Designing Systemic Policies: Zombies in the Classroom

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Structured Extended Abstract

Purpose – This paper presents a methodological framework that uses the leverage points proposed by Meadows (1999) as drivers for designing policies. The methodology that we present here articulates the principles of "bathtub dynamics" (Sterman, 2010; Sweeney & Sterman, 2000) along with feedback loop dominance analysis (Ford, 1999) and heuristics of critical thinking (Ulrich, 1987). We call the process of devising such policies as "designing systemic, leverage-points based policies". We have developed this framework for the past years in a mandatory, undergraduate course for industrial engineering students. In this paper we illustrate how to design such policies by using an exam of our own course: a case that concerns a hypothetical zombie outbreak. The case demands for the students to design strategies to stop a zombie invasion by developing a "bathtub dynamics" analysis for a stock variable of "Zombies" and by experimenting with a computer simulator for finding dominant loops that should be tackled for producing big changes and stop the outbreak. The strategies must be explicitly articulated with various leverage points. The goal of the paper is to share this experience with the System Dynamics community and to think of new opportunities for expanding this type of approaches in higher education.

Design/methodology/approach – The paper presents the mentioned methodological framework for driving policy design and the way we use it in the mentioned course. First, the paper presents the basic aspects of our undergraduate course. Second, the article sets the conceptual framework for designing systemic policies; the proposed methodology sets a series of guidelines that lead the students to develop an understanding of the dynamics of accumulations along with basic principles of loop dominance as basic requisites for designing and evaluating what we call "systemic policies", that is, sets of operational strategies (Olaya, 2015) aimed at leverage points that tackle the explicit and implicit design that underpins a social system. The article illustrates that framework with the case of a zombie outbreak that we used as an exam in our undergraduate course; the text includes annexes with detailed material of what we use in class. We discuss some results of the application of the methodology and the zombies case along with key summarizing points.

Findings – The framework encourages considering and identifying counter-intuitive, systemic actions for improving a situation. In particular, it entices policy makers and students to think beyond "obvious" solutions and consider structural and transcendental leverage points. The resulting policies warrant the incorporation of systemic considerations. In the context of higher education, the framework stimulates systematic and rigorous thinking by requiring conceptual support for courses of

action that should be based on understanding dynamic complexity (stock dynamics, feedback loop dominance); It also motivates students to develop systemic thinking creatively. Following the competences development framework for learning and teaching System Dynamics proposed by Schaffernicht & Groesser (2016), the methodology we present here promotes the development of learning outcomes for policy evaluation and design since it requires students to: explain the causal structure of a problem and how the problem is created by the model structure, explain why one policy has high impact while others fail to do so, explain how established policies are the underlying cause of the problematic behavior, argue in favor of better policies and communicate effectively with stakeholders about the use of the model. The next steps will be aimed at developing some formal aspects to structure a methodology and solve some specific issues such as ways to systematically evaluate what we call "transcendental" strategies.

Originality/value – The heuristic proposed by Meadows (1999) helps to identify, guide and prioritize leverage points and search for effective courses of action. We show the way in which that heuristic can be used for devising strategies under a coherent framework that promotes and makes the most of understanding "bathtub dynamics" and feedback loop dominance. The framework integrates all these elements in a single methodological approach for designing systemic policies. Using this framework in a System Dynamics course through cases as the "Zombies" case, engage engineering students to tackle semi-structured situations by developing SD skills and using simulation. The approach also highlights action-learning experiences using simulations (Gröbler, 2004; Kopainsky & Sawicka, 2011; Sterman, 2014) which is a key element in engineering education (Caulfield & Maj, 2002; Radzicki & Karanian, 2002).

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