes. A future study, to be undertaken by the author, related to this study, will be to determine if teachers

produce behaviors in response to toxic IEQ/IAQ within their school building. Behaviors may include physical workarounds, separation from spaces perceived to be of risk, or other adaptive behaviors.

Process as Cognition

The memories, meaning, and knowledge linked to a place (termed "cognition" in the PPP model) are the key psychological process that impact the development of place attachment. The current study will specifically examine cognition as related to existing knowledge regarding IAQ. This construct can be measured by asking teachers about air pollution knowledge, its health impact, sources, and mitigation options (Wong-Parodi et al., 2018). As awareness of the importance of IAQ grows, and technology advances the ability to measure environmental conditions, teachers may learn about IAQ through national channels such as the EPA's IAQ toolkit for schools (EPA, 2009), state-specific resources for teachers such as the health department (Minnesota Department of Health, 2019), unions (Fuller, 2011), or through informal channels such as the facility operator, the internet, physicians, or social groups. Assessing the degree of what teachers know about IAQ and any moderating outcomes will provide cognitive information about their understanding of IAQ.

Tripartite Model: Person

Person is the third construct of the tripartite model of place attachment and can occur at an individual level due to personal experiences, realizations, and milestones. At the group level, attachment involves symbolic meanings of a

place that are shared among members (Low, 1992), such as religious or historical groups (Scannell & Gifford, 2010).

Person as Individual

Place perception relies on the person's individual characteristics and information available in the environment. Sociodemographic characteristics, self-reported health conditions, self-reported healthcare utilization, disease frequencies, years working at the school building, and occupational factors within the school building can be used to determine the teacher's perception of their overall health as compared to the general population by using the National Health Interview Survey (NHIS). Rollero and De Picolli (2010) affirm Stedman's (2002, 2003) assertion that individuals attribute different perspectives to the same environment. These perspectives can differ in features and meanings in accordance with their level of place attachment. Researchers looking at social constructs have found that individual constructs, such as physical improvements in the home, neighborhood improvement, and belongingness (Brown et al., 2003; Hay, 1998; Hidalgo & Hernandez, 2001; Kyle & Chick, 2007) are predictors of place attachment. Afshar et al. (2017) found that place attachment is a strong predictor for the social well-being of older adults. Any change in place of attachment leads to changes in the social well-being of the elderly.

Person as Group

The social group that one belongs to at a workplace is comprised of social interactions with colleagues (and in this case may also include students and parents) that one identifies with. Through the linking of symbolism, historic

experiences, and shared values, one may become attached to the physical place (Scannell & Gifford, 2010). These social identities can be formed in distinct ways and create unique dynamics in terms of identity in the workplace (Clair et al., 2005). According to Deci and Ryan (2017), proximal social contexts, such as families, peer groups, schools, teams, and work organizations, can influence an individual's motivation, development, and wellness. The Work Preference Inventory (WPI), which was designed to assess individual differences in intrinsic and extrinsic motivational orientations (Amabile et al., 1995), was used to measure the psychosocial relationships in this study.

Summary

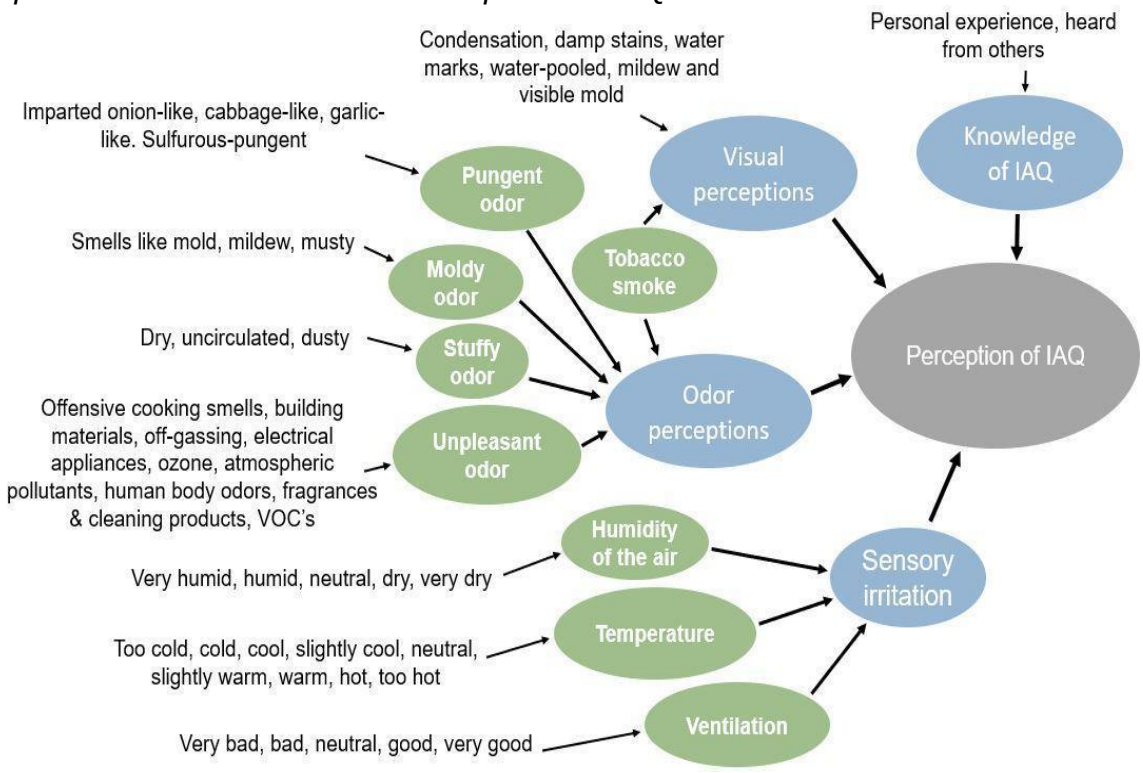
With the crisis of COVID-19 highlighting the indoor air quality problem in schools, the outdated nature of many school buildings becomes central to the next wave of school district crises. Indoor air quality is ever changing and roughly determined by geographical region, climate, ownership values, maintenance, human activities, mechanical activities, bioaerosols, and individual perceptions (CCOHS, 2019). Common indoor air pollutants that threaten indoor air quality of school buildings include lead, dust mites, mold (Park et al., 2004; Patovirta et al., 2004), radon, pests, carbon monoxide, pet dander, human activities, pathogens, and fomites (EPA, 2018c; Meadow et al., 2014). The epidemiologic triad is useful in this study as a model to understand indoor air quality. Moisture and IAQ problems in school buildings remain one of the largest areas for research (EPA, 2016). Finland has undertaken the assessment of IAQ in moisture-problem schools but has realized the problems in sampling and technical issues.

The perception of IAQ is a subjective awareness of air that is determined to pose a risk constructed by using the five senses. Teachers' spaces require a different approach to understanding place attachment since they function more like public spaces than office spaces (Yin et al., 2016). To better understand the perceptions of adverse indoor air quality, empirical studies were referenced to form an inclusive set of sensory experiences (Bickerstaff, 2004; R. J. de Dear et al., 2013). Figure 12 represents my conceptual model for phenomenological perceptions of indoor air quality, which will guide future research.

The Bowlby framework outlines three attachment-related strategies for affect regulation: secure (positive), anxious-ambivalent (negative), and disorganized and avoidant (negative) (Bowlby, 1973). The psychological framework from Bowlby is utilized by Scrima's (2014, 2015, 2017, 2018, 2019) ongoing work of place attachment in the workplace. Place, as defined phenomenologically in this study, uses Coates and Seamons' (1984) definition of place as a phenomenological concept that integrates natural personal and cultural dimensions of environment into one experiential whole, inclusive of space and time. Sense of place, to be used in this study, is the intersection of Canter and Punter's union of meaning, form, and activity, with the role of place attachment falling under the emotive construct of meaning (place identity and place dependence).

Figure 12

Operationalized Definition of Perceptions of IAQ



Note. By author

Place attachment refers to the relationship between individuals, or a group of individuals, to their environment, over time. Scannell and Gifford (2010, 2014, 2016, 2017) utilized a three-dimensional framework of place attachment intended to integrate and structure the variety of definitions (Sebastien, 2020), including the tripartite model of place attachment of person, place, and process as constructs. Cross (2001) and Devine-Wright (2011) have argued that there are multiple processes for obtaining attachment to place, and Williams and Roggenbuck (1989), Shamai (1991), Jorgensen and Stedman (2001), and Hildago et al. (2001) note the various scales to measure it. However, a quantitative scale of negative place attachment is missing from the literature.

The current study specifically examined cognition, as a component of process, as related to existing knowledge and processes regarding perceived IAQ. The impact of the school environment on children's respiratory health and IAQ has been previously investigated (Choi et al., 2014; Haverinen-Shaughnessy & Shaughnessy, 2015; Sandora et al., 2008). Nevertheless, there is a lack of knowledge regarding the effect that the school environment's IAQ may have on teachers' psychological wellbeing (Fuller, 2011; Kielb et al., 2015; Lopez & Sidhu, 2013; Sadick & Issa, 2017b). The condition of school buildings, nationwide, is not well documented. The last inclusive survey of the condition of school facilities was conducted in 1995, with a smaller survey of a representative sample of schools conducted in 1999 (Alexander & Lewis, 2014). In 2013, another small survey regarding the condition of public-school buildings was mailed to only 1.35% of public schools (Alexander & Lewis, 2014; NCES, 2019). However, many states do not track the condition of their school buildings, and the state sampled in this study is one of them ([the state] Department of Children, 2003). Instead, this state defers to individual school districts to assess building conditions, which is controversial.

Any aspect of the physical environment that distracts teachers from the main emphasis of instructional activities influences the degree of their effectiveness (Anderson, 2004). The research for this dissertation seeks to fill the gaps identified here.

The key research article used to benchmark this study's purpose and external validity also provided the primary survey instrument and derives from a

collaborative study undertaken by the Mt. Sinai School of Medicine and the New York teacher's union, NYSUT (Claudio et al., 2016). Other related literature that broadly informed my study include "Building-related health symptoms and classroom indoor air quality: A survey of schoolteachers in New York State" (Kielb et al., 2015; Lin et al., 2012) and "Molds in floor dust, building-related symptoms, and lung function among male and female schoolteachers" (Ebbehøj et al., 2005). Hermeneutic phenomenology (Heidegger et al., 1962; Laverty, 2003) and phenomenology (Gadamer, 1989; Giorgi, 1985; Merleau-Ponty, 1962; Van Manen, 2014), and the writings of Seamon (2000, 2002, 2013; Seamon & Sowers, 2008) on place, placelessness, and phenomenology in philosophy informed my study.

The *Journal of Mixed Methods Research* article titled "The Journal of Mixed Methods Research Starts a New Decade: The Mixed Methods Research Integration Trilogy and Its Dimensions" provided the basic framework for designing my mixed-methods study and is explained in each of the three phases (Fetters & Molina-Azorin, 2017).

The tripartite model of place (person, psychological process, and place [PPP]), is where the personal attachment can vary by the meanings of individual actors and/or group memberships, psychological processes that include cognitive (identity), affective (emotion), or behavioral (action) dimensions that are manifested in the attachment, and place as the object of attachment, conceptualized having both social and physical characteristics. The model was

intended to organize the main definitions of place attachment in the literature and grow as understandings of place attachment are discovered.

CHAPTER 3 METHODOLOGY

In this three-phase study, I surveyed, interviewed, and collected data to examine these issues. The guiding hypothesis of the study is informed by my own background as an interior designer, school building designer, project manager at an architectural firm for public school building renovations, and as a mother of school-age children.

The tripartite model of place (person, psychological process, and place [PPP]) is where (1) the personal attachment can vary by individual factors and/or group memberships; (2) psychological processes include cognitive (identity), affective (emotion), or behavioral (action) dimensions; and (3) with place conceptualized as having both social and physical characteristics (Hernandez et al., 2014). See Figure 6 on page 55.

This chapter will include Phase I, creating a survey based on previous surveys, pilot testing with 5 teachers, disbursing to 2,214 teachers, and then running a factor analysis on survey data. Phase II involved interviewing 13 teachers who met the criteria of expressing negative place attachment or place detachment by answering closed-ended and open-ended questions on the survey. Phase III integrated data from the earlier phases alongside data.

The Research Questions to be Addressed in Chapter 4, Results:

1. **How do teacher's perceptions of toxic IEQ/IAQ relate to negative place attachment outcomes?**

Hypothesis: Based on the relationships between physical place, occupant characteristics, and processes of cognition and affect, the hypothesis of

this study is that place attachment is significantly lower for teachers who perceive toxic IEQ/IAQ in their school building, and some teachers may be experiencing place detachment.

2. **What person, process, or place variables predict teachers negative place attachment with the school building? Do teacher's negative perceptions of indoor environmental quality/indoor air quality predict teacher feelings of detachment in the school building?**

   Hypothesis: Teachers who perceive that their school building is physiologically unhealthy will experience heightened negative place attachment or possible detachment from their school building.

3. **What are the differences between teachers who experience negative place attachment and teachers who have place detachment?**

   Hypothesis: Teachers who are actively trying to change their workspace are still attached, although negatively, as the physical place is still important. Teachers who are experiencing place detachment have severed the emotional bond with the physical building and have physically removed themselves from the building or express thoughts of the building being razed.

The purpose of this explanatory sequential mixed-methods study was to examine the potential links between perceived indoor air quality (IAQ), teacher psychosocial and environmental attributes, and place attachment/detachment outcomes. A second objective was to understand in more depth the experiences of teachers who rate their school building's IAQ as poor. The third objective was to develop a better metric for assessing place attachment. An explanatory study

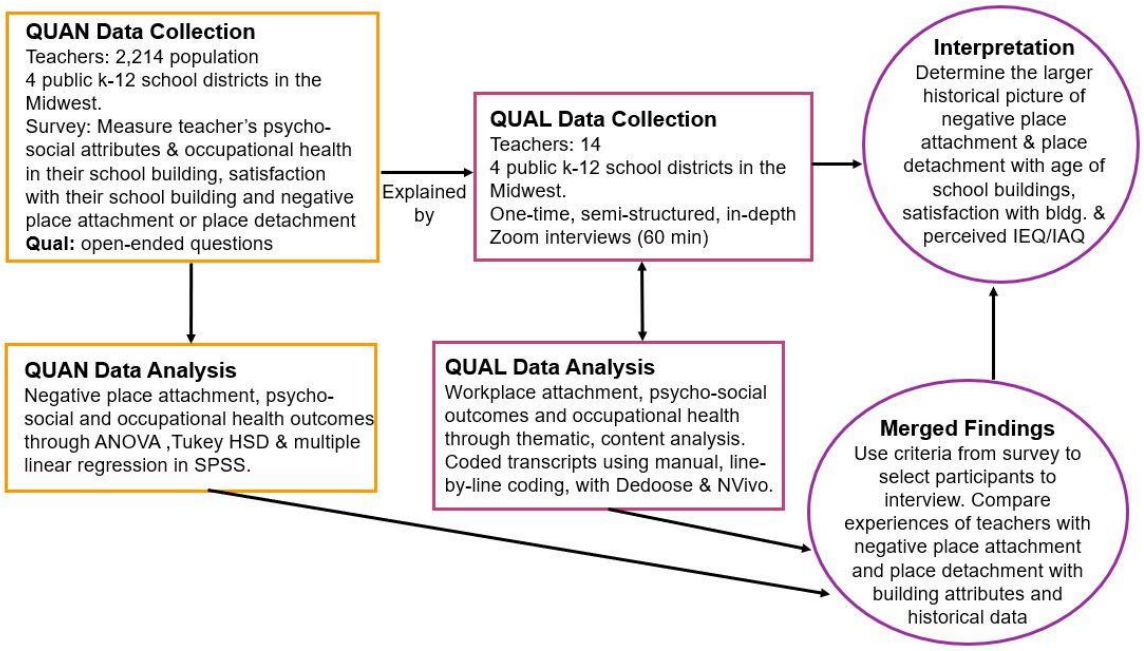
design was chosen because the goal was to obtain background information and to define the terms of the research problem. The knowledge gained from this explanatory study provides the initial groundwork for further research with measurable IEQ attributes, inclusive of IAQ. A sequential mixed-methods approach was used because the quantitative results could then be used to determine a purposive sample of participants to interview, providing subsequent interpretation and clarification of the quantitative analysis.

Study Design

Sequential explanatory research design builds each phase of data collection on the last, sequentially moving from one stage to another (Creswell et al., 2003) and offers the potential to maximize strengths and minimize weakness of each design, both quantitative and qualitative (Groat & Wang, 2013). A sequential explanatory mixed methods design is useful for explaining initial quantitative results in more detail (Ivankova et al., 2006) and offers the researcher the ability to be nimble with Phase II qualitative research when unexpected results were obtained from the quantitative portion of Phase I (Morse et al., 2002), and groups can be formed to follow up for purposive sampling (Creswell et al., 2004). Data collection for this study took place during the spring and summer of 2021. See Figure 13 for the design of this study.

Figure 13

The Design of this Sequential Mixed-Methods Study



Note. By author

Many examples of prior studies specifically influenced and provided guidance for how this study was constructed. Procedures and best-practice protocols were guided by the works of "Advanced mixed methods research designs" (Creswell et al., 2003), "Using mixed-methods sequential explanatory design: From theory to practice" (Ivankova et al., 2006), multimodal coding and coding with affect (Craig et al., 2021; Crichton & Childs, 2005), and "Mixed methods sampling: A typology with examples" (Teddlie & Yu, 2007). Guidance on qualitative analysis was obtained from "Developing and using a codebook for the analysis of interview data: An example from a professional development research project" (DeCuir-Gunby et al., 2010), and guidance for two coders in assessment of inter-rater reliability (IRR) to demonstrate consistency among observational

ratings from “Computing inter-rater reliability for observational data: An overview and tutorial” (Hallgren, 2012).

Participating School Districts

The participating school districts in this study represent a range of the rural, town, suburb, and city school settings (where 79% of all schools in the Midwest fall into these designations [Keaton, 2014]). The ages of the school buildings varied from three years old to approximately 130 years old (Creswell, 2014; Fowler Jr, 2013; Fowler Jr. & Cosenza, 2009). Monetary incentives were used to encourage participation and aid with the response rate (Dillman et al., 2009).

I have worked as a designer in the Midwest for my entire career, so using the Midwest for my research was a pragmatic decision. However, it was the architectural and procedural knowledge that I had gained during the renovation and creation of a new district high school and my role at an architectural firm, and as the project manager for all the district’s furniture, fixtures, and equipment from 2008 through 2011, that provided the basis for wanting to go through the teacher’s unions instead of through the school districts directly. To hear the stories of the teachers, themselves, it was necessary to avoid any suspicion that their district or school board would retaliate because of the information they shared for this study.

Recruitment

To recruit participants, the e-mail addresses for district union presidents would be necessary, which required navigation of state union gatekeepers to

obtain permission. Union participation is optional, and therefore my sample size may be smaller than the actual number of teachers employed in the districts. The addresses of district union presidents were at the discretion of the state-wide union, an American trade union representing pre-K to 12 educators, affiliated with both the National Education Association, the American Federation of Teachers, and with the AFL-CIO. Obtaining an initial gatekeeper was the first step to gain access to district union presidents' email addresses. It was through a union contact with whom I worked on a prior project that proved to be critical to gain access to these participants. I called the district 2 teachers union and spoke with the secretary who informed me that my contact at the union was now employed as an administrator at the state-wide union. The secretary provided me with her new email address. Table 2 highlights the number of members in the union per district.

Table 2

Union Membership

School District	Number of members in union	Number of teachers in District 2 website	Educator pop., approx.
District 1	458		626 FTE
District 2	N/A	1,128	2,200 FTE
District 3	398		683 FTE
District 4	230		184 FTE
Total	1,086	1,128	3,693

Note. Please contact author if you need further information.

An introductory email was sent on March 13, 2021, to my former contact, the initial gatekeeper, and she agreed to bring the details of this project to the next leadership team meeting at the statewide union for discussion on whether to assist with providing the union president's email contact information for use in this study. On March 15th, 2021, an email was received from the initial gatekeeper requesting the names of school districts that were identified as desirable for this study. A list of ten small to medium districts and eleven rural and vulnerable districts were identified by me as representing state-wide, non-urban geographies, various aged school buildings, and spread across this state in the Midwest (see Table 3). On March 16th, the gatekeeper provided the contact email of the ten union presidents for the small to medium districts and nine of the eleven requested rural districts. An email was sent on March 31st to all twenty union presidents requesting assistance with dispersing this study's on-line survey and their willingness to assist with the study. Three of the union presidents agreed to participate. A list of teacher's emails for District 2 existed on the school website and was used to disburse the on-line survey directly, creating a total of four school districts in this study.

Table 3

Percentage of School Buildings Built, by Year

School District	# Of School Buildings*	< 1970**	1970 – 1999**	> 2000**
District 1	11	31%	40%	29%
District 2	13	68%	22%	10%
District 3	7	36%	33%	31%
District 4	7	52%	36%	12%

*Obtained by author

** From: IES>NCES National Center for Education Statistics https://nces.ed.gov/ccd/districtsearch/district_detail.asp.

Delimitations of This Study

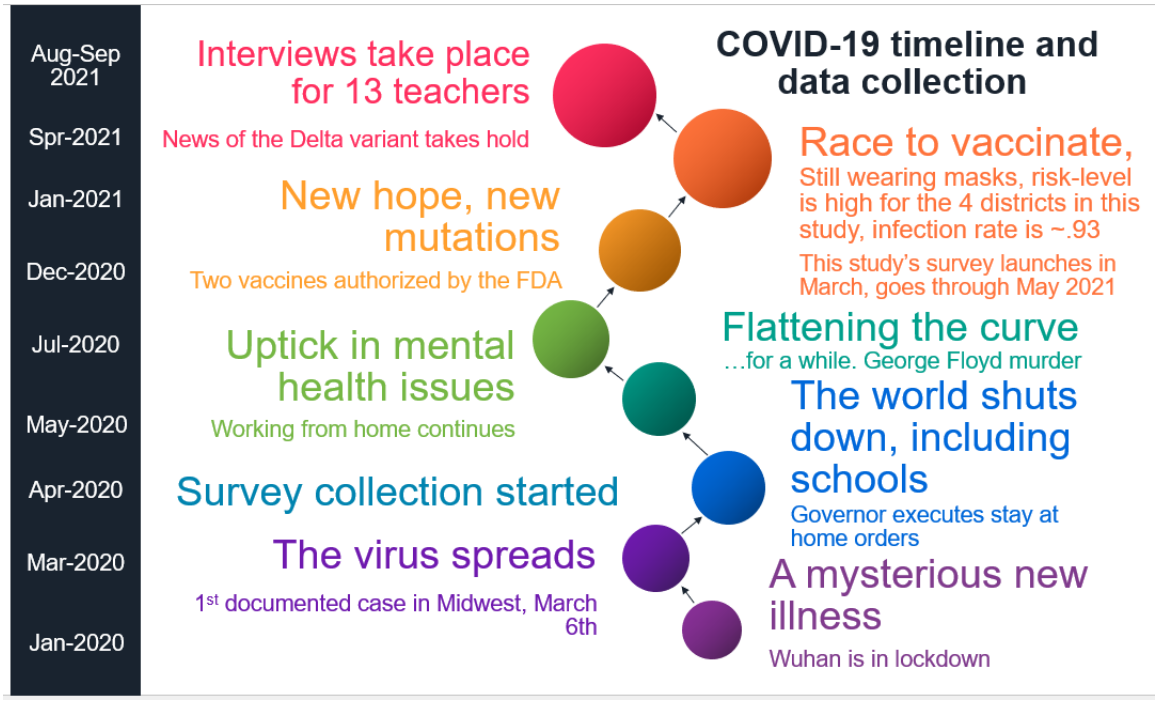
- Only staff 18 years or older and a current member of the selected teachers' unions or in District 2 as listed on the school website as of January 2021 participated in the study.
- The study was confined to four school districts. The uniqueness of the study within a specific context makes it difficult to replicate exactly in another context (Creswell, 2003).
- Participants' responses were reflections of and confined to their personal experiences as employees of their respective school district, involving the self-assessment component.
- The study provides only one perspective on perceived IAQ and place attachment/detachment in the four school districts - that of the teachers themselves, excluding other employees.

COVID-19 Limitations

The acquisition of data for this study took place during the active pandemic of COVID-19. See Figure 14 for an illustration of the important milestones in the pandemic thus far, and how this study's data collection concurrently took place.

Figure 14

Timeline of COVID-19 and Data Collection



Note. By author

From: The dates and facts are from Yalemedicine.org "Our pandemic year – A COVID-19 timeline" and Jacobsen, Jeremiah; Haavik, Emily; Griswold, David (March 6, 2020). "Health Department confirms first 'presumptive' coronavirus case in the [state]", retrieved February 15, 2021. Data for the infection rate came from the author's collection of data from www.covidactnow.org/us/the [state]/county, retrieved on May 5th, 2021.

The teachers who were surveyed and interviewed for this study were actively employed by public school districts. Hilger et al. (2021) determined an exceptional change in the work life of teachers by using the job demands–resources model, which found that COVID-19 had a direct impact on work characteristics (job demands: emotional demands, interpersonal conflict, workload; job resources: autonomy, social support, feedback, task variety) and three job-related well-being indicators (fatigue, psychosomatic complaints, job satisfaction) (Hilger et al., 2021). In a 2020 essay written to the Annals of Internal Medicine, Gaffney, Himmelstein, and Woolhandler posit that teachers have a high risk of obtaining COVID-19 when school occurs in-person. Among teachers, 39.8% (weighted n = 2.32 million [95% CI, 1.98 to 2.66 million]) had definite and 50.6% (weighted n = 2.95 million) had definite or possible risk factors for severe COVID-19 illness (Gaffney et al., 2020).

If teachers were experiencing extraordinary job demands, stress on their well-being, and the knowledge that they are at a higher risk for obtaining COVID-19, this could influence response rate, the willingness to be interviewed via Zoom, or in the self-reported answers. Not all psychological constructs can be observed, and through this survey, information was gathered about the teachers' inner processes. If some teachers left their employment due to this pandemic, a bias exists in the remaining population that was surveyed and interviewed. News of the pandemic is ever present and remains at the forefront of breaking news stories, which means they are highly aware of the dire situation. The teachers participating in this study have had to change their instructional methods,

relationships at school, their scope of procedures, as well as their understanding of what a classroom “looks like” during a pandemic. By surveying and interviewing teachers at this stage of the pandemic (immediately preceding or during vaccine administration), teachers reported experiences or data at the height of severity. However, this data can be utilized in future longitudinal studies to compare perceptions over time (Mendell et al., 2015; Zhao et al., 2006).

Phase I – Survey

The purpose of this study was to determine if negative place attachment, and consequently place detachment, was significantly higher for teachers who perceived toxic IEQ/IAQ in their school building. This explanatory, sequential study investigated the social relationships from the employee perspective, focusing on teachers in public school buildings.

The first phase of data collection and analysis was the quantitative portion of the study. This study used a descriptive and analytical cross-sectional design for a non-experimental one-time survey. A cross-sectional survey may be descriptive and used to assess the burden of a particular ailment in a defined population (Friis, 2012) and provides a snapshot of the teachers' practices and perceptions in four school districts (Creswell & Poth, 2018; Friis, 2012). In a cross-sectional survey, the risk factors and outcomes are measured simultaneously. Therefore, it may be challenging to determine whether the exposure (in this study, school buildings with perceived IAQ) preceded or followed the disease (the outcome of place attachment) (Friis, 2012).

The data collection and analysis for Phase I are summarized and are depicted in Table 4.

Table 4

Data Collection and Analysis Overview for Phase I

Data collected	Analysis	Variables measured (PPP)	# Of school buildings	# Teachers in population	# Surveyed	# Inter-viewed
Teacher survey data	Descriptive, analytic & inferential	Positive place attachment Negative place attachment	38	2,214	2,214	0

The purpose of my new survey was to explore the relationships between teachers' place attachment (positive and negative) and their perceptions of air quality in the school building, which was determined to be a gap in place and indoor air quality literature. The tripartite model of place was used as a framework in the multiple linear regression model, so survey questions regarding person, process, and place were purposeful (see Figure 6).

The survey adapted previously validated survey instruments to measure the constructs of interest to create a new survey. An instrument for measuring perceived IAQ has been used in a study of public elementary school teachers in New York City and was obtained via e-mail by the Program Coordinator, Division of International Health, Environmental Medicine and Public Health, Icahn School of Medicine at Mount Sinai (Claudio et al., 2016). Although the survey instrument was not disclosed, a similar study in New York State also provided guidance for the essence of this study (Kielb et al., 2015). Also influential was an earlier,

broader study of teachers in Chicago and Washington, D.C. to assess how well school buildings support teaching (Schneider, 2002; M. Schneider, 2003). The 2003 Schneider study asked teachers to identify what supported their ability to teach, to assess the adequacy of school conditions and school design as experienced by teachers (2003), examine the distribution of quality school facilities, and to identify the impact of facilities on learning outcomes. The results of this study, although now almost 20 years old, still resonate today. The survey data provided evidence that teachers experienced problems with the facilities in which they work, and there was a high level of dissatisfaction among teachers with the condition of their schools. Dissatisfaction was much higher in Washington, D.C. than Chicago because of the statistically significant differences in the demographic make-up of the worst and the best schools in the two cities (Schneider, 2002). The new survey instrument was pilot tested with five teachers via email from District 2 before launching. I contacted one person from my personal network, and through snowball sampling, obtained four more. Based on verbal feedback, by speaking with the teacher over Zoom, it was decided to shorten the survey and eliminate questions that did not have strong outcome potential, and slightly alter wording in some questions to provide clarity. One such question was gender. The teachers did not take the survey. Because of teacher feedback, the instruction for question 17 was explained in a more approachable and clear way that made sense to teachers as a group. Qualtrics software also makes recommendations for the most successful endeavor, and

many suggestions were adopted. Qualtrics estimated the time to complete the survey at 11 minutes.

Construct and Measures

The revised survey, post pilot, measured the following constructs.

Positive and Negative Place Attachment, where Negative Place Attachment was the outcome variable of interest. (Q17): Place attachment can be measured on different spatial levels, differing in scale from a bedroom to a national park (Lewicka, 2010). For this analysis, I measured both positive place attachment and negative place attachment but identified the outcome variable as negative place attachment, as the negative valence of overall attachment (Manzo & Devine-Wright, 2013; Scrima et al., 2017; Shamai, 2018).

Place Attachment Scale. Question 17 was adapted from a validated scale measuring workplace attachment (Scrima, 2018; Scrima et al., 2017, Rioux, 2006), which contains three sections; secure workplace attachment, preoccupied workplace attachment, and dismissive workplace attachment, assessed on a 7-point Likert scale (e.g., 1 = Strongly Disagree, 4 = Neither Agree or Disagree, 7 = Strongly Agree) to obtain nuanced feelings and accuracy (Finstad, 2010). Teachers were asked as to what emotions they may feel toward their main school building. These emotions describe attachment, or a bond that they have for the physical school building where they work, which is different from the attachment they feel about the school district they work for (called workplace attachment). Section 1 of the new survey had six prompts regarding secure place attachment. As an example, “I am attached to my school building.”

Section 2 had five prompts related to preoccupied attachment, such as “In my school building, I prefer to avoid certain places, even if it interferes with my work,” and section 3 had five prompts related to dismissive attachment, such as “Nothing would make me stay in my school building longer than necessary.”

Health Concerns with School Building, an independent variable (Q41). Physical place, operationalized as a teacher’s health concerns regarding perceived IEQ in the school building, assessed via a self-report of health concerns about the condition of the school environment (Claudio et al., 2016). The tangible and intangible items consisted of such perceptions as general indoor air quality, air-borne pathogens, asbestos, building structural conditions, carbon monoxide, cleanliness of floors and surfaces, crime/safety, healthy food choices, noise levels, non-working restrooms, pest control, vehicles idling outside, and quality of drinking water.

Experienced Health Symptoms in School Building, an independent variable (Q28). Person-individual, operationalized as 14 items present the last day the teachers were physically in their school building (Claudio et al., 2016). The Likert question ranged from 1) Not at all to 4) Extremely. The general health and respiratory symptoms included stuffy nose/cold, dry/sore throat, phlegm, dry cough, hoarseness, shortness of breath, wheezing cough, eye symptoms, tiredness, pain in joints, muscle pain, headache, skin symptoms (eczema), and concentration difficulties.

Variation of the Covariates of “Social” and “Person” (Q28 and demographic questions). These were isolated and measured on an interval scale

as categorical (Claudio et al., 2016) or as a continuous variable. The question bank began with basic demographic information, the number of school buildings they worked in during their career, the name and number of buildings they currently work in, the number of hours they work in a 7-day week, and the number of hours they are physically present in their school building(s) (questions 2-16).

Social Place. This was operationalized as teachers' social relationships, and person, as individual and group identities. Both were measured via participant demographic factors such as age, number of years working in the current workplace, role within the school, occupational health, and current physical health. Empirical knowledge gained from previous studies specifically on IAQ and teachers, where respiratory health issues were found to have been associated with the physical school environment, is addressed in the current study (Claudio et al., 2016; Ebbehøj et al., 2005; Kielb et al., 2015; Sadick & Issa, 2017b).

Validity and Reliability

A factor analysis was conducted to determine factors. Cronbach's alphas were calculated for each factor for internal consistency and reliability. An ANOVA was performed for each item in question 41, places in the school building related to IEQ/IAQ where the teachers express health concerns with Tukey to determine significant pairs. The categorical independent variables specifically related to person, place, and process were dummy coded to see if they predicted negative place attachment in the Stepwise linear regression model.

See Table 5 for the factor loadings and Cronbach's Alpha for the outcome variable, and Table 6 for the independent variables. This is consistent with the literature that informed the survey creation, such as Williams & Roggenbuck, 1989; Williams and Vaske, 2003; Lewicka, 2005; and Stokols & Schumaker, 1981. Open-ended questions were imported from Qualtrics software into NVivo for semantic and manual analysis for content, frequency, and tone (see Appendix A for the survey).

Data Analysis – Survey

The revised online survey was then administered to teachers in District 2 using the public listserv as the sampling frame and to the three union presidents from the other three districts (Dillman et al., 2009). Selection bias was reduced by allowing volunteer participation in the survey, which was incentivized by offering participants the chance to win one of twenty $100 Amazon gift cards. If the pandemic and social distancing was not instituted at the time of survey launch, solicitation at union meetings and re-visiting the groups to boost response rate and target missing populations (e.g., teachers who favorably rate their IAQ) as determined within preliminary analyses within Qualtrics survey software would have been employed (Qualtrics, Provo, UT).

Qualtrics was utilized to disburse the survey and cover letter and to collect information. For the other three districts, the survey was distributed via a unique link to the three union presidents on April 15th, 2021. A reminder email was sent on April 29th. The union presidents were asked to confirm the date of distribution

and the number of members that received the invitation to participate. The survey remained open until May 31st, 2021, for a period of approximately 6 weeks.

Data was collected through an online survey that allowed employees to complete the survey electronically and allowed the author to follow up as many as three times to try to increase the response rate (Dillman et al., 2009). The response rate of this survey was 12%, which is a limitation of this study. This is a lower than desirable response rate and could be explained by the ongoing pandemic and additional demands placed on teachers, leading to fatigue, decreased job-satisfaction, changes in job-related well-being, and increased stress due to a sudden change in work demands (Hilger et al., 2021). During the COVID-19 pandemic, the number of surveys created and disseminated has increased significantly, and on average, each survey has targeted more regions. The U.S. Census Bureau noted that the response rate for their surveys was 10%-20% lower than in 2019 (Rothbaum, 2021), and a study aimed to analyze the effects of the COVID-19 pandemic on neurosurgical survey responses noted that an unprecedented number of people are refusing to complete any part of a survey (de Koning et al., 2021). The survey data was exported to SPSS for further statistical analysis. Using SPSS, the survey data was cleaned and prepared for analysis by checking for duplicity, fixing structural errors, and ensuring missing data was handled consistently.

For Phase I data analysis, survey constructs were confirmed using reliability and factor analyses. A principal axis factor analysis with varimax was conducted on the bank of 16 items in question 17, with the outcome variable of

place attachment, using N of 242. The items for the two factors were placed as they were originally designed, and therefore confirming the two factors and the items that make up each of those factors. Since the sample size for this study was over 200, the cut-off for factor loading was determined to be >0.40 (Black & Babin, 2019; Hair et al., 1998). No elimination of items was necessary, as all items were above .40 as the level determined (Watkins, 2018). The Kaiser-Meyer-Olkin (KMO) test measures how well suited the data is for factor analysis and measures the adequacy for each variable in the model and for the complete model (Vogt & Johnson, 2015). The KMO for factoring question 17, the outcome variable in this study, was .905. The results of the KMO for this model indicate that the sampling is adequate. Items 1-6 factored together as “positive place attachment” and items 7-16 factored together as “negative place attachment.” Factor one correlations ranged from 0.870 to 0.608 and factor two ranged from 0.877 to 0.572. Cronbach’s alpha for positive place attachment was .88 and was .917 for negative place attachment.

Table 5

Place Attachment, Factor Analysis of the Dependent Variable

	Factor loading	
Recorded Place Attachment	1	2
Factor 1: Secure; Positive Place Attachment (n = 242, α = .88)		
1. I am attached to my building	0.870	
2. There are certain places I am particularly attached	0.789	
3. If I moved, I would miss my building	0.807	
4. This building is part of my identity	0.754	
6. After a time away, I am happy to go back to my building	0.713	
5. There are places in this building which bring back memories	0.608	
Factor 2: Anxious and Avoidant; Negative Place Attachment (n = 242, α = .92)		
7. I avoid places in my building		0.651
10. I dread going back to my building after a holiday		0.665
16. I won't stay in my building longer than necessary		0.572
12. I prefer not to go to certain places in my building		0.702
13. I tend to put off going to my building		0.674
11. I feel anxious in the building		0.830
15. Thinking about the building makes me feel anxious		0.877
9. It is difficult to be at ease in this building		0.822
14. I have bad memories in this building		0.665
8. I feel oppressed by this building		0.752

Note. N = 242. The extraction method was principal axis factoring with rotation method of varimax with Kaiser normalization.

The mixed-method approach for sampling, called the “identical strategy,” was used for this study, where both qualitative and quantitative data were collected from the entire study sample. Identical strategy was used here by sampling all union members and the teachers who’s email addresses were listed on District 2’s website (2,214 total) as an intentional effort to obtain integration (Fetters & Molina-Azorin, 2017).

The open-ended questions were input to NVivo 1.5 for manual and automatic coding. The raw responses were reviewed, and preliminary data was coded using a combination of deductive codes drawn from the research questions and the theoretical model, and inductive codes generated by the data. The automatic coding function of NVivo coded the data by sentiment and themes because all participants responded to the same set of questions (QSR International, 2021). By focusing on people, place, and person from the modified tripartite model and the auto-coding function of NVivo, topics were identified by frequency and identified as very positive, moderately positive, very negative, and moderately negative. Excerpts may have more than one code. As Ritchie and Spencer (2002) argue, the co-incidence of different codes within the same piece of data is a useful finding, as “single passages” often contain a number of different themes, each of which needs to be referenced; and multiple indexing of this kind can be useful to highlight patterns of association with the “data.”

Open-ended questions were provided in the survey as follow-ups to closed-ended questions, or as topics that were not well defined (see Appendix A). The open-ended questions were to encourage participants to share details

about their experiences that I did not anticipate, to share information more openly because the topic was sensitive or related to personal matters (Allen, 2017). By asking for authentic feedback and highlighting the diversity of responses, the open-ended responses capture the “why” that complements the quantitative results, helping to tell a more nuanced story with the data and include participants that were not asked for follow-up interviews (Elliott, 2018). Included at the end of the survey question block was the question, “Are there any other comments you have?” as a way to conclude the survey and provide the participants an opportunity to share final thoughts (O'Cathain & Thomas, 2004).

Participants

A total of 272 surveys were initiated by participants from a Midwestern state; however, 242 completed the survey. Each response was assigned a participant ID number. For all the quantitative data, IBM SPSS Statistics version 27 was used for data analysis. Responses were eliminated for participants who did not complete the survey. Of the respondents, 56% have a master’s degree and 23% have a bachelor’s degree or post-graduate work. The ages of the participants were evenly distributed with 36% in the category of 25-40 years of age, 39% in the 41-56 years category, 11% aged 57 or more, and 2% between the ages of 18-24. Most teachers reported currently being assigned to one building (86%), with 8% working in two or more buildings. The number of school buildings the teachers have worked in during their career included one building (13%), two buildings (15%), three buildings (15%), four buildings (10%), five

buildings (11%), and the remainder working in six or more buildings or did not answer the question.

Concerning their length of service for their career, 8% reported working as a teacher for 16-20 years, 23% between 5-10 years, and 19% between 1-4 years. Only 3% reported having worked as an educator for more than 30 years. Teachers also expressed the work demands they are currently under during the pandemic, with 41% reporting they work more than 46 hours per week, 30% reporting working between 41-45 hours per week, 14% work between 36-40 hours per week, and 15% report working part-time. Teachers also reported that during the timeframe of this survey (February through March 2021), while school buildings were under orders to close or were in a state of pandemic operations, 76% still physically reported to their school building for more than 36 hours per week, and 22% reported being at their school 16-35 hours per week.

In the survey period, Spring of 2021, 23% of teachers described their health as average, 54% as good, 21% as excellent, and 3% as poor, with 77% reporting that they had had at least one COVID-19 vaccine. What was interesting to note is that 8% said they did not have the vaccine, and 15% refused to answer. Regarding the mental health questions, more than 60% of all respondents refused to answer, which is revealing.

Outcome Variable Construct. The 7-point “agree/disagree” Likert question was composed of two dimensions, positive and negative emotional valence. The positive emotional valence (items 1-6) used action words and phrases such as attached, miss, part of inner self, memories, and happiness.

The negative emotional valance (items 7-16) contained action words and phrases such as avoid, dread, prefer not, put off, anxious, difficult to be at ease, bad memories, and feelings of being oppressed by the building. Because this study focuses on the negative attachment to place, and ultimately place detachment, a new variable was created in SPSS to combine items 7-16 in a new dependent variable called Negative Attachment.

Following the confirmatory factor analysis and establishing the two factors, positive place attachment and negative place attachment, a series of multiple regressions were performed to determine significant relationships between the independent variables, covariates, and negative place attachment.

Prior to employing these regressions, basic assumptions were examined. First, normality *f* of the outcome variables was performed. Visual inspection of the outcome variables was performed through histograms and QQ plots. Visual inspection revealed that the positive place attachment variable did pass the test for homogeneity and normal distribution, while the negative place attachment variable did not. Therefore, the outcome variable was transformed using Log10 to create a new variable that passed the test of normality. The other assumptions for linear regression were met, linearity, homoscedasticity, absence of autocorrelation, the number of intendent variables for the sample size, and multicollinearity. A series of descriptive statistical tests were run to determine mean, standard deviation, and standard error of the new dependent variable. The Cronbach's alpha for each of the independent variables were over the threshold of .70 for reliability analysis (Tavakol & Dennick, 2011). The newly transformed

negative place attachment variable was isolated to use for stepwise linear regression.

Independent Variables Construct. The IV's used below were dummy coded if they were categorical. Per the rule-of-thumb regarding the sample size and number of IV's the model can handle without losing power, my study had an N of 242. So, starting with the number 50 and adding 20 for each variable, the model falls within the acceptable range.

Table 6

Perceived Indoor Air Quality, Independent Variables with Factor Analysis and Descriptives

Category name and survey items	Fac-tor load-ing	Final no. of items	Cronb ach's alpha (>.70)	*M* (SD)
Recently experienced gen'l body symptoms (Q28)		7.000	0.85	9.28 (3.147)
Dry cough	0.688			
Dry sore throat	0.726			
Hoarseness	0.760			
Phlegm	0.568			
Shortness of breath	0.542			
Stuffy nose or a cold	0.655			
Wheezing cough	0.603			
Recently experienced respiratory symptoms (Q28)		7.000	0.84	10.50 (3.855)
Concentration difficulties	0.693			
Eye symptoms	0.498			
Headache	0.492			
Itchiness or eczema	0.469			
Muscle pain	0.659			
Pain in joints	0.736			
Tiredness	0.651			
Health concern regarding healthy bldg. (Q41) *		9.000	0.80	14.38 (3.976)
Air quality, generally, indoors	0.749			
Air-borne pathogens such as COVID, influ-enza, or common cold virus	0.617			
Cleanliness of floors and/or surfaces	0.479			

Crime and safety	0.786			
Healthy food choices	0.637			
Noise levels	0.467			
Non-working restrooms	0.468			
Quality of drinking water	0.593			
Vehicles idling outside	0.617			
Moldy, dirty, unsanitary air problems (Q40)		4.000	0.79	6.39 (2.617)
Too dirty	0.832			
Too dusty	0.676			
Unsanitary	0.654			
Mold problem	0.465			
Hot, stuffy, humid air problems (Q40)		3.000	0.74	6.574 (2.454)
Stuffy air	0.729			
Too humid	0.630			
Too warm	0.568			

Limitations of the Quantitative Phase of This Study

- Non-response bias is a problem affecting cross-sectional studies and can result in bias in outcome measures. Bias is a particular problem when the characteristics of non-responders differ from responders (Creswell & Poth, 2018; Dillman et al., 2009; Friis, 2012).
- Misclassification bias is a kind of sampling bias that occurs when a disease of interest is poorly defined, when there is no gold standard for diagnosis of the disease, or when a disease might not be easily detectable, as may be the case with respiratory illnesses, dermatological issues, or allergies.
- Regarding regression analysis, there may be variables other than x which are not studied yet to influence the response variable.

Phase II – Interviews

The interview questions were crafted with a phenomenological perspective to capture the teachers' own perspectives, describing the social world as experienced by the teachers, and with the notion that social reality is what people observe it to be. The goal of the interview was to go beyond the directly experienced meanings to convey the ordinary social day-to-day experiences of lived meanings in their school buildings.

Instrument for Data Collection

Phase II qualitative research was guided by a social constructivist framework and adopted a phenomenological approach (Creswell & Poth, 2018; Nielsen, 2007). The paradigm of social constructivism explains that the teacher's knowledge and experiences about IAQ may have been built from the social networks of which they are a part in order to learn (Vygotsky, 1925). Phenomenology is described by Groat (2009) as an accurate description of a phenomenon that searches for essences where free imaginative variation was bracketed by reflexivity and intentionality and was an essential character of my consciousness (Finlay & Gough, 2008; Giorgi, 2009; Groat & Wang, 2013). As used in this study, existential-phenomenological psychology is a phenomenological approach that relies on the specific individual experiences of teachers involved in actual situations and places to understand the essence and meaning of their experiences in relation to IAQ and place theory (Von Eckartsberg, 1998).

Under this framework, this study examined the meaning participants make of their workplace experiences regarding their physical school building, and the perceptions of toxic IEQ/IAQ through one-time, in-depth interviews (Creswell & Poth, 2018). Please see Appendix B for the interview questions in a matrix that depicts the empirical inspiration and guidance for crafting the questions.

The Phase I survey was used to identify individuals who (1) noted negative emotions within their school building related to indoor air quality by selecting feelings in question 17 (a 7-point Likert scale) that indicate negative place attachment or place detachment and crafted a narrative of unhealthy places in their building and why they are unhealthy, in the open-ended questions, and (2) indicated interest in the follow-up interviews. Semi-structured interviews were conducted with participants who met the criteria of exhibiting negative place attachment or place detachment in Q17 or in the open-ended questions and signed up for an interview slot on my Sign-up Genius site. Thirteen interviews were conducted across rural, town, suburb, and city geographical contexts. Interview protocols were prepared with the guidance of the Institutional Review Board (IRB), Creswell (2018), Merriam and Tisdell (2016), and Castillo-Montoya's article for The Qualitative Report titled "Preparing for Interview Research: The Interview Protocol Refinement Framework" (Castillo-Montoya, 2016), and the dissertation committee. The 60-minute semi-structured interviews were held at a location of the participant's choice, through the on-line platform, Zoom, and recorded with Otter Ai, an AI-powered software. Interviews were

incentivized by offering a $50 Amazon gift card to each teacher who completed a research interview as a token of gratitude for their time.

The process of collecting data, including the semantics of the interview questions, was integral to the data (Castillo-Montoya, 2016; Creswell & Poth, 2018; Patton, 2002). Interview questions were open-ended and allowed the participant to tell their story or experience in their own words. Yes/no questions were avoided, and time was allowed for probing questions such as “Tell me more,” “How did that feel,” and “What does that mean to you?” The interview questions focused on understanding the psychological dimensions of occupying a building with poor IAQ (Aim 1) and place attachment. The questions were created with the tripartite model of place as a guide and included questions informed by the research of the following: Scannell and Gifford (2010), Aguilar-Raab (2015), Meyer et al. (1990), Claudio et al. (2016), McNeill and Dunlop (2016), Wong-Parodi (2018), Elfenbein (2007), and Nissila (2019). See Appendix B for the matrix.

Qualitative Data Collection

E-mails were sent to 16 participants having been identified on the survey results as indicating they may experience place detachment with their school building and a willingness to participate in follow-up interviews. Question 17 contained 16 items that inquired about the participants’ emotions regarding their school building. Participants who indicated a disagree/strongly disagree to the positive, secure attachment, and participants who indicated an agree/strongly agree to the negative preoccupied and dismissive attachment were identified as

possible interviewees. Respondents who also indicated through open-ended questions a strong emotion towards unhealthy places within the school buildings were also identified as possible interviewees. Sixteen emails were sent on 8/3/2021 with an invitation to participate in 60-minute Zoom interviews. An online sign-up was created through Sign-up Genius with confidential sign-ups from 8/16/2021 – 9/3/2021, ensuring the participants could not see the names of the other participants. Thirteen participants signed up through this platform (see Table 7 for participant characteristics). Interviews were conducted from 8/16/2021 to 9/9/2021. Participants were given the Zoom room invitation via email the night before the interview with the proper IRB disclosures (see Appendix D for the Interview Consent Form and Appendix E for the Interview Protocol).

Table 7

Participant Characteristics

Name	*District*	*Role*	*Age group*	*Highest degree earned*	*Years at current school building*	*Length of service at current school district in years*	*Ethnicity*	*Hours work in a 7-day week*	*Hours work physically in school building per week*
Abby	District 4	Teacher	25-40	Master's Degree	2	5-10	White	>46	16-35
Alyssa	District 4	Teacher	25-40	Bachelor's Degree	8	5-10	White	>46	>36
Amy	District 4	Teacher	41-56	Master's Degree	3	5-10	White	>46	>36
Bryce	District 4	Teacher	41-56	Master's Degree	20	16-20	White	>46	>36
Jessica	District 4	Teacher	41-56	Master's Degree	5	5-10	White	>36	>36
Julia	District 4	Educational Assistant	25-40	Associate's Degree	5	5-10	White	36-40	16-35
Kate	District 4	Teacher	41-56	Master's Degree	12	21-30	Prefer not to answer	>46	>36
Lori	District 4	Teacher	41-56	Master's Degree	21	21-30	White	16-35	16-35
Mary	District 2	Teacher	41-56	Master's Degree	4	5-10	White	16-35	16-35
Mia	District 3	Teacher	25-40	Master's Degree	8	5-10	White	>46	>36
Mike	District 4	Teacher	25-40	Master's Degree	4	1-4	White	36-40	16-35
Patricia	District 3	Teacher	41-56	Master's Degree	5	5-10	White	41-45	>36
Stephanie	District 4	Teacher	41-56	Master's Degree	9	11-15	White	>46	>36

Performing Qualitative Research During a Pandemic

For all research to be considered ethical, the benefits must be high and the risk minimized. The research protocols for interviewing participants were consistent with the IRB's guidance, which includes video conferencing (e.g., Zoom) as an accepted method for conducting interviews, with awareness that there is a risk of Zoom-bombing that was acknowledged in the consent forms. As the host of the meeting, I only allowed the scheduled participant to join the meeting.

Participant data is protected by storing it using the University of Missouri's encrypted OneDrive storage, accessible only with my 2-way encrypted login credentials, and not in Zoom's cloud storage facilities. Participants were aware that their interviews were recorded and that their anonymity was limited. Zoom notified participants that recording was in progress and they verbally consented to being recorded.

Rapport in face-to-face interviews is built not only through what is said but also through body language and non-verbal cues (Zakaria & Musta'amal, 2014). The head and shoulders are only visible during online interviewing, and much of the body language and non-verbal cues can be lost (Bayles, 2012). Lo Iacono et al. (2016) note that not all non-verbal communication is lost, however, since facial expressions are still visible. Non-verbal communication is diminished when online interviewing. To engage in active and sympathetic listening, the researcher must show their interest to the participant (Shuy, 2002). In face-to-face situations, this can be done through mirroring and non-verbal cues such as nodding (Murphy & Manzanares, 2008; Zakaria & Musta'amal, 2014). However, with online interviewing, it is challenging to mirror someone on a screen, and similarly nodding or eye contact are not always visible through the camera connection (Deakin & Wakefield, 2014). Building rapport online is more challenging than in a face-to-face situation (Carter, 2011) because of the way the researcher and participant understand and trust one another during online interviews compared to face-to-face interviews (Weller, 2017). Lo Lacono et al. (2016) note that some of the vividness of the interaction is lost in online

interviews, as they are less three-dimensional than face-to-face interviews. The potential loss of intimacy has implications on the data collected during online interviews (Weller, 2017). To concur, Sweet (2002) argues that the challenge in building rapport online might diminish the quality and quantity of responses, and Novick (2008) notes it is more difficult to create a positive interview ambience when rapport is reduced. However, Deakin and Wakefield (2014) claim that online interviews were in fact more responsive than face-to-face interviews, and rapport was built more quickly and suggest that the challenge of rapport building is not so much linked to the medium of the interview, but rather the personality of the participant. It is noted that it may be more challenging to build rapport online with a shy or reserved participant (Deakin & Wakefield, 2014).

The anonymity of the survey participants was protected by coding each returned questionnaire and keeping the responses confidential using pseudonyms (Dillman et al., 2009). While conducting individual interviews with selected respondents, pseudonyms were assigned and used throughout the study.

Interviews were recorded via Zoom and were saved to my personal computer, which has an encrypted, university-provided OneDrive. A memo was created after each interview as a reflection, noting the place where the participant was interviewing from, their wardrobe, tone of voice, performative actions, stress, strain, engagement, dynamics of voice, points of differing demeanor, and emotion. Otter.ai, a speech to text transcription and translation application using artificial intelligence and machine learning was used to upload Zoom voice

recording files. Using Otter Ai's real-time voice and editing platform, the transcripts were first edited for the participant's actual grammar and phrasing. The average time for each interview was 60 minutes, with the shortest interview at 50 minutes and the longest at 1 hour, 15 minutes. This allowed for an understanding of the content of the data without any analysis. A second round of transcription was made for formal editing, such as pauses, sighs, coughs, interruptions, and overall tone. Memos were created at this second round of transcription as reflection. The transcripts were saved as Word documents with "Speaker 2" identified in addition to the interviewer. The file name was saved as the date of the interview and the time (e.g., 081621_1pm). The participants were given their responses to the interviews for the member-checking portion of validation, and confirmatory emails with edits or approvals were received from 10 of the 13 participants. The remaining three did not respond to the member-checking emails. Ten of the 13 emails were responded to with small edits and approvals. The files were then edited to reflect the participant's corrections. See Table 8 for a summary of the data collection and analysis for Phase II.

Table 8

Data Collection and Analysis Overview for Phase II

Data collected	Analysis	Constructs analyzed (PPP)	Inter-viewed
Teacher interviews	Content (syntactic, lexical, and thematic), Video (for performance, emotion, dynamics)* Audio (for tone, dynamics, and performance)	Perceived IAQ, as place Satisfaction with place, as physical Place (physical & descriptive) Place: Social relationships, including workplace attachment Place (Social relationships at work) Process: Affect Process: Cognition of IAQ issues Process: Behavior (negative place attachment and detachment) Person: Individual Person: Group	13

*See Appendix H for an example of the process.

Role of the Researcher

Integration through the researcher dimension involves “leveraging personal and professional background experiences that lead one to consider, and hold valuable, qualitative, quantitative, and mixed methods procedures for making sense of the world” (Creswell & Poth, 2018), and further that my experiences in life, personal and professional, shape my world views. According to Greene (2007), my mental model includes my basic philosophical assumptions (ontology, epistemology, and methodology), but also my “inquirer stances, values, beliefs, disciplinary understandings, past experiences, and practical wisdom.”

Personal Experiences

My personal experience as a researcher, professional interior designer, mother, employee, and occupant of buildings guides my worldview. My role is etic, as an observer from the outside, and my biases and assumptions are from this experiential knowledge.

My role in this phenomenological study was to access the thoughts and feelings of the study's participants. This endeavor was challenging because it required the participants to reveal thoughts, feelings, or memories that are personal to them. I established rapport and a feeling of wanting to listen and reinforced the confidentiality of their information to entice the participants to reveal personal stories, values, and beliefs. For this phase, I was the human instrument for which that data was mediated. This differs from my role in Phase I, in the quantitative phase, where I was to separate and have no connection with the participants. In this study, the survey is the instrument in Phase I, although my bias informed coding, and analysis of the qualitative questions was required.

For the qualitative second phase, I assumed a more participatory role (Creswell & Poth, 2018) and personal involvement with the research topic. I have worked as a designer for an architectural firm and participated in designing one of the high schools and the furniture inventory for thirteen of the District 2 buildings as well as have children in a public school district. However, I have never worked for the other school districts in this study. My experiential knowledge of District 2 and the school district introduced a possibility for subjective interpretations of the phenomenon being studied and created a

potential for researcher bias (Creswell & Poth, 2018). I estimate that, at most, 20 of the 1,100 or so members of District 2 have had teacher-student relations with my family.

Creswell raises the issue of studying “in one’s own backyard” and offers cautionary advice as raised by Glesne and Peshkin of a power imbalance between the researcher and the participants (Creswell & Poth, 2018; Glesne & Peshkin, 1991). Although not strong enough to eliminate the possibility of bias, I understand these arguments. The methods of analysis were triangulated using a mixed-methods approach, including triangulation of data sources, member checking by emailing the transcripts to the participants for accuracy, and thick and rich descriptions were used to establish the findings' accuracy.

Limitations of The Qualitative Phase of This Study

- Because of the interpretative nature of the qualitative research, I may introduce my bias into the analysis of the findings.
- Due to the pandemic, the interviews were held via Zoom. The participant had the choice of where they were located.
- There is a potential for bias in the qualitative results interpretation because I have worked for an architectural firm hired to redesign the District 2 school buildings.

Phase II Results: Establishing Credibility, Transferability, Dependability, and Confirmability

The criteria for judging a qualitative study differ from quantitative research. The study appeals to the criteria of trustworthiness and authenticity, as noted in a

paradigm of inquiry used here from the 1980s called the “naturalistic” paradigm (Creswell & Poth, 2018; Groat & Wang, 2013; Lincoln & Guba, 1986; Patton, 1978). A qualitative study's distinctiveness within a specific context prevents it from being precisely replicated in another context. Nevertheless, statements about the researcher’s positions – the central assumptions, the selection of participants, the disclosure about my biases, beliefs, and values, presenting detailed methodology and instruments – enhance the study’s chances of being replicated in another setting (Creswell & Poth, 2018).

Analytical rigor was ensured by following the quality standards for credibility, transferability, dependability, and confirmability (Groat & Wang, 2013; Miles & Saldana, 2013). Credibility was enhanced by the engagement of 60-minute interviews, persistent observation during the interview, and triangulation, including member checking, where interviewees were shown the final transcription and asked if they believe it represented their input accurately (Terrell, 2016). Transferability was achieved by creating a “thick description” of context (providing great detail of an event, scenario, or situation), which can be used to assess similarity to other contexts (Creswell & Poth, 2018; Groat & Wang, 2013; Guba, 1981; Patton, 2002). Various methods of tracking the data to ensure dependability were utilized in this study, including the creation of a digital and audit trail at the beginning of the data management process, memoranda sorted across time and participant, and creating coding procedures that include the codes, codebook, and descriptions (Creswell & Poth, 2018; Denzin & Lincoln, 2011; Guba, 1981). A codebook inspired by the “living codebook” was created

(Reyes et al., 2021), which is a tool that documents the data analysis process to keep track of initial codes and act as a final database for completed codes (see Appendix F). This information is available to an external auditor, such as the dissertation supervisor and committee, to examine and evaluate the research process and the accuracy of the results (Terrell, 2016). Tools such as tables and diagrams were used to stabilize the data. Since qualitative research aims to include the researcher in the study and maintain close proximity to the data, confirmability was documented through the triangulation of data, which includes reflexivity, member-checks, and bracketing of my position (Creswell & Poth, 2018; Groat & Wang, 2013; Guba, 1981).

Analysis

When thinking about person, place, and process as terms in this study, these are some of the things that I coded for: person as a group and individual, place as physical and social relationships, and process as affect, behavior, and cognition. This deductive reasoning approach to coding allowed me to begin with the tripartite framework as modified for this study and provide predictive codes that were general. By also using inductive reasoning, I allowed codes to emerge based on specific scenarios. I found that some codes were more useful than others, such as process and place, and some codes related to “person” were not as useful as I predicted. The codes (see Appendix I) from the interviews were analyzed in Dedoose for co-incidences and according to descriptors such as length of service, school building where currently employed, and age of participants. The open-ended questions from the survey were imported into

NVivo for automatic and semantic coding. The codes were then manually sorted and edited for frequency and theme.

Open-ended questions were provided in the survey as follow-ups to closed-ended questions, or as topics that were not well defined (see Appendix A for the entire survey). The open-ended questions were to encourage participants to share details about their experiences that I did not anticipate, to share information more openly because the topic was sensitive or related to personal matters (Allen, 2017). By asking for authentic feedback and highlighting the diversity of responses, the open-ended responses capture the “why” that complements the quantitative results, helping to tell a more nuanced story with the data and include participants that were not asked for follow-up interviews (Elliott, 2018). Included at the end of the survey question block was the question, “Are there any other comments you have?” as a way to conclude the survey and provide the participants an opportunity to share final thoughts (O'Cathain & Thomas, 2004). The open-ended questions were input to NVivo 1.5 for manual and automatic coding. The raw responses were reviewed, and preliminary data was coded using a combination of deductive codes drawn from the research questions and the theoretical model, and inductive codes generated by the data. The automatic coding function of NVivo coded the data by sentiment and themes because all participants responded to the same set of questions (QSR International, 2021). By focusing on people, place, and person from the modified tripartite model and the auto-coding function of NVivo, topics were identified by frequency and identified as very positive, moderately positive, very negative, and

moderately negative. Excerpts may have more than one code (see Appendix I). As Ritchie and Spencer (2002) claim, the co-incidence of different codes within the same piece of data is a useful finding, as “single-passages often contain a number of different themes each of which needs to be referenced; multiple indexing of this kind can be used to highlight patterns of association with the data.”

An example of the coding process, used in Dedoose, is provided in Appendix I, which depicts the codes assigned to an excerpt after my inductive and deductive passes. A table identifying themes, with a count-per-case, grouped into the themes is provided in Appendix G.

As qualitative experts note, the initial passes at coding, both inductive and deductive, are but the first level of analysis through which themes can be identified. The detailed results of analysis will be discussed in Chapter 4.

Phase III – Integration

The third phase of the study incorporates analysis from both Phases I and II, alongside external data regarding the built environment, cultural attitudes, and historical context surrounding the data collection phase. News articles from the past ten years from the four districts under examination were acquired through online and person-to-person research. The primary source of news articles were back-issues of the local newspapers; Districts 1 and 4 were provided directly by the Editor via email link. Districts 2 and 3 articles were located via web-based research. Key terms being investigated included: HVAC, asbestos, indoor air quality, remodel, renovation, upgrades, and mold. School building information

was hard to collect. The query for District 1 obtained 12 news articles and minutes for one school board meeting; 6 items populated for District 2, minutes for one school board meeting and 5 news articles; District 3 had 6 news articles and one video; and District 4 had 35 news articles. I leveraged my connections with District 2 for their data, along with web-based school data provided by each school district. I reached out to each district's building permit office at the city to obtain remodel and permit issuance data. Information regarding the school buildings was linked to the participant's interviews in Dedoose for analysis.

In this study, survey questions about teachers' school buildings, perceptions of indoor air quality, and place attachment were matched with interview questions about healthy and unhealthy places, definitions of indoor air quality and adverse indoor air quality, with attention placed on experiences and meaning, while still being open to emerging themes from the qualitative data. Questions related to affect, cognition, and behavior were explored in the qualitative phase of interviews, and in Phase III, collection of secondary data to produce "cuts" or "diffraction" as an expanded approach to integration (Uprichard & Dawney, 2019). Through a Pillar (PIP) analysis (Guetterman et al., 2015; Johnson et al., 2017), it becomes possible to reconcile quantitative and qualitative data for deeper insights into the places where the findings align, specifically around the question of the point between negative attachment and detachment. Beyond that, situating the data collected in geospatial and historical context also frames the physical attributes and particulars that may be markers indicating higher or lower risk of place-detachment versus negative attachment.

Advantages of Using Mixed Methods Research (Fetters, 2019)

Mixed-methods research uses the strengths of qualitative and quantitative research to offset respective weaknesses and enhances the breadth and depth of the research. One of the main advantages of mixed-methods research is that I was able to compare data from both types of research to examine different, similar, or seemingly discordant findings about the phenomenon. In this study, the results of one type of data collection, surveys, were used to build procedures, interview questions, and keywords for the collection of the other type of data.

Limitations of Using Mixed Methods Research

Creswell and Fetters have widely discussed the strengths and weaknesses of mixed methods designs in literature (Creswell, 2014; Fetters, 2019; Fetters et al., 2013) and are noted by Fetters (2019):

- Perceived incompatibility of qualitative and quantitative paradigms.
- May not need the complexity of mixed methods research to answer the research questions.
- Difficult to have the skills to conduct both qualitative and quantitative together.
- Requires more resources.
- Extends beyond the scope of usual procedures.

Research Permission and Ethical Considerations – IRB #2038442

Ethical issues were addressed at each phase in the study. In compliance with the University of Missouri-Columbia Institutional Review Board (IRB) regulations, permission for this study was required. Application for research

permission contains the project's description and its significance, methods, procedures, participants, and research status. This study did not include children or animal subjects, but rather included educated adults. Care was taken in developing the survey questions and the interview guidelines to allow for the collection and analysis of valid data and, ultimately, the development of a reliable dissertation report.

Significance of This Study

This mixed-methods study was designed to expand the understanding of the social processes related to poor IAQ in the school setting. A better understanding of the social costs can amplify the importance of addressing IAQ for school administrators, teacher's occupational health professionals, unions (United Federation of Teachers, 2010), and researchers. Examining IAQ issues can give school districts specific areas for improvement to better protect and support the health of all school building occupants. The findings from this research could improve how school districts respond to IAQ issues in their buildings and create policies that improve school buildings' working conditions. The research results can also contribute to public health disciplines and informatics, as with the broader NORA initiatives to collaboratively improve workplace practices for respiratory health (NORA Respiratory Health Cross-Sector Council, 2019).

Conclusion

In this study, looking at the relationship between perceived adverse indoor air quality in school buildings and place attachment/detachment, I opted for a

mixed methods approach to better understand how teachers' experiences and knowledge of indoor air quality shape teachers' commitment to their school buildings and explored the psycho-social and environmental outcomes that resulted because of this phenomenon. I surveyed, interviewed, and collected secondary data to examine these issues in a 3-phase study of educators from four school districts. This approach will inform the chapters to follow.

CHAPTER 4 RESULTS

> Our identities are thus bound up with particular places, or localities, through the very structuring of subjectivity and mental life within the overarching structure of place. Particular places enter into our self-conception and self-identity because it is only in, and through, our grasp of the places in which we are situated that we can encounter objects, other persons, or, indeed, ourselves. (J. Malpas, 2018)

This study investigated teachers' perceptions of adverse indoor air quality in their school buildings utilizing place attachment theory. The purpose of this study was to determine if place detachment is significantly higher for teachers who perceived toxic IEQ/IAQ in their school building. In this three-phase study, I surveyed, interviewed, and collected secondary data to examine these issues.

Does perceived indoor air quality impact positive place attachment, negative place attachment, or place detachment for teachers? If so, can we use indoor air quality as a metric for predicting place attachment? A mixed methods approach was undertaken in this study to better understand how teachers' experiences and knowledge of indoor air quality shape their commitment to their school buildings and possible psychosocial and environmental variables that predict this phenomenon. According to Creswell, mixed methods approaches allow for better consideration of phenomenological and physical elements of lived experience side by side (Creswell et al., 2004). Creswell, Fetters, and Ivankova (Fetters et al., 2013; Ivankova et al., 2006) assert that neither quantitative nor qualitative methods are adequate to capture the essence and details of the

phenomena. Together, both quantitative and qualitative data produce a more complete analysis and complement each other (Creswell et al., 2004). The following researched questions were answered in this chapter:

Research Questions

1. **How do teacher's perceptions of toxic IEQ/IAQ relate to place attachment outcomes?**
2. **What person, process, or place variables predict teachers' negative place attachment with the school building? Do teacher negative perceptions of IEQ/IAQ predict teacher feelings of negative place attachment and/or place detachment in the school building?**
3. **What are the differences between teachers who experience negative place attachment and teachers who have place detachment?**

The tripartite model of place (person, psychological process, and place [PPP]), is where the personal attachment can vary by the meanings of individual actors and/or group memberships, psychological processes that include cognitive (identity), affective (emotion), or behavioral (action) dimensions that are expressed in the attachment, and place as the object of attachment, conceptualized having both social and physical characteristics. The model was intended to organize the main definitions of place attachment in the literature and grow as understandings of place attachment are discovered.

Phase I – Survey

Outcome Variable

The outcome variable in Phase I of this study is **Negative Place Attachment** (Manzo & Devine-Wright, 2013; Scannell, 2013; Shamai, 2018). Survey question 17, “The following statements inquire to what emotions you may feel toward your main school building. These emotions describe attachment, or a bond that you may have for the physical school building where you work, which is different from the attachment you may feel about the school district you work for.” Measured on a 7-point ordinal scale from strongly agree to strongly disagree.

Independent Variables

Two main independent variables under the constructs of person and process were determined to be predictors of negative place attachment through Stepwise regression.

First Main Independent Variable. The first independent variable was IEQ/IAQ, as a component of physical place, and was operationalized as teacher’s perceived IEQ/IAQ in the school building—“healthy buildings”—as asked in survey question 41, “Does the condition of your school environment ever cause you to be concerned about health?” which was factored as healthy drinking water, IAQ, pathogens, vehicles idling outside, non-working restrooms, noise, crime/safety, healthy food options, and cleanliness of floors & surfaces (Claudio et al., 2016).

Second Main Independent Variable. The second independent variable was "General body symptoms" (eye symptoms, tiredness, pain in joints, muscle pain, headache, skin symptoms/eczema, & concentration difficulties) from

question 28, “The last day you were physically in school building, did you experience any of the following symptoms?”

Covariates. Covariates included social place operationalized as work relationships—“quality of a relationship” (Aguilar-Raab et al., 2015; Scrima, 2015)—and “person” individual and group identities measured via participant demographic factors (see Appendix C) such as age, number of years working for the school district, role within school, occupational health, length of time in their current school building, and current physical health (Claudio et al., 2016).

The research question of how teacher perceptions of toxic IEQ/IAQ relate to negative place attachment outcomes was answered using survey research, including the described open-ended questions, to investigate the potential significant relationships between physical place IEQ/IAQ in school buildings, through place attachment to place detachment, workplace attachment, as a work organization, and satisfaction with the school building.

Quantitative Results

A one-way ANOVA was performed to answer research question 1:

1. **How do teacher’s perceptions of toxic IEQ/IAQ relate to negative place attachment outcomes?**

Based on the relationships between physical place, occupant characteristics, and processes of cognition and affect, the hypothesis of this study is that place attachment is significantly lower for teachers who perceive toxic IEQ/IAQ in their school building and some teachers may be experiencing place detachment.

For this study, the independent variables were asbestos, vehicles idling outside, carbon monoxide, air-borne pathogens such as COVID-19, influenza, or the common cold virus, and general indoor air quality and the frequency of thinking that the condition of their built school environment ever causes them to be concerned about their health: 1=never, 2=sometimes, 3=always, 4=often.

Presented in Table 9 are the ANOVA, homogeneity of variance, and eta-squared results, which show significant (in bold) relationships between the DV and IVs. This analysis shows that asbestos, carbon monoxide, cleanliness of floors and surfaces, crime/safety, IAQ, noise levels, non-working restrooms, pathogens, quality of drinking water, and structural concerns are significant. The Lavene test of homogeneity of variance was greater than .05 for all variables.

The eta-squared, point effect of the variables, ranged from 0.29 for IAQ and cleanliness of floors and surfaces, to the least effect, 0.09 pest control. The variables in bold meet the criteria for significance and the test for homogeneity. A bar chart with error bars best illustrates the mean differences among the groups as shown below. The error bars of the IV IAQ with the groups of sometimes and always, never and often, and never and always are significant as they do not intersect. And in pathogens, the groups who answered never and the groups who answered always, as well as groups never and often, and sometimes and always are significant. For an expanded table of mean differences for all constructs, see Table 13.

Table 9

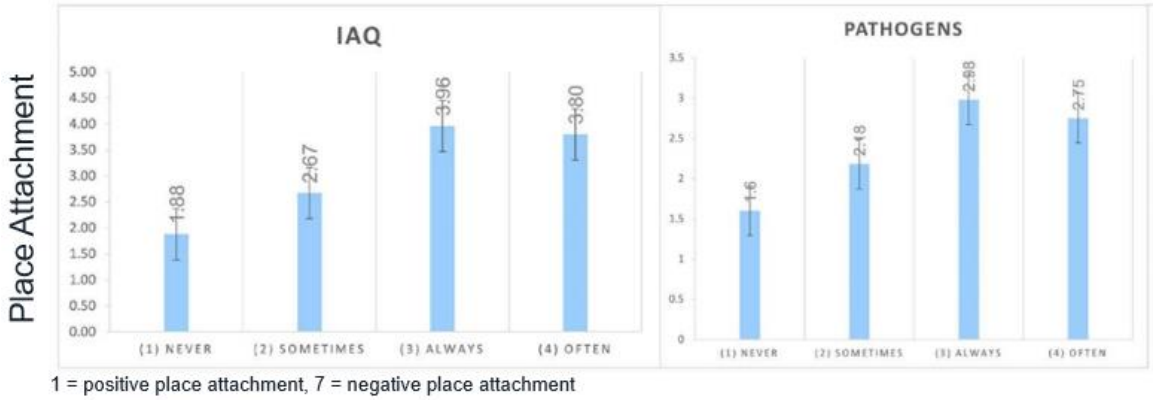
ANOVA, Homogeneity of Variances (Lavene Statistic) and Eta-squared

	Sum of Squares	df	Mean Square	>3.95 F	Sig.	>.05 Lavene Statistic	sm .01, med .06, lg .14 Eta-squared Effect size
Asbestos						**1.238**	0.13
Between Groups	9.915	3	3.305	2.308	**<.001**		
Within Groups	177.568	124	1.432				
Total	187.482	127					
Carbon monoxide						**3.271**	0.11
Between Groups	5.453	1	5.453	**3.975**	**0.048**		
Within Groups	171.461	125	1.372				
Total	176.913	126					
Cleanliness of floors & surfaces						**4.275**	0.29
Between Groups	34.353	3	11.451	**9.273**	**<.001**		
Within Groups	153.129	124	1.235				
Total	187.482	127					
Crime & safety						**1.149**	0.28
Between Groups	32.411	3	10.804	**8.639**	**<.001**		
Within Groups	155.071	124	1.251				
Total	187.482	127					
Healthy food choices						**3.439**	0.14
Between Groups	11.026	3	3.675	2.583	0.056		
Within Groups	176.456	124	1.423				
Total	187.482	127					
IAQ, generally						**9.719**	0.29
Between Groups	73.39	3	24.463	**17.429**	**<.001**		
Within Groups	289.138	206	1.404				
Total	362.529	209					
Noise levels						**4.389**	0.23
Between Groups	24.906	3	8.302	**6.332**	**<.001**		
Within Groups	162.576	124	1.311				
Total	187.482	127					
Non-working restrooms						**0.921**	0.22
Between Groups	21.233	2	10.616	**8.359**	**<.001**		
Within Groups	158.75	125	1.27				
Total	179.982	127					

Pathogens						**11.192**	0.24
Between Groups	27.765	3	9.255	**7.097**	**<.001**		
Within Groups	169.519	130	1.304				
Total	197.284	133					
Pest control						**1.673**	0.09
Between Groups	3.896	1	3.896	2.767	0.099		
Within Groups	176.029	125	1.408				
Total	179.925	126					
Quality of drinking water						**2.756**	0.26
Between Groups	28.541	3	9.514	**7.437**	**<.001**		
Within Groups	157.337	123	1.279				
Total	185.878	126					
Structural						**2.073**	0.14
Between Groups	9.227	2	4.614	3.412	**0.036**		
Within Groups	167.686	124	1.352				
Total	176.913	126					
Vehicles idling outside						**1.697**	0.07
Between Groups	3.044	2	1.522	1.072	0.345		
Within Groups	177.424	125	1.419				
Total	180.469	126					

Figure 15

Bar Chart with Error Bars Depicting Health Concerns about the Condition of the School Environment and Place Attachment



PROCESS: Condition of school environment causes health concerns (Q41)

Examination of the post hoc Tukey pairwise comparison revealed multiple pairs were significant, for all constructs tested from question 41, “Does the condition of your school environment ever cause you to be concerned about your health?” The Likert question had 4 levels of concern: never, sometimes, always, and often. As an example of the IAQ constructs in the question, air-borne pathogens, significant pairs were observed: 1 (never) (M =1.60, SD= 0.901) to 4 (always) (M = 2.98, SD = 0.1.690) were significant (p = <.001), with those who never express concern about their health regarding the condition of their school environment and have more positive attachment to the school environment than those who always have concerns about the condition of their school environment having more negative place attachment. In addition, 1 (never) (M =1.60, SD =0.901) was significant (p = .040) compared to those who often express concern regarding their health and the condition of the school environment (M = 2.75, SD =1.359).

Lastly, regarding IAQ, generally, there was a significant difference between those who never express concern (M = 1.88, SD = 0.945) and those who always express concern (M = 3.80, SD= 1.681), those who never express concern and those who sometimes express concern (M = .2.67, SD 1.300), and those who never express concern and those who often express concern (M = 3.80, SD = 1.681). Thus, overall, the more participants expressed their concerns regarding their health and the condition of the school environment considering air-borne pathogens and IAQ, generally, the more negative place attachment they expressed for the school environment, compared to those who had less

concern. These findings will assist with the independent variables to test with regression and provide valuable insight to the perceptions of IAQ by teachers in their school buildings. See Table 10 for the independent variables tested.

Table 10

Independent Variables Tested for Linear Regression Assumptions

	Sig from ANOVA		
Variable	Test of homogeniety of variance (want it to be greater than .05)	ANOVA must be less than .05, unless use 1%	Tukey sig. pairs
PERSON: Individual: Have you smoked >100 cigarettes in your life? (bivariate) Q22			
PERSON: Group: Number of bldgs currently work in (continuous) Q11			
PERSON: Group: Number of bldgs worked in career (continuous) Q10	0.660		
PERSON: Individual: Age (categorical) Q5	0.262		
PERSON: Individual: Describe overall health (categorical) Q20	**0.001**	**0.001**	1,3 & 1,4 & 2,3
PERSON: Individual: Education (categorical) Q6	0.096		
PERSON: Individual: How many sick days taken 2020-2021 (continuous) Q21			
PERSON: Individual: Have had at least 1 COVID-19 vaccine (bivariate) Q27	-		-
PLACE: Physical: How much dust is accumulated on surfaces? (categorical) Q30			
PLACE: Physical: Noise levels in my room bother me (categorical) Q29	0.011		1,3
PLACE: Physical: How many staff desks in classroom? (categorical) Q33			
PLACE: Physical: How many student desks in room (categorical) Q34	0.320		
PLACE: Physical: What grade would you give the IAQ in your bldg? (continuous) Q45	**0.001**		
PLACE: Physical: Is your room assgned to others? (bivariate) Q32		0.246	
PLACE: Social relationships, workplace attachment: Hrs work per 7 days (categorical) Q13	0.298		
PLACE: Social relationships, workplace attachment: Years work at school district (categorical) Q9	**0.016**		none
PROCESS: Behavior (external aspects): Do you wish you had control over the following? (check all that apply)	**0.015**		1, 2
PROCESS: Cognition: Hours per 7-day week physically work in school bldg past 30 days (categorical) Q15	0.198		
PROCESS: Cognition: Years worked in current bldg (continuous) Q14	**0.025**		none

Categorical survey questions 20, 26, 28, 40, and 41 were dummy coded (Table 11) to allow the mean of the independent variable to represent the levels for bivariate analysis in regression. By determining the significant pairs from the ANOVA and Tukey test, the item variables were recoded to the binary values of 1 and 0, representing a respondent's membership in a category (1) and non-membership (0), and saved in SPSS as new independent variables (Salkind, 2010). Some questions were already binary, such as whether the respondent had at least one COVID vaccine or whether they smoked 100 or more cigarettes in their entire life. The grade assigned by the teachers of the IAQ in their school

building, ranging from 0=F to 13=A+ was recoded into a dichotomized variable as values pass/fail. Variables that were already continuous did not need recoding.

Table 11

Table of Dummy Coded Variables

Change to dichotomous: 0 = not member of group 1 = member of group
Variable
PERSON: Individual: Age (categorical) Q5
(1) 18-24 years
(2) 25-40 years
(3) 41-56 years
(4) 57 years or more
PERSON: Individual: Describe overall health (categorical) Q20
(1) Terrible
(2) Poor
(3) Average
(4) Good
(5) Excellent
PERSON: Individual: Education (categorical) Q6
(1) Some high school
(2) High school diploma or equivalent
(3) Vocational training
(4) Some college
(5) Associate's degree
(6) Bachelor's degree
(7) Some post undergraduate work
(8) Master's degree
(9) Specialist degree
(10) Applied or professional doctorate degree
(11) Doctorate degree
(12) Other
PLACE: Social relationships, workplace attachment: Years work at school district (categorical) Q9
(1) Less than 1 year
(2) 1-4 years
(3) 5-10 years
(4) 11-15 years
(5) 16-20 years
(6) 21-30 years
(7) More than 30 years
PROCESS: Cognition: Hours per 7-day week physically work in school bldg past 30 days (categorical) Q15
(1) 0-15 hours per week
(2) 16-35 hours pere week
(3) 36+ hours per week
*Passed the test of homogeneity and ANOVA significance at .05

Stepwise Multiple Linear Regression Analysis

Stepwise linear regression was used to answer research questions 2 and 3:

2. **What person, process, or place variables predict teachers' negative place attachment with the school building? Do teacher negative perceptions of IEQ/IAQ predict teacher feelings of negative place attachment and/or place detachment in the school building?**
3. **What are the differences between teachers who experience negative place attachment and teachers who have place detachment?**

The stepwise method in the linear regression determined three significant models using the probability of F: entry at .05 and removal at .10. All three models excluded question 20, describing overall health. Other models excluded question 21, the number of sick days taken in the last school year, question 45, which was factored into two dimensions of pass/fail grade of the school building, and the 2nd factor in question 41, which was comprised of asbestos, carbon monoxide, and pest control, labeled "indoor pollutants." The model with the best fit as R-squared was chosen as is displayed below.

In the chosen model, the significant independent variables were adverse health experiences as of the last physical day in the classroom-general body symptoms (PERSON) and concerns about the healthiness of the building (PROCESS). The two variables were treated as dichotomous data. Next, negative place attachment was used as the outcome variable and was treated as a continuous variable. The scale for this variable is from 1 to 7, where 1 is "strongly disagree" and 7 is "strongly agree." This translates to 1 being positively attached and 7 being negatively attached. Examination of the model summary table revealed an adjusted R^2 of .396, or 40% of the variance was explained by

the variables in the model. Based on this, further examination of the coefficients table was warranted. Examination of the coefficients table revealed that two of the predictors were significant at $p < .05$ or .01. To determine which of the significant predictors contributed most to the model, examination of the standardized and unstandardized beta weights were employed. Recall that the two independent variables were dummy coded. Based on this, “experienced adverse health symptoms as of the last day physically in the school building” was determined to be the largest contributor with a standard beta weight of .429, followed by “healthy building concerns” at .288. Teachers who experienced adverse health symptoms the last day they were physically in the school building have 0.145 more negative place attachment per standard deviation (3.855) as seen in the unstandardized beta. Also, teachers who expressed concerns regarding their health for tangible items in a school building related to IAQ have .094 more negative place attachment per standard deviation (3.976), all other things being equal.

The results of this statistical test reveal that general health, not related to respiratory conditions, and tangible building attributes, rather than the intangible attributes, are significant predictors of negative place attachment. The purpose of this study is to understand what it means to teachers to occupy a workplace that they perceive has adverse indoor air quality issues. Although the actual indoor air

quality measurements would be an interesting comparison, this study focuses on determinants that may be addressed by administration and school designers.

Table 12

Results of the Stepwise Multiple Linear Regression Analysis by Effect

Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	*Beta*	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	-0.622	0.643		-0.967	0.336	-1.898	0.655					
PROCESS. Cognition. Q41. Does the condition of your school environment ever cause you to be concerned about health? Dummy variable "healthy buildings" (healthy drinking water, IAQ, pathogens, vehicles idling outside, non-working restrooms, noise, crime/safety, healthy food options, food cleanliness of floors & surfaces)	0.097	0.031	0.297	3.122	0.002	0.035	0.159	0.513	0.304	0.246	0.690	1.450
PERSON. Individual. Q28. The last day you were physically in school buiding, did you experience any of the following symptoms? Dummy variable "general body symptoms" (eye symptoms, tiredness, pain in joints, muscle pain, headache, skin symptoms/eczema, & concentration difficulties)	0.147	0.032	0.436	4.562	0.000	0.083	0.211	0.580	0.422	0.360	0.682	1.466
PERSON. Individual. Q21. About how many sick days did you take in the 2020-2021 school year?	-0.010	0.025	-0.034	-0.395	0.694	-0.060	0.040	0.212	-0.040	-0.031	0.820	1.220
PLACE. Social Relationships. Workplace Attachment. Q9. Employee length of service for the school district where you are currently employed?	-0.005	0.063	-0.006	-0.072	0.943	-0.130	0.121	0.036	-0.007	-0.006	0.949	1.054

PERSON. Individual. Q27. Have you had atleast one COVID-19 vaccine? Y/N	0.179	0.352	0.041	0.510	0.611	-0.519	0.878	0.006	0.052	0.040	0.982	1.018
PROCESS. Cognition. Q15. On avgerage how many hours per 7-day week, do you currently physically work in your school building in the past 30 days? 0-15 hours	-0.171	0.832	-0.017	-0.205	0.838	-1.822	1.480	-0.008	-0.021	-0.016	0.927	1.078
PROCESS. Cognition. Q15. On avgerage how many hours per 7-day week, do you currently physically work in your school building in the past 30 days? > 46 hours	-0.153	0.251	-0.050	-0.610	0.543	-0.651	0.345	-0.070	-0.062	-0.048	0.924	1.082

Results from the linear regression analysis exploring the impact of perception of adverse IEQ/IAQ in the school building on negative place attachment outcomes is shown in Table 9. The adjusted R^2 of the model is 40%. Although five of the IVs in this model are not significant, as they are above .05, they were left in the model with the reason that the COVID-19 vaccine was thought to be significant, and was not, but important to present in the table. The intendent variables of average hours physically worked in the school building, 0-15 and over 36 hours per week have a relationship with negative place attachment, as does the number of sick days taken during the last school year and the length of service for the current school district.

There is insufficient evidence to conclude that there is an effect at the population level. A low R^2 can warn of imprecise predictions, however, in social and behavior sciences, the model is adequate for the requirements of this explanatory study. The results here align with theory in that previous empirical

studies have had difficulties validating their survey instruments and have methodological problems posed by the diversity of scales for measuring place attachment, with focus on behaviors, attitudes, and beliefs while using the same definition of place attachment (Manzo & Devine-Wright, 2021). The scale used in this study could be better worded and assembled to exclude the item of identity, and instead focus on the whole definition as accepted here. One positive note about the scale used in this study is that it was designed to be site specific, which increases the stability of the structure of the scale, which was recommended by Manzo & Devine-Wright (2021).

The results from the multiple linear regression show that two variables are significantly associated with negative place attachment and have weight. The most significant predictor with the most weight is Person, individual: adverse health symptoms experienced the last day the teacher was physically in their school building, where $\beta = 0.147$, $p < .05$. The second significant predictor of negative place attachment is Process, cognition: health concerns about the school building, tangible building attributes of “healthy building” ($\beta = 0.097$, $p < .05$) on a scale of 1 to 7. Variables that are important but were not significant at <.05, were, in order of significance: Process, cognition: average hours physically work per 7-day week in the school building (the group that selected >36 hours/week); Person, individual: have had at least one COVID-19 shot; Person, individual: how many sick days taken in the 2020-2021 school year; Process, cognition: average hours physically work per 7-day week in the school building (the group that selected 0-15 hours/week); and lastly, Place, social relationships:

workplace attachment, employee length of service for the school district where they are currently employed.

When looking closely at the themes of person, process, and place, it is evident that the individual attributes of the person and cognitive process expressed by the teachers regarding the tangible building attributes related to IEQ/IAQ are the most important according to the Standardized Coefficient (Beta). These variables can be ranked by using the Beta because the units of measurement are eliminated. The Process, cognition: number of hours physically work in the building was dummy coded. Dummy coded variables, here, already have the unit of measurement removed as they were previously categorical. Social relationships: workplace attachment length of service for the school district and sick days were continuous variables.

The individual characteristics of the person regarding their health as being currently experienced is predictive of the negative place attachment they are feeling. The hours physically in the school building effect is interesting but was not found to be significant. In the group that is in the building for more than 46 hours a week, they are -0.050 lower (Standardized Beta) on the scale of negative place attachment than those who are physically in the building for 0-45 hours. This is also the case with the group that works 0-15 hours per week, as they are .017 lower (Standardized Beta), although the number is close to zero, which could mean that since these teachers are physically in the building less, they have formed a slight negative place detachment. The groups that reported working in the building 16-35 hours per week and 36-40 hours per week were

eliminated from the model based on the criteria of Probability-of-*f*-to-remove >= .100. This could be explained that those at the opposite end of the hours in the building are the most extremely affected by the physical building and those who are in the building for what is deemed a “normal” amount of 16-45 hours are affected by other covariates such as workplace attachment, or social relationships. The social aspect, as in the workplace attachment, noted in the number of years working for the current school district, has the least predictive effect with a Standardized Beta of -0.006. Those who reported having at least one COVID-19 vaccine are 0.179 units higher on the negative attachment scale than their counterparts who did not report having at least one vaccine.

Table 13

Mean Differences of Adverse Health Concerns (Q41)

Mean Differences, by Concern

		Healthy Buildings										Indoor Pollutants		
		Air quality, generally, indoors	Air-borne pathogens	Cleanliness of Floors/Surfaces	Crime/Safety	Healthy Food Choices	Noise Levels	Non-working Restrooms	Quality of Drinking Water	Structural Conditions	Vehicles Idling Outside	Asbestos	Carbon Monoxide	Pest Control
(I) Concerns	(J) Concerns	Mean Difference (I-J)	Mean Difference (I J)	Mean Difference (I-J)	Mean Difference (I J)	Mean Difference (I-J)	Mean Difference (I-J)	Mean Difference (I J)	Mean Difference (I J)	Mean Difference (I J)	Mean Difference (I-J)	Mean Difference (I-J)	Not performed; less than 3 groups of data	Not performed; less than 3 groups of data
1. Never	2. Sometimes	.600*	.587*	.435	.291	.183	.508*	.293	.467*	.421	7.849	.501*	-	-
	3. Always	1.543*	1.184*	1.019*	1.423*	.774	1.222*	2.498*	1.484*	1.374*	3.683	1.239	-	-
	4. Often	1.466*	1.215*	1.349*	1.767*	1.3228*	.836	-	1.329*	-	-	-.053	-	-
2. Sometimes	1. Never	-.600*	-.587*	-.435	-.291	-.183	-.508*	-.293	-.467*	-.421	-7.849	-.501	-	-
	3. Always	.944*	.598	.584	1.132*	.591	.714	2.205*	1.018*	.953*	-4.167	.738	-	-
	4. Often	.867	.628	.914	1.476*	1.146	.328	-	0.863	-	-	-.554	-	-
3. Always	1. Never	-1.543*	-1.184*	-1.019*	-1.423*	-.774	-1.222*	-2.298*	-1.484*	-1.374*	-3.683	-1.239*	-	-
	2. Sometimes	-.944*	-.598*	-.584	-1.132*	-.591	-.714	-2.205*	-1.018*	-.953*	4.167	-.738	-	-
	4. Often	.867	.031	.329	.344	.554	-.385	-	-.155	-	-	-1.292	-	-
4. Often	1. Never	-1.466*	-1.215*	-1.349*	-1.767*	-1.328*	-.836	-	-1.329*	-	-	.053	-	-
	2. Sometimes	-.867	-.628	-.914*	-1.476*	-1.146	-.328	-	-.863	-	-	.554	-	-
	3, Always	.077	-.031	-.329	-.344	-.554	.385	-	.155	-	-	1.292	-	-
ETA Squared		0.190	0.172	0.153	0.159	0.097	0.106	0.110	0.243	0.118	0.021	0.124	0.024	0.034

* Significant at <.05

Phase I Summary

The issues with the most significance and largest effect size were air-borne pathogens such as COVID-19, influenza, or the common cold virus, asbestos, carbon monoxide, and the quality of drinking water.

When teachers didn't report being concerned about their health with condition of their school environment, they had stronger attachment to their building, compared to those who expressed concerns, who had less attachment to their building.

Negative place attachment cannot be effectively used as predictive constructs. However, contributing factors to place detachment, tangible building attributes, and adverse health symptoms related to the general body can effectively be identified as indicators of areas of current negative place attachment or place detachment.

Phase II – Interviews

In the interviews, the participants were emotional in talking about the negative experiences of others when it came to constructing a sense of place and risk. Their own perceptions of the age of the school buildings and the indoor air quality were readily apparent. Listening to the interviews and looking at the code co-occurrences revealed their perceptions of place, even in evidence-based perceptions of place, that shaped the educator's processes of affect, behavior, and cognition.

One caveat of the culture of the population interviewed is that it is very homogenous, with a high percentage being White. During the interviews, all

participants mentioned their town of birth and where they grew-up. All participants are from the Midwest. Culturally speaking, the Midwest is heavily Scandinavian by origin, and still uses the phrase “Midwest Nice.'' Because I live in the Midwest, I understand and acknowledge the understanding of this phrase to mean “don’t go thinking you are exceptional,” and “if you can’t say anything nice, don’t say anything at all.” Knowing this in interpreting all responses in the surveys and interviews, nuances, sarcasm, and subtle insertions of laughter (which culturally means “trying to lighten the mood” of saying something negative) were noted to better understand the true intention of their communication.

The themes and sub-themes derived from the analysis were organized by the person, place, process of the tripartite model of place attachment (see Table 14). It became apparent after the second round of coding that some themes fit into two or three constructs. The organizing framework of the tripartite model was modified to represent the complexity of overlapping constructs.

Table 14

Themes Table

Construct	Theme	Sub-theme
Person		
	Path to distrust... the struggle for one's personal narrative to be taken seriously in the face of mistrusting authority	
		Time away (7 cases)
		Prior experience (13 cases)
		Scientific evidence to prove experience (5 cases)
	Connecting the dots (seeking remedies on their own) (4 cases)	
	Going my own way: Norm detachment about the use of place (4 cases)	
	Harmed quality of life (2 cases)	
		Lost time spent thinking about adverse IAQ (3 cases)
		The physical cost and toll of hostile place (12 cases)
Place		
	Physical building attributes, i.e., carpet, windows, surfaces (13 cases + survey responses)	
	Perceptions of healthier places (13 cases + survey responses)	
	Building as hostile (4 cases)	
	Physical place detachment due to differential access to quality physical spaces (13 cases)	
	Conformity caused by social influences (2 cases)	
	Hostility toward place is socially constructed (5 cases)	
	Seeking validation from employer (3 cases)	
Process		
	Stages of mistrust:	
		Not feeling valued (8 cases)
		Disengaged: Feeling frustrated and angry, sense of community and service are gone (the secret sauce of being a teacher), workplace attachment is now gone (3 cases)
		Futility-person to place: feeling trapped (7 cases)
	Importance of others' stories (13 cases)	
	Disempowerment through bureaucracy: people asking for remedies and being denied (4 cases)	
	Intimidation: Those in power above you are intimidating (2 cases)	
Person-Place	Medicines because of building	
Person-Process	Apathy (4 cases) Concerns about building and affect on health Greiving Nostalgia expertise	
Place-Process	Old building, hidden hazards	
Person-Place-Process	Physical environmental features, social relationships at work and attributes of the individual Individual health issues, cognitive processes, and social relationships	

Most of the stories told by the participants involved experiences before the pandemic. As was suspected, doing the research during the pandemic would also ignite evolving experiences of life during the pandemic, living with the newly discovered pathogen, but were not as numerous as expected. However, Mia shares her feelings of anxiety:

> I was pretty anxious about that [COVID-19]. um, but yeah, it, I had concerns about our building air quality, prior to the pandemic, so that just kind of… um... I was pretty anxious the whole time [last school year].

As the quote above illustrates, COVID-19 framed the fear around returning to the classroom and thus framed the interviews. As can be seen below, not only was the fear of air quality something that emerged around COVID-19, a general sense of place as hostile environment was emerging.

> I think both things, if students or staff are coming to school and feeling ill, as soon as they're coming into the building and have been in the building for a little while and there, right away the… difference, the change is your physical space, and that's what's causing you to be ill. (Amy)

This frames the entirety of the data collection process and must be recognized as a factor in perceptions of environmental safety.

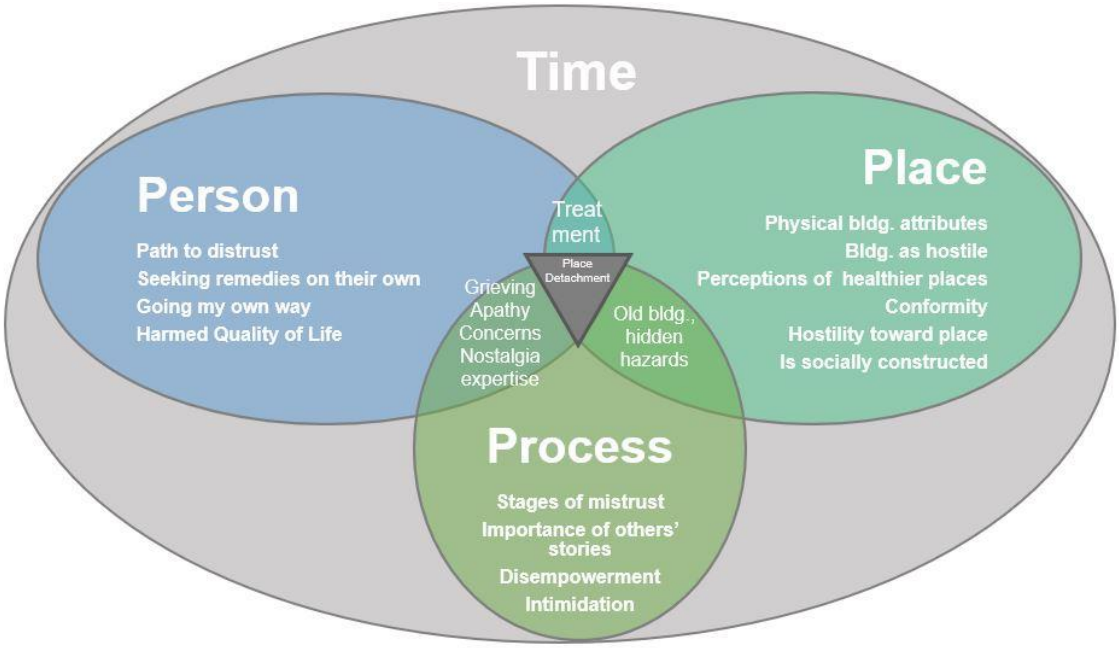
The phenomenological approach using place attachment theory and the modified tripartite model of place provided a useful framework for understanding the meaning teachers have constructed regarding adverse indoor air quality in their workplace. Recall that the three main constructs of the tripartite theory are place, people, and process. School buildings are seen as hostile and as a

motivator for workplace exit, disengagement, and underperformance for teachers who perceive adverse indoor air quality. A perception of toxic air in the workplace is a driving factor for some teachers' desire to quit, and the comparison to the pre-pandemic notions of place have been changed by the duration and experiences of the teachers during the pandemic.

The process of coding qualitative data revealed that place attachment outcomes were overlapping and thus the relationship between person, place, and process, over time, were realized. The re-creation of the Figure 16 diagram as a Venn diagram best illustrates this overlay of themes and is an organizing framework for this presentation of results. The relationship between place detachment and behavior was found not to be linear or segmented as shown in the tripartite model by Scannell and Gifford (2010), so a new model was created to illustrate the data from this phase. This illustration depicts the three constructs of PPP as complex, overlapping intersections experienced by the participants over time and will be explained below.

Figure 16

Phenomenological Model of Place Detachment



Note. By author

One large determinant from this study is that place is more process-oriented than geographical in the context of place detachment and the perceptions of adverse indoor air quality. Indoor air quality is at the intersection of place and process and is more connected than divided as depicted in the original tripartite model. The construct of time is missing from the tripartite model and through the analysis of the qualitative data, it became apparent that time has a nuanced meaning throughout the participant's lifecycle, their current age, and constructed meaning of IAQ before and during the pandemic. The impact and constructivism of social and individual experiences related to indoor air quality was insightful as the occurrences of experiences and creation of meaning by

social groups at work, sense of agency, and intimidation by administration and building engineers.

Physical

Physical place refers to the tangible and intangible attributes related to the physical building. Teacher's perceptions of IAQ, their satisfaction with HVAC issues, and retention are constructs considered in this study.

Perceptions of Healthier Places

One of the first themes that emerged around the issues of place is what is considered a healthy place. Newness seemed to be a major indicator as is demonstrated by the quotes below.

> I worked in another building in the district, that was a newer building. And I didn't have any of these issues in those newer buildings.

> Survey: The 96-year-old main building is built far sturdier than the portion that was built ten years ago. I feel that part of the building is safer, and therefore healthier. The HVAC was replaced in the old building ten years ago so is theoretically the same quality as in the new building. (Alyssa)

Specific physical attributes were noted by survey respondents when asked the open-ended questions of where they deem "healthy" and "unhealthy" places in their school building. While new renovations or new builds were coded by almost every interviewee as healthy, others identified other ways the institution worked to make their environment as healthy as possible. One survey

respondent noted, “I have an air filter and feel safer” and “My classroom with air filter on.”

The overwhelming building attribute mentioned in the surveys and in the interviews were windows, whether the teacher had them in their space, the size, and if they were operable. Teachers believe that operable windows make spaces healthier and would desire windows that were safe, yet operable, to improve ventilation, not only during the pandemic, but also if the air is perceived as stale or uncomfortable. Ventilation was the second most mentioned attribute as teachers generally note that good ventilation or fresh air is healthier and small rooms with little or no ventilation are unhealthy. Many older school buildings have not been retrofitted for air-conditioning, and if the space does not have air-conditioning, it is deemed unhealthy.

Another frequently stated problem in school buildings with perceived adverse indoor air quality is carpet. Rooms with carpet are perceived to be unhealthier, even if the carpet is newer and appears clean. The acoustical benefit of carpet is heavily out-weighed by the fact that carpets are believed to be dirty, “gross,” smelly, infrequently vacuumed or deep-cleaned, and harboring mold. The sensory perceptions of moisture and musty odor in rooms that are damp were commonly identified as unhealthy. Spaces with visible water damage or mold are unhealthier, too, which included carpets, grout in tile, ceiling tiles, and around light fixtures. When there is visible dirt, or perceptions that janitors have not cleaned, anything with the accumulated appearance of dirt is unhealthy, such as light switches, door handles, door frames, and desks.

Bathrooms, hallways, staircases, janitor's closets, and basements were the spaces that were deemed to be the unhealthiest. However, classrooms cleaned by teachers, themselves, are healthier, as noted in one respondent's open-ended answer:

> My classroom, as I have control over how much additional cleaning, I can do beyond that cleaning that is supposed to happen. Also, I generally feel that staff bathrooms are cleaner than those used by students, but it really depends on the custodian assigned to clean certain areas.

Building as Hostile

While coding, one theme that emerged was that buildings were seen as hostile environments. In some ways, the interviewees posed the buildings as a threat, risking their health. As one interviewee said:

> I do know that we [the building] leak because there are several rules that after rain or during a certain time, they get puddles and teachers are just aware of that, so they just put down buckets or they just put down cloth to soak it up. And so, I mean, that's a rule. I do know one of our... what was it, a year ago, one of our ceiling tiles ended up collapsing and falling on a teacher and hurting, she ended up getting a concussion from it. (Julia)

One major source of building hostility was the assault on the senses posed by mold, damp, and other indoor air quality issues that were olfactorily perceptible. Interviewees linked the sight and smell of moisture, mildew, and mold with health risks, as can be seen below.

> When I was in the two rooms prior at the high school to the one I was in now, um, where it smelled wet, it smelled moldy. It wasn't fresh, the air was stale. There wasn't good air flow. There's never fresh air. um, Air blows up out of the vents. But I don't know where that air comes from. It could just be the same awful air being recirculated throughout the whole building. (Kate)

Another thing that was highlighted was the refusal of administration to address the hostile environment; instead, multiple interviewees were told to ignore the health risks the perceived unhealthy environment imposed on them and their students. Fundamentally, this leads some to the processes discussed later in the analysis. This administrative approach to mitigated environmental disruption increased the perception of hostile environment as reflected in a quote below:

> I came in there to organize some stuff. It wasn't on an official school day or, or workshop day. But I had come in to… get stuff ready. And I was like, what is this?... there were buckets in there. And they're like, "We're really sorry." You know, "...it didn't ruin any of your stuff," which didn't ruin any of my books in that classroom, um. But the ceiling, the paint was chipping off it you could see like the watermarks on the ceiling. In the lights, the light fixtures, you can see the water, like, in the hanging out, in the light fixtures. It was bad. (Bryce)

Physical Place Detachment Due to Differential Access to Quality Physical Spaces

The knowledge of the difference between old buildings and new buildings in public schools is readily apparent as one drives from rural to urban settings. Disparities exist with the building stock, in part, because the renovation or new build cycle is longer than most other types of facilities. When administration is housed in a newer building, and the disparity is perceived not only to be aesthetic, but psychosocial, the parties housed in the older structure may feel differential vulnerability and perceive that they may be at greater health risk than their supervisors, which also presents an awareness of hierarchy (Brown, 2014). Mia explains her suspicions and tries to rationalize why the disparity exists.

> It just kind of feels…sneaky, like manipulative… if they know something, but they're not telling us, it's just easier for them to…brush it under the rug. And it's also easy for them to do that, because they're in a brand-new building, brand new facility…if they were working in the rooms we were working in, they would probably do a lot to change it. They had to share with the public last fall…the different buildings' air quality reports. And ours was fine. So, that's where, I just I don't know where the disconnect is. Because it's I don't think it is fine. And um, I'm not saying that they lied or anything, but there's got to be something they're missing, or something they're not testing for…rooms have mold, and for… a musty smell to be there. And… when you walk in… and my dehumidifiers full… there are mornings where it's 87%.

Social Relationships

Psychosocial is a term that describes the influence of social factors on an individual's mind or behavior, and to the interrelation of behavioral and social factors. In this study, social relationships are the relationships that teachers have with co-workers, administration, staff, and students.

Conformity Caused by Social Influences

Both Julia and Kate express how they may experience change in their beliefs or behaviors to fit in with a group. Julia feels the imagined group pressure involving the pressure of social norms and expectations, while Kate feels the physical presence of others, but imagines the social pressure of social norms. Julia said: “If everybody else's rooms had bad carpet [laughs]… I’d probably feel like, well, we all have it, so must be okay.” This approach was reflected in several other interviews.

Hostility Toward Place is Socially Constructed

Grounded in the studies of humans’ interactions with other humans, the social-constructionist theory of reality (Berger & Luckmann, 1966) and the concept of social constructivism acknowledge that knowledge develops as a result of social interaction and language use and is shared experience. Kate and Bryce communicate the social rules relating to anger appraisal and anger-related responses because they understand their school building may be hostile toward their health. Five cases expressed hostility toward their school building as being due to word-of-mouth reports of compromised health in current and former

teachers, and the speculative report of the building condition's role in that declining health.

> Obviously, you know, like I said, there's been several teachers from our building um, that have had some type of cancer... over the years. um, one lady was coming in 12 years ago when I was leaving, and she was to the point that she could hardly function. And they thought it all came from our building. There's a lot of people, the girl right next door to me. um, she's out sick all the time, with some type of sinus-bronchial stuff. (Kate)

The social construction of emotions like anger can be bordered by other socially constructed feelings (Izard, 2009). Nostalgia, especially in small towns where schooldays are remembered fondly, can work as a countervailing force. The quote below illustrates one of the ways the countervailing force works to limit the ability of teachers to express anger or frustration at the buildings remembered as through the nostalgia of childhood.

> (Nostalgia expertise) [Prior school] had a lot of parents and students who just have… the parents also went to [prior school] when they were there, so they, unless it was someone who was coming from…, a different community or something to see that school…you know, they'll just think, "oh, this is how the school is, how it's always been, and it's, it's fine. And it's not really anything to worry about. Because it was fine for me." So, it's probably fine for them…. Yeah, cuz I know, throughout all this, [prior school], that is probably is the most, the building that had the most concerns [for me]. (Mike)

Stages of Distrust

Bowlby's (1969) attachment theory provides a useful framework for understanding trust. Distrust develops progressively through stages, starting with doubt and uncertainty about someone's trustworthiness and causes someone to pause and then grows into suspicion if the doubt is not resolved (Kramer, 1998). According to Sinaceur (2010), if in a state of suspicion, perceivers are uncertain about another's motives, whereas in a state of distrust, perceivers have negative expectations about these motives. As a result, suspicious perceivers are more willing to seek information to determine whether another's motives are honest or not than distrusting perceivers (Sinaceur, 2010). Distrust signals that something is not as it appears and that one should be sensitive to information that deviates from normal; this can have a negative impact on one's motivation to perform well (Armin & Michael, 2006). The American Psychological Association performed a work and well-being survey in 2014 and found that one-third of employed adults feel their organization is not honest and truthful with them (American Psychological Association [APA], 2014), and self-doubt starts to creep in. This can then lead to worry, feeling of not belonging (Hay, 1998), or having concerns about professional advancement (for this case, achieving tenure), and feelings of being powerless, especially when resources are scarce (Catherine et al., 2001).

Not Feeling Valued

Negativity bias is a phenomenon where one remembers negative events more strongly than positive ones, and if employees are present in organizational cultures where people spend time complaining, it can become contagious (8

cases). Psychological distress and the mental health burden during the COVID-19 outbreak was shown to exacerbate the issue (Sampson, 2020). Bryce explains the process of going to human resources and the principal with an expectation of action, but nothing happens, which makes one feel unvalued. Mike explains how the district could make improvements to the building regarding indoor air to increase the feelings of being valued.

> They brought up the same exact issues to HR and to the principal... Nothing happens, you know, nothing happens. And I say “Yep, it's very frustrating,” it gets to the point of what do you even do? You know, like, well, how, what can I even do about this? But..."What?" Like, "What?" How can you... that made me feel like you don't care about the health of the people that work here [laughs]. (Bryce)

> …especially in the public schools, it is such a delicate thing, where if, you know, the district spent $100,000 on all of them [air-cleaners]. And maybe it's, District 4 Winona is kind of a unique community, I think all communities have their interesting ways, but there's a lot of scrutiny over spending in the public schools quite a bit. And if that turned out like that they did not work very well and the district spent X amount of money on it, it would almost be a borderline scandal that the district wasted blah, blah, blah on these things that don't work. So, I think it'd be great, and I think if it could just be backed up that they were effective then I think that would be excellent and teachers would feel really valued because of that. (Mike)

Seeking Validation from Employer

Teachers feeling their concerns have not been addressed by earlier attempts seek validation from authority. Bryce expresses sarcasm and passive aggressive anger (culturally appropriate [MPR News, 2009]) as an attempt to thinly veil her feelings of fear or hurt.

> When he [superintendent] finally came into the building... I think he really realized oh, how, you know how rough it was being in a newer building where he is at, you know…. So, I don't think he truly understood how difficult it was to work in these buildings. But once he came into the building, you can see his whole demeanor change towards the air quality and towards what we were saying. He seemed more involved with it once he came into our building. (Alyssa)

> I don't think their [administration] eyes would be open unless they experience themselves. I don't think so. I, I, I just think that unless they are there, following me for a month, shadowing me for a month, every minute of my day... And you will see, you know, you will see what it's like. You will complain. You will say, "Why is it like walking through a Bath and Bodyworks in the hallway?" What's going on with that? You know, "Oh, I can't breathe." Oh, really? Oh, isn't that sad? Guess what? I do it every day. You know, until they can say, "This is, this is affecting me. How can you live with this?" You know, oh, “That exhaust of the buses? That's awful." Yeah. Yeah, that's awful. Unless they experienced it firsthand, and it pains them in some way. They will not change... and for some people

> they'd be like, "Well that's not that bad. It's not that bad. What's wrong with that? Oh, that's not that bad... you know, you're just complaining you're just... finding something to complain about." (Bryce)

I used both quotes here because both participants express their need for validation and the frustration of the lack of validation in different ways. Some of this might be gendered, but it otherwise illustrates the importance of sensory experience.

Disengaged

Feeling frustrated and angry, sense of community and service are gone (the secret sauce of being a teacher), and workplace attachment to the organization is eroding, or is now gone. Several scholars have highlighted the importance of understanding moral disengagement where aggression and deviant conduct become justifiable in the eyes of an employee (Kramer, 1998). The more employees experience negative emotions in response to stressors, the more they morally disengage and turn to counterproductive work behavior (CWB) (Fida et al., 2014).

> Okay, then you're going to end up getting me a sub on a lot of days because if I have to walk through a bunch of scents that I can't handle, then I'll be going home with a migraine and you will be finding a sub for me which is costing the district more money because you're still paying my salary and...[laughs] you're paying for a sub. (Bryce)

This illustrates the lack of engagement and passive-aggressive retaliation against the school district based on their perception of a hostile work environment. The

physical disengagement may be framed as a form of resistance, but in actuality is a disengagement with place. Kate, in the following section, discusses the cost of not disengaging earlier.

> My kids are all grown now, they're 20, 22 & 24, and those were important times and I missed out on time with them because of my health and I really give all that health issue to the school district. I should be advocating for anything that they're looking forward to making the school better. But I... like I said, my kids are all older now. And when they were all in school, I, on top of being the teacher and the special ed teacher, I was I was the [lists multiple volunteer roles] I've been all these roles. And I'm to the point now, I'm done. I don't want to be any of those roles. …I'm done for the most part, with all this extra stuff, I just, I started to get burnt out. And a lot of those are really thankless jobs, but I know they're important. (Kate)

Futility Regarding Person and Place: Feeling Trapped

A person's boundaries are unseen, immeasurable, and create an inside and an outside, separating one thing from another (White, 2004). Boundaries are often formed in early childhood and again go back to Bowlby's theory of attachment (Owen, 2018). As Mary, Bryce, and Patricia say, their health is a boundary they do not want to cross, whereas Kate prioritizes money over health. Many teachers are conflicted, and the boundaries seem to fluctuate with time and stress. This cognitive dissonance regarding place detachment was apparent in all

thirteen cases but was more apparent in some as they directly noted what the boundaries are.

> I've actually thought about.... I think I'm too old and tired to do Elementary, but I've actually thought about asking to be transferred to one of the newer elementary schools just to get out of my building to be above ground. But I love the people I teach with, you know. And it's the English and social studies teachers in the basement, and I love having lunch with them. (Patricia)

One of the biggest expressions of futility is around cognitive dissonance. Where discussions of change lead to no actual resolution, but teachers just can't leave due to economics or geo-spatial limitations.

> It's kind of like when you go to some of these meetings and people re-say all these same things...we're gonna do this and this and this and they make all these plans and then it doesn't happen anyway. So then in the next year, we go back, and we redo this whole thing, and it doesn't happen anyway. So, I get kind of like 'meh', I don't even need to know because it's not like [laughs] matter to me anyway. I can't afford to not work there. So, let's say it's putting some type of cancerous ah, chemical in the air. I'd still have to go to work. I can't afford not to work. I would never speak negatively about our school. um, but those are problems that I have there. And yes, I do wish I could not work there. (Kate)

Cognition

The definition of cognition is the memories, meaning, and knowledge linked to a place (termed “cognition” in the PPP model), which are the key psychological processes that impact the development of place attachment.

Importance of Others’ Stories

Social constructivist theory argues that learning and understanding are inherently social. It is through cultural activities and the use of what Vygotsky describes as “tools of intellectual adaptation,” as cited by Palincsar (1998), that the individual acquires knowledge development, which depends on interaction with people and the tools that the culture provides to help form their own view of the world. These tools, which vary between cultures, include symbols, artifacts, and language, and through their use “thought, learning, and knowledge are not just influenced by social factors, but are social phenomena” and a cognition is a collaborative process (Palincsar, 1998).

> I just worry if there could be something there that I don't even know is, is going on, and what could this be doing harm to my long-term health? Or that of my students? Um, so I know like at my previous school it felt like we had a number of teachers and it was not all at one time but at various times that got sick with cancer and it always was this underlying fear like is there something that's in the building, in the water, you know why we have like three or four different teachers, like I said it was kind of an over you know, is this all just coincidence so you have this just like background worry, um, of that so, um, to be able to have like, you mentioned the

> purifier that tells me things are all ok, you know, to be able to have that assurance that all as well would remove that fear, a lot. (Amy)

Disempowerment Through Bureaucracy: People Asking for Remedies and Being Denied

U.S. employees, in general, have somewhat limited agency and knowledge resources regarding organizational bureaucracy and are often disempowered to act as regulators, as revealed by Gray and van Rooji (2021). According to their study, there are five patterns of disempowerment that play a crucial role in impeding successful society-based control: (a) dependency, (b) capacity, (c) social hierarchy, (d) discursive framing, and (e) perverse effects of legal rights. Julia expresses her fear that she doesn't have a choice but to work in a building that she perceives to have toxic IEQ/IAQ because she is under the impression that the school administrators have no control over the IAQ problems. Kate doesn't express that the school administration is helpless, she believes no matter how dire the situation was, she would have to be present for work. Bryce thinks administration is out of touch and do not care about the health of teachers or students.

> …just because I think that [sighs] the school board or in general, school boards are not very supportive of what the actual teachers and students maybe, are saying [about the quality of the air in the building] or bringing up the reality of the day to day, they're not in the building every day. They don't get it. [pauses]… you know, it's always a push. Oh, no, no, no, no, no, it's too much. It's too much, we're not going to give you that you're

asking for too much. No, we're just asking for reasonable things. And health should be at the top of the list. (Bryce)

Intimidation: Those in Power Above You are Intimidating or are Bullies

Feeling intimidated is when the person you're interacting with is perceived to be more powerful than you. People also have a fundamental desire for social inclusion (Scorgie & Forlin, 2019). Empirical evidence has shown that we feel rejection in much the same way as we do physical pain, as the neural systems underlying the distress experience are shared (Eisenberger et al., 2006). The social environment is a powerful selective force and social experiences may continue to shape the way in which an individual interacts with others (Krause et al., 2010). According to Lines (2008), schools, as organizations, have hierarchical structures with active power dynamics, and therefore, may constitute an archetypal atmosphere for bullying to occur. Teachers may be mistreated on one or more levels, which may include colleague-on-teacher bullying and learner-on-teacher bullying, but several investigations have found that teachers are more specifically victimized by school principals (De Vos & Kirsten, 2015).

According to Buonomo et al. (2020), being female amplifies the risk to perceive work-life conflict in general, as well as to be burnt out, when bullied, with and without the occurrence of work-life conflict. However, being male heightens the risk to perceive work-life conflict when bullied but does not seem to impact the feelings of being burned-out. Additionally, the findings suggest that family demands may influence school principals' feelings of exhaustion, regardless of

gender (Buonomo et al., 2020). It is important to note that this research was performed pre-pandemic, before the excess of exhaustive educational duties.

Mary describes the infrequent interaction she has with her principal and that because her door was propped open, her male principal closed it “because he did not like it” [being open]. The inflection of her voice and facial performance in the interview suggested that in this case, she was intimidated by the principal and felt powerless. Julia describes the social hierarchy where educational assistants (EAs) are below teachers, and how generally, the EAs stick together with social cohesion because the teachers are intimidating. Mia describes general intimidation by her principal. She expressed feelings of guilt and shame for “going over his head” to complain due to the inaction of the principal in response to her perceptions of toxic IEQ/IAQ in her school.

> The [union] president had told me like, you're not doing anything wrong. And um, as much as it feels like you're not valued at times, like they want to keep you [laughs], they want you to enjoy work. um, So, I just felt like, I just felt like I was being kind of sneaky about it, because nothing was getting done. (Mia)

Path to Distrust…The Struggle for One’s Personal Narrative to be Taken Seriously in the Face of Mistrusting Authority

The participant’s psychological and physical detachment was undertaken with sometimes short breaks away from the perceived hostile place within the school building, such as going to their car, for a walk, or going to another space they deemed healthier. The more the teachers thought about adverse indoor air

quality, the more detached they became (Phase I survey). Such as the case with teachers who prefer to stay home or delay going to work at the school building, or even entertain thoughts about quitting as a permanent solution to their despair.

Time Away

The phrase “stepping outside for fresh air” has taken on a different, more serious meaning during the pandemic. The idea that outside air is healthier has been around for centuries as the Greek physician Hippocrates (c. 460-377 B.C.E) believed bad air could be the cause of any fatal epidemic disease (Kannadan, 2018). Mia and Alyssa express how they perceive their health to have improved after time away from the suspected source of bad air.

> I'm not the only person that has noticed their health change, like when they're in the building, but like, your nose will run, or you'll cough more. Um, and then everyone magically gets better when we're not there [laughs]. (Mia)

Beyond stepping outside for a breath of fresh air, exiting the building for an extended period of time and experiencing a health improvement really impacted teacher experiences. The quote below highlights not only teacher experiences of leaving for brief breaks, but some of the health improvements reported while teaching at home during the pandemic.

> First time, I realized it was I was struggling all week. And then we went into I think it was either MEA or Thanksgiving break. And I was out of the building for four or five days straight. And I by the time I came, I was ready

> to come back. So, I was feeling great. I wasn't getting the headaches; I wasn't having to take my inhaler. And then within just a few hours of coming back to school, I started to get that tight chest again, started getting the headaches again. So that's why I started realizing that okay, this, it's not just I was, you know, fighting something off, there's more to it. I guess I don't remember if it was MEA [a professional development conference for teachers] or if it was Thanksgiving. I know, it was beginning of the school year. And it was a nice chunk of time where I was out of the building, and then came back and it's like, okay, yeah, I was feeling great. And didn't even make it to lunch. And I was already starting to feel all those effects again. (Alyssa)

Prior Experience

Humans have the innate ability to use past experiences as well as the current information that is constantly gathering about the environment to try to predict the future (Grupe & Nitschke, 2013). This comprehensive information allows a person to increase the odds of achieving desired outcomes while avoiding or bracing themselves for future adversity (Grupe & Nitschke, 2013). Stephanie explains how she used prior experience and current information to rectify a perceived threat in her environment.

> I had to go to the hospital and get tested. I was nauseous all the time…it was awful. I had no idea what was wrong with me. And um, at the end of the school year, I started feeling better on weekends, I feel a little better. But I didn't really think about it being a school thing. I just thought there

was something wrong with me. And I just…like I said, had all these tests done on me and things. um, At the end of the school year, I started feeling better, so then I kind of thought, well, maybe it was something there? um, and then they tested the carpet. I said that I hadn't been feeling well and whatever. And there was mold, so they had to pull it out. But it was really, really bad. So, all the carpet was pretty old and gross. And, like I said they're finally get rid of it.

…and then the same thing kind of happened at [prior school]. I didn't get as sick but just a little bit. Um, and so I talked to that principal right away at the beginning. And I said, I, this has happened before, and I'm starting to feel a little bit nauseous and that could be something in the carpet. I, I can't work like this [laughs]. um, So, then that year, they pulled it [carpet]. (Stephanie)

Scientific Evidence to Prove Experience

Critical thinking involves the ability to make good arguments. Arguments are claims backed by reasons that are supported by evidence. The reason for argumentation is to engage a discussion where one feels the burden of proof. Patricia reported needing to incorporate a photo from her digital hygrometer in order to file a help ticket and be taken seriously. A more extreme example, Mia explains that she feels the need to scientifically support her argument that the physical building is harboring mold, because the custodian did not believe her opinion.

> If it wasn't for the petri dish, I wouldn't know if it's mold or not, but I just, with how I feel when I'm in the building, and like, asthma and everything, I just thought something was wrong. The custodian was very skeptical and basically said, like, "How do you know this is even mold?" So, I told him that I had it tested. And then he was like, "Oh, yeah, I'll replace everything else." Just because he had seen mold before in his other area of work. And it didn't look like how it looked on the ceiling. (Mia)

Behavior

Scannell and Gifford (2010) describe behavior within the PPP model as how the actor (person) manifests behavior in the attachment to place and expresses behavior through desired actions (Williams & Roggenbuck, 1989). As a precursor to distrust, the participants expressed being somewhere in the grief cycle.

Connecting the Dots (Seeking Remedies on Their Own in Order to Increase Wellbeing)

Believing in one’s ability to exert control over the environment to achieve a desired outcome is a humanistic trait. Leotti et al. (2010) posit that the need for control, and for choice, the means by which control is exercised over the environment, is not only psychological, but biological as a means for survival. Several participants expressed how they control their environment by their own choice to increase their wellbeing. Some, like Alyssa, try to limit the total amount of time they are in the school building, whereas Stephanie would steal moments to detach from the building.

> So, we weren't allowed to leave. But even so, every now and then, I go out and sit in my car and eat out there if the air was too bad, like, I didn't stick around. I tried to pack stuff and just did a lot of stuff at home, or when it's hot. I didn't stick around either [laughs]… Pack my stuff and get out of there. (Stephanie)

Common workarounds by teachers who are displeased or experience irritation to the temperature wear layers when cold, go to cooler rooms when too warm, or open windows if they can. Distrustful or suspicious teachers bring in their own cleaning supplies and rags. Some teachers use essential oils or deodorizers to mask odors.

Going My Own Way: Norm Detachment About the Use of Place

Some teachers have learned “It’s easier to get forgiveness than permission” (Doyle et al., 2012), or may not even care about being forgiven, as teachers have detached from norms and gone their own way to obtain satisfaction with their space or activities. In some cases, the physical space itself is seen as so hostile, the teacher literally circumvents the system to relocate.

> So, I approached my principal and said, it doesn't work for me to share space with Mrs. D. [because of COVID-19 overcrowding and physical distancing] …can I use room 235, or whatever it is, to work with students? And she just flat out said, nope, no. Um, I decided I was going to try it anyway. And so, then I just started using that classroom, and, and never asked her about it again, and she never said anything about it. And then all of a sudden, we're at the end of the year, and I'm still using that little

> space. And so, I'm started this year, and I went back to that space and just kind of claimed it as my own. So yeah, typically, the building... the space issue is definitely up to principals. And sometimes they're willing to work with you, and sometimes they're not. (Mary)

Harmed Quality of Life

The extent to which the teachers noticed a diminished quality of life, due to the perception of toxic IEQ/IAQ in their school buildings, were shared through stories ranging from short-term to long-term; they contained a common thread, a decrease in their health as Kate and Mia speak of.

> Oh, it's [toxic IEQ/IAQ] affected me a lot, I gained major weight because I had to um, more or less quit working-out... because I couldn't breathe and then every time, I'd have to have a sinus surgery… I was… I would be down, and I because I couldn't exercise for a while, which then… therefore, caused me to um… start to feel terrible about myself. And, um, I look back now at that time, and I was taking a lot of prednisone and I had gained a lot of weight and I was just a very unhappy person with myself. So, it definitely affected me in a lot of ways. (Kate)

While physical health is important, the experienced workspace hostility also impacted the psychological wellbeing of teachers. Particularly tied to seasonal changes, physical respiratory symptoms caused everything from depression to anxiety, reportedly.

> I think it affects my mood..., a lot. Ah, and then, I, I, mean, it's hard because I don't, I don't know for sure that it's affecting my health, I just

> really feel that it is. um, So, during the school year, so September to May, ah, I would say that I'm affected like, five days a week, maybe six, because then I get anxious about going back then on Sunday [laughs]. um, But at certain times of the year, it's not as bad. Like when it's really dry. It's not as bad. It's, it's really, I get really anxious in um, August, September, April, May when it can be rainy. (Mia)

Lost Time Spent Thinking About Toxic IEQ/IAQ

Feelings follow thoughts, and ruminating is the process of continuously thinking about the same thoughts. The habit of ruminating can be dangerous to one's mental health as it can lead to depression or anxiety (Watkins & Roberts, 2020). The act of focusing on how things are going wrong, instead of how to generate solutions to resolve the problem, activates the fight, flight, or freeze response, which shuts down the creative problem-solving process (Lane, 2009). Mia, Stephanie, and Mary all share that they frequency consider adverse indoor air quality. Below is an example of the context in which these thoughts occur.

> This doesn't sound like very much, but probably like 20 minutes a day, are like, thoughts about the air [laughs] and the building. Um, but, but when I'm there, like, when I was there setting up for the school year, it's like, the whole time I'm there because it's all I can think about, or I see how it's affecting my things. And there's no kids around to manage and to take my thoughts [laughs] during a typical school day. Yeah, probably 20 minutes. But if I'm just there working, and I'm noticing things, like multiple hours. (Mia)

The Physical Cost and Toll of Hostile Place

Some of the teachers felt they have made personal sacrifices for their job. Mia shares how she has been through two pregnancies while occupying a building that she believes to be harmful to her health, and Kate speaks to the sacrifices of not being available for her children because of the illnesses she attributes to her school building. Whereas Amy empathizes with the sacrifices her students are making with their own health. Bryce shares detailed causal complication due to medical interventions:

> It's really difficult because that obviously that makes your mucous membranes really dry. And I get sinus infections. And even though it... I've been at home, I haven't been at school, I just got over a sinus infection. I had just had 10 days of antibiotics, really strong antibiotics. Um, and I also had to take something for yeast infection then, and I felt horrible. I had diarrhea, [laughs] for...this is TMI, but I had diarrhea for like 10 days. And that is what happens if... well, for example, the humidity in that classroom is so low that everything is drying out and I can't breathe. Um, I don't feel well because there's no humidity in the air. Um, my skin gets so dry that it will crack and bleed. So, I have to have, um... what's called?…well, moisturizer, and then Aquaphor on top of that. I wear actual fingerless gloves... to put the [laughs] moisture in the top of my hand because they will literally be bleeding.... Um, [pauses] yeah. So that's like, so that's the dryness of the air. [hygrometer read 16% humidity] (Bryce)

The Dripping Point

Indoor air quality was not the only agent found to be associated with place detachment, as initially discovered in Phase I. Cleanliness of surfaces and the quality of drinking water were also found to be significant indicators of negative place attachment. Mike said that the condition of the school building and his concerns regarding the indoor environmental quality were a major factor in his decision to leave that school district, which is indicative of place detachment.

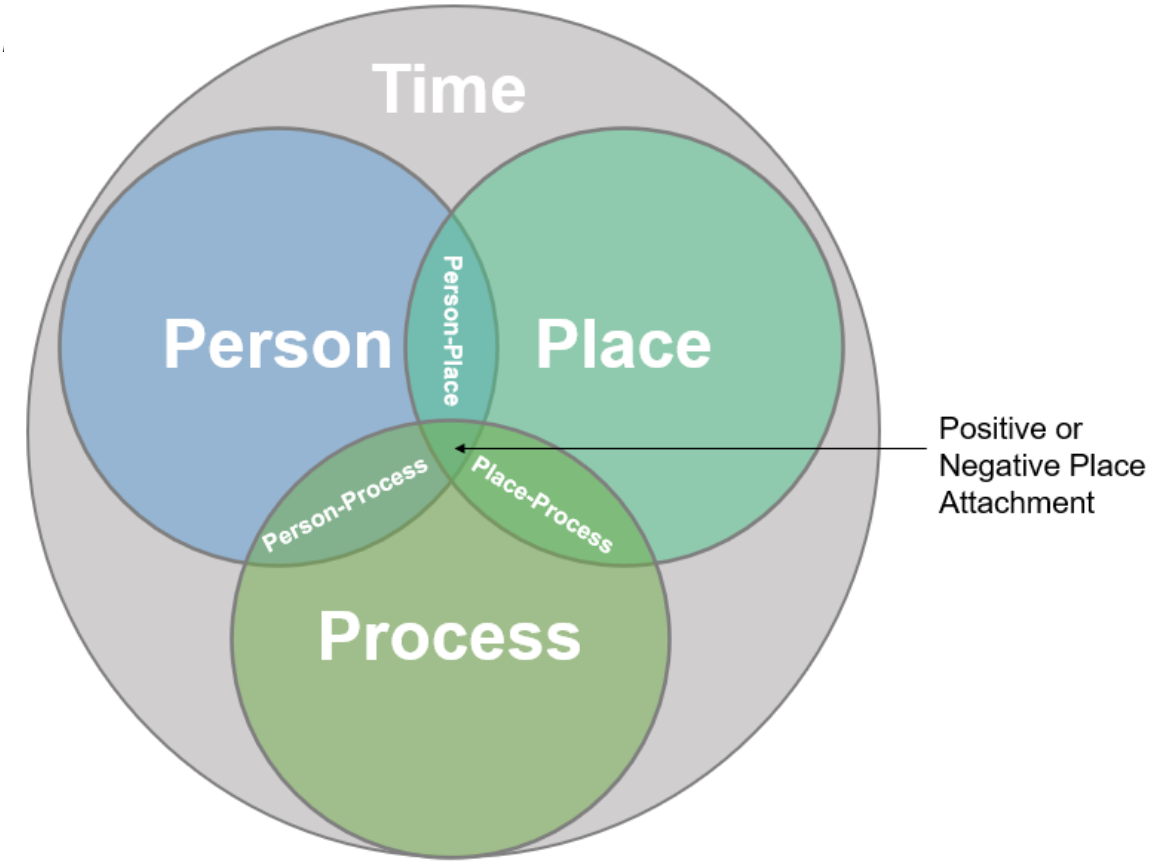
> And what I remember, I had one of my coworkers, there's like, in the teachers' lounge, there was a faucet, and it had a sign on it that said like "Do not drink this water, like lead pipes. This water's not safe." And one of my coworkers was like yeah, I've been here 10 years and I've been drinking from that. And then a few years ago, they just put this sign up and said that this is not safe to drink. And it was things like that that made me feel like, "Oh my gosh, this like this building maybe like physically damaging for me to... teach in" and like being in it, it just felt like, um, that deferred maintenance built up so much that it was borderline dangerous. It just felt, I mean, the age of it just didn't feel like a safe place to be in for a long time, for years and years, and I was not going to stick around. I do know that they did do a referendum and that they did add some additions to their building. They did some expanding, whether that was also some renovations and like HVAC stuff, or some of those lower-level rooms? I don't know. But I do know that they did, they have updated it, probably for

the first time, you know, in 30 or 40 years, but they did add an update. So that's good. (Mike)

The Complexity of Overlapping Constructs

Place attachment is a multifaceted concept conducted across space and time (see Figure 17). The most frequent and compelling characteristics and sources of knowledge will be discussed together as it was found that the participant's unique meaning of place is too complex and contextually specific to isolate.

Figure 17



Note. By author

Person-place

Compromised indoor air has been linked to various symptoms and illnesses. The respiratory system is frequently the target of indoor air pollutants and the existence of chronic inhalation of irritants can cause reoccurring infections and pulmonary diseases (Tran et al., 2020). According to the EPA (2021b), the biggest environmental asthma triggers commonly found in school buildings are cockroaches and other pests and mold resulting from excess moisture. Alyssa and Kate describe the medical interventions they experience and how the toxic IEQ/IAQ in the school building caused morbidity.

> When I was in my old classroom, they were definitely… I, every winter, would end up on prednisone or something, with bronchitis or something. And they always said it had to do with the air quality in our building and being an older building… and with the asbestos and everything else in the building….ugh. (Alyssa)

Not only is there a heightened interaction between the physical person and space, but there is also actually an identifiable link between the decline in one interviewee's health and the occupation of a classroom.

> I never had asthma in my whole life. I was a very healthy person until I started working for [a Midwest town] area public schools. I developed asthma, I had to have two major sinus surgeries… And they found mold in my sinuses that was attributed to the classroom that I was in. (Kate)

Person-process

According to the Pew Research Center, Americans believe their safety at work is more important than ever since the onset of the pandemic (Parker et al., 2020). The Occupational Safety and Health Administration has laws to ensure that employers provide a safe workplace to protect employees from risk or harm (OSHA, 2022). However, in a study undertaken by an emergency communications company, only 55% believe their employer has tried to ensure their safety in recent years, and 58% said they would reconsider their employment if their employer failed to communicate effectively about dangers (Yarbrough, 2022). The process that a person goes through to understand environmental risks can be generalized as identifying any hazards, describing the harm they may cause, identifying where the hazards are coming from, evaluating the risk of occurrence, identifying precautions, and often documenting, if advised (EPA, 2021c). One's cultural worldviews, demographics, and experiences shape risk perception (Zeng et al., 2020). Bryce expresses the process undertaken after an event:

> I think I just said, like, [pauses] "You know, I'm concerned about this... this water damage and the carpeting and, you know, is the asbestos... if there is asbestos in the ceiling, and it's coming out of the ceiling..." I took pictures. I probably even have the email still, so I could probably send it to you. I took pictures on my phone of the damage in the ceiling. And I said that, you know, like, what's going to be done about this? Like, I'm concerned about this. Can somebody tell me? [pauses] Are there risks

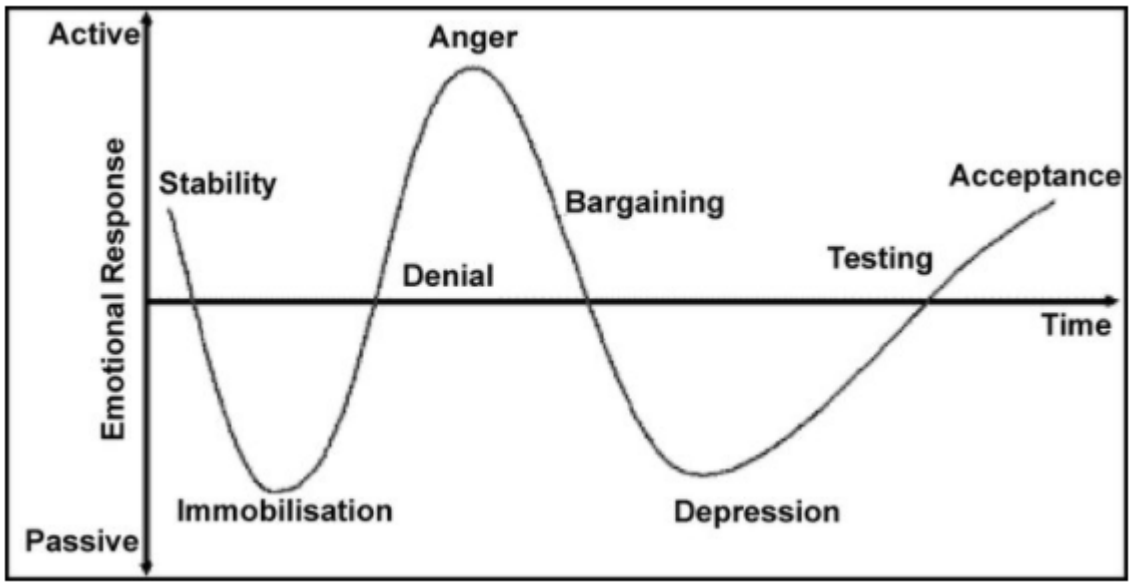
here? Because I'm in this room eight hours a day [laughs]. And then [deepens voice] "Oh, no, we're, we're working on it, you know, we're gonna fix it, we're gonna..." but never really answering my question. (Bryce)

Grieving. Kubler-Ross established the initial model of grief where individuals go back and forth among stages, and the stages can occur simultaneously (see Figure 18). An important disclaimer was noted, however, that grieving is temporal, and will be experienced as one's own life story unfolds (Kübler-Ross, 1976). In an article focusing on strategic change in management, Leybourne summarizes the words of Kubler-Ross's pivotal diagram and initiates a dialogue with Corr (1992), whose work focused on coping during this transitionary period (Leybourne, 2016). Corr (1992) suggests that each person's pathway through illness is determined by factors such as the specific disease and its course, personality, and available support, which was expressed by the participants in this study as noted in the themes.

The younger the teacher was, and the less they had been teaching, their narratives fell squarely within denial, one of the earliest stages of grief. The longer teachers were in the profession and physically in school buildings during their career, the stories progressed from denial to anger, then to bargaining, depression, and then to acceptance, or if unwilling to continue, they think about exit.

Figure 18

The Cycle of Grief, Created by Kubler-Ross (1979), Redrawn by Leyborune



From “Emotionally sustainable change: two frameworks to assist with transition,” by Leybourne, S.A. 2016, *International Journal of Strategic Change Management*, *7*(1), 23-42, Section 3, Figure 2 (https://doi.org/10.1002/pmj.21306).

Apathy. Apathy is a common feeling when grieving, as feeling disinterested, lacking motivation, or perhaps even feeling hopeless or numb, and is only a concern when it is excessive, all-consuming, or interferes with daily living (Chong, 2020). The teachers in this study had different experiences of feeling apathy but had unique reasons. Jessica generalizes the apathetic feelings of “seasoned staff,” whereas Kate expressed fatigue of dealing with “drama.” Julia shares a story that she heard about a teacher who resigned, and this experience of a fellow teacher provides enough weight that Julia says she would

not seek help from the superintendent if in a similar situation. Patricia shares how she is fatalistic about her unsatisfactory classroom.

> It's just frustration and to the point of despondency, sometimes knowing that it's just going to be that way until the new building is built. You know, I'm, it makes me less enthusiastic about the school year. It makes me less enthusiastic about getting to school. I mean, I'm a teacher that... when I taught elementary school by contrast, and granted, I was in my 20s, but I had a big, bright classroom with a whole row of South windows and a bunch of plants and, you know, um, was really well set up to use my classroom to.... and I couldn't spend enough time there, I was there at six in the morning, I was there on Saturdays I was, you know, now I bring as much stuff home as I can to work here, because I just want to get out of my classroom. I think I just adopted kind of a fatalistic attitude knowing that, because the new buildings being built, I'd be fighting harder for changes in my classroom. (Patricia)

Place-process

The knowledge of the age of the school building, and that there haven't been any renovations, has set the foundation for suspicions about hazards, especially regarding the imperceptible. Here, Kate narrates the process she was undergoing to determine if her classroom was safe to enter, or what type of remediation is effective. She is suspicious of the physical place because of the old walls, witnessing the removal of asbestos in nearby classrooms, and lack of reaffirming information from the administration.

That's a very old part of the building that nothing's been redone down there. Um, and then, like I said, there's certain classrooms that still have the old carpet. And, just because they change the carpet in these rooms, I don't necessarily know if that really makes them much more healthy. I mean, I don't know what's in the walls and the ceilings? …Last summer, I went to school, like, this time of year, and I couldn't get into my classroom, and it was blocked off because they were removing asbestos from one of the rooms nearby me... So, I honestly don't know if there's any place in there that's extremely healthy? The building's old, I think... there's probably a lot that could be done to help it out. (Kate)

Physical Environmental Features, Social Relationships at Work, and Personality Attributes of the Individual. The environmental features of the school building, combined with the legacy stories of the building, enhance the anxiety that teachers may feel. As many teachers have children that attend the same school district they teach in, the need to protect their families raises the stakes of risk perception and protective behavior. Stephanie cites a long list of morbidities associated with the school building. She questions the associations and anticipates long-term health hazards.

A lot of people were sick at that school, I know a lot of teachers that had breast cancer, lung issues, I know of several students who have had leukemia, one student who died, and I don't know if it's all related to the school, but you just wonder when all these things happen in these old buildings, if there's not something that I'm breathing, or that my kids are

> breathing in, because all my kids go to these schools, too, um, that's gonna affect them long term or something that cancer, that's gonna come up because of... asbestos or different things, mold and all this gross stuff in the building. So that, yeah, that does scare me. (Stephanie)

Individual Health Issues, Cognitive Processes, and Social Relationships. Mia describes her experience with physical ailments and the comfort she receives by knowing others have similar issues:

> Through normal conversation, like, "Oh, I've had this runny nose for a couple of weeks," and I'm like, "Oh, my gosh, I've had the same thing." And it magically gets better when we're not here. Um, not everybody, but there's like a wing of our building that is worse than other parts. And I think it all kind of stemmed originally from like coming back one year after they shampooed the carpets, and it was really humid and there were no dehumidifiers. And some of the classrooms had mold, like on everything. And so, then it just like, got us all talking and which rooms had it, which rooms didn't, um, is... just wiping it off really doing anything? Why is this happening? (Mia)

Summary of Phase II

In the qualitative analysis of both interviews and open-ended survey questions, Phase II focused on identifying themes that expressed the experiences of teachers who perceived toxic IEQ/IAQ in their school building and what that means to them. The teachers explained how they were concerned about toxic IEQ/IAQ even before the pandemic, and because of the Coronavirus,

they have more stress and anxiety. Both survey and interview participants described places that they deem to be healthy and unhealthy in terms of IAQ in their school buildings. Many of the participants deem the school building itself to be hostile and share experiences and knowledge of how their perceptions have been constructed both individually and socially. The themes can be categorized by opinions, feelings, knowledge, and experiences.

By determining the relationships between the teachers' perceived IAQ and how they feel about their school buildings (including satisfaction), the results of Phase II depict place detachment through all constructs of person, process, and place.

The overlapping of emotions, behavior, cognition, and the general constructs of person and place are what make predicting place attachment so complex. Grieving, apathy, nostalgia, expertise, and concerns about the effects on health are found at the junction of place and process. Physical environmental features, social relationships at work, and the specific attributes of the individual are found at the intersection of person, place, and process. By considering these multi-faceted elements in relation to each other, larger themes emerged that can be useful for identifying patterns that indicate the importance of positive place attachment to workplace retention.

The tables of themes as presented in this chapter represent the semantic and latent thematic analysis to go beyond what was said by the participants (Braun & Clarke, 2006), to "interpret, explain, and to identify the underlying ideas" of what it means to occupy a school building that is perceived to have adverse

indoor air quality. As a process of detachment from the school building, the teachers may start by becoming aware of the toxic IEQ/IAQ, and over time, go through the stages of mistrust in their administration, and concurrently go through various stages of grief. The teachers that have been at the building the longest appear to be in the stage of apathy or acceptance.

The teachers noted that the age of the building and the condition the building and building components appear to be in are factors in determining their perception of risk or danger. The sensory experiences of smell, followed by sight, and what they hear from their colleagues or through hearsay contribute to their knowledge of toxic IEQ/IAQ.

Phase III – Integration

Integration in data analysis conveys how the analysis of both types of data connect with each other in mixed methods research (Onwuegbuzie & Johnson, 2006). The data was integrated in several ways during analysis: through "intramethod analytics" by analyzing each type of data within the respective qualitative and quantitative methods, like how in this sequential study the quantitative survey findings informed the criterion of participant selection (O'Cathain et al., 2010); "core merging analytics" (considering linkages, contrasts, and interpretations across the databases; Fetters & Molina-Azorin, 2017); and how the analysis from the Phase I survey confirmed the hypothesis and informed the coding of Phase II interviews.

The Building and Renovation History of the School Buildings in This Study

The demographic information from each of the school buildings was obtained to compare with the issues that the teachers spoke of in the survey and interviews. The average age of the buildings in these four districts is 57 years, which is slightly better than the national average age of 63. Thirteen of the school buildings are under 40 years of age, the age at which the EPA suggests that school buildings should function properly (EPA, 2021b). Twelve buildings are between 50 and 70 years of age. Eight are between 70 and 100 years, and two are over 100 years of age.

School Building Renovation

As Table 15 below shows, elementary schools are some of the oldest schools. Elementary schools house fewer students than middle schools or high schools. The state under this research has an average number of 430 students per elementary school, with an ideal classroom size of 15.50 students per class (National Center For Education Statistics, 2012). Middle schools' range by population served, as the largest in this state houses 2,140, the average is 900, and the smallest is 476. The largest public high school in this state has 3,340 students, with the state average of 1,000 students. The total number of public schools in this state is 2,283, with 932 high schools, 870 middle schools, and 1,448 elementary schools (Review, 2022).

The news articles corroborate the information that the teachers have claimed through their experiences in this study. Eight articles regarding District 4, explaining the plans of the school board for renovations or modifications to HVAC, were published after the teachers' interviews in August 2021 until the

writing of this dissertation. The articles were approximately weekly, with headings such as: School Board appoints new Task Force (Retter, 2021a), Board approves geothermal system (Winona Area Public Schools, 2021), Board considers $15M HVAC upgrade (Retter, 2021b), Board needs $63M and new referendum (Retter, 2021c). Only one of the articles was written and published by the School Board, as listed on the school website. The newspaper is the main vehicle for transmitting school board news; however, what would be interesting for further study would be the stance the editor and journalists have regarding the tone of such issues and concerns and the success of the projects.

Table 15

School Building Age by District

District	School building	Year built	Age of building as of 2022
1	Elem. School A	1955	67
	Elem. School B	1955	67
	Elem. School C	1936	86
	Elem. School D	1936	86
	Elem. School E	1952	70
	Elem. School F	1955	67
	High School A	1989	33
	Learning Center A	2003	19
	Middle School A	2004	18
	Services Building	1929	93
2	Elem. School A	1929	93
	Elem. School B	1952	70
	Elem. School C	1992	30
	Elem. School D	1957	65
	Elem. School E	1892	130
	Elem. School F	not found	-
	Elem. School G	1919	103
	Elem. School H	2010	12
	Elem. School I	1994	28
	High School A	1926	96
	High School B	1926	96
	Middle School A	2011	11
	Middle School B	1957	65
3	Elem. School A	2016	6
	Elem. School B	1957	65
	Elem. School C	2003	19
	High School A	1957	65
	High School A	1967	55
	Learning Center A	2013	9
	Middle School A	2002	20
4	Elem. School A	1971	51
	Elem. School B	1938	84
	Elem. School C	1934	88
	High School A	1967	55
	Learning Center A	1985	37
	Middle School A	2000	22

'*If the building was renovated in portions, the earliest year was used.

What is noteworthy is that District 2 last had a major renovation and erected new buildings in 2011. Per the query to locate news articles and school board minutes, only 6 containing the keywords HVAC, remodel, or of similar topic to this study were located. Three of the news articles were “Readers’ views” as published in the local newspaper, one was a school board meeting minutes document, and two were news articles. From the survey data collected, few teachers in that school complained about their school building, and if they did, it was for the portion of the building that was un-remodeled or had a light renovation. Those in new buildings reported being happy and satisfied with their buildings, and the lack of news stories and school board meeting minutes on the topic of HVAC problems reflect the teachers’ outlook.

District 1 is currently at the end of a major overhaul of many of their school buildings. The teachers from this district also reported favorably with the renovations that had been completed or had hoped that the remodeled or new spaces would address their HVAC concerns. District 3 is also under contract for remodeling or renovating buildings; however, the new high school building is three years from completion. The news articles from District 3 area tell the story of concerned teachers in years past, but recent articles are crafted with a hopeful tone. District 4 has undergone several referendums over the recent years to address failing HVAC systems and chronic health problems expressed by teachers, students, and staff, and at the time of the interviews (August 2021), the referendum was to be addressed again by the constituency, but the teachers interviewed were fatalistic. Over the winter, it was announced that many of the

worst schools would be renovated, as a referendum was passed, and some buildings are under consideration to be razed, drawing another continuous debate. The news articles associated with the plan for District 4 have been brief, but hopeful that the public will stand behind the plans, and some teachers have written editorials in the newspaper to express their concerns and support of the referendum. It was noted, however, that some on the school board are not in favor of investing in the infrastructure as was noted by one member when asked by the journalist (Larson, 2016):

> Journalist: Do you support the district's estimated $74.5 million (excluding a field house at the ALC) facility plan? Why or why not?
>
> School Board Member: No. By 2010 the Twins had spent millions on a state-of-the-art stadium. They still have been fielding a losing team. New buildings don't equal guaranteed success. The focus should be on what is being learned, not on building something new so we can show it off.

The issue of paying for school buildings with taxpayer funds via referendums (in the Midwest, this is done with property taxes) has not been a popular strategy with taxpayers in the Midwest (Levy, 2013; MPR News, 2018). According to the Twin Cities Pioneer Press (Magan, 2019), the Midwest spends more than $13 billion a year on public schools. About 95% of that comes from state and local taxpayers, and local property taxes raise another 30%, which is approximately $3 billion annually.

The state legislature of this Midwestern state decreed that property taxes levied by the school boards governing the school districts are the primary source

of revenue for running schools. In a 2019 report called “Financing the Midwest Education,” it was noted that 71% of the funding comes from the General Education Program “Basic” fund, 10% via referendum revenue, 4% local optional funds, 7% “Compensatory,” and the remainder from a variety of other sources (the [state] House of Representatives, 2019). The concerns of the teachers might not be fully understood by taxpayers or financially strapped property owners might not be sympathetic to the school building as a workplace. Public stakeholders as decision-makers complicate understandings of the impact of HVAC and other infrastructure on workplace engagement.

Integration of Building Satisfaction Across the Phases

To determine if a central theme was present in both Phase I and Phase II, a joint display was created using the ANOVA and Tukey analysis from Phase I and the themes from Phase II that emerged. A joint display is the presentation of qualitative and quantitative data to illustrate the integrated findings and meta-inferences (Fetters et al., 2013; Guetterman et al., 2015) to efficiently compare results from different datasets (Fetters & Molina-Azorin, 2017).

Figure 19 was inspired by the Pillar Integration Process (PIP), a type of joint display used in a mixed-methods study design to narrow a particular issue to explore across the data. A PIP is completed in four steps, beginning at the onset of the study design (Johnson et al., 2017), but in this study, it was used for a display of integration. The mixed-methods study design used for this research was “Following a thread” (Moran-Ellis et al., 2006). This type of analytical technique is a multistage technique where the primary analysis of all aspects are

used within a study to identify any themes that could be explored further (O'Cathain et al., 2010). After one main issue is identified, it is followed across the other data groups within the study and from there the thread is created (Dupin & Borglin, 2020).

The participant's sense of place was found to be heavily sensory-perceptual, a combination of what they see, hear, and experience. The physical observations of the building deteriorating, or knowledge about the year in which the building was constructed, along with socially obtained hearsay, contribute to the perception teachers have of the IAQ in the building. Teachers who have first-hand knowledge of an issue that is directly related to IAQ remember details of the event, such as what objects looked like, smelled like, and how they felt physically and mentally, but only generally recall the time frame to a year or so. These experiences stay in their memory to be used as a comparison of their current IAQ going forward. The interview data confirms the results from Phase I, which was the more the teacher expresses health concerns about their adverse physical environment, the more the attachment skews negative.

A joint display of building experiences with physical attributes and the association with teacher's perceptions of toxic IEQ/IAQ and place attachment is shown in Figure 19. The constructs in bold are significant at p <.05, and the large effect size means that this research finding has practical significance as the difference between the groups is meaningful. Indoor air quality, generally, is the most notable regarding negative place attachment, with $F(3,206) = 7.437$, $p < .001$, $\eta_p^2 = .202$ followed by air-borne pathogens at $F(3,130) = 7.097$, $p < .001$,

η_p^2 = .141. The other constructs ranked by order of effect at .05 are quality of drinking water, *F*(3,123) = 7.437, p <.001, η_p^2 = .154, cleanliness of floors and surfaces, *F*(3,124) = 9.273, p <.001, η_p^2 = .183 and noise levels at *F*(3,124) = 6.332, p <.001, η_p^2 = .133.

To complement the Pillar table in Figure 19, a Scatterplot was created that illustrates the average letter grade given by teachers in the survey regarding the IAQ in their school building (Figure 20). In buildings that have not been renovated, the grade is average or below average. Buildings that have been renovated over the years or have had partial renovations have a range of grades. The age of the building has some correlation to the letter grade assigned. One plausible reason for the variation in letter grade is that teachers tend to stay in the same room, and depending on the geo-location of that room, they may be in a corner classroom with two exterior walls, which gets too cold or too hot, or they may be located near the bus idling area, or under a roof that is leaking, or near a basement door.

The age of the building, as knowledge or observation, has an impact on the perceptions of toxic IEQ/IAQ. The grade assigned to the building can range from failing, to above average. This could be partially explained by the fact that one room may have several problems, such as two exterior walls, located directly under a leaking roof, or near the bus exhaust. While inside rooms may not have significant HVAC-related failures.

Figure 19

Pillar Joint Display

QUANTITATIVE Data		QUANTITATIVE Category	Pillar building themes	QUALITIVE Category	QUALITIVE Data
Survey Q41: Does the condition of school building ever cause you to be concerned about your health? (Significant at <.05)	Effect size (small .01, medium .06, large .14) **Eta-squared**	The lower the number, the more attached, on a scale of 1-7** **Level of place attachment**		**Theme**	**Occurance in cases**
				Building satisfaction with regard to physical place as perceptions of IAQ	
					Sensory irritation i.e. thermal comfort, eye & upper respiratory irritation (13 cases)
					Odors (13 cases)
Air quality, generally (*p* <.001)	**0.20**	**2.37**			
Pathogens (*p* <.001)	**0.14**	**2.28**			
					Physical work-arounds
					Physical building attributes, i.e., carpet, windows, surfaces (13 cases + survey responses)
Odors i.e., radon, chemicals, fragrances (*p* <.001)	0.30	2.02			
					Perceptions of healthier places (13 cases + survey responses)
Asbestos (*p* <.001)*	0.05	2.26			
					Building as hostile/unhealthy places, i.e. basements, attics, perceptions of adverse IAQ condition of roof (4 cases)
			IAQ: Senses		
Building structural conditions (*p* = 0.036)	0.05	2.24			
Crime & safety (*p* <.001)	0.17	2.26			
					Age of building
					Overcrowding
Quality of drinking water (*p* <.001)	0.15	2.27			
Carbon monoxide (*p* = .048)*	0.03	2.24			
Vehicles idling outside (*p* = .345)	0.02	2.23			
					Cleaning (dust, dirt, pest/insect sightings)
Cleanliness of floors & surfaces (*p* <.001)	0.18	2.26		Visible and tangible: unpleasantries considered unhealthy	
Pest control (*p* .037)*	0.02	2.24			
Non-working restrooms (*p* <.001)	0.12	2.24			
Noise levels (*p* <.001)	0.13	2.26	IEQ*		Accoustics

DV: Negative Place Attachment

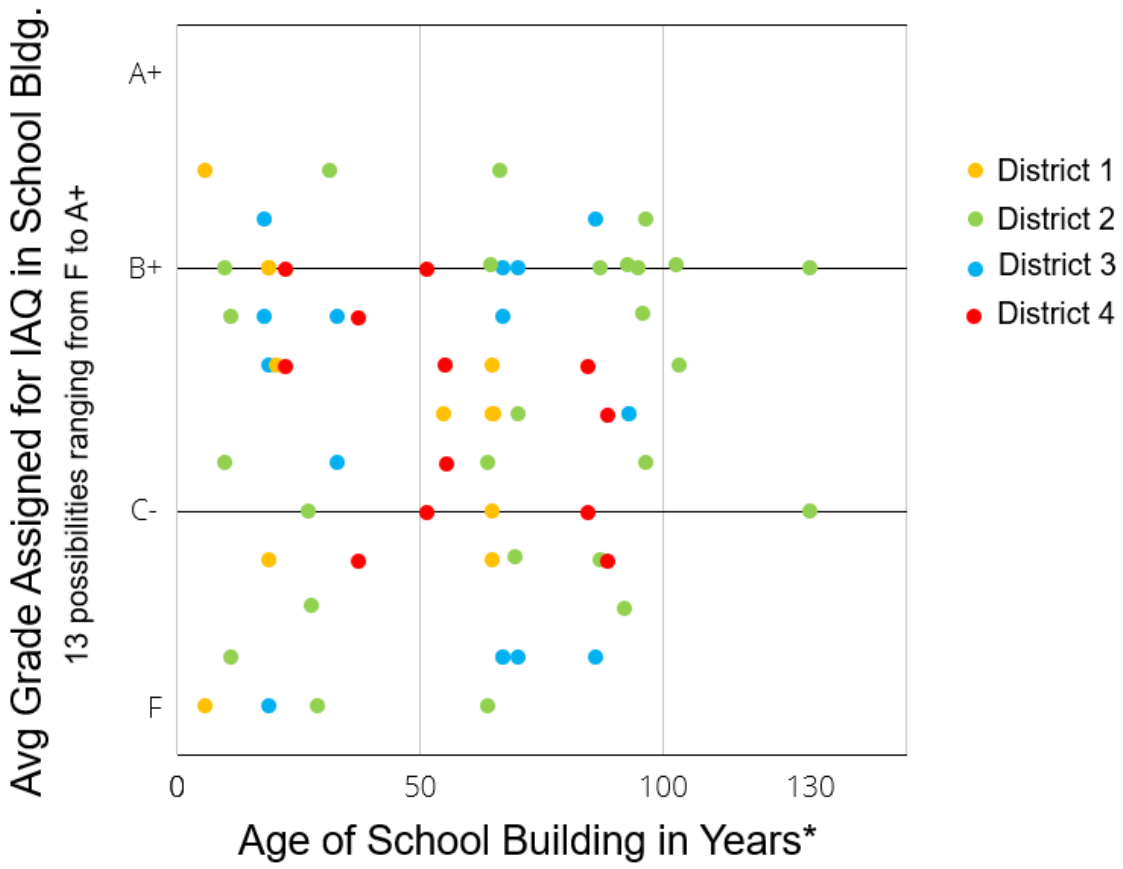
** Total Mean, over 4 groups reporting never, sometimes, always, often , One-Way ANOVA

* "Indoor Pollutants" as undetectable and intangible

Figure 20 shows the age of the school buildings by district and the satisfaction with the building as a letter grade assigned by each participant in the survey as of Spring 2021.

Figure 20

Scatterplot of Average Letter Grade for IAQ in the School Building and Age of School Building, By District



A quote by Stephanie is indicative of one teacher's experience with occupying an old building, her encounters, the ramifications, and her ideal building attributes:

> I am concerned about air quality and things in these older buildings. We have had a lot of indoor air quality issues at [her school] in the past few years. Um, like I brought up mold… so there's been a lot of mold in our basement and they've done different things, and it's so, …the building is so old, that some of that air that's from the basement is getting pushed up through the system, and we've had teachers get sick because of different things they tried to do to fix the mold issues, and different things. um, And, it's still going on… there's mold down in their playroom again this year even though it's been worked on in the last couple years. um, So, obviously all that's coming through the school, people get sick, they've got bad allergies, things that they haven't experienced before all of a sudden.... their systems are acting up, so, yeah, [laughs] we need better air quality for sure. I like hard floors and, um, surfaces that are easy to clean. Ah, also, I guess the windows right now are kind of hard to open. So, I would love to have windows that were nicer. They're really big, old windows, and…and slam down, sometimes they don't stay up.... and, I would love to have air conditioning. (Stephanie)

When the Phase II participants reflected about their experiences in the interview, they were hesitant in their answers. The lack of understanding about the technical and operating aspects of building HVAC systems, and the “why” their physical environments are the way they are, became apparent. Many teachers desired to learn more about the quality of the air they breathe and gaining more knowledge would provide some sense of security and a feeling of

being valued by administration. It was also observed in the open-ended survey questions, which allowed space for the participant to answer in their own words. A teacher in an open-ended question in the survey reflects a similar sentiment as the interview participants revealed in the themes table as “building as hostile”: “It has since been abated, but I still worry that the air quality is not good.”

This was not the only quote by a teacher speaking ill of their school building regarding indoor air, HVAC, or building-related issues. According to a semantic auto-coding by NVivo, 30 comments were considered “very negative” and 52 “moderately negative.” When manually reviewing the auto-coding, it was noted that the negative comments were coded correctly; however, NVivo missed an additional three that were worded positively and coded to “moderately positive” but were a negative situation, which totals 85 negative comments. For example, a quote about a luminaire detaching from the ceiling, “We did have a teacher that was struck on the head by a falling light fixture which is more of a safety vs health concern,” would fall under the theme in the table above as “building as hostile.” Although this specific concern was actual, and not perceptual, the teacher’s mental impression of their school building is nuanced, and as such, the survey responses might miss some of the lived reality of teachers at this exact moment in time.

Summary of Phase III

Phase III provided a synopsis of building demographic information alongside an analysis of a decade of news articles and meeting minutes for the four featured school districts regarding HVAC issues. The findings from this

integration explains the historical process that districts go through in the life cycle of HVAC and building-related issues. The PIP integration of Phases I and II showed in the joint display that the two phases are united by the central theme of IAQ senses, and that the perception of awareness of the age of the building that they are working in has a profound influence on the stigmatization that occurs with the health of the building. The teachers make judgments about their workplace, based not only on their individual perceptions of IAQ, but also through knowledge gained from their social groups and their observations about what an "old" building looks like or how it "acts."

Research on ageism with people provides insight into the reasons that lead one to view "older" in a negative way (Lyons, 2009), and these same stereotypes may explain prejudices toward older artifacts (Harold, 2020). Age discrimination can be expressed in various behaviors such as avoiding contact, making jokes, or derogatory judgements (Malinen & Johnston, 2013). It is not a far leap to say that as a modern society, it is more common to replace an object if perceived old than it is to repair it, even if it has residual value. According to www.realtor.com, the trade-off for buying old versus new is short lived, as noted by Cedric Stewart, a residential and commercial sales consultant at Keller Williams Realty in Washington, D.C., and Daniel Martin, a residential architect in the Washington, D.C. area (Booth, 2021):

> New homes should be worry-free for several years. A brand-new hot water heater, HVAC system, and roof all but ensure no major out-of-pocket expenses for at least eight to 10 years in most cases. (Stewart)

Access to newer items plays a large part in knowing that something can be replaced. For example, take the classic cars driving the streets in Cuba. For many years, Cubans were not allowed to import American cars and mechanical parts, and other manufacturers were too far away, so resourceful Cubans made do with the cars they had, and many pre-embargo cars manufactured in the 1950s are still on the street. The idea necessitating “buy new” is not new, as the field of marketing has been trying to determine what preferences make buying new become a reality. Technology has de-sensitized us to the idea of replacing an object when the benefit outweighs the cost. The concept of ageism toward buildings has not been widely studied in the literature except as noted by Jane Jacobs (1961) in “The death and life of great American cities,” when she speaks of the “plain, ordinary, low-value old buildings” (p. 187).

Findings

Finding 1: When teachers didn’t express concerns about the building issues, they had stronger attachment to their building compared to those who expressed concerns, who had negative attachment to their building.

Finding 2: Many of the participants deemed the school building itself to be hostile and shared experiences and knowledge of how their perceptions have been constructed both individually and socially.

Finding 3: Principals don’t seem to care or are intimidating.

Finding 4: The pattern of renovating or replacing a school building seems to go through a common process that takes a decade or more.

Finding 5: Physical building attributes matter when teachers make judgements about their satisfaction with their school building.

Finding 6: Teachers will take matters into their own hands.

Finding 7: Place attachment is too complex to predict through regression analysis alone.

Finding 8: While regression can't predict place detachment or negative attachment, statistical analysis can be used to identify places where it is currently occurring.

In this chapter, quantitative data have been analyzed to find significant relationships between teachers' perceptions of toxic IEQ/IAQ in their school building, negative place attachment, and place detachment. Qualitative data has shown that the older a school building is, or appears to be, the more the teacher is likely to assign a negative stigma to the building as being unhealthy. Teachers indicated that through social relationships with principles and custodians, the intimidating or invalidating way they are perceived to be treated in conversation has a detrimental effect on workplace attachment and wellbeing. The PIP comparison of these two phases of data collection alongside district-wide building information and news coverage has provided an insight into some of the ways that this data may skew based on shared experiences, as well as the ways that the results were confirmatory.

In the final chapter, I will summarize the key findings and discuss theoretical contributions, limitations of the study, and implications for practice. The chapter will end with the Conclusion to the study.

CHAPTER 5 DISCUSSION AND CONCLUSION

Organization of the Chapter

In this chapter, a brief synopsis of the research problem, purpose, and design is followed by a summary of data analysis. Findings and implications will be discussed in relationship to the research questions and their larger implications. The contributions to knowledge, limitations, future studies, and implications for practice will precede the conclusion.

Summary

Problem and Purpose

This study confronts the gap between place theory and perceived IAQ in public school buildings and links some of the psychosociological environmental relationships that forecast detachment outcomes due to the perceived IAQ in public school buildings. The purpose of this research was to determine if negative place attachment is significantly higher for teachers who perceived toxic IAQ in their school building. This explanatory sequential study investigated the social relationships from the employee perspective, focusing on teachers in public school buildings to determine if negative place attachment was being experienced and if it advanced to place detachment, which could forecast exit.

Place theory provided a framework to analyze the teachers, the physical school buildings, the perceptions of IAQ, and the process of affect, cognition, and behavior of teachers. An understanding of how teachers currently process thoughts about place detachment and what it means to occupy a workplace that is perceived to have toxic IEQ/IAQ helps designers, policy makers, building

managers, and administrators understand the severity of their issues, prompting development of more inclusive, supportive, and healthy workplaces.

This study had 242 respondents over four school districts responding to a survey. I interviewed 13 participants who voluntarily identified themselves as having negative place attachment or place detachment, and then I conducted a secondary source analysis alongside a pillar analysis of quantitative and qualitative data. As a reminder, these were the research questions:

1. **How do teachers' perceptions of toxic IEQ/IAQ in the school building relate to place attachment outcomes?**
2. **What person, process, or place variables predict teachers' negative place attachment with the school building? Do teachers' negative perceptions of IEQ/IAQ predict teachers' feelings of negative place attachment and/or place?**
3. **What are the differences between teachers who experience negative place attachment and teachers who have place detachment?**

Findings

The perceived adverse indoor air quality by teachers in the school building as a workplace was found to impact the physical and mental health of teachers, with place detachment as an outcome. This is important because the risk for teachers leaving the workplace is at a record high number and school districts are unable to fill vacancies (Reilly, 2021). The teachers who decide to stay may use sick days to the maximum allowed, and chronic absenteeism is viewed as an indicator or poor individual performance and has detrimental effects on student

performance. Teachers who are suffering from physical or mental ailments do not perform adequately.

Following the tripartite model of place (Figure 6) from Chapter 1, this study contributes to the literature on place detachment and perceived indoor air quality in the school building in several ways. The relationship between place detachment and behavior was found not to be linear or segmented as shown in the tripartite model by Scannell and Gifford, so a new model was created to illustrate the findings from this study as shown in Chapter 4. This illustration depicts the three constructs of PPP as complex, overlapping intersections experienced by the participants over time. Time is a dimensional construct composed of the past, the present, and the future. The proportion of positive and negative place attachment is specific to the individual, and the narratives expressed in this study tell of the tipping points.

Teachers who are experiencing perceptions of toxic IEQ/IAQ and are in various stages of negative place attachment or have expressed signs of severed attachment are much akin to a separation and divorce in a marriage where dissolution is a process. Teachers have noted that social relationships at work, and physical environmental features, along with their individual health issues, greatly affect their well-being and productivity. Regarding the physical attributes of buildings, teachers' judgements about the windows, flooring, temperature, and humidity matter when it comes to building satisfaction. Control and taking matters into their own hands was a theme, as every teacher expressed their own way of advocating for themselves to better their situation. Teachers may go through the

stages of grief, including the stages of mistrust with their administration. Some teachers note that they would rather not work in their current workplace, or even wish the building, if aged and stigmatized, would be razed.

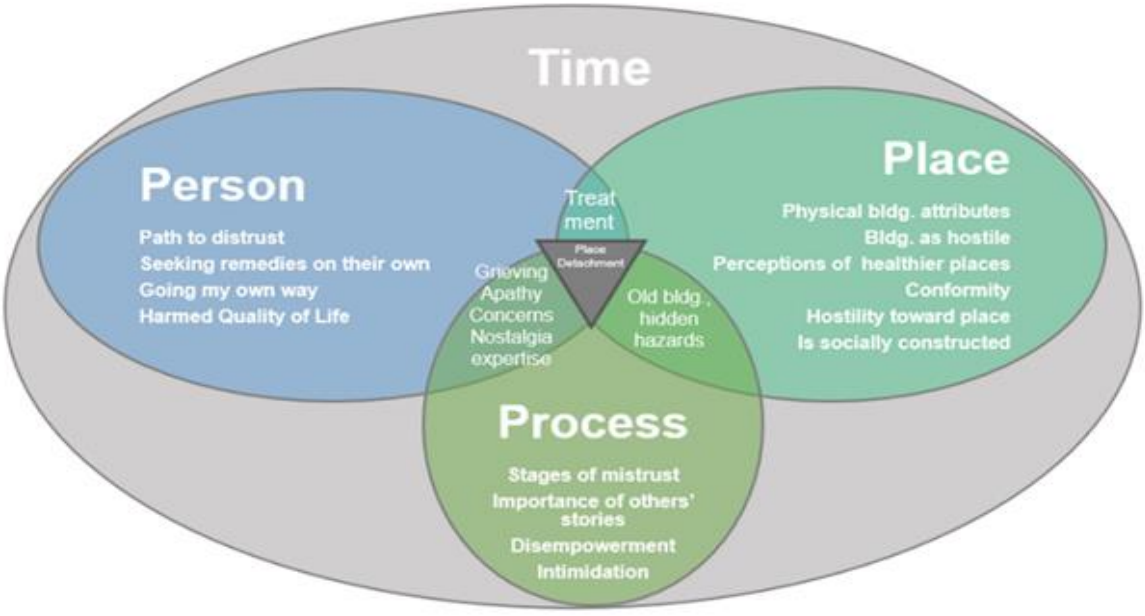
Because of the overlapping of constructs, over the phenomenon of time, the identification of IAQ to be an actor in the constructed meaning of perceptions of toxic IEQ/IAQ, and place detachment, a new model was created.

Two Models to Illustrate Place Detachment

To tie the new model of place detachment to the epidemiologic literature, the two models of PPP and the epidemiologic triad were joined with the overlapping of environment (school building) and host (teacher) to introduce the agent to the PPP model and process to the epidemiologic triad. This model expresses the point at which teachers have severed feelings of attachment.

Figure 21

Individual Phenomenological Model of Place Detachment Based on Change and Process

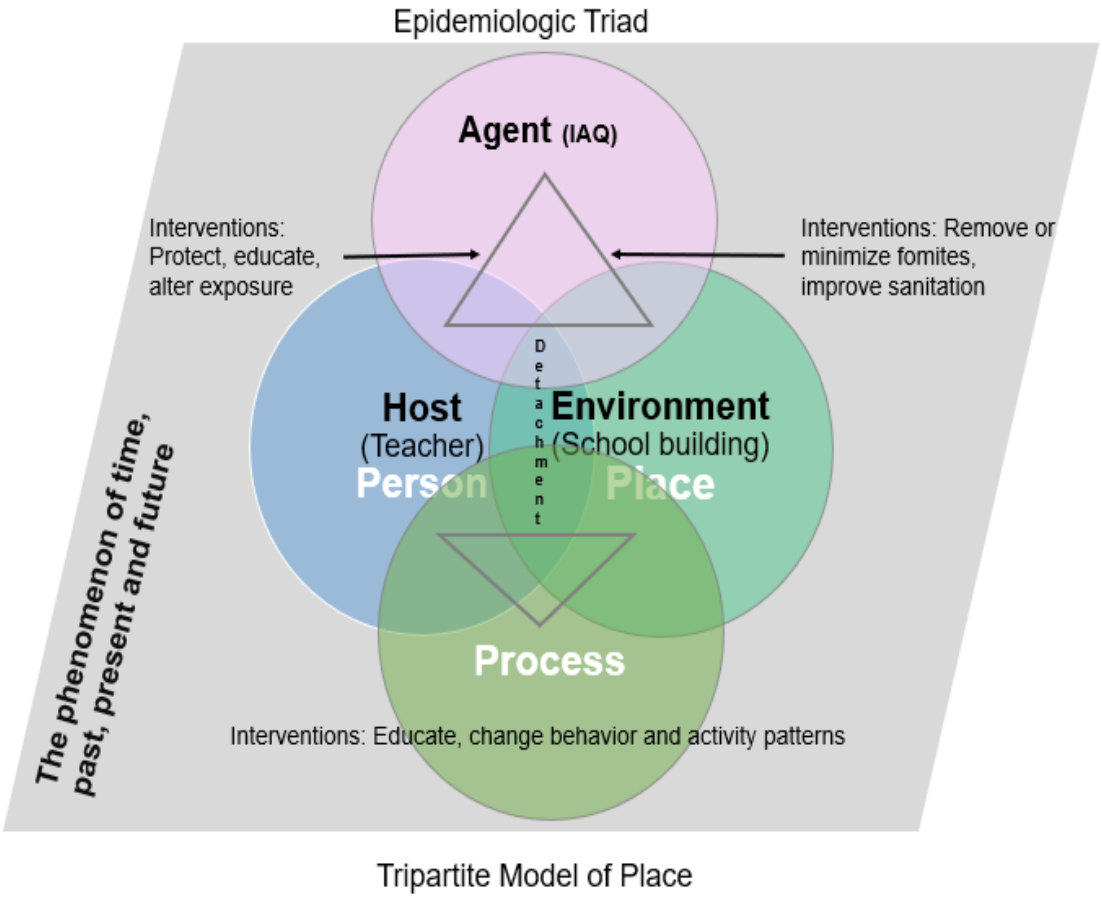


Note. By author

The epidemiological triad is relevant as a method for identifying interventions and can be useful to help determine the causal relationship with the agent. By marrying the two diagrams together, I highlight the different types of interventions an institution can take. These interventions can be targeted toward the intersection of the environment, and agent (IAQ) or between the host and the agent. Without intervention, the environment and the host detach as seen below.

Figure 22

Epidemiological Based Interventions for the Institution



When hazardous occupational health situations related to the physical building are experienced or constructed, teachers implement coping strategies,

seek support, and entertain thoughts of leaving or quitting, but many choose not to in what Sheridan et al. (2019) call “reluctant stayer.” These are employees who desire to leave, but for a variety of reasons, don’t. Here is where the teacher still has an attachment for the building and depends on it for income or another important reason. Teachers may openly discuss their negative attachment feelings or dissatisfaction with certain attributes. School buildings have become stigmatized due to the stories re-told through generations of teachers. The building's age, unkept appearance, and visible evidence of hazards are part of their perception of the healthiness of the workplace. The passage of time is important in the discussion of the complexities in their perception of toxic IEQ/IAQ and psychological and physical place detachment. Teachers may experience one-time events that are traumatizing, such as water damage in their classroom, which forms a quick perception of their workplace and initiates the process of place detachment, which happens in stages, like the process of individuals moving from instability to divorce in marriage (Booth et al., 1985). The accumulation of additional information or hearing of others’ stories add to their meaning of what it means to occupy a space that is perceived to have toxic IEQ/IAQ. Teachers who have determined their building is hostile toward their health begin the stages of grief, as noted by a study examining COVID-19, mental health, and grief (Valliani & Mughal, 2022). Grief is a usual reaction to the loss of life or a radical change in lifestyle during a distressing event, and common grief reactions include shock, disbelief or denial, anxiety, distress, anger, periods of sadness, or loss of sleep, and loss of appetite (CDC, 2021). The stages of

grief according to the Kubler-Ross model are disbelief, yearning, anger, depression, and acceptance (Maciejewski et al., 2007). These were all themes that emerged in Phase II. It is important to note that this study did not assist in the diagnosis of grief, nor discuss this with the participants, as the role of a health care provider would need to differentiate grief from pathological conditions. The grieving process can take months or years and is a powerful tool for reflection, self-realization, and to enhance compassion for self and others (Valliani & Mughal, 2022).

In determining if their workplace is unsuitable enough to leave, or has a mixture of good and bad qualities, teachers may weigh the advantages and disadvantages of their school building to a place they think may exist, or one they have become aware of. Mendoza (2009), in researching Mexican immigrants, compared the negative feelings about Mexico (low-wages, poverty, discomfort) with the positive aspects, such as family, friends, and solidarity. For those people that did immigrate, the negative feelings outweighed the positive ones, in what he described as “sense-of-place balance.”

Once the participants decided their physical workplace environment was hostile toward their health, they yearned for validation from their employer that their situation is important and worthy of consideration and remedy. If the complaints and negotiations to prove their detrimental experience(s) were not met, the teachers felt unvalued, distrustful of their employer, intimidated, or disempowered by bureaucracy. At this stage, futility and apathy set in, followed by acceptance. It is important to note that the 13 teachers who were interviewed

were at different stages of their life and career. Those teachers who were younger or had taught for less than five years were more hopeful and trusting than those teachers who were in early mid-life and mid-career. One teacher who is now tenured expressed relief that she did not have to conceal her opinions about her dissatisfaction with the school building.

Teachers' desire to be heard and concerns validated from principals was clear in the interviews. Hauserman and Stick (2013) found that the transformational leadership style of principals was critical for teacher success. Characteristics desired in principals include maintaining and creating visibility, developing rapport, showing consistent fairness, and making ethical decisions. Teachers praised individual behaviors such as collaboration, listening and caring, and intellectual consideration such as explaining decisions, trusting staff, being a proactive problem solver, and providing creative solutions. Regarding workplace attachment as operationalized in this study, the Hauserman and Stick (2013) study found that teachers who work with principals evidencing low levels of transformational qualities were frustrated with the behaviors of their principals, which had negative implications for the school's culture. Studies have concluded that empowerment has an encouraging impact on teachers' organizational behaviors (Calibayan, 2015; Shah & Abualrob, 2012), and teacher empowerment can lead to positive organizational behavior and can play an important role in organizational success and stability (Bogler & Somech, 2004). How a principal responds, and addresses a teacher's concerns has a profound impact on teacher well-being. If a principle is dismissive, invalidates the teacher's emotions, or is

intimidating, the teacher may retreat and proceed through the stages of mistrust or grief. This could lead to thoughts of place detachment and eventual exit. If a teacher is absent for any period that students expect the teacher to be present, the student is negatively impacted (Woods & Montagno, 1997).

Teachers are the most significant school-based contribution toward student learning (Bullough Jr., 2005). Empirical research shows that teachers impact a range of student outcomes beyond test scores, including student absences (Gershenson, 2016), suspension rates (Backes & Hansen, 2018), noncognitive skills (Jackson, 2018), and going to college (Chetty et al., 2014). Before the pandemic, nearly 29% of teachers were considered chronically absent (missing 10 or more school days) a year, and nationally, teachers in traditional public schools are almost three times as likely to be chronically absent as teachers in charter schools (Griffith, 2017).

Teacher retention is a high priority of school districts. A poll taken by the National Education Association in January 2022 indicates that 55% of teachers will leave teaching sooner than they had originally planned because of covering for absent colleagues, covering for unfilled positions, and undue stress (National Education Association, 2022). According to the professional journal for educators, teachers have become demoralized, not just “burned-out,” as the participants in this study expressed (Santoro, 2019). IAQ impacts demoralization as well as several sick days and place detachment; therefore, the findings from this study reflect the need to invest in at least superficial repairs and upgrades that are perceptible.

Administrators, school boards, and building engineers should meet the need for safety, as defined by Maslow, which is the need to be safe from physical and psychological harm (Maslow et al., 1987). As with physiological and physical need for a safe place to live, a basic need, the importance of a safe place to work and the recognition that a sense of security is needed regarding an employee's health (both physical and mental) should be a priority of any employer. A pre-pandemic study found associations between attachment theory and the costly organizational phenomena of voluntary turnover (Tziner et al., 2014). This study found that those who reported poor IAQ and/or place detachment felt that their needs for safety were being entirely disregarded.

Subjective assessments of IAQ are the primary means to assess the environmental condition of school buildings. Objective building-level air quality data is not available for the buildings in this study. The State of the Midwest does not have a comprehensive state-wide building evaluation, and instead places the responsibility on each school district and with approval of the [state] Department of Education Commissioner. Obtaining this information would have allowed the researchers to identify schools with good versus poor IAQ; the study relies on building user reports of environmental conditions to stratify teachers into distinct categories for IAQ perceptions (e.g., favorable versus unfavorable perceptions of IAQ) (the [state] Department of Children, 2003). One way to collect data that doesn't cost much is to use an employee survey or reporting system. It takes just a few teachers to report ill health because of a building-related issue to act as a bellwether. If a situation does not garner attention or proper respect from

administration, it could lead to a public relations disaster, which causes the district more than the cost to make building changes.

A healthier building, on average, leads to a healthier employee and lower absenteeism (Palacios et al., 2020), connecting indoor air quality and an employee's health, well-being, job satisfaction, and productivity. The research confirms there is a financial justification for specifying these features (Sadikin et al., 2021), and this study provides an initial model for designing a wider distributed set of assessments.

The teachers use tangible and intangible information about the school building to identify problems and assign blame; however, they use information about the actions (or inactions) of administration or building engineers to attribute responsibility. In judging the health of the indoor physical work environment, the teachers use their work-related social networks and their own constructed knowledge. Daily decisions regarding self-preservation, quality of life, and health are done in the presence of multiple, complex, and sometimes conflicting criteria. The influence of social relationships, family, and healthcare providers influence the cognizance of symptoms and their perception of the cause.

To illustrate the complexity of this study's findings, models were created to organize the constructs. These models assisted in uncovering new dimensions not captured by the survey results, but also triangulated the survey findings through the realization that place detachment exists for the teachers interviewed. The more teachers express their concerns about the adverse attributes of their physical school building, the less attached they are to that building.

Summary of Findings

Based on empirical Chapters 4 and 5, the major findings of this study are summarized into the 8 statements below.

Finding 1: When teachers didn't express health concerns about the building issues, they expressed positive place attachment to their building compared to those who expressed concerns, who expressed negative place attachment to their building.

The issues with the most significance and largest effect size were items related to a healthy building, such as air-borne pathogens such as COVID-19, influenza, or the common cold virus, general IAQ, non-working restrooms, cleanliness of floors and surfaces, noise level, vehicles idling outside, crime/safety, availability of healthy food, and the quality of drinking water. Those who reported general body symptoms as of the last day they were physically in their classroom, were found to be predictive of negative place attachment. The survey was a data collection method that asked the respondents to assess their current place attachment or place detachment outcomes, which along with their concerns for the IAQ building, allowed the researcher to understand which concerns were at the forefront of the teachers minds during the pandemic. This was also apparent in the interviews. As teachers started talking about their school building and IAQ, they often started the discussions with more gentle language and as the researcher asked probing questions about meaning, or to identify attributes of the building, their language became stronger and more assertive. Their dissatisfaction with the building grew with the duration of the

interview. To date, there has been scarce literature that discusses negative place attachment (Gibbeson, 2020), and no literature is known by the author that studies the relationships between health concerns of teachers and place attachment.

Finding 2: Many of the participants deemed the school building itself to be hostile and shared experiences and knowledge of how their perceptions have been constructed both individually and socially.

The teachers noted that the age of the building, the condition of the building as a whole, the exterior and interior, and the condition the HVAC-related specific building components appeared to be in, were factors in determining their perception of risk or danger. The sensory experiences of smell, followed by sight, and what they hear from their colleagues or through hearsay contributed to their knowledge of toxic IEQ/IAQ.

Finding 3: Principals don't seem to care or are intimidating.

Teachers may be mistreated on one or more levels, which may include colleague-on-teacher bullying and learner-on-teacher bullying, but several investigations have found that teachers are more specifically victimized by school principals (De Vos & Kirsten, 2015).

Teachers experience a variety of feelings when describing instances of being intimidated, bullied, or unvalued. The teacher can leave a discussion with the principal feeling powerless and fatalistic, and they express guilt and shame for raising concerns with the union or administration. The school as an organization is made out to be a family, one in which the students are "the

children," the co-workers the siblings, and the principal and administration, the parent. Especially for the younger teachers, the fear of not having their contract renewed or making tenure has them in a perpetual state of trying to please. Teachers that are tenured are not as afraid of speaking their mind to administration, but still wish to maintain a happy family-type atmosphere with their colleagues.

Finding 4: The pattern of renovating or replacing a school building seems to go through a common process that takes a decade or more.

Because each of the four districts are in a distinct phase in what appears to be a common process of renovating/replacing, the researcher was able to identify what stage each district was currently in. I suggest that indicator data about building detachment could be a useful tool in assessing buildings for renovation or replacement, which might speed up the ten-year process.

Finding 5: Physical building attributes matter when teachers make judgements about their satisfaction with their school building.

In both the survey and in the interviews, an overwhelming majority of teachers discussed windows, their size, daylighting, operability, and condition. All 13 interview participants talked specifically about windows. Having classrooms with windows becomes a sign of status or prestige. The type of flooring that teachers have experienced is also important to their satisfaction. If the teacher had a bad experience with water, mold, or other unpleasantries, they remember and use that experience to gauge their satisfaction. Hardwood floors or tile are preferred over carpet. The cleanliness of surfaces also matters as the teachers

spoke at great lengths about the cleaning measures that are or are not being done. Often teachers bring in their own supplies, as they trust their own methods. The perception of clean surfaces is significant, as visible dirt contributes to their judgment of the space as being unhealthy. If the teachers see water damage, condensation, or evidence of prior damage, they are on high alert that the condition may not be remedied and do not trust that the dangers are gone. Wall cavities or carpet are where teachers perceive hidden dangers to be.

Somewhat related to this study's finding, in a study of satisfaction, dependence, identity, affect, and behavior by Ramkissoon (2012), an attitude-behavior model was created using the moderating effects of place satisfaction alongside place attachment.

Finding 6: Teachers will take matters into their own hands.

Teachers discussed the workarounds they do for their well-being. They may create a physical work-around such as placing a cold bottle of water on the thermostat to make the radiator kick on if they are too cold or climb a ladder to adjust the valve of a ceiling heat supply duct. They will also bring in their own supplies, including a hygrometer to prove the temperature or humidity is below their threshold, or bring in their own fans or air cleaner. Teachers did express that "contraband" items such as these were often confiscated by the janitorial staff, or they were asked by the principal to remove it. A common problem in classrooms of aged buildings is the lack of a grounded plug. Teachers mentally cope with their undesirable situations by seeking support from colleagues whom

they trust or have formed a connection with because of similar circumstances. The amount of support teachers get positively influences their well-being.

Finding 7: Place attachment is too complex to predict through regression analysis alone.

Humans are emotional beings, and at times, sacrifice rationality because of emotions. There are seasonal, temporal, and experiential influences that affect perceptions. Situational circumstances, such as the pandemic, are clouding the statistical models used to predict outcomes. Place attachment is a particularly complex construct with a plethora of possible covariates that cannot be controlled for to make the statistical tests more rigorous. The best we can do is to identify patterns of attachment to detachment, and to identify places where addressing that could potentially prevent extreme detachment and career exit.

Seamons (2013, pg. 12) states that on one hand, a researcher cannot identify and measure degrees of place attachment, then on the other hand, look for correlations with predictor factors such as age, physical features, and time spent in the place. To continue the discussion of unpredictable factors, Seamon argues that there are six place processes that should not be used in predictive analysis:

1. Place interaction (the day-to-day living),
2. Place identity (consciously and unconsciously),
3. Place release (unexpected encounters and events),
4. Place realization (the presence of place as in physical constitution),
5. Place creation (how efforts can construct positive or negative action), and

6. Place intensification (the independent power of policy, design, and fabrication, to strengthen place).

Lewicka (2011, p. 217), a researcher that has often used predictive methods in studies regarding place attachment, states that if researchers study predictors and not mechanisms of attachment, questions regarding the directionality of causal relationships, especially social predictors, remains especially challenging. Theoretically, Devine-Wright and Howes (2010) suggest that when place identity and strong emotional attachments to a particular place are threatened, this leads to negative, oppositional attitudes and oppositional behavior. However, I argue that in the context of "workspaces," negative attachments are not oppositional in all contexts.

Finding 8: While regression can't predict place detachment or negative attachment, statistical analysis can be used to identify places where it is currently occurring.

The findings from the quantitative section of Chapter 4 weren't as useful as I had originally hypothesized, but the Stepwise statical analysis, although not producing perfect predictors for negative place attachment, can be used as likely indicators for predictors due to the elements seen in the ANOVA. When predicting divorce, Heyman and Smith (2004) posited that "divorce" substitutes for "disease" in a predictive test and that there are inherent difficulties in predicting low-prevalence diseases, that cross-validation is necessary to assess risk, and that caution should be taken with interpretation due to sensitivity and specificity issues (Mausner & Kramer, 1985, p. 217).

A mixed-methods approach supports the limitations of statistical tests, when there aren't clear, causal relationships that can be found in regression analysis. One of the things that can be found are the correlates, and those significant correlates can be understood more clearly through re-examining relationships with things like building age and improvements, alongside the narratives of the people who are experiencing and reporting negative place attachment. The experiences themselves aren't things that can be controlled for with survey questions that are closed-ended.

Limitations

The results of this study should be interpreted with caution. Only conscious emotions were captured using the self-reported information by teachers, during the pandemic, which may introduce pessimism bias and suggestibility bias. The negativity surrounding the pandemic and current world events may be contributing to the tendency to overestimate the likelihood of negative events while underestimating the likelihood of positive events. Memory is a key factor in cognitive processes, and suggestibility with the theme of the study can introduce the tendency to fill in gaps in memory with information from others that may be incorrect. And suggestibility bias, the retrospective distortions produced by current knowledge and beliefs, can be incorporated into answers provided by participants due to leading questions.

Age, neuroticism, personality, and tiredness can influence retrospective emotions and can be problematic (Mill et al., 2016), given that they are vulnerable to memory recall when the emotional valence was influenced by

strong, negative stimuli (Maraz et al., 2021). The survey's response rate (12%) is a limitation of this study, but as an initial study, it proved fruitful. As previously discussed, survey respondents did align nicely with the demographics, which indicate some reliability to the measures. Collaborating with the U.S. Department of Education, a state board of education, or a state-wide teacher's union would improve validity and reliability.

Objective building-level air quality data was not available for the buildings in this study. The State of [the Midwestern state] does not have a comprehensive state-wide building evaluation, and instead places the responsibility on each school district and with approval of the [the State] Department of Education Commissioner. Obtaining this information would have allowed the researcher to identify schools with good versus poor IAQ. The study relied on building user reporting of environmental conditions to stratify teachers into distinct categories for IAQ perceptions (e.g., favorable versus unfavorable perceptions of IAQ) (the Midwest Department of Children, 2003). One such tool is the Facility Condition Index (FCI). The FCI is a standard facility management benchmark that is used to objectively assess the current and projected condition of a building asset. The FCI is defined as the ratio of current year required renewal cost to current building replacement value. The purpose of the FCI is to provide a means for objective comparison of facility or building condition as well as allow senior decision makers to understand building renewal funding needs and comparisons. The use of this index in future assessments of workplaces would be advantageous.

Cross-sectional research design also limits the study's usefulness. Cross-sectional studies do not allow for a meaningful induction period between exposure and outcome and cannot facilitate causal inference from interventions. Typically, epidemiological studies are either descriptive or analytical. For descriptive studies, the patterns of health-related "states" are described across one or more factors, such as over time and place. States, in this usage, is any health-related state (Efsa Scientific Committee et al., 2020). The discipline of architecture could benefit from research studies which are longitudinal in design, as opposed to the default cross-sectional study, but specifically regarding environmental epidemiology and the built environment (Klepeis et al., 2001; Lewicka, 2011b; Manzo & Devine-Wright, 2013).

All findings, conclusions, and implications are relative to this research context, 242 survey respondents, and thirteen interview participants. Despite the complex process of a mixed-methods study, it is acknowledged that other interpretations of participant responses are possible. These thirteen participants are not intended to represent the general population of public K-12 teachers in the state of the Midwest. Therefore, each reader must determine the applicability of study findings to alternate contexts.

Contribution to Knowledge

Theoretical

This study has contributed to the growing literature of place attachment theory, from the view of an interior designer, including a new definition of place detachment. It also demonstrates a unique mixed-methods approach combining

regression analysis with phenomenology to understand meaning. The addition of indoor air quality as an actor in the tripartite model of person, place, and process, over time, called the Epidemiological Model of Place Detachment-Interventions for the Institution (time, actor, person, process, and place) can assist place attachment studies that involve a component as a mediating factor. This study also contributes to the total body of public health literature, which largely overlooks the process-oriented dimensions of poor IAQ.

Place attachment theory has not drastically shifted over the past 12 years, since Scannell and Giffords' tripartite model was published. The literature has begun to embrace the negative side of attachment through stigma (Chapman et al., 2019; Gibbeson, 2020; Taylor et al., 2016). Place detachment is different from displacement and disruption. Devine-Wright and Howes (2010) advocate that when place identity and strong emotional attachments to a particular place are threatened, this leads to negative, oppositional attitudes and oppositional behavior.

This work contributes to the work on memory, as part of place attachment, as stories told by others that stay in participants' memories (Tyng et al., 2017), and the ways that a range of emotions and experiences contribute to what it means to be emotionally and physically detached from one's workplace due to experiences or trauma. The results of this study speak to the complex dynamics of place detachment over the context of time as the future is anticipated, the present is realized, and the past is recognized. Teachers' changing social relationships and shared stories from co-workers and legendary hearsay offer

valuable empirical support to advance place detachment theory. With the new Epidemiological Model of Place Detachment-Interventions for the Institution model, other building typologies can be explored to obtain a better understanding of the complex relationship between person, place, and process, over time.

Empirical

This study also contributes an operationalized definition of the perception of adverse indoor air quality, for it was through facial performances, voice inflections, and spoken word to indicate dissatisfaction with the school building along with the understanding of subtle cultural cues that told the stories of perceived hazards in the workplace (see Appendix J). The survey used for this study also added an empirical contribution, because the perception of IAQ was operationalized in the survey questions. A new survey instrument was created measuring place attachment. Additionally, a dataset was generated that allows for further investigation as well as a study that highlights the relationships between IAQ and place detachment.

CONCLUSION

This study examined the effect that perception of indoor environment quality has on place attachment outcomes and what influence the characteristics of individuals and building may have on overall place detachment. Data collected during the spring and summer of 2021 is particularly relevant given the current and ongoing health crisis. In understanding the ways in which place attachment and place detachment occur within the educational workspace opens new

pathways for worker retention and educational physical building improvements and design of new structures.

In a recent essay in The Atlantic (Allen, 2021), Dr. Joseph G. Allen, an assistant professor at the Harvard T.H. Chan School of Public Health, said that fresh air, not foosball tables and coffee bars, should be prioritized in the workplace. To appease employees, employers have tried to make workplaces more attractive by adding amenities, such as gyms, coffee bars, and beanbag chairs, that supposedly foster creativity and cooperation and keep younger workers happy. According to Allen, before the coronavirus pandemic, few designers and human resource professionals who decide how offices look, paid attention to ventilation. Allen directs the Healthy Buildings program at Harvard's public-health school, where research focuses on how indoor air affects cognition and other aspects of human well-being. In a recent open access letter in Environmental Research Letters, Allen and colleagues urge governments to do more than provide "acceptable" air quality, as currently required by engineering guidelines, and to establish regulations to ensure the air in buildings is clean, just as guidelines state for water (Laurent et al., 2021).

Megahed (2021) mirrors Allen and colleagues' thoughts and states that the inadequate knowledge and doubts about the safety of these [ventilation and air] technologies limit their practical applications in architecture. Learned out of the pandemic, the need for efficient techniques for indoor air disinfection and purification, and advanced ventilation-related interventions, are essential to protect people from cross-infection. As guidance, Megahed advises designers to

be more focused on touchless technology, and together with other engineering measures and guidelines, to ensure these technologies are implemented and integrated with architecture correctly; and if so, building immunity is enhanced. Interdisciplinary teams need to address standards, guidelines, and recommendations to follow.

This study has highlighted some of the ways that place attachment is impacted by perceptions of poor IAQ, the ways in which unresponsive management impacts place attachment, and strategies for mitigation of poor IAQ at the individual level. Through my contribution to theoretical literature and the empirical data provided here, it is my hope that further IAQ studies will take into consideration the satisfaction and dissatisfaction of employees.

Future Research

This research was motivated by my curiosity about the intersection of the interior-built environment, human behavior, and public health. An enduring theme of my research is to understand non-physiological human behaviors in the interior-built environment of schools and to better appreciate the impact spaces can have on health and well-being. Practitioners, school districts, and the greater medical community are aware that detrimental interior school environments can have harmful effects on the mental health of school building occupants. This research is important because of the relatively common health afflictions school building occupants endure in spaces that are occupied for a large portion of their day. Afflictions such as these can have a large impact on absenteeism and the learning process. Health related costs strain already financially strapped school

districts, increase health insurance costs, and place an undue burden on families, teachers, and child-care providers. The primary purpose of my research is to recognize the associations between the building users' perceptions of their indoor environmental quality and their well-being. My long-term goal is to entwine the disciplines of architecture, public health, and sociology through evidence-based design and empirical theory to advance the occupational health of school building occupants and occupants of workplaces, in general.

Because of the insight garnered in this study, the notion of place attachment can be applied to other building typologies to understand the attributes of physical places that influence the detachment from place; for example, healthcare sites, such as hospitals, pharmacies, or dental offices.

The indoor air quality was not scientifically measured during this study and is noted as a limitation. A study that combines the measurement of specific agents along with introspective interviews could provide a richer understanding of the perceptions of toxic IEQ/IAQ. To complement this study, epidemiologic and clinical studies are warranted to better understand the effect of school or classroom microbiomes on health in teachers (Park et al., 2021).

Satisfaction with the building was assessed through building letter grades with one question in the survey. Future studies could adopt an attribute-level conceptualization of satisfaction as attribute weights in determining satisfaction shift over time (Mittal et al., 1999); for example, the physical attributes of window operability and floor materials contribute to the judgment teachers have during specific seasons or experience temperatures and may change over one's lifetime

as personal health changes. Establishment of a causal relationship between school facilities and occupant well-being is a major challenge (National Research Council, 2007). The inclusion of the multitude of confounding variables is very difficult to capture with this research, and this study suffers from varying degrees of confounding due to lack of adequate controls for possible causal variables, as only the dependent variables of place attachment and building satisfaction were measured and there was no intervention and no predictive variables used in this explanatory study. Confounding variables could be workplace attachment, as attachment to the organization, school culture, and performance of work duties. Place detachment and toxic IEQ/IAQ could be related and the factors unrelated to the interview questions or themes that emerged, including a personal dislike for their administrators, the fatigue of the pandemic, or other psychological or psychosocial behaviors could be mediating variables. Possible moderating variables affecting the strength of the relationship between place detachment and toxic IEQ/IAQ issues could be gender, location, race, or age.

Examining aged or problem buildings for further analysis with geospatial technology, such as geographic information systems (GIS), remote sensing (RS), global positioning system (GPS), as well as human-focused approaches such as wearable technology, could enhance this research. LiDAR is one example that can detect particles in both air and water, can identify pollutants and atmospheric gasses and aerosols, and be used for forensic examination to accurately represent interiors. This pin-point accuracy could be beneficial in determining the “hidden dangers” that are presumed present in wall cavities. REVIT MEP and

Autodesk simulation CFD software can also be used to design scenarios for optimum healthy airflow. Possible collaborations could be where this, and other related research, is paired with industrial hygienists, chemists, or mechanical engineers.

Implications for Practice

Socioeconomic Status and Social Injustice

Much progress has been made to understand the components of poor indoor air quality and the populations that may be at greatest risk (Burroughs & Hansen, 2020). Socioeconomic factors such as income, education, and job have been shown to have a direct correlation with health, regarding indoor air quality (Laurent et al., 2007). Socioeconomic factors can influence air quality due to the proximity to vehicle exhaust (Aung et al., 2018), dilapidated structures (Bernard et al., 2007), and inferior building materials (Muñoz-Pizza et al., 2020).

IAQ problems cross economic status, race, and ethnicity, and take a toll on those with immune-related diseases or respiratory issues (The National Institute for Occupational Safety and Health [NIOSH], 2013). Further, lower income areas tend to have greater indoor air quality concerns due to the older infrastructures often associated with financial strain (Maantay, 2001).

Etiology of IAQ-related health issues can be problematic to establish because many signs and symptoms are nonspecific, making differential diagnosis a challenge (EPA, 2018b). Infectious diseases are caused by microbes, such as bacteria, viruses, fungi, and protozoa (a type of parasite). SARS, Severe acute respiratory syndrome coronavirus 2 (SARS-CoV2), is an

example of such a microbe. Exposure to indoor air particles, including microbes, could include a range of adverse emotional reactions that affect the long-term health of building occupants, can increase absenteeism, and can cause a decrease in productivity (Joshi, 2008; Runeson et al., 2006; Wargocki et al., 1999).

The concept of “injustice,” defined here, is an individual experience that one is not treated fairly, and the experience arises from the perception that specific justice rules have been violated (Finell & Seppälä, 2018). Studying injustice experiences is important because experienced injustice can deeply influence individuals’ well-being and behavior, and previous research has shown that experienced injustice strengthens the association between pain severity and depressive symptoms and increases the risk of not returning to work (Robbins et al., 2012). Experiences like this influence employees’ ability to cope with and recover from various symptoms and injuries (Scott et al., 2013).

Recommendations for Practice

Workplace health promotion should include programs for employee well-being. Environmental and personal risk factors should also be compiled and assessed by the employer or human resources. Carrer and Wolkoff (2018) recommend a building assessment, inspection by walk-through of the office workplace, a questionnaire survey, and environmental measurements, in that order, to be made available to employees when someone expresses concern about the indoor air quality. The survey used for this study could be used as part of workplace health promotion. The outcome from the survey could be used for

mapping the IAQ and to prioritize the order in which problems should be dealt with.

Administrators should pay particular attention to teachers characterized by an insecure attachment style (Bess & Dee, 2014; Morris-Rothschild & Brassard, 2006). Improving the work-life balance and job satisfaction of teachers and identification of place detachment styles would be an additional tool available to manage retention (Naz et al., 2021). When occupants of spaces have emotionally and physically detached from their workplace due to perceived hazardous conditions, the implications for administration can be costly. However, the federal government has recently provided access to funding to implement upgrades for school buildings due to the COVID-19 pandemic. The U.S. Government has provided more than $100 billion for schools through the CARES and CRRSA bills earmarked for K-12 public schools, called the “Elementary and Secondary School Emergency Relief Fund (ESSER) (Office of Elementary & Secondary Education, 2021). These funds are available to support upgrades to critical school infrastructure such as improvements to HVAC systems and IAQ. One of the ways to improve teacher satisfaction with air quality is to put together a performance of air quality. Seeing a need for building standards aside from building codes, non-governmental organizations such as WELL and LEED have stepped in to fill the need.

The WELL Building Standard (WELL) is a performance-based system for measuring, certifying, and monitoring features of the built environment that impact human health and wellbeing, through air, water, nourishment, light,

fitness, comfort, and mind (International Well Building Institute, 2015). WELL is managed and administered by the International WELL Building Institute (IWBI), a public benefit corporation whose mission is to improve human health and well-being through the built environment. WELL v2, Q4 2021, Concept-Air, has established criteria, monitoring, awareness, and management guidelines to promote clean air and minimize human exposure to harmful contaminants to maximize productivity, well-being, and health (International Well Building Institute, 2021). These guidelines, along with the survey and methods from this study, could assist designers and building managers with measuring, certifying, and monitoring features related to toxic IEQ/IAQ and reach a wide audience that is already considering initiatives to improve well-being of building occupants.

Leadership in Energy and Environmental Design (LEED), another non-governmental organization, is a green building certification program used worldwide (U.S. Green Building Council, 2016). Developed by the non-profit U.S. Green Building Council (USGBC), it includes a set of rating systems for the design, construction, operation, and maintenance of green buildings, homes, and neighborhoods, which aims to help building owners and operators be environmentally responsible and use resources efficiently (U.S. Green Building Council, 2016). The USGBC, through LEED, has pilot credits related to managing indoor air quality during COVID-19. This credit, called Arc Re-Entry pilot credit, recognizes efforts to reduce infection risks by measuring and analyzing indoor air quality. Although there is not currently a measurement that is able to detect infectious agents in the air, data gathered is useful to assess that

adequate ventilation is achieved and maintained (U.S. Green Building Council, 2020). LEED could benefit from this research to add to the growing resources that designers utilize when approaching sustainability.

Wong-Parodi et al. (2018) completed a convincing study on the perceptions of and behaviors toward air pollution with favorable results. Providing teachers with low- or no-cost portable indoor air quality monitors, with a complementary app that offers information about how to reduce risk of environmental exposure, can help teachers better communicate perceptions about the air quality they are experiencing, and adopt behaviors proportionate with the risks they face. The participants were significantly more knowledgeable about air quality, reported experiencing significantly better indoor air quality, and felt more confident knowing how to mitigate their risk after using the Speck sensor than before the study. Participants tended to take more action to reduce indoor air pollution after using the sensor. Qualitative analysis suggested a possible knock-on-effect of use, urging family and friends to learn about indoor air quality. Therefore, thoughtfully designed and used personal sensing devices can help empower people to take steps to reduce their risk. By disseminating the findings from this study to the participants and unions that requested an executive summary, along with the research supporting portable IAQ monitors, schools may be able to institute a way to address immediate concerns for teachers while more costly solutions are explored.

Finally, designers, administrators, building engineers, and the greater fields of occupational and public health can collaborate to intervene in already

built school buildings as depicted in the new Epidemiological Model of Place Detachment-Interventions for the Institution model: protect building occupants, educate stakeholders, alter exposure, remove or minimize fomites, improve sanitation, and change behavior and activity patterns (see Figure 22). The results of this study can be disseminated at professional conferences, teacher, superintendent, and principal conferences, teachers' unions, state boards of higher education, and in peer-reviewed literature to educate stakeholders in the design of new school buildings. The results of this study should aid school managers in making strategic decisions about the maintenance of their existing schools with lower-cost options and the benefits of visible change. The number of teachers in the world is substantial, which means this is a significant occupational health issue, and the results from this study can be used by other countries that have aged or unhealthy school buildings.

Policy Implications, IAQ, and School Buildings in the News

Drastic and urgent demands to remedy toxic IEQ/IAQ in the school building have been seen in higher education. This is a policy problem. The most recent egregious example of poor IAQ making national news happened in January 2022, when Florida State University temporarily closed the Sandels Building due to a faculty-initiated study following eight cancer deaths of faculty members and former students within ten years (Inside Higher Ed, 2022). The report also links the building to diagnosed autoimmune disorders and cases of allergies, pneumonia, and other chronic conditions (Panton et al., 2022). The faculty members have reported the concerns about their building for Florida State

University for the last twenty years and the report includes evidence and observations of mold, elevated moisture problems, elevated radon, and toxic chemicals. The report was provided to OSHA to request an independent investigation as the “right to safe and healthful working conditions,” and the faculty demand immediate remediation—to teach remotely until the OSHA study is complete, a new laboratory space, air purifiers, to move faculty, staff, and students to a different location, and measuring radon levels (Panton et al., 2022). In addition to cancer cases, the faculty-initiated report links the building to three diagnosed autoimmune disorders and seven cases of allergies, pneumonia, and other chronic conditions (Inside Higher Ed, 2022). The building was constructed in 1956 and renovated in 1998, and asbestos was removed from the building in the mid-2000s. Air ducts were inspected and cleaned in 2009, with third-party experts documenting black mold and dust debris in the coils of the building’s heating, ventilation, and air-conditioning system. Faculty complained and photographed evidence to present to administration, but the report notes that administration did not act, and faculty are still finding debris and particles. Just days after the announcement of the health sciences building, Florida State University announced that the Williams building, which houses the English department was the next building to be reported for air quality concerns, and classes were moved online (Cann, 2022).

Studies measuring IEQ/IAQ from teacher perspectives can be used to identify risky buildings. One result of this study is a strong suggestion that teacher and faculty experiences of IEQ/IAQ are taken seriously as a metric both

for worker retention and for workspace investigations for risk. This could prevent health clusters, massive lawsuits, and publicity disasters. A healthy indoor environment requires collaborative research with a variety of disciplines, and the outcomes can reshape future spaces.

APPENDIX A. Survey Instrument

Per Qualtrics software, the estimated time to complete the survey is 11 minutes.

You have been invited to participate in the 2021 Teachers Occupational Health and Indoor Air Quality Survey. Please read the consent information below and let me know if you agree to participate at the bottom.

Agreement to Participate in the 2021 Teachers Occupational Health and Indoor Air Quality Survey

MU IRB Project No. 286085

What is the purpose of the survey?

The primary goal of this survey is to allow the author to analyze Indoor Air Quality (IAQ) preferences and outcomes of teachers and help others understand what it means to work in a public-school building.

What does this study involve?

In this study, teachers will be asked to complete a short online questionnaire. You are only eligible to participate if you are a current teacher in the ISD709 or ISD2165 school districts. Your participation is voluntary. The results of this study will remain confidential and will only be shared with the Committee of Dawn Loraas, PhD Candidate. These data may also be published, but only cells with greater than 10 respondents will be shared.

What are the risks?

This survey poses no more risk than normal, day-to-day activities.

Where is this study being done?

This research survey is being conducted by Dawn Loraas, PhD Candidate, Architectural Studies School at the University of Missouri.

Who is conducting this study?

This survey was developed by Dawn Loraas, PhD Candidate. The University of Missouri Doctoral Committee is acting as an affiliate member of the study, under the supervisor of Dr. Laura Cole.

Who do I contact if I have more questions?

If you have any questions about this survey, you may contact Dawn Loraas, PhD Candidate, at dmlmp3@mail.missouri.edu. If you have questions about your rights as a research participant, you may contact the University of Missouri Institutional Review Board at (573) 882-318 or email irb@missouri.edu.

Thank you for your participation!

Block: Default Question Block (45 Questions) Standard: End of survey (5 Questions)

Start of Block: Default Question Block

Q1 **Indoor air quality in the school building** You are invited to take part in a research study being conducted by an Architectural Studies Doctoral Candidate at the University of Missouri- Columbia for a dissertation. This project investigates how educators in public school buildings feel about the indoor air quality in their school building in light of the COVID-19 pandemic. Your responses here will help me understand how you are thinking about these important issues. The results of this study will provide useful information to you, administrators, policy makers, facility managers, and school designers who wish to better address the air quality in the school building. Procedures: Please read this form before agreeing to participate. The survey is anticipated to take about 15 minutes, depending upon the length of your answers. Risks and Benefits: The study has minimal risks. You will be asked to share your feelings and experiences with the indoor air quality of your school building during the pandemic of Covid-19. You will also be asked for some general health information. Voluntary nature of the study: Participation in this study is voluntary.

Incentive: Your input is very valuable to me, and I welcome your participation. At the end of the survey, you will be asked whether you want your name to be included in a drawing for one of twenty $100 Amazon gift cards. Your privacy will be protected regardless of whether you put your name in the drawing or not. You will also be asked if you would like to do a 30-45-minute follow-up interview after the school year so that I can learn more about the impacts of indoor air quality in your school building. If you participate in the zoom interview, you will be emailed a $50 Amazon gift card for your time.

What Are My Rights as a Study Participant? Taking part in this survey is voluntary. If you do decide to take part, you have the right to change your mind and drop out of the survey at any time. Whatever your decision, there will be no penalty to you in any way. Who Can I Call If I Have Questions, Concerns, Or Complaints? If you have more questions about this study at any time, you can call Dawn Loraas at 218-343-7827 or email her advisor, Dr. Laura Cole at colelb@missouri.edu. You may contact the University of Missouri Institutional Review Board (IRB) if you:

Have any questions about your rights as a study participant; Want to report any problems or complaints; or feel under any pressure to take part or stay in this study. The IRB is a group of people who review research studies to make sure the rights of participants are protected. Their phone number is 573-882-3181.If you want to talk privately about your rights or any issues related to your participation in this study, you can contact University of Missouri Research Participant Advocacy by calling 888-280-5002 (a free call), or emailing MUResearchRPA@missouri.edu Statement of consent: Answering yes to the first question implies your willingness to participate in this research study.

Merged survey IAQ

Survey Flow

Block: Default Question Block (45 Questions)
Standard: End of survey (5 Questions)

Page Break

Start of Block: Default Question Block

Q1 **Indoor air quality in the school building** You are invited to take part in a research study being conducted by an Architectural Studies Doctoral Candidate at the University of Missouri-Columbia for a dissertation. This project investigates how educators in public school buildings feel about the indoor air quality in their school building in light of the COVID-19 pandemic. Your responses here will help me understand how you are thinking about these important issues. The results of this study will provide useful information to you, administrators, policy makers, facility managers, and school designers who wish to better address the air quality in the school building. Procedures: Please read this form before agreeing to participate. The survey is anticipated to take about 15 minutes, depending upon the length of your answers. Risks and Benefits: The study has minimal risks. You will be asked to share your feelings and experiences with the indoor air quality of your school building during the pandemic of Covid-19. You will also be asked some general health information. Voluntary nature of the study: Participation in this study is voluntary. **Incentive:** Your input is very valuable to me, and I welcome your participation. At the end of the survey, you will be asked whether you want your name to be included in a drawing for one of twenty $100 Amazon gift cards. Your privacy will be protected regardless of whether you put your name in the drawing or not. You will also be asked if you would like to do a 30-45-minute follow-up interview after the school year so that I can learn more about the impacts of indoor air quality in your school building. If you participate in the zoom interview, you will be emailed a $50 Amazon gift card for your time.
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Q2 Do you consent to taking this survey?

- ○ Yes (1)
- ○ No (2)

Q3 What is your role within the school district?

▼ Teacher (1) ... Other (4)

Display This Question:

If Q3 = 4

Q4 If you selected 'other', enter your role within school district here

_____

Q5 What is your age?

- ☐ 18 - 24 years (1)
- ☐ 25 - 40 years (2)
- ☐ 41 - 56 years (3)
- ☐ 57 years or more (4)

Q6 Which categories describe you? Select all that apply to you:

- ○ Some high school (1)
- ○ High school diploma or equivalent (2)
- ○ Vocational training (3)
- ○ Some college (4)
- ○ Associate's degree (e.g. AA, AE, AFA, AS, ASN) (5)
- ○ Bachelor's degree (e.g. BA, BBA, BFA, BS) (6)
- ○ Some post undergraduate work (7)
- ○ Master's Degree (e.g. MA, MBA, MFA, MS, MSW) (8)
- ○ Specialist degree (e.g. EdS) (9)
- ○ Applied or professional doctorate degree (e.g. MD, DDC, DDS, JD, PharmD) (10)
- ○ Doctorate degree (e.g. EdP, PhD) (11)
- ○ Other, please specify (12)

Q7 How would you describe your work arrangement in your main job at the school?

- [ ] I am a regular, permanent employee (standard work arrangement) (1)
- [ ] I work as an independent contractor, independent consultant, or freelance worker (2)
- [ ] I am on-call, and work only when called into work (3)
- [ ] I am paid by a temporary agency (4)
- [ ] I work for a contractor who provides workers and services to others under contract (5)

Q8 Which categories describe you? Select all that apply to you:

- [ ] Hispanic, Latino, or Spanish (1)
- [ ] Black or African American (2)
- [ ] American Indian (3)
- [ ] Multi-racial (4)
- [ ] White (5)
- [ ] Some other race, ethnicity, or origin please specify (6) _____
- [ ] I prefer not to answer (7)

Q9 Employee length of service for the school district where you are currently employed:

- ○ Less than 1 year (1)
- ○ 1-4 years (2)
- ○ 5-10 years (3)
- ○ 11-15 years (4)
- ○ 16-20 years (5)
- ○ 21-30 years (6)
- ○ More than 30 years (7)

Q10 How many different school buildings have your worked in your entire career as an educator?

_____

Q11 How many school buildings do you currently physically work in?

- ○ 1 (1)
- ○ 2 (2)
- ○ 3 or more (3)

Q12 What is the name of the main school building you work in?

_____

_____

_____

_____

_____

Q13 On average, how many hours do you work in a 7-day week on school-related activities, including time at another location (such as a coffee shop), school building, or working at home in the past 30 days?

- Less than 15 hours (1)
- 16-35 hours (2)
- 36 - 40 hours (3)
- 41-45 hours (4)
- More than 46 hours (5)

Q14 Including this school year, how long have you physically worked in your school building?

- If less than 1 school year, enter number of months (1) _____
- If more than 1 school year, enter number of years (2) _____

Q15 On average, how many hours per 7-day week, do you currently physically work in your school building in the past 30 days?

- 0-15 hours per week (1)
- 16-35 hours per week (2)
- 36 + hours per week (3)

Q16 What is your level of supervisor responsibility in your school? Besides a title, a supervisory role may include such activities as being a direct link between management and the work force

and can be most effective in developing job training, safety attitudes, safe working methods and identifying unsafe acts.

- ○ None (1)
- ○ I do have a supervisory role. Please type title/role/responsibility below: (2) _____

Q17 The following statements inquire as to what emotions you may feel toward your main school building. These emotions describe attachment, or a bond that you have for the physical school building where you work, which is different from the attachment you may feel about the school district you work for, for example, ISDxxx.

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
I am attached to my school building (1)	○	○	○	○	○	○	○
There are certain places in the school building to which I am particularly attached. (2)	○	○	○	○	○	○	○
If the school district moved this school to another building, I would miss my current building (3)	○	○	○	○	○	○	○

This school building is part of my inner self (4)	○	○	○	○	○	○	○
There are places in this school building which bring back memories (5)	○	○	○	○	○	○	○
After time away, I am happy to go back to my school building (6)	○	○	○	○	○	○	○
In my school building, I prefer to avoid certain places, even if that interferes with my work (7)	○	○	○	○	○	○	○
I dread going back to my school building after a holiday (8)	○	○	○	○	○	○	○
Nothing would make me stay at my school building longer	○	○	○	○	○	○	○

than necessary (9)							
I prefer not to go to certain places in my school building (10)	○	○	○	○	○	○	○
I tend to put off going to my school building (11)	○	○	○	○	○	○	○
I often feel anxious in my school building (12)	○	○	○	○	○	○	○
Just thinking about my school building makes me feel anxious (13)	○	○	○	○	○	○	○
I find it difficult to feel at ease at my school building (14)	○	○	○	○	○	○	○
Some places in my school building bring back bad memories (15)	○	○	○	○	○	○	○

I sometimes feel oppressed by my school building (16)	○	○	○	○	○	○	○

Q18 Describe any places within your main school building that you deem unhealthy and why.

_____

_____

_____

_____

_____

Q19 Describe any places within your main school building that you deem to be healthier than others and why.

_____

_____

_____

_____

_____

Q20 How would you describe your overall health?

- ○ Terrible (1)
- ○ Poor (2)
- ○ Average (3)
- ○ Good (4)
- ○ Excellent (5)

Q21 About how many sick days did you take in the 2020-2021 school year?

0 10 20 30 40 50 60 70 80 90 100

days ()

Q22 Have you smoked 100 or more cigarettes (not including e-cigarettes) in your entire life?
NOTE: 5 packs = 100 cigarettes

- ○ Yes (1)
- ○ No (2)

Display This Question:
If Q22 = 1

Q23 Do you currently smoke (check all that apply):

- [ ] cigarettes (1)
- [ ] e-cigarettes (2)
- [ ] other tobacco products (3)

Display This Question:
If Q23 = 3

Q24 If selected other, please specify:

_____
_____
_____
_____
_____

Display This Question:
If Q22 = 1

Q25 In 30 days, do you smoke...

- ○ 1 or 2 days (1)
- ○ 3 - 5 days (2)
- ○ 6 - 9 days (3)
- ○ 10 - 19 days (4)
- ○ 20 - 29 days (5)
- ○ All 30 days (6)

Q26 Have you been told by a doctor that you have any of the following conditions? CHECK ALL THAT APPLY

	Told in the past (ever) (1)	Told in the past 12 months (2)	Currently have (3)
Allergies (1)	○	○	○
Anxiety disorder (2)	○	○	○
Asthma (3)	○	○	○
Bronchitis (4)	○	○	○
Chronic upper respiratory infection (5)	○	○	○
COVID-19 (6)	○	○	○
Depression (7)	○	○	○
Migraines (8)	○	○	○
Nosebleeds (9)	○	○	○
Pneumonia (10)	○	○	○
Other -> specify (11)	○	○	○

Q27 Have you had a minimum of one COVID-19 vaccine?

- ○ Yes (1)
- ○ No (2)

Q28 The last day you were in your physical school building, did you experience any of the following symptoms? (CHECK ALL THAT APPLY)

	Not at all (1)	Slightly (2)	Moderately (3)	Extremely (4)
Stuffy nose/cold (1)	○	○	○	○
Dry/sore throat (2)	○	○	○	○
Phlegm (3)	○	○	○	○
Dry cough (4)	○	○	○	○
Hoarseness (5)	○	○	○	○
Shortness of breath (6)	○	○	○	○
Wheezing cough (7)	○	○	○	○
Eye symptoms (8)	○	○	○	○
Tiredness (9)	○	○	○	○
Pain in joints (10)	○	○	○	○
Muscle pain (11)	○	○	○	○
Headache (12)	○	○	○	○
Skin symptoms (itch/eczema) (13)	○	○	○	○
Concentration difficulties (14)	○	○	○	○

Q29
Complete the following statement regarding noise levels in your room:
The noise levels in my room...

- ○ Don't bother me (1)
- ○ Don't bother me, but interfere with student listening/learning (2)
- ○ Bother me and interfere with student listening/learning (3)

Q30 In your room, how much dust is accumulated on top of surfaces not frequently used? (e.g. high shelves, above door sill, above light fixtures, tops of baseboards, etc.)

- ○ No visible dust (1)
- ○ Visible dust but not enough to write your name in it (2)
- ○ At least enough to write your name in it (3)

Q31 In the past 2 weeks, have you seen or observed any of the following in your school building or on school grounds? CHECK ALL THAT APPLY

- ☐ Cockroaches (1)
- ☐ Mice (2)
- ☐ Rats (3)
- ☐ Mold/water-damaged materials (4)
- ☐ Strong chemical odor/fumes (5)
- ☐ Other (6) _____

Q32 Is your room assigned to other staff besides you?

- ○ No (1)
- ○ Yes. If so, how many other staff? (2) _____

Q33 How many staff desks/workstations are located in the room?

- ○ 1 (1)
- ○ 2 (2)
- ○ 3 or more (3)

Q34 How many student desks/workspaces are currently located in your room?

- ○ 0-5 (1)
- ○ 6-15 (2)
- ○ 16-25 (3)
- ○ 26-35 (4)
- ○ More than 35 (5)

Q35 In your room, do you have the option of controlling (check all boxes you have control over)

- [ ] Windows (1)
- [ ] Thermostat (2)
- [ ] a fan (3)
- [ ] an air cleaner (4)
- [ ] Your room door being open or closed (5)
- [ ] Furniture arrangement including the position of your desk (6)

Skip To: Q36 If Q35 = 4

Q36 The air cleaner in your room:

- ○ Was purchased by you, personally, for use in your room. (1)
- ○ Is part of the overall temperature/HVAC control system in your room and NOT controllable by you (2)
- ○ Is part of the overall temperature/HVAC control system in your room and IS controllable by you (3)
- ○ Was requested by you, for purchase by others, to be used in your room. (4)
- ○ Other (5) _____

Display This Question:
If Q35 = 3

Q37 The fan in your room:

- ○ Was purchased by you (1)
- ○ Is a common household fan purchased by others (2)
- ○ Is part of the overall room temperature/HVAC system (3)
- ○ Other (4) _____

Q38 Do you wish you had control over (check any of the following):

- ☐ Windows (1)
- ☐ Temperature (2)
- ☐ Humidity (3)
- ☐ Other, related to air quality (4)

_____

Q39 Are any of the following present and/or in use in your room? CHECK ALL THAT APPLY

- [ ] Area rug(s) (1)
- [ ] Carpet (wall-to-wall) (2)
- [ ] Cleaning products brought from home (3)
- [ ] NO windows (4)
- [ ] Windows that open (5)
- [ ] Windows that do NOT open (6)
- [ ] Plug-in air freshener, spray or essential oils (7)

Q40 Select the air problems you encountered the last time you were in your room:

	Never (1)	Seldom (2)	Sometimes (3)	Often (4)
Dryness of the air (1)	○	○	○	○
Humidity of the air (2)	○	○	○	○
Too cold (3)	○	○	○	○
Too warm (4)	○	○	○	○
Stuffy air (5)	○	○	○	○
Too dusty (6)	○	○	○	○
Too dirty (7)	○	○	○	○
Odor of mold (8)	○	○	○	○
Fragrance or perfume (9)	○	○	○	○
Unsanitary (10)	○	○	○	○
Other -> specify (11)	○	○	○	○
None (12)	○	○	○	○

Q41 Does the condition of your school environment ever cause you to be concerned about health?

	Never (1)	Sometimes (2)	Always (3)	Often (4)
Air quality, generally, (indoors) (1)	○	○	○	○
Air-borne pathogens such as COVID-19, influenza, or the common cold virus (2)	○	○	○	○
Asbestos (3)	○	○	○	○
Building structural conditions (4)	○	○	○	○
Carbon monoxide (5)	○	○	○	○
Cleanliness of floors and/or surfaces (6)	○	○	○	○
Crime and safety (7)	○	○	○	○
Healthy food choices (8)	○	○	○	○
Noise levels (9)	○	○	○	○
Non-working restrooms (10)	○	○	○	○
Pest control (11)	○	○	○	○
Vehicles idling outside (12)	○	○	○	○
Water quality (drinking) (13)	○	○	○	○

Other -> specify (14)	○	○	○	○

Q42 In the past 2 weeks, how often do you often feel? CHECK ALL THAT APPLY

- ☐ A cynical attitude (1)
- ☐ Anxious (2)
- ☐ Apathetic (3)
- ☐ Burned out (4)
- ☐ Depressed (5)
- ☐ Harassed/threatened by staff/administration (6)
- ☐ Low personal accomplishment (7)
- ☐ Overwhelmed (8)
- ☐ Physical and emotional exhaustion (9)
- ☐ Stressed (10)

Q43 If the pandemic is still going on when school begins in the fall, regarding the mode of instruction, how likely are you to (select one):

- ○ Ask to instruct online classes only (1)
- ○ Ask to instruct in a hybrid model (2)
- ○ Return to instructing in the physical school building as was done pre-pandemic (3)
- ○ Return to instructing in the physical school building, only if vaccinated (4)
- ○ Retire or leave (5)
- ○ I am not given a choice regarding the mode of instruction (6)
- ○ This question does not apply to my role (7)
- ○ Other (8) _____

Q44 The statements below refer to the pandemic. For each statement, please check if you strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, or strongly agree

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I have learned that what is going to happen will happen (1)	○	○	○	○	○
If something bad is going to happen to me, it will happen no matter what I do (2)	○	○	○	○	○
If bad things happen, it is because they were meant to happen (3)	○	○	○	○	○
Life is very unpredictable, and there is nothing one can do to change the future (4)	○	○	○	○	○
Life is very unpredictable, and there is nothing one can do to change the future (5)	○	○	○	○	○
People die when it is their time to die and there is not much that can be done about it (6)	○	○	○	○	○

Q45 What grade would you give the indoor air quality of your school building?

1 (1)
2 (2)
3 (3)
4 (4)
5 (5)
6 (6)
7 (7)
8 (8)
9 (9)
10 (10)
11 (11)
12 (12)
13 (13)

End of Block: Default Question Block

Start of Block: End of survey

Q46 Would you like to be entered into the drawing to receive one of twenty $100 Amazon gift cards?

- Yes (1)
- No thank you (2)

Q47 I would like to do follow-up interviews with survey respondents to learn more about the impacts of indoor air quality in your school building. Would you be willing to do a 45-minute Zoom interview after the school year and receive a $50 Amazon gift card?

- Yes (1)
- No (2)
- Maybe (3)

Q48 Would you like to receive an executive summary of the survey results when I am done?

- ○ Yes (1)
- ○ No thank you (2)

Q49 **Please enter your email here if you answered yes or maybe to the questions above.**
This email address will only be used for the purposes of the current study.

_____

Q50 Do you have any additional comments for me at this time?

_____

_____

_____

_____

_____

End of Block: End of survey

APPENDIX B. Interview Questions

	Phenomenology: Contextual, Giorgi, and "deliberate naiveté" according to Kvale and Brinkmann (1985, 2009)		
Resource for questions	***Component & construct (from the Tripartite Model)***	***Question No.***	***Interview questions***
	Building rapport	1.	I see you work at …school building. Tell me what that is like during the pandemic?
	Person: individual	Overall question: 2.	"Describe your experiences with this school building?"
Scannell-Gifford (2010) Tripartite Model of Place Attachment. Definitions in text.	Person: group		
	Historical	3.	What is your experience with other people in the school district, in relation to the toxic IEQ/IAQ in this building or other buildings?
	Place: social relationships:	Overall question: 4.	Describe your role in your school building
		Sub-questions:	
Anguilar-Raab (2015) Table 1. Item descriptives, factor loadings, and model fit for Study 1.	Communication	5. a & b	Tell me how you communicate with your colleagues. Your students.
	Resources	6.	Tell me how you use the resources available to you to reach your work-related goals?
Allen and Meyer (1990) Affective Commitment Scale (ACS)	Affective Commitment Scale (ACS)	7.	Describe how long you see yourself working in this school building
	Process: cognition	Overall question: 8.	"What does this school building mean to you?"
	Person: individual:	Sub-questions:	
Scannell-Gifford (2010) Tripartite Model of Place Attachment. Definitions in text.	Realization & schema	9.	Could you describe a moment when you realized that the adverse indoor air

			quality was detrimental to your health?
Claudio et al. (2016) Experience questions **and McNeill & Dunlop (2016)** Questions related to worry: Table 1 Means, Standard Deviations, and Geomin-Rotated Maximum Likelihood Robust Factor Loadings for the 18 Retained Items of the Constructive and Unconstructive Worry Questionnaire From Sample 1	Experience	10.	How do you foresee your perception of toxic IEQ/IAQ impacting your quality of life >12 months from now?
	Worry	11.	What do you worry about regarding the pandemic?
	Milestones	12.	Imagine describing a milestone in this journey
Scannell-Gifford (2010) Fig. 1. The tripartite model of place attachment**.** Definitions in text. **& Wong-Parodi (2017)** Air Quality question from questionnaire	Memory	13.	Which came first, the symptoms or knowledge of an indoor air quality issue?
	Knowledge	14.	What kind of professional, expert advice did you seek to confirm your suspicions?
	Meaning	14.	How would you describe your knowledge about this building?
	Meaning	16.	How has this pandemic experience impacted your day-to-day life?
	Process: affect	Overall question: 18.	"Tell me how you feel about the school building?
		Sub-questions:	
Elfenbein (2007) 7 Emo-tions in organiza-tions **& Nissila (2017)** Parental worry about IAQ in	Pride	19.	In what ways are you proud of your school building?
	Shame	20.	In what ways are you ashamed of your school building?

schools was measured using the Questionnaire & **Ung-Lanki S, Lampi J, Pekkanen J**. Analyzing symptom data in indoor air questionnaires for primary schools. *Indoor Air*. 2017;27:900-908.	Fear	21.a & b	Define the word fear. What do you fear about the building?
	Love	22.	What are the main assets of the building, by order of importance?
	Hate	23. a	Describe any feelings you may have when distancing yourself from any element in the school building.
		b	to what intensity? From low-to high
	Sorrow	24.	Portray any disappointment you may have with your school building. If participant answers with overtone of negativity, ask probing questions related to anger and contempt.
	Anger	25.a-c	What conflicts are there in relation to the school building? The causes? Who are your adversaries? Your allies?
	Contempt	26.	Describe your ideal school building in relation to the value of your school building.
	Conclusion	27.	Before we conclude this interview, what else should you tell me about your experience?

APPENDIX C. Participant Demographic Table

Pseudonym	*District*	*School Building*	*Role*	*Age group*	*Highest degree earned*	*Years at current school building*	*Length of service at current school district*	*Ethnicity*	*Hours work in a 7-day week*	*Hours work physically in school building*
Abby	District 4	Learning Center	Teacher	25-40	Master's Degree	2	5-10	White	>46	16-35
Alyssa	District 4	Elem. School B	Teacher	25-40	Bachelor's Degree	8	5-10	White	>46	>36
Amy	District 4	Elem. School B	Teacher	41-56	Master's Degree	3	5-10	White	>46	>36
Bryce	District 4	High School	Teacher	41-56	Master's Degree	20	16-20	White	>46	>36
Jessica	District 4	High School	Teacher	41-56	Master's Degree	5	5-10	White	>36	>36
Julia	District 4	High School	Educational Assistant	24-40	Associate's Degree	5	5-10	White	36-40	16-35
Kate	District 4	High School	Teacher	41-56	Master's Degree	12	21-30	Prefer not to answer	>46	>36
Lori	District 4	Middle School	Teacher	41-56	Master's Degree	21	21-30	White	16-35	16-35
Mary	District 2	Elem. School D & E	Teacher	41-56	Master's Degree	4	5-10	White	16-35	16-35

Mia	District 3	Elem. School B	Teacher	25-40	Master's Degree	8	5-10	White	>46	>36
Mike	District 4	Learning Center	Teacher	25-40	Master's Degree	4	1-4	White	36-40	16-35
Patricia	District 3	High School	Teacher	41-56	Master's Degree	5	5-10	White	41-45	>36
Stephanie	District 4	Elem. School B	Teacher	41-56	Master's Degree	9	11-15	White	>46	>36

APPENDIX D. Interview Consent Form

Email with Zoom link

From: Loraas, Dawn dmlmp3@mail.missouri.edu
Sent: Day, Month, 2021 h:mm PM
To: _

Subject: Zoom Invite for: Minding Toxic Environments: A Mixed-Methods Study of Perceived Indoor Air Quality and Place Detachment in the School Building Interview

Dear_____,

Thank you for your willingness to be interviewed virtually, via Zoom, for my research study, Minding Toxic Environments: A Mixed-Methods Study of Perceived Indoor Air Quality and Place Detachment in the School Building Interview. Below is the link to our Zoom meeting.

In return for your time and effort, you will be given a $50 Amazon gift card to be emailed to you at the address you provided for this interview.

Dawn Loraas is inviting you to a scheduled Zoom meeting.

Topic: Minding Toxic Environments: A Mixed-Methods Study of Perceived Indoor Air Quality and Place Detachment in the School Building Interview

Time: June 15, 2021, 10:00 AM Central Time (US and Canada)

Join Zoom Meeting
https://umsystem.zoom.us/j/95379972345?pwd=SFVJTUZ6NXNTKzdLb0NkdWhKeE1aZz09

Meeting ID: 953 7997 2345
Passcode: 095992
One tap mobile
+13017158592,95379972345# US (Washington DC)
+13126266799,95379972345# US (Chicago)

Meeting ID: 953 7997 2345

Find your local number: https://umsystem.zoom.us/u/adPYQ4qf0E

Join by SIP
95379972345@zoomcrc.com
Meeting ID: 953 7997 2345
Passcode: 095992

Consent

You are invited to take part in a research study being conducted by an Architectural Studies Doctoral Candidate at the *University of Missouri-Columbia for a dissertation*. This project investigates how teachers in public school buildings feel about the indoor air quality in their school building in light of the COVID-19 pandemic. Your responses here will help me understand how you are thinking about the issues. I would like to understand what teachers are feeling and provide useful information to teachers and administrators who wish to better address the air quality in their school building.

Our meeting will be recorded unless you prefer to participate without having your image or voice recorded. If you do consent to the recording, it will be used by the researcher to transcribe the interview for data analysis. I will not share the recording outside of the research, and the recording will be destroyed once the researcher verifies that the transcription is accurate. The data analysis will be developed into a dissertation, conference presentations and journal articles with the goal of providing useful tools to educators, school building designers, and administrators who wish to better address indoor air quality in the school building.

Procedures: The interview is anticipated to take about 45 minutes depending upon the length of your answers.

Risks and Benefits: The study has minimal risks. You will be asked to share your feelings and experiences with the indoor air quality of your school building during the pandemic of Covid-19.

Voluntary nature of the study: Participation in this study is voluntary.

Incentive: Your input is very valuable to me, and I welcome your participation. In return for your time and effort, you will be given a $50 Amazon gift card to be emailed to you at the address you provided for this interview after the interview.

What Are My Rights as a Study Participant?

Taking part in this study is voluntary. If you do decide to take part, you have the right to change your mind and drop out of the study at any time. Whatever your decision, there will be no penalty to you in any way.

Who Can I Call If I Have Questions, Concerns, Or Complaints?

If you have more questions about this study at any time, you can call Dawn Loraas at 218-343-7827 or email her advisor, Dr. Laura Cole, PhD at colelb@missouri.edu.

You may contact the University of Missouri Institutional Review Board (IRB) if you:

- Have any questions about your rights as a study participant;
- Want to report any problems or complaints; or
- Feel under any pressure to take part or stay in this study.
- The IRB is a group of people who review research studies to make sure the rights of participants are protected. Their phone number is 573- 882-3181.

If you want to talk privately about your rights or any issues related to your participation in this study, you can contact University of Missouri Research Participant Advocacy by calling 888-280-5002 (a free call), or emailing MUResearchRPA@missouri.edu

Zoom will automatically notify you at the start of a meeting that the meeting is being recorded; additionally, at the start of the meeting, the researcher will let you know that you are being recording by making the statement:

"*Our interviews are recorded for use by me as a researcher to transcribe the content for data analysis. Please answer, "yes" to the question I am going to ask if you are willing to have your interview recorded during our Zoom meeting. Please answer "no", to my question if you are not willing to have your interview recorded during our Zoom meeting."*

"Do you consent to having this Zoom meeting, your interview, recorded?"

If you answer yes, we will continue with the recorded meeting. If you answer no, we will turn off Zoom's recording ability before continuing with the interview.

Thank you,

Dawn Loraas

Dawn Loraas, PhD Doctoral Candidate :: NCIDQ, LEED AP, WELL AP

Architectural Studies :: University of Missouri-Columbia

APPENDIX E. Interview Protocol

Interview Protocol with Interview Questions

Minding Toxic Environments: A Mixed-Methods Study of Perceived Indoor Air Quality and Place Detachment in the School Building Interview

Interview Protocol

Institution: University of Missouri-Columbia
IRB No. 2038442
Interviewee (Pseudonym): _____
Interviewer: Dawn Loraas
Date: _____
Time: _____
Place: _____

Minding Toxic Environments: A Mixed-Methods Study of Perceived Indoor Air Quality and Place Detachment in the School Building Interview

Introductory Protocol

To facilitate my notetaking, I am going to record our conversations today on my iPhone, laptop or iPad. Only the research team on this project will be privy to the recording and that includes a transcriber and me. The recording will be eventually erased after it is transcribed.

Here is a consent form that explains the interview process we will have today. You do not need to sign anything. This is for your information only. Let me know if there is something you do not understand. Essentially, this document states that: (1) all information will be held confidential, (2) your participation is voluntary, and you may stop at any time if you feel uncomfortable, and (3) I do not intend to inflict any harm. Thank you for your agreeing to participate.

This interview will not last longer than forty-five minutes. During this time, I'll ask you some questions, but mostly I want to learn from you and hear about your experience. Feel free to share something with me that I do not ask about if you think it matters to me understanding your experience.

If you are ready, we will go ahead and begin.

> *Our interviews are recorded for use by me as a researcher to transcribe the content for data analysis. Please answer, "yes" to the question I am going to ask if you are willing to have your interview recorded during our Zoom meeting. Please answer "no", to my question if you are not willing to have your interview recorded during our Zoom meeting."*

"Do you consent to having this Zoom meeting, your interview, recorded?"

If you answer yes, we will continue with the recorded meeting. If you answer no, we will turn off Zoom's recording ability before continuing with the interview.

Questions

1. I see you work at _____school building. Tell me what that is like during the pandemic?
2. How long have you been in your current classroom?
3. Describe your **knowledge** about this building and your classroom.

    How did it come to be? Your own research, building engineer, other people…**(process)**

4. Describe some of your **memories** with this school building itself.
    a. And your classroom?
5. Describe what your classroom **means** to you.
6. If you were to leave your classroom to go to another space or building, what would you hope the next occupant is able to change? **(meaning)**
    a. What would you hope they don't change?
    b. What would you miss?
7. Tell me about the **physical properties of your classroom**.
8. Why or why not is **controlling** any physical properties of your classroom important to you?
9. What does the phrase 'indoor air quality' **mean** to you?
10. What does adverse indoor air quality **mean** to you?
11. Tell me about the indoor air quality of your classroom. relates to survey Q40
    a. Describe a moment when you realized that the adverse indoor air quality in your workplace was or could be detrimental to your health?
    b. What, if any characteristics of your school building or classroom worry you?
    c. What kind of professional, expert advice, if any, did you seek to confirm your suspicions?
    d. How do you foresee your perception of IAQ impacting your quality of life more than 12 months from now?

e. What influences the physical make-up of your classroom (like district policies, Principal, building engineer, your own research, social media, friends, family, other)?

12. Describe any objects or spaces in your building or classroom that you deem healthy and why.
13. Describe any objects or spaces in your building or classroom that you deem unhealthy and why.
14. Tell me more about how you use your air purifier.
15. Describe any feelings you may have when distancing yourself from any physical element/spaces in the school building.
    i. to what intensity? From low-to high
    ii. What does that mean to you?
16. In relation to the toxic IEQ/IAQ in this building or other school buildings what are your experiences with other people in the school district?
17. Tell me how you use the building-related resources available to you to reach your work-related goals?
18. How has this pandemic experience impacted your day-to-day work-life in the school building?
19. In what ways are you proud of your school building?
    a. And classroom?
20. What are the main assets of the building, by order of importance?
    a. And your classroom?
21. In what ways, if any, are you ashamed of your school building, by order of importance?
    a. And your classroom?
22. Define the word fear. What, if anything, do you fear about being in your building?
    a. And being in your classroom?
23. How satisfied with your school building are you?
    a. And your classroom?
24. Describe any disappointment you may have with your school building.

Do you recall what letter grade +/- that you gave your school building? Why did you assign that grade? What is the significance of that to you?

25. Is there anything else you would like to say that I haven't asked about?

Conclusion

Thank you for taking the survey and being willing to talk about your experience today. In a couple of days, I would like to email you the complete transcript of your interview so that you can verify that what is written is what you said.

APPENDIX F. Codebook

Parent code	child code	Definitions/examples
place: physical		
Temporal		How many hours per day/per week are you present in this building?
Occupation of space		Give me walk-through of your day
	perceptions of IAQ	comfort: humidity, ventilation, temperature
descriptive		Describe healthy and unhealthy spaces
	satisfaction	describe ideal classroom
Other physical		Not related to IAQ (do in memo)
place: social: social relationships:		
cohesion		The use of 'we'
communication		Who are 'each other'? And how do you communicate? Email, meetings, in-person, spontaneous, social media, informal gatherings
resources		How do they obtain their goals? Group advocacy, achievement
Affective Commitment Scale (ACS)		Describe how long you see yourself working in this school building
process: affect		feeling: an emotion is a subjective state of being that we often describe as a feeling

		any experience of feeling or emotion, ranging from suffering to elation, from the simplest to the most complex sensations of feeling
anger		Who are your adversaries? Your allies?
apathy		
cognitive dissonance		What conflicts are there in relation to the school building? The causes?
compassion		
contempt		a feeling that someone or something is not worthy of any respect or approval (the act is a behavior)
disappointment		empty promises
empowered		
fear		Define the word fear. What do you fear about the building?
fellow-feeling		
happiness		
hate		Describe any feelings you may have when distancing yourself from any element in the the school building.
hope/hopeless		
love		What are the main assets of the building?
mental avoidance		
mental fatique		
mental frustration		
mental security/safety		
motivated, internally		the impetus that gives purpose or direction to behavior and operates in humans at a conscious or unconscious level
pride		In what ways are you proud of your school building?
psychological control		
premonition/huntch		
shame		In what ways are you ashamed of your school building?
sorrow		Portray any disappointment you may have with your school building.
suspicion		
worry		

	attach-ment styles	secure, dismissive, pre-occupied
process: cognition		
beliefs		
comparisons		
definitions of IAQ		
desire to learn		
experience		What is your experience with this school building?
knowledge		What kind of professional, expert advice did you seek?
meaning		How would you describe your knowledge about this building? How has this experience impacted your day-to-day life?
meaning		What does this mean to you?
memory		Which came first, the symptoms or knowledge of a indoor air quality issue?
motivation, external (extrinsic)		rewards or punishments that can encourage or discourage certain behaviors
opinions		
others' stories		
schemas		How did you know?
process: behavior-actions one takes, internally		
creates own rules		
disregard of rules		
physical avoidance		**sick days, absenteeism, presenteeism, leaving early**
physical control		
physical modifications		
workarounds		

self-advocacy		process by which people make their own choices and exercise their rights in a self-determined manner. Making informed decisions about what services to accept, reject, or insist be altered.
person: individual:		
culture		
demographic info		age, # years worked in building, income
family lineage		
health history		
mental health state		cognitive health, emotional health, and behavioral health. self-worth
milestones		
personal stories		
personal traditions		
physical health state		physiological health
realizations		
person: group - identifies with		
social group at work		specific co-workers (cliques), union, department members, teams, peer groups, schools, work organizations, social media groups
historical experiences		Linking of shared values, symbolism
students, parents		
role within school environment		Describe your role in your school building-title, duties

APPENDIX G. Codes, Frequencies, and Category Development from the PPP Framework and Emerging Themes.

Final Codes, Frequencies and Category Development

Level One	Level Two Categories	Level Three Codes	Level Four Codes	Frequency
Person	Group (roles within and identifies with)			
		Importance of teacher's social groups		37
		Students as extensions of themselves		10
	Individual	Demographics		33
		Impact of lineage, tradition and geographic upbringing		9
Place	Physical, as it relates to HVAC			
		Perceptions of IAQ		
			Perceptions of odor	35
			Sensory irritation	56
		Satisfaction with building		183
		Teacher retention and the school building		22
	Social relationships			
		Custodian/HVAC/maintenance guy		29
		Employee-employer relations		47
		Group advocacy		45
		Social cohesion		46
		Teachers' as problems		17
		Workplace attachment (to the organization)		68
Process	Affect			
		Negative emotional reactions		157
		Psychological place attachment or detachment		49
		Suspicious of administration		44
	Behavior			
		Contemptuous behavior		9
		Coping mechanisms		32
		Physical control issues		73
		Physical place detachment		33
		Physical work-arounds		62
		Self-advocacy		83
Process	Cognition			
		Evidential knowledge		105
		Experiences		18
		Importance of others' stories-urban myths		37
		Importance of understanding the reasons 'why'		42
		Lack of understanding building-related HVAC issues		38
		Teacher's motivations		47

APPENDIX H. Example of Coding for Emotion and Performance

Memo from video 08-19-2021

LORAAS Dissertation

Participant: "Patricia" pseudonym

Interviewer: Dawn, via Zoom (recorded, 51 min.)

Where: (Zoom) Participant's home, bedroom used as office. Participant was visibly alone in the room. Interviewer was in dining room of own house.

Wardrobe: Casual, sleeveless top, glasses, coffee in hand

Ambient conditions: Sunny, 9am. The outside was visible through a window adjacent to the participant. Windchimes were hung outside the window. A birdfeeder was suctioned to the window. Stained glass ornaments were hanging so the daylight would penetrate through the colored glass.

Procedure: Beginning when the participant speaks, analyze for performative actions, visual cues, posturing every 10 minutes.

Overall emotion expressed during interview: passionate, strong-willed, opiniated, emotive, typical of Midwestern demeanor.

Emotion at intervals: (basic: anger, fear, sadness, happiness) or (non-basic: boredom, curiosity, disappointment, disgust, humiliation, pride, shame).

Pride when speaking that she went to school there, shame when she recalls her children call the high school "a dump". She is passionate about teaching and her comfort needs. She expresses basic anger at times, especially when referring to the custodian, building engineer, and principle. She expresses wide eyes with surprise, eyebrows raised, wide mouth, right hand active in the air, when discussing things that are upsetting or disappointing.

Performative experience: (drawn-out, exhale, inhale, sigh, tremello, vibrato, sforzando, rallentando).

When discussing things that she is thinking about or are troubling, she draws out the word gradually, as to make it an accent. She uses air-quotes around administrative leadership such as "collaborative". She is very expressive with her face, hands, and posture. She flips long hair off her shoulders when telling long stories, or as an 'add' to some expressive part of the story. She uses right hand to visually indicate up/down, sideways, left-right. She draws-out and expresses sarcasm with her face with the word "supposedly" & "control" which is used often when she is trying to understand the motives of others. She grimaces often when recalling her uncomfortableness in the physical classroom due to temperature issues or speaking about something negative. Her voice inflections don't always parallel her face as her face is more expressive.

Dynamics of voice: (crescendo, decrescendo, forte, piano)

Very dynamic. Uses voice change when impersonating others in a derogatory way, such as the school architect, building engineer, custodian, principal). Uses piano when describing the cultural sensitivities of her students (she teaches English second language).

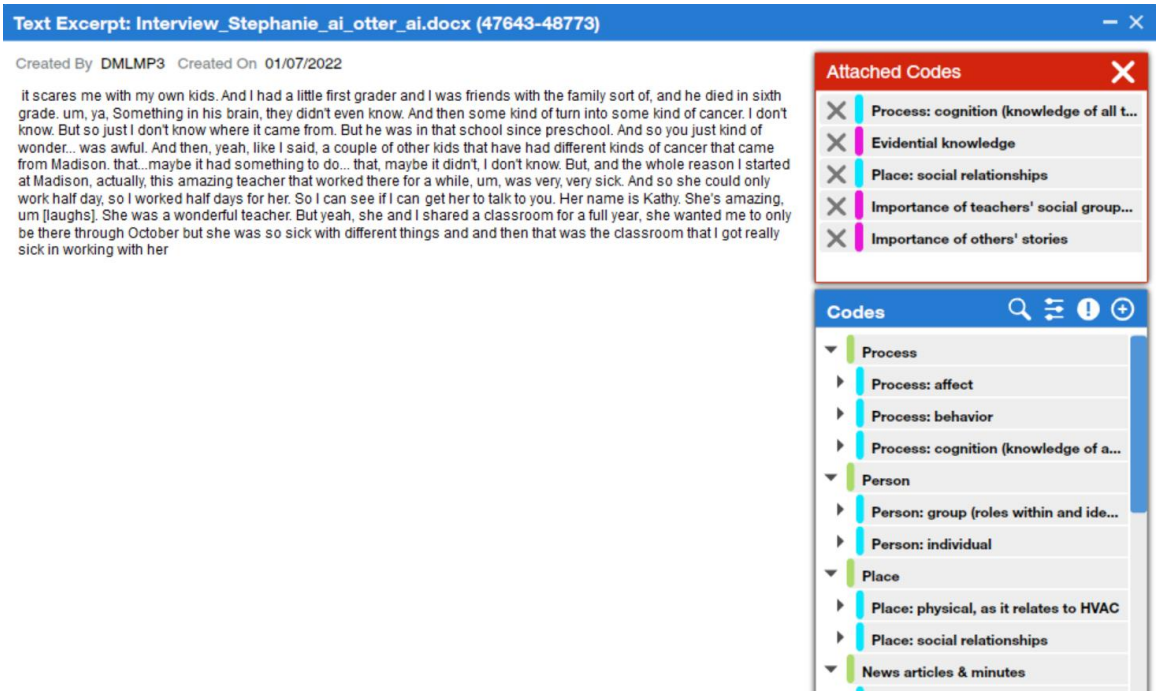
Engagement: (actively engaged, actively disengaged, not engaged).

She was actively engaged for the whole interview, hardly drank her coffee. She would pick it up to drink, then put it down when she wanted to speak about something important that she didn't want to forget.

Points of differing demeanor:

She was so excited that she often interrupted herself. She wanted to tell me more and more experiences of hers, and others. She would get quiet when changing the subject of her story to her students, then back again louder when speaking about her personal comfort struggles and concerns about IAQ. She would be loud 9different from normal volume) when speaking for others in "everybody – (thinks, says, feels…)"

APPENDIX I. Coding Example



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VITA

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