HIGH RELIABILITY SCHOOLS: A SYSTEMATIC REVIEW OF SCHOOL MINDFULNESS

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This systematic literature review presents a detailed analysis on school mindfulness research in the United States and United Kingdom that has developed out of the field of high reliability organizations. The purpose of this systematic review was to present a comprehensive analysis on the development of school mindfulness and to examine the methodological approaches scholars have utilized to investigate this theoretical construct in educational settings. This literature review is organized into the following sections: high reliability theory, individual and organizational mindfulness, educational research on high reliability and school mindfulness in the United States and United Kingdom.

Keywords: high reliability organizations, school mindfulness, reliability

This systematic review utilized Boote and Beile's (2005) analytical framework as a guideline to review relevant literature and applied the following concepts: coverage, synthesis, methodology, significance, and rhetoric. The following search strategies were used to pinpoint and position relevant research: electronic databases, educational journals, educational reports, and references lists from relevant articles, books, and dissertations. Electronic databases and search engines were used to cast a wide search net for relevant studies, which included Google Scholar, Google Books, ERIC, EBSCO, etc. To find relevant studies, keywords (*mindfulness, mindful leadership, high reliability theory, organizational mindfulness, etc*.) were searched in these electronic databases. In addition, the following journals were searched electronically: *Journal of Management Studies, Journal of Contingencies and Crisis Management, Educational Administration Quarterly, Journal of Educational Leadership, Review of Research in Education, and the Journal of School Effectiveness and School Improvement*.

In addition, relevant reference lists from published journal articles (e.g., Hoy et al., 2004, 2006; Kearney et al., 2013; Stringfield et al., 2011; Weick & Sutcliffe, 2007) and dissertations related to school mindfulness (Gilbert, 2012; Marshall, 2013; Peterson, 2015; Rodriquez, 2015; Russell, 2015; Spencer, 2015) were used to identify relevant sources. The results from this search process provided a large bank of articles, dissertations, books, chapters, and presentations. This collection of literature was then trimmed down to 13 studies directly related to the practice of mindfulness in schools and six studies related to principles of high reliability applied to school reform in the United States and the United Kingdom (see in Table 1).

Table 1

Empirical and Theoretical Studies on Mindfulness and High Reliability Schools

		Methodology				
Author(s)	Sample	Quan	Qual	Mixed	Design	Findings
Gage (2003)	75 middle schools	X			Correlational	Significant relationships found between school mindfulness, faculty trust, and collective efficacy. Faculty trust in principal, enabling school structure, and school mindfulness were significant.
Gilbert (2012)	1 school		X		Case study	Data driven inquiry improved reliability and resilience. Descriptive analysis confirmed that data driven inquiry reflected mindful strategies present in high reliability organization (HRO) theory.
Hoy (2003)					Theoretical	The concepts of enabling structures and mindfulness are developed, contrasted, and synthesized.

Table 1

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		Methodology				
Author	Sample	Quan	Qual	Mixed	Design	Findings
Hoy et al. (2004)	75 middle schools; teachers (*n* = 2600)	X			Factor analysis	Findings confirmed the reliability and validity of the measures for mindfulness in schools. Also, collective efficacy and enabling structures related positively to principal, faculty, and overall organizational mindfulness.
Hoy et al. (2006)	75 middle schools	X			Descriptive statistics, multivariate analysis, multiple regression analysis	Findings confirmed the link between mindfulness and trust. Mindfulness was best explained by faculty trust in others and with the principal.
Kearney et al. (2013)	109 elementary, 28 middle, 12 high schools, and 11principals			X	Regression analysis, semistructured interviews	Findings confirmed a positive relationship between principal mindfulness and student success. Reflection relationship building and perpetual renewal were common themes amongst principals.

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Author	Sample	Quan	Qual	Mixed	Design	Findings
Lee (2012)	5 elementary schools		X		Case study	Findings showed similarities between high poverty schools that prevent failure and characteristics of HROs. Findings suggested that HRO characteristics must be at the district-level to reach the classroom. Further, there is a relationship between the characteristics of HROs and the effective turnaround strategies.
Marshall (2013)	51 elementary, middle, and high schools; 521 teachers and 45 principals and assistant principals	X			Correlational and linear regression analysis	Findings showed no relationship existed between teacher flow and mindfulness; however, findings showed a relationship between enabling structures and mindfulness.
Peterson (2015)	293 elementary schools	X			Independent samples *t* test	Findings showed that elementary principals are most mindful in community engagement and the least mindful in gathering data. No statistical relationship found between principal mindfulness and experience.

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Author	Sample	Quan	Qual	Mixed	Design	Findings
Potter (2002)					Theoretical	High reliability school (HRS) model may be relevant to school improvement efforts and to shape intervention activities.
Ray et al. (2011)	180 business colleges; 310 deans, associate deans, assistant deans, and department chairs	X			Factor analysis	Characteristics of organizational mindfulness present in business schools. Individuals at the top of the organization viewed their organization as more mindful than those in other roles.
Rodriquez (2015)	505 principals; 293 elementary, 131 middle, 81 secondary schools	X			Correlational and descriptive analysis	Small but significant correlation between individual mindfulness and principal practices.
Reynolds et al. (2006)	25 secondary schools	X			Correlational	Findings revealed that a school improvement program in schools that coconstructed with personnel on high reliability, school effectiveness, and school improvement is related to greater student achievement.

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Author	Sample	Methodology			Design	Findings
		Quan	Qual	Mixed		
Russell (2015)	293 elementary, 131 intermediate, 81 secondary schools; 1465 elementary teachers, 655 intermediate teachers, 405 secondary teachers	X			Descriptive analysis, chi-squared analysis	District leaders and teachers perceived mindful beliefs and practices were linked to closing achievement gaps and least associated with a culture of instructional improvement. Principals believed their instructional leadership to be most linked to community engagement.
Schaffer et al. (2012)	1 school district		X		Case study	In each of the four schools the majority of characteristics of the HRO model were at work. The characteristics of the HRO model can serve as a guide for diverse, valuable, and restructuring efforts.
Schaffer et al. (2013)	16 schools			X	Longitudinal case study	Schools can achieve equity and liberty through HRO principles.

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		Methodology				
Author	Sample	Quan	Qual	Mixed	Design	Findings
Spencer (2015)	293 elementary teachers	X			Descriptive analysis, exploratory factor analysis	Developed a survey instrument to measure the relationship between collective mindfulness and teacher collaboration.
Stringfield (1997)	4 elementary schools		X		Case study	The majority of HRO characteristics at work in all four schools.
Stringfield et al. (2011)	12 secondary schools			X	Longitudinal case study	Four years after HRS project, student outcomes remained positive. Additionally, schools continued to use HRO principles after the project ended.
Stringfield et al. (2012)	2 secondary schools			X	Longitudinal	After 16 years of the HRS project, schools sustained progress and continued to utilize HRO principles after the project ended.

In addition, this collection included works on high reliability principles and various fields outside of education.

High Reliability Theory

Over the past three decades, high reliability organization (HRO) theory has generated a great deal of scholarly interest in multidisciplinary fields of research such as management, health care, and education (Bourrier, 2011; Eck, 2011; Hoy et al., 2004; Marzano et al., 2014; Ray et al., 2011; Roberts, 1993; Roberts, 2009; Rochlin, 1993; Schulman, 1993; Stringfield et al., 2012; Sutcliffe, 2011**;** Weick & Sutcliffe, 2007). High reliability theory is grounded in the belief that safe operations can be achieved with hazardous technologies as opposed to normal accidents theory that takes on a more pessimistic perspective by assuming accidents will inevitably happen (Sagan, 1993). Research on HROs was initiated in 1984 by a team of Berkeley researchers who embarked on an intensive study of three fail-safe organizations working in air traffic control, gas and electric, and a nuclear-powered aircraft carrier. These fail-safe organizations all operated with extraordinarily complex and dangerous technologies that shared a potential for operational errors which could result in a catastrophic disaster but were able to reliably avoid failure. This team of researchers were struck by the absence of literature on organizations that could not fail and in explaining why some organizations were successful at avoiding disaster while others were not (Bourrier, 2011). According to Rochlin (1993), the following organizational characteristics emerged from the Berkeley project's research that distinguished these organizations from others:

1. An ab initio assumption that errors are omnipresent and insidious, and that eternal vigilance is the price of success.
2. A parallel assumption that the sources of error are dynamic, not static, so that the monitoring mechanisms themselves must be constantly renewed and re-invigorated.
3. As a result, the operational assumption that the operating environment is a constant source of threat, requiring constant vigilance, even (and especially) at times when things seem to be going well.
4. Maintenance of redundant modes of problem solving at the operational level, and resistance to pressure to resolve or 'rationalize' the process by adopting a single 'best' approach.
5. The creation, maintenance, and exercise of multiple simultaneous informal organizational structures adapted to contingencies (structural variation according to the nature of the problem).
6. An organizational commitment to anticipatory as well as reactive modes of dealing with real and potential problems.
7. A relative empowerment of organizational units dedicated to searching or incipient or latent error.
8. The inability or unwillingness to test the boundaries of reliability (which means that trial-and-error learning modes become secondary and contingent, rather than primary).
9. The absence of 'stopping rules' for self-improvement and self-regulation, as long as organizational resources and time remain available, so that additional information is always cost-effective at margin as a means of controlling and bounding uncertainties.
10. A particular kind of obeisance to formal regulations and codes ('going by the book')-extended with accepted standard operating procedures (SOPs) based on tradition.

11. Acceptance of the proposition that even if a complete formal history and analysis were available, the task of actively maintaining performance and searching for error would only be simplified, and not removed or reduced in importance. (pp. 23–24)

At the heart of these characteristics is an organizational paradox whereby HROs seek perfection but never assume to reach it, require safety but never accept it will happen, fear surprise but vigilantly predict it, and follow the book but are reluctant to perish by it (Rochlin, 1993). Creed et al. (1993) indicated that reliability in HROs takes on several different a priori meanings that are imbedded in both technical and societal constraints that include error avoidance and error reduction. For Creed et al., effectiveness is culturally derived, and reliability is a manifestation of fundamental cultural assumptions, value oriented against ineffectiveness rather than toward effectiveness. Therefore, HROs experience no equilibrium state or stopping rules in their pursuit of safety and nongoal avoidance (Creed et al., 1993).

The findings from the Berkeley study fomented interest by organizations and researchers concerned with safety, public image, organizational effectiveness, and reliability (Bourrier, 2011). The HRO literature has evolved from a research topic to a label of success for different organizations in health care and business (Bourrier, 2011) and has also surfaced in education (Hoy 2003; Hoy et al., 2004, 2006; Kearney et al., 2013; Marzano et al., 2014; Stringfield et al., 2012). As Bourrier indicated, the term HRO has become a powerful marketing label and a desired classification for organizations interested in safety, effectiveness, and their public image.

Although defining the concept of HRO has created challenges for organizational researchers from its inception (Bourrier, 2011; Rochlin, 1993; Schulman, 1993; Sutcliffe, 2011), the term has come to mean that the intersectionality of risk and effectiveness is possible and that organizations can perform reliably if they support rigorous efforts to do so. Weick and Sutcliffe (2007) suggested that businesses and other organizations outside of high-risk industries could utilize the principles of HROs and incorporate the mindful infrastructures practiced in HROs to manage unexpected events and achieve reliable performance. Weick and Sutcliffe (2001) consolidated the characteristics of HROs into five key cognitive elements: preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise.

Weick et al. (1999) indicated that HROs utilizes these elements to induce a continued state of mindfulness, which facilitates discovery, modification, and awareness of details that enables individuals to manage events that they would otherwise be unaware of. Clarke (1993) suggested that individuals often search for confirmation while neglecting information that may disconfirm or contradict their preconceived expectations. Frequently, people seek confirmation in their routines and lack efforts to continuously reevaluate, update, and reframe their routines and expectations (Weick & Sutcliffe, 2007). Hoy et al. (2006) noted that this inclination toward a habit of mind seeks to embrace routines to simplify experiences and justify behavior. Weick and Sutcliffe (2007) argued that through these infrastructures, HROs break the routines of mindlessness and facilitate an environment of learning and awareness. Eck (2011) indicated that attending to this constant state of collective mindfulness, organizations are equipped to identify failures, collaborate, innovate, improvise, and be creative. However, prior to unpacking these mindful processes, it is necessary to first understand the development and evolution of the construct of individual mindfulness (Hoy et al., 2004).

The Development of Western Mindfulness

The construct of mindfulness has emerged in both Eastern and Western thought but has taken on different meanings and traditions (Weick & Putnam, 2006). In Eastern thought, mindfulness is grounded in Buddhist tradition and concentrates on counteracting the undisciplined mind (Weick & Putnam, 2006) and "enhancing attentional stability and clarity, and of then using these abilities in the introspective examination of conscious states to pursue the fundamental issues concerning consciousness itself" (Wallace, 2005, p. 5). Weick and Putnam noted that the cornerstone of Eastern mindfulness is an introspective focus on the body, emotions, and conceptual objects. In Western thought, the construct of mindfulness emerged in the field of psychology and in the early work of Langer (1989), Ryle (1990), and Sternberg (2000). Langer's (1989) seminal work expanded upon the concept of mindfulness and noted that the way information is initially taken in defines how an individual will utilize it later whether mindfully or mindlessly.

Individual Mindlessness

In Langer's (1989) work, the concept of mindlessness was described as a form of blind rule following and commitment to routines that cause individuals to function like automatons trapped in rigid worlds, presenting significant consequences to themselves and others. Drawing from this description, Weick and Sutcliffe (2001) depicted mindlessness as "a style of mental functioning in which people follow recipes, impose old categories to classify what they see, act with some rigidity, operate on automatic pilot, and mislabel unfamiliar and new contexts as familiar old ones" (p. 92). For Hoy et al. (2006), mindlessness is a paradox in which personality and thoughtful adaptability are sacrificed for routines and standard practices. This paradox develops out of repetition whereby individuals become so accustomed to and secure in doing things a certain way that their responses become routine and automatic (Hoy, 2003).

Hoy (2003) noted that individual mindsets are challenging to break as people develop habits of mind around routines, rules, procedures, and classification schemes. Previous successes can reinforce habits of mind and sow seeds of destruction (Hoy et al., 2004) as individuals tend to revert to certain mindsets, rules, procedures, and routines that brought them success in the past. Hoy et al. (2004) noted that the tendency is a premature cognitive commitment whereby individuals commit to categories, adhere to routine procedures, and are stuck in habits even when they are not working. This tendency often occurs when rule following becomes mechanisms of security whereby individuals do not take risks or participate in problem solving to protect themselves (Hoy, 2003). Langer (1989) noted that individuals construct and share realities and fall victim to them. On the other hand, Levinthal and Rerup (2006) indicated that mindless or automatic behaviors do have virtues and that mindful and less-mindful actions are not completely distinct but are more interrelated.

Individual Mindfulness

On the contrary, Langer (1989) viewed individual mindfulness as a process orientation whereby processes precede outcomes. Langer (1989) noted the following:

> Just as mindlessness is the rigid reliance on old categories, mindfulness means the continual creation of new ones. Categorizing and recategorizing, labeling and

> relabeling as one masters the world are processes natural to children. They are an adaptive and inevitable part of surviving in the world. (p. 63)

Weick et al. (1999) suggested that mindfulness is centered on the value and conversation of attentiveness and the interpretative work of acting upon what is noticed and the process of noticing. Hoy et al. (2006) suggested that mindfulness is a continual state of scrutinizing and refining expectations according to "new experiences, appreciation of the subtleties of context, and identification of novel aspects of context that can improve foresight and functioning" (p. 238). Weick and Sutcliffe (2007) described mindfulness as an awareness to details and involves a combination of scrutinizing, refining, and reframing expectations to make meaning of events and a new understanding of context. Essentially mindfulness contains two fundamental elements: alertness to context and the ability to respond accordingly (Levinthal & Rerup, 2006). This study will utilize Langer's (2013) definition of mindfulness: the active state of noticing things, being in the present, being aware of context and perceptions, and to continuously refine and scrutinize one's expectations.

Organizational Mindfulness

The earlier work of Weick and Roberts (1993) indicated that reliability seeking organizations enact cognitive mental processes, which enables individuals to better understand the complexities they face and empowers them to respond accordingly. This concept refers to the collective mind in HROs that is distinct from individual cognition as it refers to the interrelated actions of people within the organizations (Weick & Roberts, 1993). Organizational actors in these systems act with the understanding that their actions are connected to themselves and to others and are interrelated within the entire system (Weick & Roberts, 1993). Drawing from Langer's (1989) work on individual mindfulness, Weick et al. (1999) extended the construct of individual mindfulness to the collective organizational level with the organizational characteristics practiced in HROs. Researchers have indicated that HROs are mindfully organized to enable actions that identify subtle signs of failure and the variations of context thereby being more resilient (Sutcliffe, 2011; Weick et al., 1999; Weick & Sutcliffe, 2007).

Weick and Sutcliffe (2001, 2007, 2015) outlined five hallmarks or elements that promote mindfulness in the HROs: preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise. These five hallmarks extend beyond the sum of mindful individuals (Hoy, 2003; Hoy et al., 2006) and to a process orientation that utilizes processes to develop a state of readiness and learning whereby the organization can anticipate the unexpected under trying conditions and prevent errors from disabling the entire system (Weick & Sutcliffe, 2007) thus becoming more effective and reliable (see Figure 1).

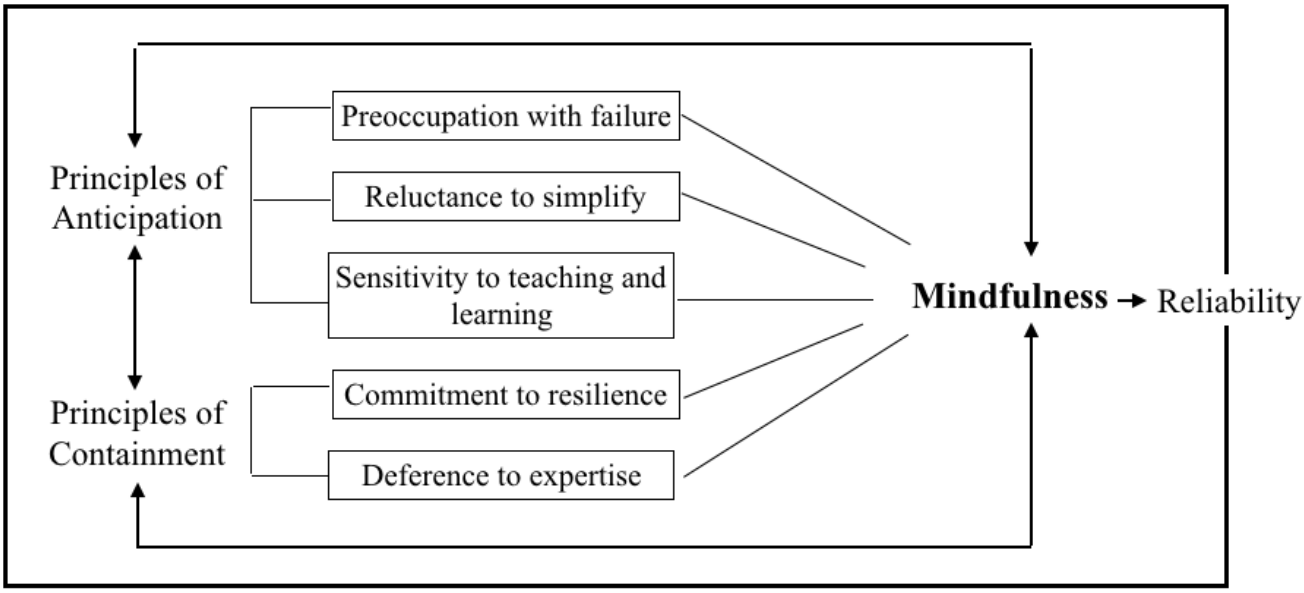
Principles of Anticipation

HROs mindfully anticipate the unexpected through a focus on failure, reluctance to simplify, and sensitivity to their operations. Weick and Sutcliffe (2007) noted that the principles of anticipation are based upon an attentiveness to failure, simplification, and operations. Weick et al. (1999) indicated that anticipation is the act of predicting and preventing potential dangers prior to damage being done. Anticipation in HROs demands that members within the organization commit to identifying events and situations that cannot happen, detect any and all possible precursor signals

of failure, and generate a standard operating procedure to avoid them (Sutcliffe, 2011). Anticipation is grounded in an organizational culture that believes failure is not an option as it would lead to a catastrophic disaster of some kind.

Figure 1

Mindful School Structures That Illustrates the Five Mindful Structures of Anticipation and Containment.



Focus on Failure

A focus on failure is the act of paying attention to details and inconsistencies within the system that may be indications of much larger problems (Weick & Putnam, 2006). HROs are unique in that they are obsessed with failure as opposed to success. Although a focus on failure may seem counterproductive and considered pessimistic, it has the potential to enhance organizational capacity to detect both small and large failures (Hoy et al., 2004). Weick and Sutcliffe (2007) suggested that by embracing failure organizations prevent weak signals of failure from cascading into much larger problems and clearly articulate mistakes that individuals should not make. Schulman (1993) noted that the distinguishing feature of these types of organizations is that members are continually alert to the possibilities and cost of failure. HROs are actively attentive to surprises and signals that may indicate a system is not functioning appropriately (Sutcliffe, 2011). In addition, Weick and Putnam (2006) noted that HROs look for signals of failure and understand that they have not faced or imagined the abundant ways in which the system can fail.

This principle prevents organizations from developing a false sense of confidence in past successes, which can develop into complacency and arrogance (Eck, 2011; Hoy et al., 2004). To foster this organizational element, Weick and Sutcliffe (2007) argued that organizational actors need to feel safe, have climates of openness, and trust in discussing and reporting failures without

fear of recourse. Weick et al. (1999) added that to be preoccupied with failure is to convert imperfect situations into grounds for improvement. In school contexts, Kearney et al. (2013) noted that schools often pay attention to mistakes and are trying to prevent them from developing into much larger problems. Stringfield et al. (2011) argued that schools cannot afford to allow students to fall by the wayside as the consequence of failure is detrimental to the student, family, and community. Therefore, schools must understand the consequences of academic failure and become preoccupied with preventing it.

Reluctance to Simplify

Individuals tend to handle complex tasks by simplifying how they interpret a situation (Sutcliffe, 2011; Weick et al., 1999). However, simplifications have the potential to jeopardize organizational effectiveness as they might reduce the safeguards people take and lead to blind spots (Sutcliffe, 2011; Weick et al., 1999). Simplification can lead to misspecification and inaccurate assumptions about the complexity of projects, the resources needed to achieve objectives and goals, and the methods utilized to avoid failure from occurring (Weick & Sutcliffe, 2007). In addition, Sutcliffe (2011) noted that simplifications reinforce a false sense of security in which individuals confidently believe they are in control of and know exactly how to fix problems that arise. Weick and Sutcliffe (2007) argued that less simplification allows organizations to see a more complete view of the problems faced within the context from which they are embedded.

A reluctance to simplify enables organizations to better understand the subtleties of the context (Hoy et al., 2006) by gathering multiple perspectives to see more, challenge norms, and reveal blind spots (Sutcliffe, 2011; Weick et al., 1999). Eck (2011) noted that this includes the utilization of sophisticated data systems and practices that identify the root cause of problems. Organizations positioned in unstable, unpredictable, and complex environments require diversity of experiences and views, skepticism, negotiating tactics, and concerns over generalizing superficial similarities between the past and present (Weick & Sutcliffe, 2007). Furthermore, a reluctance to simplify is the resistance towards accepting simplified explanations of both successes and failures. It induces a heightened attention to what is occurring in the present while remaining reluctant to labels and routines of the past (Weick & Putnam, 2006). Weick et al. (1999) indicated that HROs foster requisite variety whereby they believe that it takes a complexity to manage the complexity of an organization. This means that a wide variety of responses are needed to effectively deal with an array of problems that exist in a complex system (Weick, 1987; Weick & Sutcliffe, 2007). However, when organizations lack the requisite variety needed to manage the demands of a complex system, they overlook information, fail to detect real problems, and implore inadequate remedies thereby intensifying rather than reducing problems (Weick, 1987).

The complex and loosely coupled nature of schools demands that administrators and faculty are reluctant to simplify and invite multiple perspectives to understand what is going on beneath the surface (Eck, 2011; Hoy et al., 2006). However, schools share the inherent human tendency to simplify interpretations to validate a false belief that they understand and control their context (Hoy et al., 2004). Developing a reluctance to simplify in schools promotes the subtleties of context, enables schools to see more (Hoy et al., 2006), and encourages reflection and scrutiny (Kearney et al., 2013). Schools that practice mindfulness attempt to reconcile differences in interpretations without damaging the diversity of opinions (Hoy et al., 2004). Furthermore, schools that practice mindfulness utilize and monitor data to determine student needs and provide prompt interventions rather than waiting until the end of the year to act (Eck, 2011).

Sensitivity to Operations and Teaching and Learning

Hoy et al. (2006) indicated that sensitivity to operations is staying close to the purpose of the organization and the ability to develop interpersonal relationships. Sensitivity to operations is the capability to create and maintain the big picture through an ongoing monitoring of information (Sutcliffe, 2011). Although this may appear to be like the previous two organizational elements, Weick and Sutcliffe (2007) noted that sensitivity to operations is about seeing the actual work being done rather than what is believed to be or planned to be accomplished.

Weick et al. (1999) referred to this organizational element as having the bubble or the ability to achieve high degrees of situational awareness that reduces both inaction and surprise. This organizational structure requires that managers are proactive in understanding and being sensitive to operations as well as human relationships within the organization. The core function of schools is teaching and learning (Eck, 2011; Hoy, 2003; Hoy et al., 2006; Kearney et al., 2013). This core function is focused on assessing teaching and learning to prevent errors from turning into more serious failures (Hoy et al., 2004). Eck indicated that this is managed by continuous face-to-face interaction and communication in real-time. The principles of anticipation in sum are focused on preventing minor errors from transpiring (Eck, 2011); however, HROs extend beyond preventative processes and incorporate principles of containment.

Principles of Containment

Although the principles of anticipation concentrate on prevention, it is impossible for organizations to anticipate all errors and discrepancies from occurring (Eck, 2011; Levinthal & Rerup, 2006; Sutcliffe, 2011; Weick, 1987; Weick & Sutcliffe, 2007). When unanticipated events inevitably occur, HROs shift their attention to principles of containment: commitment to resilience and deference to expertise (Weick & Sutcliffe, 2007). Weick and Sutcliffe (2007) indicated that the principles of containment differ from anticipation as it focuses on preventing unwanted outcomes following an unanticipated event. Once the unexpected has occurred, HROs develop a capacity to effectively cope with the surprise and flexibly manage it (Levinthal & Rerup, 2006).

Commitment to Resilience

Weick et al. (1999) referred to resilience as the ability to learn to bounce back and cope with unanticipated events that have become manifested in the moment. These unanticipated events are the unavoidable parts of an unknown world (Eck, 2011). Sutcliffe (2011) noted that this capacity to rebound and recover from the unexpected is developed from an action repertoire developed from "training and simulation, varied job experience, learning from negative feedback and ad hoc networks that allow for rapid pooling of expertise to handle unexpected events" (p. 140). For Weick and Sutcliffe (2007), resilience is to be mindful of mistakes that have happened and correct mistakes before they become more serious. In addition to bouncing back from surprises, a commitment to resilience is to persevere through adversity and to learn from resilient performances of the past (Weick & Sutcliffe, 2007). Weick and Putnam (2006) indicated that this process utilizes whatever resources are available to rebound and recover from setbacks.

A commitment to resilience is a quality of being mindful, and schools must also manage the unexpected through anticipation and resilience (Hoy, 2004; Hoy et al., 2006). Hoy et al. (2006) noted that mindful school leadership understands that schools are not perfect and work to develop

this capacity within the school. A commitment to resilience in schools means that both principals and teachers develop a capacity for resilience and that mindful school structures contain and rebound from errors (Hoy, 2003; Hoy et al., 2004, 2006).

Deference to Expertise

The final organizational element in HROs is deference to expertise in which decision-making is shifted away from hierarchy to expertise and diversity of perspectives (Eck, 2011; Sutcliffe, 2011). Rank and position take a back seat to expert knowledge that is relevant to the situation. In HROs, authority is situational (Hoy et al., 2004) and decision making migrates flexibly between hierarchical lines in tandem with problems (Sutcliffe, 2011). This concept of migration is the belief that expertise and hierarchical position are not automatically matched and that blindly committing to hierarchy in decision making removes those on the frontline from sharing their experience and expertise (Weick & Sutcliffe, 2007). HROs prioritize expertise above hierarchy and are equipped with expert and skilled personnel to enlist in order to deal with uncertainty (Sutcliffe, 2011). Hirschhorn (1993) noted that procedures and verbatim compliance to hierarchy and procedures is inadequate as procedural writers cannot fully anticipate every situation and that procedures cannot substitute for technical knowledge. Therefore, decision making may arise spontaneously and to areas with the greatest demands of needs (Weick & Putnam, 2006).

On the other hand, HROs pull from the strength of well-functioning hierarchies whereby authority and accountability is delegated according to the complexity and importance of the task (Hirschhorn, 1993). Weick (1987) noted that the real trick in HROs is the ability to simultaneously achieve both centralization and decentralization. In mindful schools, fluid decision making and enabling structures replace rigid administrative rules and policies (Hoy, 2003; Hoy et al., 2004, 2006). In addition, schools hire individuals with specialized knowledge to resolve problems (Hoy, 2003). Weick and Sutcliffe (2007) indicated that deference to expertise is a cultural belief whereby individuals do not fear asking for help and acknowledge when they have limited knowledge to address problems.

In summary, organizing for high reliability does not supersede Eastern mindfulness but rather provides a yardstick to detect and alter deficiencies (Weick & Putnam, 2006). Mindful schools develop an organizational capacity to anticipate the unexpected by focusing on failure, being reluctant to simplify, and developing a sensitivity to teaching and learning. Furthermore, mindful schools understand the inevitability of failure, and as a result, adhere to principles of containment: commitment to resilience and deference to expertise. Sutcliffe (2011) indicated that organizations that act mindfully or have mindful actions reduce the likelihood of being surprised and disabled by unforeseen events. In school contexts, Hoy et al. (2006) suggested that

> in brief, mindful schools have teachers and administrators who develop the ability to anticipate surprise by focusing on failure, avoiding simplification, and remaining sensitive to operations. But when the unexpected happens, the organization rebounds with persistence, resilience, and expertise. (p. 240)

Educational Research on Organizational Mindfulness

In the midst of HRO theory development in management and health care, educational researchers began applying the theory to school settings and reform efforts in both the United States and the

United Kingdom (Bellamy et al., 2005; Hoy, 2003; Hoy et al., 2004, 2006; Kearney et al., 2013; Lee, 2012; Marzano et al., 2014; Potter, 2002; Stringfield, 1997; Stringfield et al., 2008, 2011, 2012). In 1991, Stringfield presented a thought piece at the International Congress for School Effectiveness and School Improvement that explored the potentiality of HRO principles applied to school contexts and to school reform efforts (Stringfield et al., 2011). Stringfield's thought piece inspired school effectiveness and improvement research in the United States and United Kingdom to examine HROs in schools.

Research on School Reliability in the United States

In the United States, the earliest study on HRO principles in school settings was conducted by Stringfield (1997) in a 2-to-11-year case study. Stringfield examined four high-performing elementary schools across the United States that experienced successful school improvement efforts. Stringfield argued that underlying the chaos of highly effective schools were common characteristics and that most HRO characteristics were present in all of them. Stringfield's work drew the first connection between HRO characteristics functioning in school settings and the relationship that it may have on reliable student achievement in the United States. All four of the high-performing schools in the study had large percentages of economically disadvantaged and racially diverse students with a history of low academic achievement. This investigation consisted of mostly urban schools with only one rural school from the state of Louisiana. Stringfield's findings suggested that the HRO characteristics present in these schools might be linked to successful school improvement. Although Stringfield provided interesting insight for school effectiveness and improvement research regarding theoretical underpinnings of the HRO framework in schools, it consisted of a very small sample size and did not specifically focus on rural schools.

More recently, Marzano et al. (2014) pulled from Hattie's (2009, 2012) 800 meta-analysis on student achievement research to identify specific factors that affect achievement that schools have control over. From Hattie's list of factors, Marzano et al. identified 46 factors that schools control and collapsed them into five operational levels for high reliability: safe and collaborative culture, effective teaching in every classroom, guaranteed and viable curriculum, standards-referenced reporting, and competency-based education. Although Marzano et al. indicated that these operational levels are grounded in past educational research and will assist schools in achieving reliable performance, they have yet to be examined empirically in educational research.

School Mindfulness

In addition to Stringfield's (1997) work, other researchers began developing and applying HRO theory to schools in the United States. Drawing from Weick and Sutcliffe's (2001, 2007) elements of organizational mindfulness, Hoy et al. (2004) extended the construct to the school context. Hoy et al. (2004) indicated that schools could mindfully anticipate and contain unexpected events by utilizing the five key organizational elements in HROs. Hoy et al.'s (2004) mindful school structure mirrored Weick and Sutcliffe's (2001; 2007) five HRO elements: focus on failure, reluctance to simplify, sensitivity to teaching and learning, commitment to resilience, and deference to expertise.

Hoy et al. (2004) developed the Mindfulness Scale (M-Scale) survey instrument that includes a 6-point Likert response questionnaire that surveys teacher perceptions of school

mindfulness based upon these five HRO elements. Hoy et al.'s (2004) M-Scale provided the field with a reliable and valid survey instrument to measure the practice of mindfulness in school settings. Unlike Stringfield's (1997) work that explored HRO constructs in successful turnaround schools, Hoy et al.'s (2004) study validated a reliable tool for measuring the five cognitive elements of HROs in 75 middle schools in the state of Ohio. Hoy et al.'s (2004) M-Scale has stirred research interest in the relationship between mindful school elements and student achievement, trust, collective efficacy, teacher flow, and enabling school structures (Gage, 2003; Gilbert, 2012; Hoy et al., 2006; Kearney et al., 2013; Marshall, 2013; Peterson, 2015; Ray et al., 2011; Rodriquez, 2015; Russell; 2015; Spencer, 2015).

In addition to Hoy et al.'s (2004, 2006) work, Lee (2012) examined Weick and Sutcliffe's (2007) mindful school elements in four high-poverty turnaround schools in the state of Louisiana. The findings from Lee's qualitative case study found that schools that displayed significant growth demonstrated all of Weick and Sutcliffe's (2007) five HRO characteristics. Lee's work confirmed Stringfield's (1997) suggestion that schools are more successful in reform or turnaround efforts in high poverty contexts when they employ HRO characteristics. However, like Stringfield's work, Lee's use of a case study design restricted the sample size and generalizability of the findings.

Although the body of HRO research in the United States has been limited, it has primarily utilized quantitative methodologies to investigate the phenomena of mindfulness in school settings. Out of this body of research only two studies have utilized qualitative case studies (Gilbert, 2012; Lee, 2012), one mixed methods (Kearney et al., 2013), and nine quantitative studies (Gage, 2003; Hoy et al., 2004, 2006; Marshall, 2013; Peterson, 2015; Ray et al., 2011; Rodriquez, 2015; Russell, 2015; Spencer, 2015). In addition, few studies, if any, have utilized Hoy et al.'s (2004) M-Scale in a mixed methods design to examine the practice of mindfulness in rural secondary schools and to examine how principals understand the practice of mindfulness.

Kearney et al.'s (2013) study is among the few that has utilized a mixed methods design to specifically investigate principal mindfulness in 149 public schools in Texas. This study surveyed elementary, middle, and high schools throughout the state and included all school locale types (urban, suburban, and rural), student demographics, and socioeconomic status. For the quantitative phase, Kearney et al. discovered a positive relationship between the dimension of principal mindfulness and student achievement and found that principals in highly mindful schools gain their success by reflection, relationship building, and perpetual renewal. Although this study is among the few that have investigated the relationship between principal mindfulness and student achievement, it did not examine the practice of mindfulness in specifically rural contexts, configurations of mindfulness, and how leadership might explain the extent of mindfulness practiced by faculty.

Research in the United Kingdom: The High Reliability Schools Project

Similar to studies in the United States, Stringfield's (1997) work inspired a 16-year research project in the United Kingdom that analyzed the characteristics of HROs and student achievement in an economically disadvantaged area in a Welsh district. In what they termed the High Reliability School (HRS) project, a team of researchers incorporated HRO principles in reform efforts in disadvantaged secondary schools (Reynolds et al., 2006; Stringfield et al., 2008; Stringfield et al., 2011, 2012). This seminal study was unique in that no previous efforts had assisted local education authorities in improving the reliability of services and programming that was being delivered to school reform (Stringfield et al., 2008).

In their preliminary results, Reynolds et al. (2006) found that programs that coconstructed practice with personnel on the basis of high reliability, school effectiveness, and school improvement research greatly enhanced student achievement. In the first 4 years of the project, achievement scores rose dramatically compared to the 3 years prior to the project (Stringfield et al., 2012). Sandfields Comprehensive School, for instance, rose from 14% proficient to 35% proficient in just 4 years (Stringfield et al., 2012). Nine years after the reform initiative begun, Stringfield et al. (2008) conducted a 5-year longitudinal follow-up investigation and collected mixed methods data on the schools participating in the study. Stringfield et al. (2008) discovered that most of the schools in the Welsh district continued to utilize the HRO principles even after the intervention was completed and continued to make strong academic improvements each year. In addition, quantitative data indicated that the Welsh district had raised its achievement scores over the course of 9 years by 21.3% and that the largest gains were made in the first 4 years of the HRS intervention but were followed by 6.8% increase 5 years following (Stringfield et al., 2008).

The qualitative component of this study revealed the following themes: the importance of finite goals, evolving sophistication with data and data analysis, standardized procedures, seeking best practice and collaboration, off-site professional development, leadership successions by trained leaders, and a year-to-year cyclical effect of achievement gains (Stringfield et al., 2008). The mixed methods data indicated that heightening the reliability of school functioning produced consistent improvements in student outcomes over the course of 9 years (Stringfield et al., 2008). This study indicated that reliable student achievement and improvement was possible in a high-poverty district in the UK through the utilization of HRO principles.

In addition, Schaffer et al. (2012) later conducted a case study on the Sandfields Secondary School, which included 11 years of multimethod data. Results from this study also confirmed that the school experienced consistent increases of student achievement throughout the project and utilized the HRS principles to continuously raise scores for over a decade. Like the previous studies, the application of HRS principles not only made positive and sustained increases in student achievement but also found that the school continued to apply HRO principles after the project ended to continuously improve its practices (Schaffer et al, 2012; Stringfield et al., 2011, 2012). The HRS project produced significant findings that pointed to the theoretical relevance of HRO characteristics in school settings and to the appropriateness of utilizing such constructs for school improvement efforts in high-needs schools.

Conclusion

This review of literature has attempted to provide an analysis of the extant research on high reliability theory and organizational mindfulness in schools. This critical review has shown that although research has attempted to explore the complexity of high reliability theory in education, frequent calls for further research on the practice of mindfulness (Hoy et al., 2006; Kearney et al., 2013; Ray et al., 2011) underpins the importance of further expansion in this field. This includes studies of socioeconomic status, community type (urban, rural, and suburban), grade phases, and governance structures (Reynolds et al., 2016; Teddlie & Stringfield, 2007). The field of high reliability theory applied to education has been long overdue for theoretical developments that examine the organizational mindfulness framework contextually. Although the literature has indicated a positive relationship between the practice across organizational levels of mindfulness and student achievement (Kearney et al., 2013), trust (Hoy et al., 2006), and enabling structures (Hoy, 2003), more contextualized research is needed to understand how the practice might be

uniquely practiced across contexts while overlapping relational space. Furthermore, limited attention in this field has provided voice to principals and examined how leadership practices impact the extent of mindfulness practiced in schools. This warrants the need for further scientific investigations that examine the theoretical framework of organizational mindfulness in different contexts, grade phases, and organizational levels.

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