Combining Crisis Management and Evidence-Based Management: The Queensland Floods as a Teachable Moment

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Abstract

Natural disasters, such as floods, provide teachable moments for students to learn about crisis management. The authors argue that evidence-based management offers a pedagogical tool for leveraging these teachable moments to deepen student learning about the management challenges of crisis situations. An emerging area in management education, evidence-based management involves using best available scientific evidence as the basis for management decision making and practice. Using data from 782 student assignments in an undergraduate introductory management course, the authors show how combining crisis management and evidence-based management in an assignment task in the aftermath of the 2010-2011 Queensland floods in Australia deepened student learning of general and crisis management concepts and increased students' engagement in learning an evidence-based management approach.

Keywords

crisis management, natural disasters, evidence-based management, systematic literature review, teachable moments, deep learning

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Crisis events involving natural disasters such as floods, earthquakes, and hurricanes bring to the foreground fundamental management questions about planning and controlling. The crisis management literature distinguishes natural disasters as a special type of organizational crisis in which an act of nature creates a collective crisis situation for whole communities in and across geographic regions (Quarantelli, 1988). Because natural disasters receive extensive media coverage and may be personally experienced by students in local communities, they provide "teachable moments" for enhanced student learning in management courses. A teachable moment is defined as a high-interest situation in which a student is receptive to new understandings about a topic (Rosile, 2007; Wagner & Ash, 1998). However, if students focus on the sensationalism and emotion of the natural disaster in their efforts to make sense of it (Maitlis & Sonenshein, 2010), they may miss the insights into management theory that the disaster illuminates. Thus, a pedagogical challenge confronting educators is how to leverage teachable moments involving natural disasters to facilitate deep learning of crisis management (Cirka & Corrigall, 2010).

A solution lies in evidence-based management, an approach to the teaching and practice of management that proposes to replace thinking based on hype and emotional biases with systematic analysis of evidence. Evidence-based management is defined as "managerial decisions and organizational practices informed by the best available scientific evidence" (Rousseau & McCarthy, 2007, p. 84). Drawing from physicians' use of evidence-based medicine to diagnose and treat patients by applying current medical research, scholars argue that managers should use evidence-based management to solve organizational problems by applying principles derived from social science and organizational research rather than personal preferences, experience and the latest media hype and consultant fads (Pfeffer & Sutton, 2006). Over time, these managers become professional experts who systematically seek out and translate best available evidence to their daily practice in organizational life (Rousseau, 2006).

In this article, we evaluate the use of evidence-based management to deepen students' learning during teachable moments involving natural disasters. Our evaluation focuses on the 2010-2011 Queensland floods in Australia. This natural disaster, in which 78% of the state of Queensland was flooded, provided a teachable moment for students in our undergraduate introductory management course about the challenges crisis situations create for planning and controlling. We designed a written assignment requiring students to search for, and apply to the flood event, scientific research published in leading management journals. Our evaluation of 782 student assignments

demonstrates that the application of evidence-based management to natural disasters enhances student learning of planning and controlling as general functions of management and of the specific communication, command, and coordination challenges involved in disaster crisis management. Our evaluation also shows that students are less resistant to learning an evidence-based approach to management when it is linked to a recent crisis event.

Our article makes two contributions. First, we contribute to the literature on crisis management education by presenting a novel pedagogical approach for teaching students about the managerial implications of crisis events involving natural disasters. Preparing future managers for crises is particularly important given expert predictions of "more and worse" natural disasters as the 21st century progresses (Quarantelli, 1993, p. 11). Second, we contribute to the dearth of literature on evidence-based management teaching practices in undergraduate courses. Prior evaluations of teaching practices and curricula have tended to focus on MBA courses and executive education (Burke & Rau, 2010; Charlier, Brown, & Rynes, 2011; Navarro, 2008; Rubin & Dierdorff, 2009). Rousseau and McCarthy (2007) call for greater incorporation of evidence-based management in undergraduate teaching to build "learner awareness, appreciation, and active use of relevant high-quality evidence . . . [as] a powerful framework to draw upon throughout their professional lifetimes" (pp. 96-97). Our article addresses this call by showing how natural disasters provide an opportunity to generate undergraduate student interest in evidence-based management.

The remainder of our article proceeds as follows. After reviewing the literature on crisis and disaster management, we outline how evidence-based management offers a pedagogical tool for leveraging teachable moments involving natural disasters. We then describe the 2010-2011 Queensland floods, providing a context for the written assignment task we designed to deepen student learning in the aftermath of the floods. We then present our data analysis about the impact of the Queensland flood assignment on students' learning of crisis management and evidence-based management. The article concludes with a discussion of implications for management education.

Crisis Management and Natural Disasters

The crisis management literature defines an organizational crisis as "a low-probability, high-impact situation that is perceived by critical stakeholders to threaten the viability of the organization" (Pearson & Clair, 1998, p. 66). Examples of crisis situations include industrial crises caused by human,

technological, and organizational failures, such as the gas leak at Union Carbide's plant in Bhopal, India or the Tylenol poisonings (Shrivastava, 1987; Shrivastava, Mitroff, Miller, & Miglani, 1988), and natural disasters, such as extreme weather events destroying an organization's information base and facilities and disrupting products and services (Pearson & Clair, 1998). Managing crisis situations involves minimizing potential risks by anticipating and planning for the crisis (e.g., Cirka & Corrigall, 2010; Pearson & Mitroff, 1993; Watkins & Bazerman, 2003) and being able to implement both planned and ad hoc responses to make sense of the changing environment during the crisis and recovery (e.g., Maitlis & Sonenshein, 2010; Pearson & Clair, 1998; Shrivastava, 1987; Weick, 1988, 1993).

All crisis situations place increased emphasis on the management functions of planning and controlling, but natural disasters create special challenges. Unlike industrial crises, which are triggered by destructive events in the production and/or consumption sides of organized industrial activities (Shrivastava et al., 1988), natural disasters are triggered by acts of nature and, hence, it is difficult to foresee when they will occur and to guard against them (McEntire, Fuller, Johnston, & Weber, 2002). A natural disaster is said to occur when a natural hazard, such as a hurricane or flood, creates "demands on the system (that) are greater than the capabilities of the community to meet them" (Simpson, 2008, p. 646). The outcome is a collective crisis situation for whole communities in, and often across, geographic regions (Quarantelli, 1988). Although the worst impacts are felt at the time and place the act of nature occurs (Kreps, 1984), natural disasters "unfold with little respect for human boundaries" such as government jurisdictions (Dobel, 2010, p. 182). The social, economic, and infrastructure costs on communities remain long after the immediate crisis situation has passed (Quarantelli, 1988).

These characteristics complicate planning and controlling for natural disasters in several ways. First, governments often do not possess strategic management capacity to focus on all four phases of disaster management: mitigation, planning and preparedness, response, and recovery (McGuire & Schneck, 2010). They also do not agree on whether and how communities can mitigate and plan for natural disasters (McEntire et al., 2002). Second, the disaster response phase(s) "often require(s) the assistance of outsiders and multiple levels of government, thereby leading to multijurisdictional response operations" (Drabek & McEntire, 2002, p. 206). Thus, disaster management may potentially involve many organizations and sometimes thousands of volunteers. Third, management problems arise during the response phase with respect to communication and information flows within

and between organizations and with the public, the exercise of authority over new disaster tasks and over jurisdictions, and the development of coordination and loosening of the usual hierarchies of control (Quarantelli, 1988). Finally, the collaboration between stakeholders needed to respond to and recover from natural disasters is undermined by the uncertainty and intense stress of the disaster situation (Dobel, 2010).

Given that natural disasters bring to the foreground fundamental issues about planning and controlling, we argue that they provide teachable moments in management courses. A teachable moment is a high interest situation that favors discussion of a topic and in which a student is receptive to new understandings (Wagner & Ash, 1998). Educators in diverse fields in the sciences and social sciences have used crisis situations and natural disasters as teachable moments to facilitate active and deep learning (e.g., Bertrand, 2009; Lipscomb, 2002; Malveax, 2000; Pagliavo, 1991). Just as management educators have seized teachable moments in classroom discussion to enhance learning of diversity and cheating (Baker, 2004; Kirk & Durant, 2010; Rosile, 2007), we propose that natural disasters provide another form of teachable moment. In the following section, we discuss how evidence-based management offers a pedagogical approach for leveraging these teachable moments to deepen student learning about the challenges of crisis management.

Evidence-Based Management

Evidence-based management is an emerging area of interest in management education. As a response to growing concerns about the gap between management research and management practice and the relevance of business schools (Bennis & O'Toole, 2004; Pfeffer & Fong, 2002; Rynes, Bartenuk, & Daft, 2001), evidence-based management bridges the research–practice gap by using best available scientific evidence to inform management decision making (Rousseau, 2006). Evidence-based management is a way of thinking about and practicing management that recognizes that there is a cumulative and progressive knowledge base of research evidence from which principles can be derived through systematic review (Tranfield, Denyer, & Smart, 2003). Paraphrasing Pfeffer and Sutton (2006), evidence-based managers are professional experts with the skills to separate the hard facts from the dangerous half-truths and total nonsense. Training evidence-based practitioners requires that business schools teach students to find and evaluate the best available evidence and to develop a logic for applying it to their practice (Graen, 2009; Rousseau, 2006).

Recognition is growing among management educators that the basic premise of evidence-based management has value. As Klimoski (2007) observes,

> After all, who among us would prefer that we advocate a practice of management that is based primarily on such things as tradition ("we have always done it this way"), impulse ("it feels right"), faulty models ("I read about this recently–somewhere"), or whim ("it suits me"). (p. 81)

Despite this recognition, incorporation of evidence-based management into the curricula and teaching practices in business schools remains limited. A recent survey of more than 800 U.S.-based MBA programs found that only 25% of core MBA courses used evidence-based management in some form (Charlier et al., 2011). Although no similar studies have been conducted of undergraduate programs, explicit incorporation of evidence-based management in undergraduate courses is rare (see, Schwarz & Murphy, 2008, for an exception).

Scholars have proposed a variety of reasons for the dearth of evidence-based management in business school teaching, including ambiguity and paradigmatic battles over what constitutes quality evidence and who decides (Learmonth, 2006). One factor is especially important. As Rousseau and McCarthy (2007) observe, "Students have strong normative beliefs about what they as future managers need to know" (p. 92). They express strong preferences for teaching based on business case studies and popular concepts from non-research-oriented magazines such as *Harvard Business Review*. Thus, academics fear that they will receive lower teaching evaluations if they force students to use the peer-reviewed management research literature (Rousseau, 2006), which is difficult to read and has nonobvious implications for practice (Bartunek & Rynes, 2010). The assumption is that students, especially undergraduates, will become disengaged and uninterested if made to read and evaluate research articles (Graen, 2009).

Combining evidence-based management with teachable moments involving natural disasters offers a solution to this problem. Learning about evidence-based management becomes interesting and engaging to students when it is applied to a teachable moment involving a natural disaster. At the same time, learning about crisis management is deepened when students move beyond the sensationalism and emotion of the natural disaster and make sense of it using an evidence-based management framework. Scholars in the crisis management literature have noted how the extreme emotionality

of crisis situations can affect sense making (Maitlis & Sonenshein, 2010). Thus, the combination of evidence-based management as a pedagogical approach and a natural disaster as a teachable moment offers mutual benefits for educators. In the following sections, we describe how we leveraged these mutual benefits in the teaching of an undergraduate introductory management course in the aftermath of the 2011 Queensland floods.

Applying Evidence-Based Management to the Queensland Floods

Queensland is the second largest state in Australia in terms of land mass. Flooding in December 2010 and January 2011 saw 78% of the state declared as a disaster zone with 29,000 homes and businesses inundated and 35 deaths. The floods created crisis management challenges for local and state government emergency services, regional water agencies responsible for flood mitigation dams, the weather bureau, the Australian army coordinating evacuation and recovery efforts, and volunteer organizations. More information about the Queensland floods is included in Appendix A (available online at http://jme.sagepub.com/supplemental).

The Queensland floods caused extensive human tragedy. They also provided a teachable moment about crisis management in the semester that immediately followed the disaster. The floods occurred during the summer break in the Australian academic calendar. When classes resumed in March 2011, students at our Queensland-based university could reflect on their own personal experiences of the disaster. This timing created a teachable moment in which our students were especially open to new insights that would help them make sense of their experiences. Following Hansen (1998), who reported that learning from teachable moments lasts longer when linked to assessment, we designed a written assignment about the Queensland floods. The assignment task required students to adopt an evidence-based management approach to analyze the planning and controlling issues involved in the floods and to reflect on the challenges that crisis situations create for management. In the sections that follow, we describe the steps we took to design the assignment task, to prepare students to complete the task, and to assess students' completed assignments.

Step 1: Designing the Assignment Task

The evidence-based management assignment we designed on the Queensland floods appears in Appendix B (available online at http://jme.sagepub.com/

supplemental). The assignment task was used in a first-level compulsory course in the core of the undergraduate business and commerce programs. The course teaches foundational knowledge about management theory and practice on which students subsequently build expertise in a specialty area, such as accounting, marketing, or international business. The course covers general management topics aligned with the four functions of management: leading, organizing, planning, and controlling. Because the latter two functions are especially prominent in the literature on crisis management, we focused the assignment on planning and controlling. The assignment task contained three components: (a) a research component, (b) an application component, and (c) a reflection component.

We designed the research component to develop students' skills in evidence-based management in several ways. First, students were required to search for and evaluate "quality" evidence on planning and controlling. We strived to build students' awareness of the existence of criteria for judging the quality of management research evidence by confining their search to a list of 21 peer-reviewed management journals. In addition to general management journals (e.g., the *Academy of Management Journal* and *Strategic Management Journal*), the list included journals that had published special issues and articles focused specifically on crisis and disaster management (e.g., *Public Administration Review, Long Range Planning*, and *Journal of Management Studies*). Second, we required students to find only three articles as their evidence and to review each article for its core insights into planning and controlling. Limiting students to three articles forced them to make conscious choices about what was the best available evidence. Third, we helped students appreciate the cumulative nature of management research evidence, by requiring them to choose at least two articles published in the past decade.

We designed the application component of the assignment to deepen student learning of crisis management and to develop their capacity to apply an evidence-based logic. Students were asked to choose an issue of planning and controlling pertaining to the Queensland floods. The assignment task included the following suggestions: management of water capacity levels in the dams, flood warning advice from the Bureau of Meteorology, coordination and control during the floods by state government and local governments, information dissemination during the floods by state government disaster management services and/or by local government, coordination of flood recovery efforts by local governments, local government building and planning regulations in flood-affected areas, and coordination of emergency shelters. Students were then required to apply the insights that they learned from their research

articles to analyze their chosen flood issue. Consistent with Rousseau's (2006) notion that evidence-based management involves deriving principles from research evidence and translating these into practice, students were expected to demonstrate how their evidenced-based insights could be applied to understand how different managers, organizations, and/or government departments responded to the floods in practice.

Finally, we designed the reflection component of the assignment to deepen student learning of the challenges of both crisis management and evidence-based management. Students were required to reflect on what they learned from applying scholarly research evidence to the practical management of a crisis situation involving a natural disaster. To help ground their reflections, we asked students to consider the following three questions: (a) How could planning and controlling have been improved? (b) What challenges do extreme situations such as floods cause for planning and controlling in practice? (c) How can we ensure that that the theoretical insights about planning and controlling published in scholarly management journals inform better practice in real organizations? The first two questions focused on learning about crisis management; the final question encouraged reflection about the value of evidence-based management.

Step 2: Preparing Students to Complete the Assignment Task

We prepared students for the assignment task over several weeks of classes. The first lecture for the course introduced students to management as an academic discipline. We emphasized the central premise of an evidence-based approach to management: Management scholars conduct scientific research published in peer-reviewed journals and the theoretical principles derived from their findings can be applied by managers in real organizations to achieve better outcomes. The second lecture outlined the historical development of management as a field of scholarly inquiry. Whereas a number of management approaches were discussed, Taylor's scientific management and the Hawthorne experiments as the foundation for the human relations school were most easily recognized by students as examples of an evidence-based approach to management.

In the third lecture, both the assignment task and general course content related to the topic of planning and controlling were presented. The lecture began with a detailed explanation of the task requirements for the Queensland flood assignment. Students were fully briefed on the research, application, and reflection components of the task. This took 30 minutes of class time. The remaining 90 minutes were devoted to presenting a lecture on the topic

of planning and control. This lecture did not explicitly cover material on crisis management, but it included the following relevant concepts: (a) planning tools and techniques to accommodate for uncertainty, such as forecasting, scenario planning, and contingency planning; (b) the challenge of balancing formality and flexibility in planning and the potential problem of plans being out of touch with day-to-day realities in crisis situations; (c) the challenge of aligning strategic, tactical, and operational planning and control when environments are changing rapidly; (d) the need for control systems to be understandable, accurate, timely, and flexible to contingency; and (e) the advantages of decentralized control in unstable environments. In addition to this lecture, students received a 1-hour tutorial class in which they applied theories on planning and control to a business case study.

Students had 1 month after the lecture on planning and controlling to complete their assignment applying evidence-based management to the Queensland floods. The evidence-based management literature notes that a barrier to its implementation in both management practice and student education is lack of training in accessing and searching scholarly peer-reviewed literature (Rousseau & McCarthy, 2007; Tranfield et al., 2003). Therefore, course-teaching staff and librarians provided in-class training and consultation to support students in the research component of the assignment.

The university library provided general training in literature searching. Prior to the start of the semester, course-teaching staff liaised with the library about the assignment and appropriate search strategies for scholarly journals. When the semester began, the library ran general training sessions for business school students to provide guidance on using the library's facilities to find information, including searching the databases for peer-reviewed journal articles. These 1-hour training sessions were scheduled multiple times each week, beginning in the first week of lectures and continuing up to the week the assignment was due. Although these training sessions were not targeted specifically at the task requirements of the flood assignment, librarians were available after the sessions for one-on-one consultation with students to answer questions about our assignment. The library estimated that 10% to 15% of students enrolled in our course completed an optional library skills training session.

We provided more specific training in assignment-focused literature search internally within the course. One of the authors developed a special recording to guide students through the process of searching the library's databases for articles relevant to the assignment. The 45-minute recording captured both audio and screen content. As she gave a voiceover explaining each step in the search process, students viewed screen shots of the

progression from typing key words into the library's electronic databases, locating articles in approved journals, confirming that the article was published in the acceptable time frames, and reading the abstract to check its suitability for the assignment. Stating that the search terms *planning* and *control* were too broad for the assignment, the author advised students to choose more specific keywords appropriate to the flood management issue in which they were interested. The recording was posted on the course website to allow multiple viewings by students.

In addition to this recording, course-teaching staff were available for one-on-one consultation with students encountering problems with their literature search. Students were repeatedly told that the key criterion for choosing an article should be their ability to apply the article's conceptual and/or empirical findings to gain insight into their flood management issue. That is, if a student could not see how an article related to their flood issue, they should not use that article for their assignment as the research and application components of the assignment were interrelated. Because of this interrelationship, students were encouraged to choose and research their flood management issue *before* searching the peer-reviewed literature for theories and concepts offering a more scholarly lens for understanding it.

Step 3: Assessing the Assignment Task

We assessed the student assignments against the marking rubric presented in Appendix C (available online at http://jme.sagepub.com/supplemental). Marking rubrics require the marker to make judgments against qualitative criteria and hierarchical standards of performance for each criterion (Sadler, 2005). Consistent with the principles of constructive alignment (Biggs, 1999) and criterion-referenced assessment (Norton, 2009; Sadler, 2005), we designed our marking rubric to assess how well students had achieved the intended learning outcomes of the assignment task. As described previously, the assignment task was intended to increase learning of evidence-based management by requiring students to research, apply, and reflect on the scholarly peer-reviewed management literature during a teachable moment involving a natural disaster. The marking rubric, therefore, incorporated criteria and standards for markers to make judgments about (a) a student's depth of understanding of, and critical thinking about, theories of planning and control as reported in his or her chosen sources of evidence; (b) the depth of the student's application of theoretical insights to management practice in the Queensland floods; (c) a student's depth of reflection about his or her learning as expressed in his or her conclusion; and (d) the level of student's research and writing skills.

The marking rubric, which students received with the assignment task sheet, served as a means of communicating performance expectations prior to assignment completion. After the students submitted their assignments, the marking rubric was used to assess their level of competence in achieving the intended learning outcomes and to assign a grade based on this assessment. None of the authors of this article undertook any assignment marking. Instead, one of the authors trained eight markers to assess the assignments against the rubric. She met with the whole group of markers prior to the start of marking to explain the rubric and marking standards. She also had an individual meeting with each marker after that marker had completed a sample of 30 assignments, to ensure consistency across markers in the application of the rubric. In total, 782 students submitted their assignment by the due date. More than 98% of these students selected at least one of their articles from the list of peer-reviewed journals prescribed in the assignment task and some 87% of students selected all three articles from the approved list. In the next section, we present an evaluation of how students performed in the assignment.

Evaluation of Student Outcomes on the Queensland Flood Assignment

Consistent with our interest in using evidence-based management to leverage a teachable moment involving the Queensland floods, we evaluated the submitted assignments to draw some inferences about the effectiveness of our approach for deepening student learning. As shown in Table 1, the following journals published the most articles chosen by students: *Long Range Planning, Strategic Management Journal, Academy of Management Journal*, and *Public Administration Review*. Nearly half of the articles students selected came from these four journals. Articles that specifically addressed crisis and disaster management came largely from *Public Administration Review, Long Range Planning, Management Science*, and *Journal of Management Studies*. Appendix D (available online at http://jme.sagepub.com/supplemental) reports the 20 articles most frequently chosen by students. An article on strategic planning in turbulent environments was chosen by almost 12% of students, followed by articles on risk management (about 7%) and capacity planning (almost 6%). The latter two articles were popular among students who chose to examine flood mitigation at the region's dam. Six articles in the top-20 articles focused specifically on crisis and disaster management, and a further 4 articles addressed risk management and environmental turbulence or instability. The remaining articles addressed planning and control from a general management perspective.

Table 1. Summary of Students' Choices of Journals

Journals on Approved List	Total Articles Chosen	Crisis Management Articles[a]
Long Range Planning	105	18
Strategic Management Journal	80	6
Academy of Management Journal	69	3
Public Administration Review	68	36
Journal of Management Studies	61	10
Management Science	48	11
Journal of Operations Management	46	6
Academy of Management Review	40	1
Journal of Management	39	0
British Journal of Management	23	2
Organization Studies	16	1
Journal of Business Venturing	14	0
Journal of Management Inquiry	12	2
Journal of Organizational Behavior	12	0
Academy of Management Learning & Education	11	1
Human Relations	11	2
Organization Science	10	2
Administrative Science Quarterly	7	1
Public Administration	6	1
Entrepreneurship Theory and Practice	6	0
Organization	5	0
Total[b]	689	103

a. The coding scheme for the articles is explained in the text.
b. In addition to the 689 articles on the approved list, students chose 91 articles from nonapproved journals.

Students' choices of journal articles could be broadly categorized as general management articles or crisis management articles. We were interested in the question of whether or not students who chose crisis management articles performed better on the assignment than students who chose general management articles about planning and controlling. Although students had not been explicitly directed to favor one type of article, they had been instructed to choose articles they could "see" were relevant and applicable to their flood management issue. We speculated that the applicability of crisis management articles would be more obvious to students and, if this were the case, that

students who chose crisis management articles would perform better on the assignment when assessed against the criteria on the marking rubric. The procedures we followed to analyze this possibility are described below.

Statistical Analysis of Students' Choice Between General and Crisis Management Articles

We conducted a statistical analysis of the choices students made between general management and crisis management articles and their performance on the assignment. Performance was measured by the numerical mark assigned by the marker to reflect a student's achievement of the intended learning outcomes on the marking rubric. We confined our data sample to only those students who chose all three of their articles from journals on the approved list. Given that students received a marking penalty for using an article from a nonapproved journal, including their assignments in the sample was expected to confound the relationship between choice of crisis management versus general management articles and their performance on the marking rubric. The data sample of students choosing only approved journals represented a total of 685 assignments, with these students choosing 689 different articles from the approved journals.

The 689 articles were then coded into the two categories of crisis management and general management. An initial coding scheme was developed using keywords from the crisis management literature (crisis, disaster, emergency management, disaster or crisis mitigation/planning/preparedness/response/recovery, decision making under stress, catastrophe). Two of the authors separately read the titles of 70 articles (about 10% of all articles) and identified other keywords relevant to crisis management. After discussion, the coding scheme was broadened to include keywords related to risk and uncertainty (risk, ambiguity, uncertainty, environmental turbulence, rare events, dynamic environment), time pressure (speedy decision making, fast response), and particular crisis events (Hurricane Katrina, the Challenger Space Shuttle disaster).

After agreeing on the coding scheme, the two authors independently coded the full list of articles based on their titles. Crisis management articles were coded as a one (1) and general management articles were coded as a zero (0). Any titles about which the coder was uncertain were marked with a question mark and the article's abstract was checked to determine the appropriate code. Comparisons between the two coders indicated 95% agreement, which is an extremely high level of interrater reliability (disagreement on 33 articles only). Differences were resolved through discussion and reference to the

article's abstract. When coding was completed, 103 articles and 586 articles were coded as crisis management and general management, respectively.

Statistical analysis of the relationship between students' choice of articles and their assignment mark (based on their performance against the marking rubric) proceeded as follows. For each of the 685 students, the codes given to each of their three chosen articles were summed to produce a score out of 3. Students who chose three crisis management articles and no general management articles scored 3, with this group comprising 59 students and achieving a mean assignment mark of 22.8 out of 30. Students choosing two crisis management articles and one general management article scored 2, comprising 128 students with a mean assignment mark of 22.5. Students who chose one crisis management article and two general management articles scored 1, comprising 217 students with a mean assignment mark of 22.1. Students who chose no crisis management articles and three general management articles scored 0, comprising 281 students with a mean assignment mark of 21.5. We found a weak, but significant positive correlation between students' choice of crisis management articles and their performance on the assignment measured against the intended learning outcomes on the marking rubric (Pearson's $r = .1346$, $p = .0002$).

Overall, students performed well in the assignment irrespective of their choice of articles, supporting the pedagogical utility of an evidence-based management approach to crisis management in deepening student learning. We believe that the correlation between crisis management articles and assignment performance reflects the connection between the research and application components of the assignment task. Students who were more focused in their choice of evidence in the research component were able to produce greater depth of analysis in their application component. Whereas the general management literature offered broad insight into planning and control in organizational contexts, the crisis management literature provided a specific set of concepts and a language contextualized for crisis situations. Thus, those students who made more focused choices among the available scientific evidence were better able to apply the insights that they derived from this literature to evaluate specific planning and controlling issues in the Queensland flood disaster.

Qualitative Analysis of Student Reflections on Their Learning

The reflection component of the task assignment provided an opportunity to explore if there were any differences in learning between students who chose all crisis management articles and those who chose all general

management articles. Students were required to write a 400-word personal reflection on their learning as the final part of the 1,800-word assignment task (see Appendix B). To gain greater insight into how choices of evidence influenced student learning, we compared the 400-word personal reflections of two samples of assignments. A sample of 15 student assignments was selected from the 59 assignments that used only crisis management articles (article sum = 3). Sample selection was based on relevance to crisis management, with every article in these 15 assignments being narrowly focused on crisis and disaster management rather than the broader concepts of risk and uncertainty. A second sample of 15 assignments was then selected from the 281 assignments that used only general management articles (article sum = 0). Each assignment in the latter sample was selected as a matched pair to an assignment in the former sample in terms of assignment mark. The average mark awarded for both samples was 22.2 out of 30, with a standard deviation of 3.519. Use of a matched-pairs design ensured that we were comparing the personal reflections of "what" learning occurred between two samples of students who had demonstrated the same level of competence on the overall assignment task based on substantively different types of articles as their sources of evidence.

The reflection components of the assignment were then compared across the crisis management and general management samples. One of the authors coded for themes within each of the three reflection questions, comparing within and across the two samples. The results of this thematic coding appear in Table 2, which shows that students in both samples suggested similar improvements to planning and controlling during the flood disaster by incorporating more flexibility in plans and feedforward and feedback controls. Both samples identified the need for coordination and communication between multijurisdictional agencies, along with learning from experience.

Differences existed, however, in the level of theoretical abstraction. Students in the general management sample were more likely to frame their improvements to planning and control as specific techniques, such as scenario planning and participatory planning. In contrast, the crisis management sample tended to be focused on meta-themes, such as flexibility and communication. This sample also expressed more sophisticated conceptual insights grounded in the crisis management literature, highlighting the need to "balance adaptive and bureaucratic control systems" during crisis situations and the need to "prioritize emergency management" and "risk assessment."

Table 2. Comparison of Student Learning of Crisis Management and Evidence-Based Management

Reflective Questions	Student Responses Based on Crisis Management Articles	Student Responses Based on General Management Articles
How could planning and controlling have been improved?	Contingency plans, forecasting, scenario plans	Contingency plans, forecasting, scenario plans
	Feedforward and feedback controls	Feedforward and feedback controls
	Coordination between agencies and different levels of state and local governments	Coordination between agencies and different levels of state and local governments
	Communication and information management within and between agencies and with the public	Communication and information management within and between agencies and with the public
	Learning from experience during the crisis	Learning from experience during the crisis
	More flexibility allowed in plans	More flexibility allowed in plans
	Risk assessment	Emergent planning
	Balancing adaptive and bureaucratic control systems	Need for multiskilled managers
	Prioritize emergency management	
What challenges do extreme situations such as floods cause for planning, and controlling in practice?	Extreme events create high uncertainty and surprise	Extreme events are unexpected and unpredictable
	As events are unforeseeable, there is a lack of scripts for dealing with them	Unforeseen circumstances make planning and control measures obsolete
	Secondary effects complicate manage ment (e.g., effects on transport system)	Multiple priorities must be balanced

(continued)

Table 2. (continued)

Reflective Questions	Student Responses Based on Crisis Management Articles	Student Responses Based on General Management Articles
	Stress/pressure leads to misinterpretation and errors	Conflict arises in communication
	Communication and public relations are difficult to manage	Staff training for extreme events is difficult and problem-solving skills are required
How can we ensure that the theoretical insights about planning and controlling published in scholarly management journals inform better practice in real organizations?	Training and education of managers	Training and education of managers
	Make academic research more readily available in the public domain	Academic theory is hard to implement and needs to be more relevant to practice
	Ensure academic knowledge is easily communicated	Academic research should focus on contemporary case studies and evaluation of planning techniques
	Create incentives for academics to be practical	Academics need to engage with industry
	Develop academic-industry networks via conferences, seminars, and workshops	

In terms of student learning of the challenges that extreme situations create for planning and controlling, both samples recognized the unpredictability of extreme situations and the potential for conflict arising over plans, priorities, and communication. However, students who chose crisis management articles had a deeper and more coherent understanding. They identified more

challenges than those in the general management sample ($n = 23$ vs. $n = 15$), including the "complication of secondary effects," the absence of "scripts to follow," and the "emotional stress" that leads to cognitive biases.

Qualitative differences between the two samples were most apparent in student perceptions of the practical value of academic theory. On the whole, the crisis management sample viewed academic research as having "inherent value" that would be recognized by practitioners if made available, and were heavily in favor of management education and industry-academe liaison to connect theory and practice. In contrast, the general management sample perceived academic research as having less practical value. This sample was more inclined to attribute any disengagement by practitioners to theory's being "inadequate," "disconnected," and/or "impractical." These differences suggest that a student's perceptions of the value of evidence-based management are shaped by his or her own choices of best available evidence. The more focused a student's choice of evidence on the practical problem at the hand, the more favorably he or she is likely to perceive evidence-based management.

Student Evaluation Data

Scholars have previously noted that a major barrier to the spread of evidence-based management is faculty members' fears of receiving lower teaching evaluations for forcing students to engage with the scholarly research literature (Graen, 2009; Rousseau, 2006; Rousseau & McCarthy, 2007). In contrast, we found that our assignment on the Queensland floods was associated with an increase in course-teaching evaluations based on the question "Overall, how would you rate this teacher?" from 4.3 in the previous semester to 4.5 on a 5-point scale. Lecturing staff were the same across both semesters. The only change in the course content and curriculum was to contextualize the assignment task, which was similarly designed on evidence-based management principles in the previous semester, to the Queensland floods. In addition to rating the course as being taught more effectively when the assignment was contextualized to the Queensland floods, students had a clearer understanding of the aims and goals of the course regarding how management theory informs practice. This rating increased from 4.1 to 4.3. Although we are unable to run statistical analyses on these evaluation data, which our university collects and reports, the higher ratings suggest that student engagement in, and understanding of, generalist management courses may be increased when the course includes an evidence-based learning and assessment activity linked to a natural disaster relevant to the university community at that point in time.

Conclusions

In this article, we argued that evidence-based management offers a pedagogical approach for leveraging teachable moments involving natural disasters to deepen student learning about crisis management. Support for the effectiveness of this approach comes from our analysis of student performance data collected from an evidence-based assignment, which was applied to the 2010-2011 Queensland floods in a very large introductory management course. Our analysis suggests that combining crisis management education with evidence-based management offers mutual benefits. The evidence-based management approach enhances students' learning of the challenges of crisis management by directing them to look beyond the sensationalism and emotion of a disaster to focus on its managerial implications. At the same time, students' resistance to evidence-based management was reduced. Reading and evaluating the scientific research literature becomes more interesting and engaging to students when it offers new insight into a disaster that they have personally experienced.

Our article provides several lessons for management educators.

Students Do Not Necessarily Resist Evidence-Based Management

It is possible to teach an evidence-based management approach without encountering student resistance when educators look for teachable moments that provide meaningful contexts for applying scholarly evidence. Natural disasters offer one such teachable moment. Industrial crises can provide another meaningful context for teachable moments. In a previous semester, we found that students became engaged when they were asked to write an evidence-based management assignment on the BP oil spill, which had recently occurred in the Gulf of Mexico. Our experience shows that contrary to what some scholars have suggested, it is not the case that students will reject evidence-based management out of hand. Rather, students will respond well to evidence-based management that is presented in a way that is salient to them.

Our experience is that teachable moments for evidence-based management have three characteristics. First, teachable moments occur when an event is personally experienced by students and/or receives significant media coverage such that students have some sense of a shared experience, even if a vicarious one. For example, many of the international students enrolled in our course were not in Australia during the Queensland floods

but had viewed international news media reports as the floods occurred and experienced an emotional reaction. Second, teachable moments are linked to events involving multiple stakeholders with varied interests and featuring critical moments or key decisions. Students have more options on which to focus, facilitating deep analysis of part of the story rather than superficial analysis of the whole. Third, teachable moments have broad theoretical relevance. They afford management educators the flexibility to leverage them for different topics (depending on the scheduling of the assignment task) and in different courses. For example, in our introductory management course, the Queensland floods could have been analyzed through the theoretical frames of leadership or decision making instead of planning and controlling. An advanced-level strategy course might focus on the implications of the Queensland floods for business planning in the recovery phase. Organizational behavior and management communications courses might focus on the leadership and communication challenges, respectively, during the response phase of the disaster.

We propose that management educators wishing to use an evidence-based management approach look for teachable moments that display these three characteristics. These teachable moments need not be crisis related. Other teachable moments could include high-profile lawsuits involving products used and valued by a student cohort, such as Google and Microsoft's battle over smartphone technology, or changes in government regulations that affect a student cohort, such as affordability of student loans. Moreover, our experience with the flood assignment shows that even if the teachable moment is crisis related, the pedagogical utility of the disaster for management educators is not limited to facilitating student learning of crisis management specifically. Many students in our course used the flood assignment task to deepen their learning of general management concepts and theories reported in the scholarly management literature. We believe that this is an appropriate and valuable application of evidence-based management for student learning.

Plan to Leverage Teachable Moments

A second lesson our article provides for management educators is the possibility of adopting a planned approach to leveraging teachable moments. Management educators have previously written about how they spontaneously used teachable moments for conversational learning in classrooms (Baker, 2004). Teachable moments may also arise spontaneously in management courses as an unintended consequence of assessment, such as

through cheating (Rosile, 2007) or when students "cross the line" in their comments on course electronic discussion boards (Kirk & Durant, 2010). We agree that the spontaneous use of teachable moments is a valuable learning tool. At the same time, we propose that management educators should also look for teachable moments that can be created by planning formal assessment tasks. One possibility is to anticipate teachable moments that may arise over the teaching period for a course. Although the Queensland floods as a natural disaster were unpredictable, after they occurred a government enquiry into the floods was commissioned with a known reporting date. Thus, we were able to schedule our assignment anticipating a teachable moment when the enquiry released its report. Management educators wishing to leverage teachable moments in formal assessment tasks may similarly find that they can anticipate the timing of important political, economic, or sociocultural events and then build these into their assessment design as sources of teachable moments.

Use Teachable Moments to Teach About Crises

Our article offers a final important lesson for management educators. Our analysis demonstrates how teachable moments in the aftermath of natural disasters can provide a means of ensuring that students learn about the challenges of crisis management when curricula are too crowded to include a specialist course. We offer one caution to adopting this approach. Management educators choosing to leverage teachable moments after natural disasters must be mindful of not causing further trauma to students. Our goal with the Queensland flood assignment was to fulfill our university obligations to facilitate productive learning about management in our course, while at the same time being humane and considerate of individual differences in the personal situations and emotional responses to the floods. Students whose families, friends, and communities had been adversely affected by the Queensland floods were encouraged to contact course-teaching staff with any concerns they had about completing the assignment. Two students opted to complete an alternative assessment. Others requested and were given extensions to accommodate challenging physical working conditions caused by the floods, such as problems with accommodation or access to computers. Several students whose homes had been flooded indicated that they wanted to complete the assignment as part of their own personal journey of recovery.

Helping students to make sense of their experiences by providing new frameworks for interpretation and reflection is an important role for educators across all disciplines, including management. Our evidence-based

management approach to leveraging teachable moments involving natural disasters is one means of achieving this role. Spee's (2005) focused classroom conversations and Schaffer's (2004) service learning response to help students cope with the tragedy of the September 11 terrorist attacks are others. Developing pedagogically rigorous approaches to promote students' reflection on and learning from their experiences of crisis and to help them become more effective and socially responsible managers in the future as a result, is particularly important given predictions of increasing natural disasters and industrial crises in the years ahead (Cirka & Corrigall, 2010; Dobel, 2010).

References

Baker, A. C. (2004). Seizing the moment: Talking about the "undiscussables" in conversations. *Journal of Management Education, 28*, 693-706.

Bartunek, J. M., & Rynes, S. L. (2010). The construction and contributions of "Implications for practice": What's in them and what might they offer? *Academy of Management Learning & Education, 9*, 100-117.

Bennis, W. G., & O'Toole, J. (2004). How business schools lost their way. *Harvard Business Review, 82*(3), 96-104.

Bertrand, B. (2009). Hurricane Katrina: A teachable moment. *The Science Teacher, 76*(7), 30-35.

Biggs, J. (1999). What the student does: Teaching for enhanced learning. *Higher Education Research & Development, 18*, 57-75.

Burke, L. A., & Rau, B. (2010). The research-teaching gap in management. *Academy of Management Learning & Education, 9*, 132-143.

Charlier, S. D., Brown, K. G., & Rynes, S. L. (2011). Teaching evidence-based management in MBA programs: What evidence is there? *Academy of Management Learning & Education, 10*, 222-236.

Cirka, C. C., & Corrigall, E. A. (2010). Expanding possibilities through metaphor: Breaking biases to improve crisis management. *Journal of Management Education, 34*, 303-323.

Dobel, J. P. (2010). Mission integrity in disaster management. *Public Administration Review, 70*(Suppl. s1), s182-s184.

Drabek, T. E., & McEntire, D. A. (2002). Emergency phenomena and multiorganizational collaboration in disasters: Lessons from the research literature. *International Journal of Mass Emergencies and Disasters, 20*, 197-224.

Graen, G. B. (2009). Educating new management specialists from an evidence-based perspective: A proposal. *Academy of Management Learning & Education, 8*, 255-258.

Hansen, E. J. (1998). Creating teachable moments . . . and making them last. *Innovative Higher Education, 23*, 7-26.

Kirk, D. J., & Durant, R. (2010). Crossing the line: Framing appropriate responses in the diversity classroom. *Journal of Management Education, 34*, 823-847.

Klimoski, R. (2007). Introduction: Physician heal thyself. *Academy of Management Learning & Education, 6*, 81-83.

Kreps, G. (1984). Sociological inquiry and disaster research. *Annual Review of Sociology, 10*, 309-330.

Learmonth, M. (2006). "Is there such a thing as 'evidence-based management'?" A commentary on Rousseau's 2005 presidential address. *Academy of Management Learning & Education, 31*, 1089-1093.

Lipscomb, G. B. (2002). Dealing with crises: Teachable moments in the social studies classroom. *Social Studies, 93*, 237-238.

Maitlis, S., & Sonenshein, S. (2010). Sensemaking in crisis and change: Inspiration and insights from Weick (1988). *Journal of Management Studies, 47*, 551-580.

Malveax, J. (2000). Terrible tragedy, teachable moment. *Diverse: Issues in Higher Education, 17*(2), 33.

McEntire, D. A., Fuller, C., Johnston, C. W., & Weber, R. (2002). A comparison of disaster paradigms: The search for a holistic policy guide. *Public Administration Review, 62*, 267-281.

McGuire, M., & Schneck, D. (2010). What if Hurricane Katrina hit in 2020? The need for strategic management of disasters. *Public Administration Review, 70*(Suppl. s1), s201-s207.

Navarro, P. (2008). The MBA core curricula of top-ranked U.S. business schools: A study in failure? *Academy of Management Learning & Education, 7*, 108-123.

Norton, L. (2009). Assessing student learning. In H. Fry, H. S. Ketteridge, & S. Marshall (Eds.), *A handbook of teaching and learning in higher education: Enhancing academic practice* (pp. 132-149). New York, NY: Routledge.

Pagliavo, M. M. (1991). Using crises for cognitive development: A case study. *Education, 111*(3), 339.

Pearson, C. M., & Clair, J. M. (1998). Reframing crisis management. *Academy of Management Review, 23*, 59-76.

Pearson, C. M., & Mitroff, I. I. (1993). From crisis-prone to crisis prepared. *Academy of Management Executive, 7*, 48-59.

Pfeffer, J., & Fong, C. (2002). The end of business schools? Less success than meets the eye. *Academy of Management Learning & Education, 1*, 78-95.

Pfeffer, J., & Sutton, R. (2006). *Hard facts, dangerous half-truths, & total nonsense: Profiting from evidence-based management*. Boston, MA: Harvard Business Press.

Quarantelli, E. L. (1988). Disaster crisis management: A summary of research findings. *Journal of Management Studies, 25*, 373-385.

Quarantelli, E. L. (1993). The environmental disasters of the future will be more and worse but the prospect is not hopeless. *Disaster Prevention and Management, 2*, 11-25.

Rosile, G. A. (2007). Cheating: Making it a teachable moment. *Journal of Management Education, 31*, 582-613.

Rousseau, D. M. (2006). Is there such a thing as "evidence-based management"? *Academy of Management Review, 31*, 256-269.

Rousseau, D. M., & McCarthy, S. (2007). Educating managers from an evidence-based perspective. *Academy of Management Learning & Education, 6*, 84-101.

Rubin, R. S., & Dierdorff, E. C. (2009). How relevant is the MBA? Assessing the alignment of required curricula and required management competencies. *Academy of Management Learning & Education, 8*, 208-224.

Rynes, S. L., Bartenuk, J., & Daft, R. (2001). Across the great divide: Knowledge creation and transfer between practitioners and academics. *Academy of Management Journal, 44*, 340-356.

Sadler, D. R. (2005). Interpretations of criteria-based assessment and grading in higher education. *Assessment & Evaluation in Higher Education, 30*, 175-194.

Schaffer, R. A. (2004). Learning management in a crisis: A service learning response to September 11, 2001. *Journal of Management Education, 28*, 727-742.

Schwarz, J. L., & Murphy, T. E. (2008). Human capital metrics: An approach to teaching using data and metrics to design and evaluate management practices. *Journal of Management Education, 32*, 164-182.

Shrivastava, P. (1987). *Bhopal: Anatomy of a crisis*. New York, NY: Ballinger.

Shrivastava, P., Mitroff, I. I., Miller, D., & Miglani, A. (1988). Understanding industrial crises. *Journal of Management Studies, 25*, 285-303.

Simpson, D. M. (2008). Disaster preparedness measures: A test case development and application. *Disaster Prevention and Management, 17*, 645-661.

Spee, J. C. (2005). Uisng focused conversation in the classroom. *Journal of Management Education, 29*, 833-851.

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management, 14*, 207-222.

Wagner, P. S., & Ash, K. L. (1998). Creating the teachable moment. *Journal of Nursing Education, 37*, 278-280.

Watkins, M. D., & Bazerman, M. H. (2003). Predictable surprises: The disasters you should have seen coming. *Harvard Business Review, 81*(3), 72-80.

Weick, K. E. (1988). Enacted sensemaking in crisis situations. *Journal of Management Studies, 25*, 305-317.

Weick, K. E. (1993). The collapse of sensemaking in organizations: The Mann Gulch disaster. *Administrative Science Quarterly, 38*, 628-652.