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Developing tools for research on school leadership development

An illustrative case of a computer simulation

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Abstract

Purpose – The extant literature on school leadership development is dominated by conceptual analysis, descriptive studies of current practice, critiques of current practice, and prescriptions for better ways to approach practice. Relatively few studies have examined impact of leadership development using experimental methods, among which even fewer studies have employed a cross-cultural comparative perspective. The aim of this paper is to discuss the feasibility of using a computer simulation as tools for research in leadership development.

Design/methodology/approach – This is a methodology development paper. It discusses the feasibility of using a computer simulation as tools for research in leadership development. Exemplary research questions, research designs, and data analyses are used to illustrate the potential of this approach for addressing under-explored issues in management education.

Findings – Three categories of cross-cultural comparative research questions are proposed: comparative study of leadership expertise, comparative study of instructional approaches, and comparative study of leadership development processes. This study demonstrates the research potential of using the computer simulations to address complex issues in leadership development across cultures.

Originality/value – Although computer simulations have been used as training tools for several decades, few scholars have explored their potential for use in the collection of complex data in an efficient fashion. The current study not only demonstrates how a specific simulation has been adapted to collect data on leadership development in education, but also models the means by which computer simulations could be employed in a similar fashion in other domains of education and training.

Keywords Simulation, Experiment, Cross-cultural comparison, Leadership development, Leadership, Schools

Paper type Technical paper

The literature on school leadership preparation has long been dominated by conceptual analyses, critiques of practice, descriptive studies, and prescriptive essays (Bridges, 1977; Brundrett, 2001; Bush, 2008; Griffiths *et al.*, 1988; Hale and Moorman, 2003; Hallinger, 2003; Huber, 2003, 2004; Jackson and Kelley, 2002; Leithwood *et al.*, 1996; McCarthy, 1999; Murphy, 2006; Murphy and Hallinger, 1987). This literature has yielded useful information about the content, trends, curriculum designs, and learning methods employed in leadership preparation and development programs in education (Bush, 2008; Hallinger, 2003; Murphy, 2006). Yet, as noted a decade ago by Wildman (2001), despite the large volume of publications in this domain, there is relatively little empirical research on which to assess the efficacy of educational programs and practices.

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The cause for the stunted development of knowledge in this field stems, at least in part, from the modal research designs and methods that have been employed by scholars (Bridges, 1982; Leithwood *et al.*, 1996, 2009; Murphy, 2006). If we hope to gain greater leverage on important questions concerning the learning process and outcomes of leadership preparation and development programs, scholars in our field will need to adopt a broader set of research designs. We especially call attention to the need for increased use of longitudinal, quasi-experimental, and experimental designs by scholars in educational leadership and management. These research designs involve creating a specific set of conditions in the learning process and tracing the impact on participants' knowledge, leadership practice, and organizations (e.g. see Camburn *et al.*, 2007; Goldring *et al.*, 2009; Hallinger *et al.*, 2010; Hallinger and Lu, 2011; Honig and Louis, 2007; Leithwood *et al.*, 1996, 2003, 2009; Luyten *et al.*, 2005; Spillane *et al.*, 2010; Veenmana *et al.*, 1998).

These observations take on added significance in light of recent international growth in programs aimed at the education of school leaders[1]. Prior to the mid-1990s, both literature and practice in the education and training of school leaders were dominated by the USA and Australia (Murphy and Hallinger, 1987; Murphy, 1992). Since the turn of the millennium, however, the education of school leaders has transformed into a global enterprise (Brundrett, 2001; Bush, 2008; Hallinger, 2003; Huber, 2004; Murphy, 2006; The Wallace Foundation, 2008; Walker *et al.*, 2008). As part of this trend of "going global," we find increasing evidence of cross-national "policy borrowing" and curriculum exports in the education of school leaders. Nonetheless, our review of the literature finds few studies that can inform program designers about the portability of training content and methods of learning across cultural contexts.

This paper describes a research and development effort aimed at developing tools designed to facilitate research on the learning of school leaders. More specifically, the paper describes how one widely used computer simulation, *Making Change Happen*™ (The Network Inc, 1997), was enhanced with the capability to gather meaningful data on the learning of school leaders. Given observed limitations of prior research conducted in this field, we elaborate specifically how the data collected by this computer simulation could be employed in a program of experimental research. More broadly, however, in this paper we seek to demonstrate how technology-enabled simulations can facilitate research aimed at understanding and extending the impact of leadership education within and across cultures.

Theoretical perspectives

In this section of the paper, we begin by providing a critical overview of research design and knowledge gaps in research on school leadership development. Then we examine relevant research on the use of simulations in management education. Finally, we introduce the specific simulation employed in this research and development effort.

Design gaps in school leadership development research

For more than four decades scholars have observed that the range of research designs employed in educational leadership and management remains severely attenuated. Reviewers of this literature conclude that scholars have demonstrated an unswerving reliance on *post hoc* cross-sectional surveys, and a persisting disinclination to employ experimental designs of any variety (e.g. see Bridges, 1982; Erickson, 1967; Haller, 1979; Hallinger, 2011; Murphy, 2006). Table I shows the frequency of experimental

research designs employed in studies published in eight international school leadership and management journals over the past decade. The journals published few papers that used experimental methods of any type (0.005 percent), and even fewer on the effects of leadership preparation and development. When compared with the frequency of experimental research in "sister fields" concerned with learning in the professions (e.g. medical education, management education, engineering education), this "systemic aversion" of scholars in educational leadership and management to experimental research appears difficult to justify.

Various reasons have been suggested to explain the paucity of experimental studies in our field. Scholars have noted a possible lack of appropriate problem tasks for surfacing and measuring what school leaders know and can do (Goldring *et al.*, 2009). Others have highlighted the difficulty in maintaining fidelity of experimental conditions when conducting experimental studies outside of lab settings (Camburn *et al.*, 2007; Leithwood *et al.*, 2003). Although these represent obstacles, we note that researchers in related fields have, nonetheless, persisted in the application of experimental methods in the study of learning processes and outcomes. Moreover, in contrast to *post hoc* surveys, these research designs are explicitly geared toward exploring the impact and effectiveness of educational practices and programs (e.g. Barnes *et al.*, 2010; Camburn *et al.*, 2007; Goldring *et al.*, 2009; Hallinger and Lu, 2011; Hallinger *et al.*, 2010; Veenmana *et al.*, 1998). While we do not concur with those who view experimental research as the "gold standard" for all research questions, we suggest that experimental and quasi-experimental research designs deserve greater consideration among researchers engaged in the study of leader preparation and development in education.

Moreover, since the processes and outcomes associated with leader learning unfold over time, they also seem ideally suited to longitudinal research. Yet, longitudinal studies in educational leadership and management are again distinguished primarily by their rarity (Heck and Hallinger, 2005, 2009; Leithwood *et al.*, 2009). We trace this to the context of research conducted in our field, much of which is conducted by graduate students (Agusto, 2009; Archbald, 2008; Bridges, 1982; Haller, 1979; Hallinger, 2011; Murphy and Vriesenga, 2004). Not surprisingly, graduate students tend to avoid longitudinal studies which, by their nature, take longer to complete.

Nonetheless, we wish to suggest that longitudinal studies may not be as impractical as often assumed. For example, we note that both graduate and professional development programs collect copious information on the learning of students regularly over extended periods of time. This type of "institutional data" can be

Table I.
Use of experimental methods in research published in school leadership and management journals, 2000-2011 (number of articles)

	Year (2000-2011)											
Journals	00	01	02	03	04	05	06	07	08	09	10	11
EAQ	1		1									1
EMAL												
IJEM												
IJLE			1									
JEA												
LPS												
SESI					1	1	1	2		1	1	1
SLAM						1						

employed in longitudinal analyses that are capable of shedding light on a variety of issues concerned with learning methods, curriculum processes, and program effects. Examples of how scholars can employ institutional data can be found in studies of graduate education programs (see Hallinger and Lu, 2011; Hallinger *et al.*, 2010) as well as professional development programs for school leaders (e.g. see Leithwood *et al.*, 2003). Thus, we assert that scholars should "work smarter" in finding ways to incorporate longitudinal data into their research on leader learning.

Another obvious gap in the school leadership literature is revealed by the paucity of cross-cultural comparative research. Despite the increasingly global scope of interest in school leadership development, relatively few scholars have sought to conduct empirical comparisons of these processes across different cultures (e.g. Brundrett, 2001; Huber, 2003; Johnson *et al.*, 2008). Representing the state-of-art endeavor, Johnson *et al.* (2008) conducted a study that compared successful principal practices in the USA, Norway, and China. Their research highlighted the fact that leadership practices are both socially constructed and sensitive to the national, cultural, and institutional contexts. Yet, as is typical in this field, their methodology was largely descriptive.

These observations concerning research in school leader education mirror a trend in scholarship in educational leadership and management that dates back more than 50 years (Bridges, 1982; Erickson, 1967; Haller, 1979; Hallinger, 2011). Given the data presented, it should come as no surprise when we report that our search for studies that combined a cross-cultural comparative focus with experimental, quasi-experimental, and/or longitudinal research designs yielded a null set. Yet, during this era in which accountability and globalization represent defining trends in education, we suggest that scholars must become more proactive in addressing two key priorities. First, they should accord higher priority to studying the learning processes and outcomes of leadership education and their variations across cultures. Second, they should employ more powerful research tools and designs in undertaking these studies.

Knowledge gaps in school leadership development

As noted above, a voluminous descriptive international literature has emerged on the education of school leaders. If we consider this literature within the broader literature on education in the professions, several gaps are revealed that appear especially relevant in the context of global growth in policies and programs in this field. One trend in the broader literature in professional education over the past two decades has been greater interest in understanding both the nature and process of developing expertise. This research has built explicitly upon findings from cognitive science (e.g. Bransford *et al.*, 2000). While we note that this research has been applied to the study of school leadership and management (e.g. Leithwood and Stager, 1989; Nelson *et al.*, 2008), in our judgment, this remains a relatively underdeveloped approach that continues to hold great potential.

Fundamentally, school leadership preparation is oriented toward enhancing the knowledge and skills of prospective and practicing leaders (Bridges, 1977). Here enhancement of "knowledge and skills" refers quite explicitly to the development of "professional expertise." Since educational leadership is a professional domain, the development of expertise must be geared toward the application of knowledge (Murphy and Hallinger, 1987; Murphy, 1992, 2006; Murphy and Vriesenga, 2004).

With this in mind, cognitive science offers a useful distinction between different types or levels of expertise: declarative knowledge and procedural knowledge

(Bransford *et al.*, 2000). Declarative knowledge is the body of knowledge that someone knows or can produce when asked. In contrast, procedural knowledge is knowing "how to apply that knowledge successfully in a given situation" (Goldring *et al.*, 2009, p. 198). Scholarly critiques of school leadership education have frequently identified the focus on declarative knowledge as a major weakness in the design of these programs (Bridges and Hallinger, 1995; Jackson and Kelley, 2002; Levine, 2005; Murphy, 1992, 2006).

These critiques of the modal approaches to leader preparation in education have led to increased experimentation with a much greater range of program designs and methods of learning over the past 20 years (Hallinger, 2003; Huber, 2003; Murphy, 1992, 2002, 2006; Murphy and Hallinger, 1987). Notably, these new program designs have increasingly been oriented toward the development of procedural knowledge. Yet, we observe that empirical studies which seek to understand the process and impact of these programs continue to rely heavily on measures of declarative knowledge. Moreover, as noted earlier, researchers tend to fall back on the use of the tried and true but relatively weak method of *post hoc* surveys in assessing characteristics, responses, and effects of these leadership education programs and practices.

Using simulations as tools in learning and research

Simulations and games, used as long ago as the 1950s, have become increasingly common in programs of professional education (Boulos *et al.*, 2007; Faria, 2001; Hallinger *et al.*, 2010; Hallinger and McCary, 1990; Lean *et al.*, 2006; Salas *et al.*, 2009; Scherpereel, 2005). Proponents have argued that simulation-based learning is closely aligned to several important goals of education in the professions. These include enhancing complex applied competencies in decision making and teamwork, fostering skills in higher order thinking and reflection, and learning to use knowledge as a tool for problem solving (Gary and Wood, 2011; Hallinger and McCary, 1990; Salas *et al.*, 2009; Scherpereel, 2005; Steadman *et al.*, 2006). Scholars in various disciplines further assert that computer simulations offer unique advantages in creating a problem-focussed, engaging, active learning environment (Hallinger *et al.*, 2010; Lean *et al.*, 2006; Salas *et al.*, 2009). Moreover, some empirical studies suggest that simulation-based learning offers a superior method of helping students learn how to apply theoretical principles (e.g. Gary and Wood, 2011; Hallinger *et al.*, 2010; Salas *et al.*, 2009; Scherpereel, 2005; Steadman *et al.*, 2006).

Well-designed computer simulations create a form of "virtual reality" that challenges participants to solve high fidelity, complex, dynamic management problems (Bell *et al.*, 2008). Participants must "situate knowledge in a problem context" and consider the contingencies that impact on its application (Wagner, 1993). Researchers conclude that simulations are a useful means of surfacing participants' assumptions, and scaffolding the development of knowledge and skills (Hallinger and McCary, 1990; Stasser, 1988). This makes them a promising tool in a program of research and development in educational leadership and management (Berends and Romme, 1999; Hallinger *et al.*, 2010; Salas *et al.*, 2009).

The potential of simulations as research tools has been demonstrated in psychology (e.g. Loomis *et al.*, 1999), organizational studies (e.g. Cohen *et al.*, 1972; Harrison *et al.*, 2007), medicine (e.g. Larson *et al.*, 1996), and education studies (e.g. Garrison and Anderson, 2003; Hallinger *et al.*, 2010). In one line of research, simulations function as a high-fidelity task to surface participants' "hidden" cognition. Participants solve a common problem under the same or slightly different conditions. The simulation

records features of their problem-solving strategies and/or their individual/interpersonal behavior while playing the simulation. These data are then analyzed in order to understand the underlying thought processes of the learners and their relationship to simulation outcomes. In the second line of research, learners solve a simulation problem under the same or slightly different conditions. However, only part of their problem-solving record, often indicative of specific behavioral variables of interest to the researchers, are tracked and analyzed. For example, researchers have used simulations to study information flow in diagnosing medical cases by physician teams (Larson *et al.*, 1996). Others have examined the social norms and behaviors of teams in a virtual world (Yee *et al.*, 2007).

In summary, scholars have suggested that computer simulations offer an advantage in developing the higher order thinking of learners (Gary and Wood, 2011; Hallinger *et al.*, 2010; Salas *et al.*, 2009; Scherpereel, 2005; Steadman *et al.*, 2006). We take this assertion one step further by asserting that simulations have the capacity to collect more meaningful data on the knowledge acquisition and application of learners (i.e. procedural knowledge) than paper and pencil tests. Simulation software can track the sequence and types of decisions made by the learners as well as assess success in solving the simulated problem. Thus, we suggest that there is untapped potential in using simulations as tools for research into the learning of school leaders. In the next section we show how this is possible in the context of a specific simulation used in leadership education and development programs.

The Making Change Happen™ simulation

The *Making Change Happen™* (The Network Inc, 1997) computer simulation has been used in training programs with more than 10,000 leaders over the past decade. Initially designed for use with school leaders in North America, the simulation has since been adapted for multiple cultural and linguistic (e.g. Netherlands, China, Thailand, Korea) contexts (Hallinger and Kantamara, 2001). Originally the simulation was played as a "board game" with cards and movable pieces. A decade ago, the simulation was programmed into a computer version that could be played as a stand-alone software application (i.e. installed on individual computers).

More recently, the simulation has been redesigned into an online version. This offers two key advantages over the stand-alone version. First, it enables accessibility by learners anywhere and at any time. Second, as we shall describe below, this also facilitates the collection of data for research.

Overview of the Making Change Happen™ simulation as a learning tool. In the *Making Change Happen™* simulation, the new Director of the Best School System (BSS) is implementing reforms in teaching and learning, school management systems, and information and communication technology. Foremost among these changes is a new IT system (IT 2020) that will enable teachers to communicate and access information more easily, and integrate learning technology into teaching and learning activities.

Learners can play the simulation individually or as members of teams. When playing the simulation, the learner(s) is placed in the role of a project implementation team. The team is responsible for developing a strategy for implementing IT 2020 over a three-year period of time in the BSS. The strategy will be aimed at raising staff awareness of the change, creating a broad base of interest, enabling new skills, and supporting staff use of IT 2020 in their daily work. The simulation "game board screen" is presented in Figure 1.

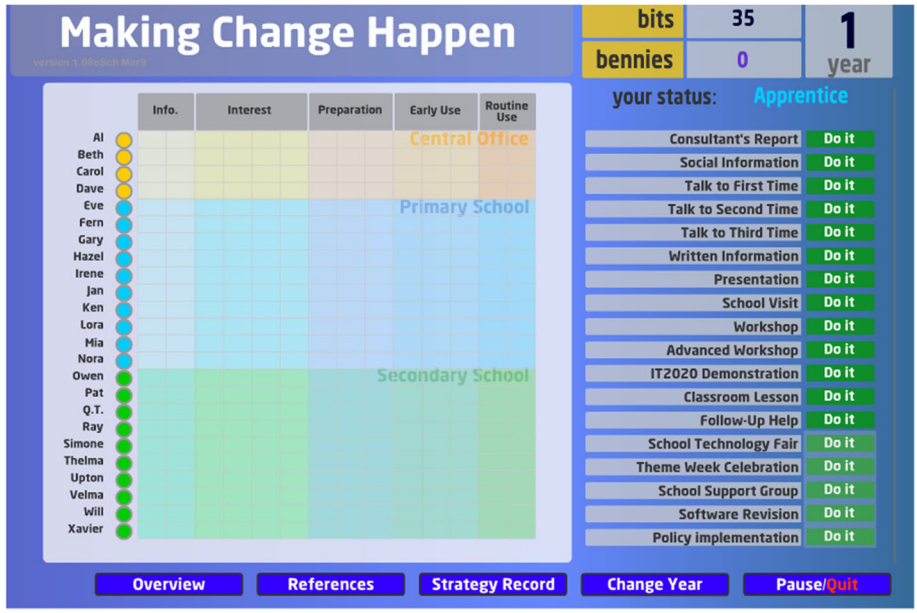

Figure 1.
Game board of the *Making Change Happen*™ simulation

While playing the simulation, learners encounter a wide range of "typical obstacles" to change: budgetary constraints, lack of administrative support, uneven levels of staff interest and skills, and political resistance. The team uses a budget to select/implement activities that engage and support the staff as they come to terms with this innovation (see the right side of the game board in Figure 1). During implementation of the change strategy, the learner receives continuous feedback on the effectiveness of each activity. Feedback comes in three forms: first, movement of the staff members through the "stages of change" on the game screen; second, changes in levels of "student benefits" (Bennies) that accrue from successful implementation; and third, explicit narrative responses that tell the learner "what happened" in response to the specific activity that was implemented.

A "successful change strategy" will result in most of the staff reaching the "routine use" level of use of IT 2020 as well as a substantial increase in the number of "Bennies" (i.e. student benefits from use of the new learning technology). At the end of the simulation, the team receives an assessment of its level of success. This summative evaluation of the learner's change strategy is based upon the number of staff who "changed" (i.e. staff in routine use stage) and improvements in school performance (i.e. Bennies).

The decision rules embedded in the simulation are based on several complementary theories of organizational change (e.g. Crandall *et al.*, 1986; Hall and Hord, 2002; Kotter, 1996; Rogers, 2003). For example, the descriptions and actions of staff are based on Rogers's (2003) adopter type theory. Patterns in staff responses to change over time incorporate principles derived from Hall and Hord's (2002) CBAM model. Effective strategies can also be represented in terms of Kotter's (1996) sequence of strategic organizational change and theories of knowledge dissemination (Crandall *et al.*, 1986). We emphasize, however, that these theories are embedded and implicit in the hidden decision rules that underlie the actions of the simulation (i.e. not labeled or explicit).

Nor are they introduced to learners in advance of playing. Instead, they represent a form of tacit knowledge that learners access as they gain experience in managing change in the context of the simulation.

The computer simulation combines features of problem-based (Bridges and Hallinger, 1995) and experiential learning (Kolb, 1984). As learners play the simulation multiple times, they begin to "see patterns" in the form of sequences of activities that combine to overcome the various obstacles to change. Gradually, the knowledge base that underlies successful change strategies becomes apparent to the learners. The learning sequence employed with the simulation enables students to construct principles of successful change and compare these both to their personal experience as well as to formal theories (Bransford *et al.*, 2000).

As noted, the focus of change in the simulation is implementation of a new IT system. However, the simulation has been designed so that the lessons in change management learned by students are broadly applicable to many other types of change efforts. These include implementing a new curriculum, other innovations in pedagogy, a school merger, or new performance appraisal system. Moreover, as suggested earlier, the simulation has been adapted for different organizational (i.e. business and school) and cultural contexts. These adaptations have involved revisions to text describing the context, as well as decision rules, and language (see e.g. Hallinger and Kantamara, 2001).

Developing the research capacity of the simulation. Our interest in developing the simulation's capacity as a tool in leadership education research led us to undertake the reprogramming of the simulation. This had two goals. First, as noted above, we enhanced the computer simulation with the capacity to be played online. This, in turn, meant that we could, for the first time, "save" a data file for each simulation session played by a learner anywhere and at any time. This stimulated us to develop a data collection capability for the simulation. Thus, as we shall describe in detail, this enhancement enables the simulation to track the sequence of decisions that each team (or individual) makes when playing the simulation, as well as the results. This information is "captured" and "saved" as a data file. The "data" can then be employed in understanding features of the learning process and outcomes of learners, individually and collectively.

When these two revisions are combined, the potential of the simulation as a research tool becomes readily apparent. In the new online version, each simulation session played by learners anywhere in the world is saved as a data file comprised of information that can be analyzed. Moreover, as implied earlier, it is typical for learners to play the simulation anywhere from five to 50 times. Thus, it is possible not only to compare data profiles across individuals, but also within individuals over time. That is, one could examine the learning trajectory of an individual or team that plays the simulation ten times, thereby offering insight into how knowledge develops. Thus, if the online version had been developed ten years ago, by now its usage would have generated a global data set comprised of more than 100,000 data records describing features of the learning of more than 10,000 learners.

The combination of online accessibility to the simulation and data collection capacity on key facets of leader learning means that the simulation can be used as an efficient tool in the study of leadership development across different national contexts. In the following section of the paper we describe how the simulation could be employed in a program of cross-cultural research on leader learning.

Illustrations of simulation-enabled research on leader learning

In this section of the paper, we offer examples of research questions that could be addressed by employing the *Making Change Happen*™ simulation as a tool for cross-cultural comparative research. For each cluster of research questions we will identify a suitable research design and demonstrate how the simulation could generate relevant data. Then we provide an illustrative example of how the data could be analyzed. It should be noted that this paper is not analyzing actual data; rather our purpose is limited to elaborating on the use of the simulation as a tool in collecting data for research.

Understanding novice-expert differences in school leadership development

One popular type of research employed by cognitive scientists aimed at understanding the development of expertise is the expert-novice comparison. This type of study compares the manner in which novices and experts approach and solve practical problems (e.g. Leithwood and Stager, 1989; Wagner, 1993; Yekovich, 1993). Comparisons can be used to identify both differences in content knowledge and thinking processes employed by members of the two groups. The results also shed light on differences in how knowledge is employed by experts and novices, which can inform approaches to the development of expertise.

In educational leadership, Leithwood and Stager (1989) compared the problem-solving processes employed by groups of novice and experienced principals. They found differences in the problem-solving strategies employed by the more experienced leaders. When solving complex problems, the thinking of experts was guided by over-arching principles that could be applied across situations. This conclusion is similar to findings reported by researchers who have studied practical problem solving in other professional fields (e.g. Wagner, 1993; Yekovich, 1993).

Distinguishing the knowledge base of novice school leaders and expert leaders has clear implications for the design of leadership development programs. A well-examined phenomenon in the novice-expert literature is expertise reversal effect (Kalyuga, 2007; Kalyuga *et al.*, 2001, 2003). The theory's basic premise is that instructional designs which are effective for novice learners may lose their effectiveness and even have negative consequences for expert learners. For expert learners, prior domain knowledge may lead to cognitive conflict with novel information or feedback, thus hindering their cognitive processing and performance outcomes (e.g. Paas *et al.*, 2003). Therefore, novice-expert research on school leadership has the potential to inform leadership preparation designs. Here we offer illustrative research questions and designs.

Research questions. We believe that the simulation can be employed as a powerful tool for data collection on similar research issues. Rather than asking people to tell us "What would you do […] ?" the simulation allows us to capture the active decisions of leaders as they seek to solve a complex and highly relevant management problem. Since the simulation is grounded in specific theoretical constructs of change management, we are able to assess both problem-solving processes and application of knowledge. Using the simulation we could address questions such as the following:

(1) Are there differences in the outcomes of experts and novices in the results of their problem solving (i.e. ability to solve the problem of change implementation)?

(2) In what ways do the change strategies employed by experts and novices differ when understanding the problem in the simulation?

(3) In what ways do the change strategies employed by experts and novices differ when solving the problem in the simulation?

Research design. This study could employ a quasi-experimental design with one between-subjects factor. The study is labeled "quasi-experimental" because the participants are not randomly assigned to differentially manipulated conditions. Instead, the participants are classified according to a preexisting characteristic (i.e. novice or expert status). A weakness of this type of quasi-experimental design may be that "the independent variable is confounded with extraneous variables so that researchers do not know whether any change in the dependent variable is actually due to variation of the independent variable" (McGuigan, 1997, p. 320). Nonetheless, it is still a useful design that allows us to infer if there are causal relationships between independent and dependent variables when randomized treatments are not possible (Campbell and Stanley, 1966).

Regarding the measurement of variables in the illustrative research, participants' novice/expert status can be coded from the strategy record. Their performance scores and levels can also be directly retrieved from the data saved on the server. Specific conceptual variables derived from change theory (e.g. Kotter's model of creating a sense of urgency, vision formation and communication, coalition building, etc.) can be operationalized in the simulation.

Through analysis of the decision sequence tracked by the computer, conceptual variables can be coded into continuous numerical variables and thus measured. Using this approach, we can compare the strategies of the expert and novice principals. Since this type of quasi-experimental design contains only one between-subjects factor, we could perform a *t*-test to test the propositions whether expert school leaders perform better and use different change strategies than novice school leaders. By way of this expert-novice approach, a form of validity of the simulation can also be established by comparing the alignment of high-impact strategies embedded in the simulation with those employed by the expert. Closer alignment of embedded strategies with those of the experts would represent a form of external validity.

Cross-cultural study of the leadership development process

Researchers have also shown interest in analyzing how the development of leadership expertise changes over time (e.g. Barnes *et al.*, 2010). Simulations engage participants in a complex extended problem-solving process that challenges participants to apply formal and tacit knowledge in the development of a solution. This makes simulations ideally suited for the purpose of examining the impact of leadership development on the higher order thinking of learners. By employing the simulation, we could also explore learning trajectories of Asian and western school leaders. *Making Change Happen*™ can be used to convey a broad range of important principles of successful change. Here we use learning the principle of "persuasive communication for change" as an example, and show how simulation can be employed in tracking leaders' conceptual development in learning why and how to use system-wide persuasive communication for change.

In Asian schools, institutional and cultural norms have traditionally supported a centralized model of leadership with formal and informal authority located in the

principal (Cheng and Walker, 2008; Hallinger and Kantamara, 2001; Hallinger and Lee, 2011). It has been asserted that Asian school leaders tend to adopt a "top-down" approach in change implementation. More specifically, it has been observed that greater centralization of formal authority and cultural influence among formal leaders (e.g. school principals) creates a tendency to forego information giving and interest building among staff during the early stages of the change process (Hallinger and Lee, 2011). Some scholars and practitioners regard this as a key obstacle for successful change implementation due to school leaders' inability to interest, motivate, and mobilize teachers to change (Hall and Hord, 2002; Hallinger and Lee, 2011; Kotter, 1996).

Research questions. Here we compare the use of "communication for change" in the change management strategies of expert and novice principals across cultures as a means of exploring patterns of leadership and learning across cultures. The concept of "communication for change" refers to the density and breadth of activities employed by leaders to convey the purposes and goals of change, understand and address personal and professional concerns of staff, and motivate staff to positively engage the change. The related research questions might include the following:

(1) How do the "communication for change" strategies of expert and novice principals compare in the American context?

(2) How do the "communication for change" strategies of expert and novice principals compare in the East Asian context?

(3) How do differences in the "communication for change" strategies of expert and novice principals compare between American and East Asian contexts?

(4) Are there differences in the rate at which novice principals learn more effective "communication for change" strategies across the two different cultural contexts?

As suggested above, we hypothesize that Asian school leaders would tend to employ a higher incidence of top-down change strategies. These strategies would feature less communication and emphasize one-way information giving more than interest building. Although this pattern of "communication for change" would also be most apparent among the novices in both groups, we predict more rapid learning among the western novice leaders due to more conducive cultural norms supporting communication across levels (e.g. lower power distance).

Research design. A mixed methods quasi-experimental design with both between-subjects and within-subjects factors can be employed to address this research question (Seltman, 2012). The between-subjects factors are the cultural background of school leaders (e.g. east Asian vs American school leaders) as well as novice or expert status of school leaders. The within-subjects factor is the longitudinal effect of culture on learning over time. The dependent variable is participants' learning of the "communication for change" strategies.

Within the context of the simulation in which the school system is implementing new learning technology, we can operationalize this variable as the presence of specific activities or sequences of activities that fulfill the requirements of this definition. We should further note that within the simulation, we define a "change strategy" as the cumulative sequence of decisions made by learners to implement the new learning technology.

As noted above, both density and breadth of communication are incorporated into our definition of "communication for change." For example, communication activities can include talk to (staff) once, twice or three times; distributing written information about IT 2020; holding a presentation about IT 2020; holding an IT 2020 demonstration with staff; or taking staff on a field visit to other schools. We are able to program the simulation to track the "change strategies" of the learners by taking into account the number of communication activities employed; their density (e.g. how many and which of the staff the leaders talked to); and the sequence of activities (i.e. interest-building activities such as the demonstration and field visit should be conducted after initial informational-giving activities such as written information and presentation). The rationale underlying these measurement decisions can be linked directly to theories of change (e.g. see Hall and Hord, 2002; Kotter, 1996).

It is typical for learners to play the simulation multiple times during a training program (Hallinger *et al.*, 2010). During the first couple of attempts, the learners rely upon their tacit knowledge to address the task (i.e. implementation of IT 2020) and solve the problems that they encounter over the three-year period of change. The instructional sequence used with the simulation does not present theoretical knowledge in advance but rather invites learners to "learn from their experience" in playing the simulation (Kolb, 1984). New knowledge is gradually shared through several channels (e.g. instructor debriefing, sharing among learners themselves, reading, powerpoint) and integrated by the learners as they continue to play the simulation.

Each simulation session will generate a data file or record for each learner. Thus, if a learner plays the simulation five times, it is possible to track the trajectory of learning through changes in the strategy employed by the learner "over time" (i.e. across the several simulation sessions). These represent "repeated measures" that can be analyzed within and across individuals, as well as within and across groups (e.g. within novice Asian principals, between Asian novice and expert principals, etc.).

In addressing the research questions posed above, we would proceed through a sequenced set of descriptive and inferential analyses. These start with analyzing the characteristics of each group, and then formulating comparisons of novices and experts within cultural groups. Then analysis would move on to comparing the "initial state" of the contrasting cultural groups, and then the learning trajectory of the contrasting groups. These analyses would provide insight into whether Asian school leaders adopt different "communication for change" strategies at an early learning stage, and the extent to which cultural norms create barriers to learning strategies. Mixed-effects model analyses can be employed to explore the learning trajectories of school leader learners and test for differences between two cultural groups (Heck *et al.*, 2010; Seltman, 2012). We would expect not only differences in the initial state of experts and novices across the two cultural groups, but possibly slower rates of learning approaches that conflict with deep-seated cultural norms.

Cross-cultural study of leadership learning approaches

A global consensus has emerged on the need for designing more effective training approaches for school leaders. As noted earlier, this has led to considerable experimentation with different approaches to administrator preparation and development. However, the fit between instructional approaches in use and the cultural orientation of learners across different societies remains a concern for researchers as well as for instructors (Coleman, 1996; Hu, 2002). This issue has taken

on increased relevance with the global spread of leadership training programs across different societies. The portability of content knowledge and learning approaches used in these programs have both been called into question.

For example, it has often been assumed that Asian learners prefer rote learning and teacher-directed instruction. Scholarly discourse suggests that active learning approaches conflict both with the Asian student's beliefs about the purposes of learning and normative hierarchical relationships that exist between teachers and learners (e.g. Hu, 2002). Despite these assertions, two different cross-culture empirical studies found little evidence indicating that the structure of learning process in Asian learners is different from western learners (Kember, 2000; Watkins *et al.*, 1991). Both interview and survey studies conducted in Asia also revealed that these cultural characteristics do not necessarily hinder students from engagement in active learning approaches.

Specifically, better learners do not see memorizing and understanding as separate, rather, they believe repetitive learning enhances retention and understanding (Biggs, 1996; Watkins, 2000). It is also noted that, in contrast with western learners whose intrinsic motivation is treated as the precursor of deep learning, Chinese learners are more likely to be activated by a mixed motivational stream. This is comprised of "personal ambition, family face, peer support, material reward, and, yes, possibly even interest" (Biggs and Watkins, 1996, p. 273). In collectivist cultures, these are high levels of achievement motive, rather than extrinsic forms of motivation that would in turn depress intrinsic learning motivation (Kember, 2000). Additional studies have documented that Asian learners are more likely to attribute success to effort and persistence (Biggs, 1996; Hess and Azuma, 1991; McClure *et al.*, 2011).

As noted earlier, simulation-based learning is an innovative learner-centered approach that is believed to be able to successfully engage students, foster higher order thinking and reflection, and enhance complex applied competencies in decision making and teamwork (Hallinger and McCary, 1990; Salas *et al.*, 2009; Scherpereel, 2005; Steadman *et al.*, 2006). Thus it presents a representative leadership learning method to test the notion about whether an active learning approach developed in the west applies to the east. Here simulations are used as the significant feature of an active learning approach to conduct cross-cultural study in leadership development.

Research questions. Based on earlier literature on the efficacy of simulation-based training and previous reasoning about the cultural characteristics of Asian learners, we have reason to believe that some of these Asian cultural characteristics may act as positive advantages rather than constraints in the implementation of simulation-based learning. With the aid of the simulation, researchers could investigate the following research questions:

(1) Are there differences in the learning effectiveness of the simulation between Asian and western school leaders?

(2) Are there differences in instructional effectiveness of simulation-based training between Asian and western school leaders?

Research design. Again we could adopt a quasi-experimental design with one between-subjects factor to examine whether Asian and western school leaders experience this change simulation differently. This time the independent variable is culture (Asian vs western), whereas dependent variables are learning effectiveness and instructional

effectiveness. This research would use the simulation as a training tool and deliver the same set of training to groups of Asian school leaders and western school leaders, and then compare their efficiency in reaching some objective learning goals and their evaluation of instructional effectiveness.

Participants' learning effectiveness initially is indicated by the extent they meet the goals prescribed in the simulation, i.e. performance scores and levels attained. Additionally, learning effectiveness can be measured using summative assessment. Participants may be asked to write up a strategy paper that describes, analyzes, and evaluates their change strategies used during the simulation. Instructors judge the extent that participants have mastered key knowledge points. Participants' instructional evaluation of instructional effectiveness could be measured by an end-of-training questionnaire. The questions may ask about the general evaluation of instructional effectiveness, as well as specific aspects such as content design and participants' engagement. Researchers could use a *t*-test for independent groups to test the propositions whether simulation-based training is an effective learning and teaching method for both Asian and western school leaders.

Discussion

This paper is grounded in the premise that the global enterprise engaged in the education of school leaders has undergone a sea change resulting from the twin forces of globalization and accountability. Recognition of the importance of leadership to effective system management and education reform has, over the past 15-20 years, resulted in increased funding for leadership preparation and development in the education sector throughout many parts of the world. Concurrently, we have observed evidence of increased innovation in program and curriculum design, as well as instructional delivery. Yet, these have not been accompanied by more sophisticated research that examines the impact of these methods on the capacity of learners to apply their knowledge.

Along with others, we assert that the increased investment of funds into the professional learning of school leaders demands the use of more powerful research tools that are capable of assessing higher levels of leadership expertise, the underlying cognitive development process, and the impact of different instructional approaches on the contextualized application of knowledge among learners. We use the term research tools to include research designs and methods of data collection as well as data analysis.

We propose that computer simulations represent a promising tool for assessing higher levels of knowledge and conducting experimental research with a cross-cultural comparative focus. Using the *Making Change Happen*™ simulation as an example, we have suggested three categories of questions in leadership development research that could be undertaken within this frame of reference using more powerful research designs.

It is worth noting that while these possible applications were proposed in response to the call for this *JEA* Special Issue on Leadership development in international contexts, we believe application of this simulation is not and should not be limited to the proposed research studies. For example, establishing the validity of the simulation is another priority area of research. Simulations could further increase the power of experimental research when researchers manipulate experimental conditions by slightly altering induction or some scenarios within the simulations. In fact, we seek to

encourage school leadership and educational administration scholars to use this simulation and others more broadly in their research.

While the potential and advantages of simulation as a research tool have been described, possible disadvantages of experimental research strategies should also be noted. Various extraneous variables (e.g. maturation, instrumentation, history) can threaten the internal validity of results (Campbell and Stanley, 1966). Further, experimental researchers using simulations have traditionally been questioned about the tradeoff between experimental control and ecological validity. The role domains of school leaders are multi-faceted. *Making Change Happen*™ is a specialized computer simulation that provides a common "ruler" to compare and contrast the assumptions, knowledge, and skills of school leaders in the domain of school change. For researchers who are interested in other types of school change such as improving student learning, shaping learning culture in schools, or turning around failing schools, this simulation may not be an ideal one.

Note

1. The paper focusses on programs that aim at both "education" and "training" of school leaders, as well as preservice "preparation" and inservice "development."

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