Bricks, Bulls, and Big Ideas: Exploring Systems Thinking in Collegiate Bull Management

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Introduction

Systems thinking is widely defined in education as a holistic approach to viewing complex issues and situations and identifying patterns or themes that may emerge from the connections (Furst-Bowe, 2011; York et. al, 2019; Elsawah et.al, 2022). Systems thinking in agriculture has contributed to a global shift toward more sustainable farming practices (Meinke, 2019). As agricultural educators, it is critical to develop students' understanding of systems thinking and its importance as they enter the workforce. In educational leadership development, self-awareness is critical for personal leadership development, and purposeful self-reflection provides ample opportunity to develop self-awareness (Kiersch & Gullekson, 2021).

LEGO® Serious Play® (LSP®), originally developed for corporate world applications, prompts dialogue, self-reflection, and the development of problem-solving skills using LEGO® bricks and imagination (Fearne, 2020). Students in the bull management program completed a one-hour session using LSP® to build individual and then group models representing attributes they bring as individuals and then as subcommittees to the overall bull management program. The session included a review of the parts of a system (including elements, interactions, paradigms, and functions) (Meadows, 2008) as well as a debrief discussion. The purpose of this study was to explore the perceptions of these students' learning about systems after participating in an LSP®-guided systems-focused workshop.

Theoretical Framework

Von Bertalanffy's (1973) general system theory (GST) framed this study. GST is rooted in approaching issues holistically, rather than solely focusing on individual elements (Von Bertalanffy, 1969). This framework is used to explore a wide variety of systems, rather than those solely associated with human development, such as Bronfenbrenner's (1979) ecological systems theory. Given the system of interest, the Cal Poly, San Luis Obispo bull management program is comprised of several interconnected elements, which are technical and social in nature. GST was selected as an appropriate lens to explore the complexities of the system.

Methodology

This study used a quantitative survey design to measure participants' perceived systems-focused learning as a post-test. Eight items were modified from Stroh's (2015) four-stage change process, focusing on stage one: Building a foundation for change. The prompts used a five-point Likert-type scale to measure individuals' perceived learning concerning systems. The items were reviewed by a panel of experts and were considered reliable ($\alpha = .97$) (Cronbach, 1957). An overall perceived systems learning score was calculated as an average of all eight items.

Participants ($n = 24$) ranged from age 18 to 24 ($M = 19.87$ years, Mode = 20). Two were male, 13 were female, and 9 declined to state. Thirteen were White and 2 identified as American Indian/Native Alaskan, while 9 declined to state. Two identified as Hispanic, 13 did not, and 9 declined to state. Response rates were not ideal (24 out of 57, 42%), but a comparison of early and late respondents' items found no significant ($p > .05$) differences; thus, we deemed results generalizable (Lindner, et al., 2001) and still a meaningful contribution to the literature (Johnson & Shoulders, 2017). We used the Statistical Package for Social Science Research (SPSS) to analyze data, which included the use of descriptive statistics.

Results and Findings

Students perceived their greatest learning concerning understanding how their role impacts others in the system ($M = 4.19$, $SD = 1.07$) and the least understanding of how systems work ($M = 3.73$, $SD = 1.15$) (Table 1). A score for overall perceived systems learning was calculated as an average from all items ($M = 3.99$, $SD = .99$).

Table 1

Description of Bull Management Students' Perceptions of LSP®-Driven Systems Learning

Item[a]	*M*	*SD*
I understand how my role impacts others in this system	4.19	1.07
My capacity to accept responsibility for my part in a system has increased	4.16	1.07
I understand how others impact my role in this system	4.16	1.05
My capacity to hold productive conversations concerning systems has increased	4.08	1.05
I enjoyed learning about systems	3.90	1.12
I understand what my role is in this system	3.89	1.15
My capacity to collaborate concerning systems has increased	3.86	1.15
I understand how systems work	3.73	1.15

Note. Scale used where 1 = strongly disagree and 5 = strongly agree

[a]Adapted from Stroh's (2015) *Systems Theory for Social Change*

Conclusions

The purpose of this study was to explore the perceptions of these students' learning about systems after participating in an LSP®-guided systems-focused workshop. The integration of an LSP®-driven systems-focused lesson, with students involved in the bull management program, bore noticeable results, specifically towards students' understanding of how their role impacts others in the system. Despite this, even after students participated in a hands-on workshop where they were able to collaborate with their peers, they still felt they had limited knowledge about how systems work. This underscores the idea that systems are complex and the bull management program, with its technical and social components, and the students involved in the program delivery, are subject to these complexities (Von Bertalanffy, 1973).

Implications/Recommendations

This research serves as a starting point for implementing systems-focused curriculum in college agriculture classes, using LSP® as a teaching method. Future research should explore how students can acknowledge their role within a system, yet still have difficulty grasping what systems are. Additionally, exploring the use of the LSP® as a systems teaching method in other groups of students may be of interest, as group culture may differ. Researchers should also explore alternative methodologies to evaluate the effectiveness of LSP® workshop sessions in impacting participants' systems thinking. Practitioners facilitating any workshop on systems thinking, whether using LSP® as a method of instruction or not, should carefully consider how they explain and model systems to college learners to ensure clarity. Consideration of what targeted interventions may be needed, related to developing systems knowledge before engaging with LSP®, may be critical in successfully introducing students to systems theory, particularly in situations where students are engaged in a specific system, like a bull management project.

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