Engaging Students in Life-Changing Learning

Royal Roads University's Learning and Teaching Model in Practice - Revised Edition

Disaster Case Study: A Theoretically Informed Learning Activity Design

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Abstract

Royal Roads University (RRU) is one of only two Canadian institutions offering a master’s degree in the disaster and emergency management (DEM) field. Given the formative stage of development of this relatively new academic field of study, there is limited scholarship related to teaching and learning in this area. In particular, little consideration has been given to how the disciplinary foundations and nature of professional practice in the DEM field should inform pedagogical practices. This article describes one RRU faculty member’s scholarly approach to the design of a multi-day disaster case study, which aimed to support students learning from the research literature, while simultaneously developing competencies needed in professional practice. The design of the disaster case study was based on a deductive approach to the application of principles derived from social constructivist learning theory. While the development of this disaster case study predated the publication of RRU’s Learning and Teaching Model (LTM), the scholarly approach to the design of the case study, the theoretical foundation for the design, as well as distinct elements in the case study activity are reflective of the principles and practices espoused in the RRU LTM. The elements reflected in the disaster case study include (a) outcomes-based, (b) experiential and authentic, (c) team-based, (d) integrative, and (e)
engaged learning. In additional to describing how these elements are manifest in a particular learning activity design, this article expands on the theoretical reasoning for inclusion of these elements in learning activities at RRU.
Over the course of the last three decades, disaster and emergency management (DEM) has emerged as a new field of study. One such initiative is the Master of Arts in Disaster and Emergency Management Program (MADEM) at Royal Roads University (RRU), which was launched in 2007 to meet the educational needs of professionals working in the emergency management field. The relatively recent growth of DEM programs parallels, and is contributing to, the professionalisation of the practice of disaster and emergency management (Britton, 2002; Mileti, 1999; Oyola-Yemaiel & Wilson, 2005a). One of the challenges within DEM professional activity is the lack of practitioner utilisation of the findings from disaster research (Fothergill, 2000; Mileti, 1999; National Research Council, 2006; Phillips, 2006). This deficiency is of concern because the body of knowledge developed through the systematic study of past disaster events, if applied, can reduce future disaster risk, as well as improve practice (National Research Council, 2006). DEM higher education programs are thus seen as an important means of developing students’ knowledge about disaster research literature in a way that supports knowledge transfer to professional practice (Lindsay & Britton, 2010; Mileti, 1999; Neal, 2005; Oyola-Yemaiel & Wilson, 2005b; Phillips, 2006).

This article describes one RRU faculty member’s scholarly approach to using learning theory to support the design of a problem-based disaster case study that uses the disaster research literature for case and problem presentation as well as a tool for further problem study. The development of the disaster case study reflected a deductive approach to the use of learning theory. With this approach, formal learning theories, which are descriptive in nature, are taken as a starting point, and principles derived from learning theory are applied prescriptively (Elen & Clarebout, 2006). This article provides an overview of the learning theory that informed the design of the disaster case study and explains the approach to application of this theory in the instructional design process. It draws from my archival documentation about the disaster case study design, which dates back to the fall of 2010, as well as reflections on my experience with implementing the design over a five-year period.

While describing a personal account of an instructional design experience, this article also serves to illustrate how different elements of the RRU Learning and Teaching Model (LTM) were realised in one learning activity in the MADEM program. The association between the elements of the LTM and the disaster case study design is retrospective, as the development of the disaster case study predated the publication of the LTM. However, the ability to develop innovative pedagogy was supported by the culture of RRU as a professionally oriented university with a reputation and focus on innovation in teaching. The LTM elements reflected in the disaster case study include (a) outcomes-based, (b) experiential and authentic, (c) team-based, (d) integrative, and (e) engaged learning. Given the use of learning theory to inform the disaster case study design, this article also offers additional perspectives on the theoretical basis for these elements of RRU’s LTM.
Theoretical Framework for the Activity Design

The theoretical framework for the instructional design was grounded by my belief that learning and the construction of knowledge are both an individual cognitive and socio-cultural process; these beliefs align with constructivist learning theory (Cobb, 2005; Cole & Engeström, 1993; Fosnot & Perry, 2005; Greeno, 2006; Kaptelinin & Nardi, 2006). The development of constructivist learning theory is attributed to the work of Piaget and Vygotsky; while Piaget (1969) studied the individual cognitive dimensions of the learning and knowledge construction process, Vygotsky (1978) explored learning as a socio-cultural process. Activity theory is viewed as an appropriate organising framework for integrating the individual cognitive and social constructivist dimensions of learning (Cobb, 2005).

Activity Theory

Activity theory proposes that knowledge is constructed and learning occurs through activity. The first generation of activity theory is attributed to Vygotsky (1978), who explained that human activity, at its most basic level, is a subject (person or group) acting on an object (physical or mental) through the use of mediating tools (material or psychological), which are culturally derived. He also argued that intra-psychological development is supported by engagement in inter-psychological activity. Vygotsky (1978) further explained that intra-psychological construction of knowledge is supported by guidance from others in a cultural environment. He used the term zone of proximal development to reference the difference between individual capabilities and what can be achieved with and through social interaction with an elder or expert.

The second generation of activity theory is attributed to the work of Leont’ev and Engeström, who built on the work of Vygotsky and other Russian scholars, and expanded on the collective nature of activity. Leont’ev (1974) argued that activities are both determined and differentiated by the object of an activity. He elaborated on the relationship between a subject’s needs and the object, suggesting that needs are the motives for activity. Needs have their origins, Leont’ev explained, in prior activity. Leont’ev expanded the unit of analysis of activity to include the actions that make up the activity, and the operations that enable the action. Within this hierarchical structure of activity, Leont’ev suggested that activity, by its nature, is collective, while actions that make up the activity are individual. Further, he explained that while an object motivates activity, the actions that make up and comprise the activity are directed to goals. Engeström (1999) added the elements of outcome, community, rules, and division of labour to the basic model of activity (subject, object, and tools). Just as tools mediate the relationship between a subject and an object, Engeström (1999) suggested that rules mediate the relationship between a subject and the community, while the division of labour mediates the relationship the community and the object. Further,
while an object directs activity, the object of an activity can be distinguished from its outcome. Engeström’s (2015) expansion of the triangular model of activity is illustrated in Figure 1 below. Within this model, the signs and tools are both considered to be instruments. Engeström (2001) noted that elements within an activity system are understood to be dynamic and thus subject to change over time.

Application of Activity Theory to the Design of Instruction

Given that learning theories are descriptive in nature, any approach to the use of these theories for the design of instruction is an interpretive act. Three primary approaches to the prescriptive application of constructivist theories, including activity theory, were noted in the literature: (a) principles for the design of instruction, (b) procedures for the design of instruction, and (c) methods of instruction. Principles-based approaches tend to be related to the use of constructivist theories more generally, while the affordances of the triangular and hierarchical activity theory models have resulted in the development of procedures for applying activity theory to the design of instruction. Additionally, certain methods of instruction have been derived
from constructivist learning theories (e.g., anchored learning, goal-based learning). Further, methods of instruction that have emerged from practice (e.g., case- and problem-based learning) have been retrospectively identified as being congruent with the principles of constructivist learning theories. Principles, procedures, and methods that support the application of constructivist learning theories and activity theory will be briefly described, and their utility in the design of the disaster case study will be discussed.

While acknowledging that there is no one set of constructivist instructional design principles (Tobias & Duffy, 2009), through a review of literature (Driscoll, 2005; Jonassen, 1999; Jonassen & Rohrer-Murphy, 1999; Karagiorgi & Symeou, 2005; Savery & Duffy, 1996), five common principles were identified and were used to support the design of the disaster case study. The first principle was the use of authentic tasks situated in realistic environments. Savory and Duffy (1996) and Jonassen and Rohrer-Murphy (1999) suggest that authentic tasks often reflect problems encountered in practice, hence problem-based learning methods are recognised as being consistent with constructivist learning environments (CLEs). The second principle was the engagement of learners. An example of engagement includes giving students ownership for problem selection (Karagiorgi & Symeou, 2005; Savery & Duffy, 1996). The third principle was the use of alternate perspectives, which can be provided through the use of “related cases,” (Jonassen & Rohrer-Murphy, 1999, p. 69) as well as “multiple modes of representation” (Driscoll, 2005, p. 398). The fourth principle, which recognized the function of inter-psychological activity in the learning process, was to engage students in working collaboratively with one another (Driscoll, 2005; Karagiorgi & Symeou, 2005), and the fifth principle was to engage students in reflection on “both the content learned and the learning process” (Savery & Duffy, 1996). A principle-based approach was found to be of greater value in the design of the disaster case study than procedural methods.

Jonassen and Rohrer-Murphy (1999) provided detailed procedural guidance on the use of the triangular and hierarchical models of activity theory as tools for analysing professional activity in context and for using the results of the analysis to design an authentic learning task. A limitation of this approach is that it presumes that the structure of professional activity is transferable between contexts. Further, the procedure is resource intensive and it may not always be possible to conduct analysis of profession activity in situ (e.g., disaster contexts). An alternative procedural approach to the prescriptive use of theory, as suggested by Barab, Evans and Baek (2004), is to use the triangular and hierarchical models of activity as a heuristic framework for conceptualising the characteristics of professional activity. From a practical perspective, this second procedural approach was of greater value in the design of the disaster case study. In addition to principles and procedures for using constructivist theory, problem- and case-based learning methods are viewed as aligning with this theoretical perspective.
Problem- and case-based methods of instruction used in professional fields of study (e.g., law, medicine, business) share a similar history. These methods were developed out of concern that lecture-based instruction did not support subsequent knowledge transfer to professional practice (Garvin, 2003). While case-methods may or may not use a problem-based approach, cases are the foundation of all problem-based methods (Jonassen, 2011). Jonassen (2011) suggests that the function of cases, rather than their form or content, explains differences between problem-based learning methods. The function of a case determines its form and content. The functional use of cases in the fields of medicine, law and business reflects an interpretation of how cases can best support the development of professional competencies within a given field (Garvin, 2003). A more recent contribution to knowledge about learning from cases is case-based reasoning (CBR) theory, which is a cognitive constructivist theory with its origins in the design of intelligent computer applications (Kolodner, 2006). CBR explains how we learn from cases (Kolodner, 2006). The literature on problem- and case-based learning, along with the literature on the principle and procedural approaches to the application of constructivist and activity theories served to inform the design of the disaster case study.

**Design of the Disaster Case Study**

The disaster case study was designed to replace a multi-day team-based exercise that took place in the third, and final, week of the first residency in MADEM program. The exercise had been designed as an integrative activity to support the application and further development of the knowledge and skills students had gained during their first two weeks in the residency. While the exercise activity had been iteratively revised over time, certain features continued to be problematic and were motives for the redesign of the learning activity. One of the problems was that students had difficulty with the hypothetical nature of the case. Further, because students were at the beginning of their program of study, they had not sufficiently explored the research literature related to the problems within the case, and hence their recommendations about how to address a problem did not take this knowledge base into account. The starting point for the new design was to revisit the learning outcomes, which are the object of a learning activity. From an activity theory perspective, learning outcomes for a particular activity are based on the zone of proximal development (Vygotsky, 1978) between student starting points and the course learning outcomes.

**Learning Outcomes and Student Starting Points**

The use of learning outcomes as a starting point for developing an authentic activity is an alternative to analysing professional activity in situ, which was one of the procedural methods for using activity theory to design instruction. Learning outcomes in professionally oriented programs theoretically represent a program’s interpretation of the competencies of experts in a
particular field. A characteristic of professional activity is that it integrates different types of competencies, thus the object for an authentic activity would integrate learning outcomes associated with different competency domains. While activities during the first two weeks of the residency courses supported students’ development of knowledge, interpersonal, and critical thinking skills, learning outcomes associated with the research domain were not addressed in any depth. Research domain learning outcomes included being able to gather, interpret, and synthesise research findings, and to evaluate research and identify the implications of research for professional practice. Thus, the new integrative activity needed to develop students’ knowledge and skills related to the research learning outcomes, as well as to deepen and assess their knowledge and skills related to the first three learning outcomes domains. While students had a shared experience during the first two weeks of the residency, they came to the program with different backgrounds. The MADEM program had evolved over time to include two cohorts per year. One cohort was geared to students with a professional DEM background, with many admitted under RRU’s flexible admissions policies. In contrast, the other cohort was geared to those with a relevant undergraduate degree, but who were new to the DEM field. Thus, the disaster case study design also needed to take into account the differences between student starting points in the two cohorts, including differences in educational and professional experience, beliefs about disasters and the practice of disaster and emergency management, and professional aspirations.

### Design of Authentic Activity

The use of authentic activity in a learning activity is based on the CLE principle of needing to meaningfully engage students in the type of activity associated with their intended professional practice. The question considered was: What is a realistic professional activity relative to the selected learning outcomes in the MADEM program? An authentic professional activity in the DEM field is for students to (a) analyse needs, issues, or problems within a particular context; (b) determine desired outcomes; and (c) develop strategies to achieve these outcomes, while ensuring that strategies build from knowledge generated through the systematic study of human experiences with hazards. These skills are foundational to professional DEM practice.

1. The outcomes for these three domains were as follows. For the knowledge domain, the intended outcome was for students to be able apply and integrate disaster and emergency management (DEM) theory and concepts in the analysis and study of a historical disaster case. For the critical thinking domain, the outcome was to the development of competencies in critical thinking, specifically (a) problem framing and analysis, (b) outcome development, (c) argument development, and (d) self-regulation. The outcome in the interpersonal skills domain was awareness of individual preferences and styles, and competency in group facilitation.

2. In 2014 a decision was made to do away with streaming of students into separate cohorts based on their professional experience and educational backgrounds and a single cohort model was introduced.
regardless of the context. Authentic activities, however, are not decontextualized; rather, they are situated and hence, authentic learning activities must be situated in real world contexts, which are characteristically complex (Driscoll, 2005; Karagiorgi & Symeou, 2005; Savery and Duffy, 1996). The context then becomes a dimension of the problem that students must grapple with, just as context is a variable in professional practice.

Jonassen (1999) suggests that in addition to problem context, problem presentation, and problem manipulation space are two other dimensions of a problem space that need to be considered when designing a CLE. From an activity theory perspective, the problem context situates students as subjects in an activity system, in relation to a community as they engage with the object of a learning activity. Design decisions about problem presentation are about the selection and use of tools as mediators of activity. Other tools that need to be considered in the design of CLE include the use of related cases, information resources, cognitive tools, and conversation and collaboration tools (Jonassen, 1999). Problem manipulation space design decisions also need to take into account the CLE principle about the role of collaboration in the learning process; within a learning activity system, these are decisions about the division of labour between students and an instructor. Considerations with respect to problem context, problem manipulation space, and conversation and collaboration tools in the design of the disaster case study will each be discussed in turn.

**Problem Context**

The question guiding selection of context for a new learning activity was: What is a realistic context relative to the authentic activity and intended learning outcomes? The community where the majority of MADEM students live and intend to work is Canada. While practices between jurisdictions and sectors within the Canadian context vary, there is nonetheless a certain degree of cultural homogeneity associated with practice in Canada, in contrast to practice in other country contexts; hence, a problem set within the Canadian context is ‘realistic’ for most students. While hazards and risks are situated, floods are the most common type of disaster event in Canada, and thus, a type of hazard that many students can expect to encounter at some time in their practice. The hazard and disaster context selected for the case study was the flooding in the Manitoba Red River basin, with a central emphasis on the 1997 Manitoba flood, which has been called the “flood of the century.” The selection of this hazard and context was influenced by the availability of information resources, specifically peer-reviewed journal articles about hazards and associated disaster events in Canada, as well as my own experience in working on different flood responses, including the 1997 Manitoba flood.

**Problem Presentation Space**

Given the emphasis on development of students’ competencies with regard
to the use of research literature in the learning outcomes, the research literature was chosen as the vehicle for case and problem presentation. The disaster case study was presented to students as a set of four to five peer-reviewed journal articles related to the 1997 Manitoba flood, as well as other subsequent flood activity in the Manitoba Red River basin. Students were assigned to complete the readings prior to the start of the disaster case study activity and to bring copies of the articles to class. An initial intent was to use “multiple modes of representation” for case and problem presentation, as suggested by Driscoll (2005), and some video and audio clips were used in earlier iterations of the case study. However, over time, the tools for case presentation became limited to the journal articles. One of the constraints in the selection of articles was availability through the RRU library. While most relevant articles were accessible, a few were not, or were not consistently available each year.

While there is limited academic literature about the use of research articles as a tool for case study (e.g., Bordt, 2005; Epstein, 1972, White, 2001), three affordances of this practice were noted to align with the principles of a CLE. First, the use of research literature for problem presentation reinforced the value of research as a way of understanding DEM problems and gave students new insights into problems that could not be learned through practice alone. For example, one article provided students with findings from the systematic study of the gendered impacts of disasters (Enarson & Scanlon, 1999); this is an area that is commonly neglected in professional practice. Second, the use of articles that examine phenomena in more than one context can further aid in highlighting how contextual variables influence problems. For example, one of the assigned articles focused on how the cultural and developmental differences between three Manitoba communities influenced disaster outcomes as well as flood mitigation, preparedness, response, and recovery practices (Buckland & Rahman, 1999). And third, the use of multiple articles, as a form of alternative perspectives, helped to portray the complexity and diversity of problems within a specific hazard and disaster context. These affordances were realized in the design of the problem manipulation space.

**Problem Manipulation Space**

Design decisions for the problem manipulation space related to (a) the functional use of the case within the activity, (b) the structure and sequence of actions and goals that comprised the problem-based activity, and (c) the division of labour within the activity structure. In keeping with the CLE principle of authentic activity, the function of the case in the activity was as a *problem to solve* (Jonassen, 2011). While students would learn a great deal about the case through the activity, knowledge about the particular case was not the object of the activity; rather, the function of the case was as an example of an ill-structured problem associated with professional practice. The case, as problem, became the motive for the activity. The structure and sequence of the case activity was an adaptation of the classic problem-based
learning (PBL) model as used in medical schools (Barrows, 1986, 1996; Savery, 2006). While this PBL approach is normally used to frame the design of a curriculum, it was successfully adapted for use in a single disaster case study activity.

The design of the problem manipulation space included several considerations related to the division of labour. The first decision, in keeping with the CLE principle of learner engagement, was to give students choice about the particular problem associated with the 1997 Manitoba flood that they wanted to study. The boundary of problem possibilities was defined by the research literature selected for case and problem presentation. Accordingly, the problem context needed to be one where there was a sufficient social science literature base related to a Canadian disaster context. The regularity and severity of flooding in the Manitoba Red River basin has generated a reasonable amount of peer-reviewed literature, and hence this was a motive for the selection of the case. The second decision was about the division of labour between individual and collective activity. While CLE principles emphasize that social interaction is an essential part of the design of a learning environment, the principles do not provide guidance on the balance or relationship between individual vs. collective actions within an activity. The theoretical basis for the use of individual vs. collective activity was based on propositions within activity theory. The third division of labour consideration was the role of the instructor. While there are no CLE principles about the role of the instructor, from an activity theory perspective, the role of an instructor is explained in Vygotsky’s (1978) discussion of the zone of proximal development. Literature on the role of facilitators within PBL learning activities (Savery & Duffy, 1996), which is congruent with these activity theory perspectives, informed decisions about the role of the instructor as a facilitator. During all case study activities, two course faculty members observed two or more teams and provided coaching interventions as needed with regard to development of thinking skills, team process, construct development, and research and argumentation skills. Students’ and faculty members’ interactions with one another in the case study activity were mediated by conversation and collaboration tools.

**Conversation and Collaboration Tools**

Through all of the case study activities, students were asked to use the white boards and flip charts as conversation and collaboration tools, and to visually represent their thinking as they worked through the assigned tasks. This required that each team be assigned a large amount of white board space. The value of being able to look at “ideas as things” in the process of socially constructing meaning and knowledge was explained to students at the beginning of the case study (Greeno, 2006; Scardamalia & Bereiter, 2006). The extensive use of whiteboards offered a classroom-based version of Scardamalia and Bereiter’s (2006) online knowledge-building forum where students could build on the ideas of others. An observed affordance of the
use of white boards was students’ multi-modal approach to meaning making using text, diagrams, models, and maps. Students’ use of whiteboards to make their thinking explicit aided faculty in the coaching process.

The design of the disaster case study was an iterative process of reading, thinking, developing, implementing, and refining the case study design. Further, the experience of implementing the design over a five-year period and conversations with other course faculty and students about their experiences were a means of validating design decisions and identifying deficiencies in the design. Thus, while the initial design of the case study was an individual activity, the realization and advancement of the design was a collective effort. Learning theory continued to inform design modifications. With this background, the activity structure for the disaster case study will now be explained.

**Disaster Case Study Activity Structure**

While the authentic activity had three core components (analyse the problem, define an outcome, and develop strategies for addressing the problem), design decisions about the problem manipulations space resulted in a five-part activity structure, as follows:

- hazard and disaster context analysis,
- problem analysis,
- problem study,
- outcome development, and
- learning and recommendations.

Each part was comprised of one or more tasks, which were made up of a series of actions directed to specific goals. A handout describing all of tasks was given to students at the beginning of the case study.

Prior to the start of the case activity, students were assigned into teams designed to reflect the diversity of students’ professional and educational backgrounds. Time was provided at the start of the activity for students to talk about team process and to discuss how to rotate the facilitation role. In the first two weeks of residency, students had sessions on personal styles and facilitation, and were thus expected to demonstrate awareness and use their knowledge about the interpersonal dimensions of activity as they worked through the case study. Students often defaulted to old practice and needed to be encouraged to apply new knowledge related to interpersonal dynamics and team process.

At the conclusion of each of the five parts of the case activity, students were given a set of reflection questions to individually answer. Responses were then shared with the team. Questions focused on development of meta-cognitive abilities and were also designed to aid the team in identifying and
addressing how team process aided or constrained their learning. Each of the separate parts of the disaster case study will now be described.

Part 1 – Hazard and Disaster Context Analysis

The design for this first part of the activity took into account that expertise is developed through the activity of noticing salient features of a situation or problem, and that expert knowledge about particular types of problems is structured around the concepts and theories associated with a particular discipline (Bransford et al., 2006, p. 25). In keeping with these ideas, the tasks in this first part of the activity were designed to develop students’ competencies with (a) hazard analysis, which includes identifying the situational attributes of a hazard as manifest in a particular place; and (b) context analysis, which included explaining the ways in which social, economic, political, and environmental systems contribute to hazards becoming disasters. These were team activities, and the first deliverable was a statement describing the hazard. An earlier reading in the course had focused on the natural and unnatural complexities of hazards (e.g., human influence on waterways or flood plains), and students were expected to be able to demonstrate their understanding of the complexity of the hazard in their hazard statement. The second deliverable was for teams to select two representative examples of how different systems (e.g., political, economic, social, environmental) each contributed to the hazard becoming a disaster, and to cite two examples of the inter-relationship between two or more of these systems. A half-day was initially allotted for this first part of the activity, however, the students were initially not able to adequately complete their analysis of the hazard and contextual variables in this time period, and eventually, this first part of the case study became a full-day activity.

Part 2 – Problem Analysis

Problems within different fields are noted to differ in terms of structure, context, complexity, dynamicity, and domain specificity (Jonassen, 2011). Disaster and emergency management problems are ill-structured, and temporally, spatially, and cultural-historically situated, and are thus dynamic. Interpretation of problems is personal, builds from an individual’s prior experience and knowledge base, and reflects an individual’s worldview. Within professional DEM practice, it is important to recognise that there are different interpretations of problems, and often a need to construct a shared understanding of a problem, which may integrate competing perspectives.

The structure for the problem analysis part of the activity included four sub-tasks, which where problem scoping, problem selection, problem analysis, and identification of assumptions. The inclusion of a task related to problem scoping builds from the ill-structured nature of DEM problems and the associated need to make sense of the problem space. Based on the recognition that problem interpretation is personal, students were individually tasked with identifying three significant disaster and emergency management problems
as noted in one or more of the assigned research articles, and to make note of each problem on a sticky note and bring these notes to class at the beginning of the second day of the case study. Collectively, students in teams were tasked with exploring the problems that had been individually identified, and with visually demonstrating their collective understanding of the relationship between these problems in a schematic way.

Based on their initial analysis of the problem landscape, teams were tasked with selecting a problem for further study that (a) the team was collectively interested in learning more about and (b) was of significant concern to disaster and emergency managers. After selecting a problem, teams were to create a problem statement that reflected their understanding of the problem at that point in time. While an earlier session in the residency had given students the opportunity to analyse and frame problems from alternative perspectives (i.e., emergency manager versus community member perspective), students in all cohorts continued to have difficulty with framing ill-structured DEM problems. The Craft of Research (Booth, Columb, & Williams, 2008) provides a two-part structure for framing practical problems and this model was eventually included as a cognitive tool (Jonassen, 2011) to support students with their framing of the problem. The use of the two-part problem structure allowed students to self-assess their problem statement to ensure it included the necessary components.

The third task in Part 2 of the activity supported students’ development of knowledge about the particular problem they had selected for study. Students were tasked with identifying specific information in the assigned case study readings that related to the problem and that helped them to make sense of it. Again, some form of visual representation on the white board of the findings from the analysis of the problem was required as a deliverable.

The final task in Part 2 of the activity was for students to state assumptions about the problem that they were making or that were inherent in the article. The inclusion of this specific task proved to be important in students’ learning at the conclusion of the case study activity. Before moving onto the next activity in the case study, teams shared their different problem statements, which reinforced the diversity of DEM problems in a given context and situation. A half-day was assigned to the problem analysis activity, however, some teams invariably needed more time. Team dynamics was a factor that influenced the time required to complete the tasks.

**Part 3 – Outcome Development**

A characteristic of ill-structured problems is that there are many possible solutions, which can result in different outcomes. The inclusion of the step of outcomes as part of an approach to working with problems in the DEM field draws from professional practice, particularly international contexts, where the use of program logic models is common. The use of outcomes statements has emerged from concern over accountability and return on investments
relative to outcomes; while the merits of this practice are debated in the literature, the use of outcomes is now a common practice in certain sectors (e.g., international development, health). The benefits of defining outcomes as part of DEM activity is not explicitly discussed in the DEM literature, however, the consideration of outcomes is fundamental to bringing about paradigm shifts in DEM practice. For example, following a disaster, it is common to hear reference to the goal of ‘returning to normal,’ with ‘normal’ being a pre-disaster state. In some circumstances (e.g., death or permanent displacement), a return to normal is not possible. In other circumstances, states of normal may have contributed to a hazard becoming a disaster in the first place. The decision to ‘build back better’ or ‘build back safer’ will guide disaster recovery strategies. Accordingly, students’ task for this part of the case study activity was to develop an outcome statement that reflected the desired end state they were seeking in relation to the problem they had identified. As with the development of problem statements, models for the structure of outcome statements were provided to support students with this task. The time spent on development of an outcome statement was between two to three hours, as it required discussion and negotiation between team members about possible outcomes.

**Part 4 – Problem Study**

The goals for this part of the case study were to support students’ development about what is already empirically known about problems (e.g., perceptions of risk) and what is known about how to address problems (e.g., efficacy of risk communication practices). This approach to learning about problems and problem resolutions is one that we want students to adopt as part of their professional practice. This dimension of the case study activity was modeled after the classic problem-based learning (PBL) model as used in medical programs (Barrows, 1986, 1996; Savery, 2006). The first tasks in Part 4 were to (a) appraise team members’ knowledge and experience relative to the problem selected for study and (b) identify the most salient knowledge gaps and frame questions to guide further study. Questions posed for study could relate to deepening students’ understanding of the problem or learning how to address the problem, with the choice of this focus left to the students. Students were then individually tasked with (a) finding three peer-reviewed journal articles or chapters from academic texts that helped them to answer the question posed and (b) preparing three one-page summaries of the findings from the literature that help to answer the question. A full day was allotted for problem study and students were to return to class the next day with their findings from review of the literature. This part of the activity demonstrates the CLE principle about the use of alternative perspectives.

**Part 5 – Learning and Recommendations**

After completing the individual problem study, students reported back to their team the next morning and were tasked with (a) sharing their individual
knowledge gained with their team and (b) analysing how this new information informs their understanding of the problem and/or strategies to address the proposed outcomes. Based on students’ collective new knowledge, they were tasked with revising their problem and outcome statements as well as revising their assumptions.

Two other tasks were designed as part of this final learning activity, however, time constraints often limited their inclusion. One task was a team discussion about how the knowledge gained could be transferred to the contexts where students worked and how knowledge transfer might be constrained by contextual variables. The other task was for teams to identify three new and important questions that emerged for them from the case study, and to represent the relationship between these questions. The purpose of this final task was to reinforce the nature of an inquiry cycle. The tasks in this final part of the activity were all part of a classic medical school PBL design, with the primary difference being that for the disaster management case study, students did not work through the next cycle of inquiry. The case study activity concluded with a final round of reflection questions.

Conclusions

This article has described a scholarly approach to the design of a disaster case study in the MADEM program at RRU. Social-constructivist learning theories, and principles, procedures, and methods associated with these theories were used to inform the design of an authentic problem-based learning activity situated in a realistic professional practice context. The integrative nature of the activity supported students’ knowledge and skill development in all four of the program learning outcome domains. In keeping with CLE principles, the design supported the active engagement of students in the learning process by giving them choice over the problem to study. The disaster research literature was used for problem presentation and further problem study. The use of research articles for problem presentation and problem study provided students with multiple evidence-based perspectives about DEM problems as well as approaches to dealing with DEM problems. The lack of practitioner application of the disaster research knowledge base was a motive for the approach to the use of disaster research literature in the case study. The design of the activity considered the relationship between individual and social in the learning process. Collaborative activities were mediated by the extensive use of white boards as conversation and collaboration tools that supported students seeing ideas and things, and building on the ideas of others. The use of reflective activities, with attention to both process and content, supported development of students’ metacognitive abilities. The characteristics of the disaster case study design are in keeping with many of the elements of RRU’s LTM. The discussion about the design considerations provided additional theoretical perspectives on the reasoning for use of learning outcomes for the design
of an integrative and authentic activity that actively engaged students in learning with and from each other.

Student and instructor involvement with the disaster case study reaffirmed the value of a scholarly and deductive approach to the design of graduate learning activity. Due to MADEM program revisions implemented in the fall of 2014, the 1997 Manitoba Floods disaster case study learning activity is no longer in use in the program. However, the core elements of the design and associated design principles have been incorporated into new courses in the MADEM program.

References


