ASSESSING THE DEVELOPMENT OF KNOWLEDGE AND ATTITUDE FOR SUSTAINABLE LEADERSHIP THROUGH SIMULATION-BASED LEARNING

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ABSTRACT

This empirical study aims to fill the gap in higher education for sustainable development research by studying the use of an online business simulation (Leading Change for Sustainability) in a graduate business degree program in Thailand. The main objective of this empirical study is to assess the extent to which the Leading Change for Sustainability simulation, or LCS, impacts student's knowledge and attitude in the domains of change management and sustainability science (e.g., Chappin, Bijvoet & Oei, 2017; Gericke et al., 2018; Shephard, 2008).

The Brundtland Report (1987) defined sustainability or sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland et al., 1987, p.41). Achieving sustainability in organizations involves a change in organizational practices at all levels. The extensive build-up for organizational knowledge and learning, with trial and error, could lead towards learning organization and then sustainability. Reaching a sustainability equilibrium challenges leaders to balance "the economic, environmental, and social dimensions of today, as well as their inter-relations within and throughout the time dimension" (Lozano, 2018, p.16).

The significance of this study lies in several areas. First, the research will establish this new simulation's technical stability and feasibility in a graduate education program. The author used formative evaluation data to assess learner perceptions of the simulation and generate suggestions for improvement. Second, learning for sustainability requires new active learning approaches that engage students and challenge them to think holistically about sustainability challenges (Barth et al., 2007). This research will give insight into the impact of simulation-based learning on student understanding of the complex, systemic nature of sustainability challenges and solutions (Gatti, Ulrich, & Seele, 2019; Hallinger et al., 2020). More specifically, empirical evidence analyzed in this study will offer a summative assessment of the simulation's impact on student knowledge, attitudes, and skills in leading change for sustainability in organizations. Thus, the research addresses a gap in the literature on simulation-based learning (Hallinger & Wang, 2020) and education for sustainable development (Hallinger & Chatpinyakoop, 2019). The hypotheses of this study include, first, simulation-based learning is positively associated with changes in students' knowledge of general sustainability concepts and knowledge in managing organizational change for sustainability. Second, simulation-based learning is positively associated with students' attitudes towards sustainability.

This study will incorporate several conceptual frameworks of the knowledge-attitude-behavior model, sufficiency economy practice (SEP), and change management. First, this study is based on the learning assessment of the knowledge, attitude, and behavior in sustainability education using serious games, used in Chappin et al. (2017). Researchers have asserted that knowledge alone is not enough to change the behavior, and the knowledge improvement can affect the attitude, according to the theory of planned behavior (Bradley, Waliczek & Zajicek, 1999; Chappin et al., 2017). Knowledge, attitude, and behavior serve as the learning assessment in different perspectives. This also aligned with the UNESCO framework (Gericke et al., 2018). The model tells us what students understand about certain things, how they feel towards their learning issues, and how they behave. This is because behavior reflects how students understand and think about what they learn (Kaliyaperumal, 2004). Shephard (2008) also asserted that the assessment of learning in higher education for sustainability should balance both cognitive learning outcomes (which includes the learning aspects of knowledge and understanding) and affective learning outcomes (which include the learning aspects of attitude, values, and behavior or practice). Shephard's work also aligned with Gericke et al. (2018) that developed the instrument to assess knowledge, attitude, and behavior. This will be the framework for the learning assessment in this study.

Second, the sufficiency economy philosophy (SEP) process developed by Bergsteiner and Dharmapiya (2016) will be used as the foundation of sustainability that starts from developing individual and collective wisdom reflected in their virtues and attributes. The sustainability process moves further to the individual and collective knowledge and mindset development, which reflect their behavior, practices, decisions, and actions. The sustainability mindsets and wisdom decisions turn into the outputs and outcomes towards sustainability. The SEP process can be summarized into a single sentence reflecting the model. "*A virtuous person uses knowledge to make wise decisions and acts accordingly to achieve envisioned results*" (Bergsteiner & Dharmapiya, 2016, p.47). The SEP process reflects critical features of the KAB model. The "what we know" in the SEP process is presented as knowledge in the KAB model. In contrast, what we decide in the SEP model is presented as attitudes and values in the KAB model, and then how we behave in the SEP process is presented as behavior and practice in the KAB model. It should note here that behavior and practice reflect awareness, understanding, and skills developed from the earlier stages, according to the theory of planned behavior mentioned in Chappin et al. (2017). Lastly, Kotter (1995) and Hall & Hord (2001) organizational change management frameworks will be used in this study's framework, as these principles of change implementation are embedded in the LCS simulation. This is adapted from Hallinger et al. (2020).

This study uses a quasi-experimental research design to assess change in student knowledge, attitude, and skills related to managing change for sustainability. This will focus on developing leadership in change management and sustainability in the organization. Treatment in this study is learning with simulation concerning challenges of leading change towards sustainability in organizations. The dependent variables in this study are the change in learning outcomes in knowledge and attitude in leading change towards sustainability in an organization. The study assessed the impact of using simulation-based learning in developing sustainability knowledge (cognitive outcomes) and attitude (affective outcomes) with a group of 2nd-year students studying for a management graduate degree in Thailand., The pre-test and post-test surveys were distributed to collect the data for assessing their knowledge and attitude learning outcomes.

Leading Change for Sustainability (LCS) is based on multiple frameworks such as systems thinking, corporate and social sustainability, concern-based adoption model, and others. The simulation can be played online from anywhere with an internet connection. The fundamental learning goals of the LCS (Hallinger et al., 2020) are:

1. To figure out how to foster effective systems for driving the change to maintainability in associations
2. To learn how to develop effective strategies for leading the change to sustainability in organizations
3. To learn how to change staff attitudes and behavior to support sustainable growth and success to learn how different parts of the organization can contribute to sustainability
4. To learn how to work as a team in the lead for long-term success

This study collected the data from classes using LCS simulation taught in a graduate school of management in Thailand. This course is a seven-week module. Research reported in this study will include pre-test and post-test in weeks one and four. Students will meet online with the instructor via the Zoom meeting platform during a weekly three-hour class session. There are also class supplements via an online e-learning platform. Students will complete the post-test in class and simulation examination in the fourth week.

The researcher planned to collect data from four classes in three trimesters. This study is the preliminary result of the data collected from three classes with 67 respondents. The pre-test questionnaire was distributed in week one before class started, and the post-test questionnaire was distributed in week four when students took the simulation examination. The pre-test and post-test comprise the sustainability mindset test and the sustainability knowledge test. The attitude test consists of ten questions using a 5-point Likert scale. The knowledge test is the 16 multiple-choice questions. Half of the knowledge test assessed the sustainability knowledge, and the other half evaluated the knowledge in organizational change management.

From the analysis of the knowledge test, the skewness and the kurtosis of the data, both between -1 and 1. The author also tested the normality of the small sample of this data with Shapiro-Wilk. The p-value of the Shapiro-Wilk of the knowledge test is 0.688 for pre-test and 0.062 for post-test. Both passed the normality test at a p-value of 0.05, reflecting that this knowledge test is normally distributed.

The author tested for reliability with Cronbach's Alpha for the attitude test. From SPSS, Cronbach's Alpha for the attitude test is 0.602. It is relatively low but still moderately reliable and acceptable (Hinton, Brownlow, McMurray & Cozen, 2004). However, if we took out the item with the lowest correlation, the Cronbach's Alpha improved to 0.632. Therefore, the attitude test of this study is moderately reliable.

The paired t-test is used to see a significant difference between the pre-test and post-test in the knowledge test and attitude test. The paired t-tests for the knowledge test passed the t-test significantly. This means that there is a significant difference between the pre-test and post-test scores of the knowledge test. The author also used the paired t-test to assess a difference between the attitude pre-test and post-test and also found that the attitude pre-test and post-test are also significantly different.

The descriptive analysis of the pre-test and post-test of attitude and knowledge tests confirmed statistical findings. From the attitude pre-test and post-test, the average post-test score is higher than the average pre-test at 8.4 percent. The descriptive analysis of knowledge pre-test and post-test also shows that the average post-test knowledge is improved for 73.6 percent. With these descriptive and inferential analyses, the author can assert that students improve their knowledge and attitude in change management for sustainability from simulation-based learning.

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