Commentary

University Environmental Health Program
Recruitment and Stability: A Systems Analysis

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Systems analysis is enjoying resurgence in public health management as a “proven tool” for solving large-scale problems.1–5 In an article delineating the constraints of implementing systems analysis in public health management, however, Trochim et al3 reported a result of “complexity and difficulty of the process” as a reason for its lack of use. To increase an understanding and improve ease of use, case studies are frequently used to clarify complex ideas such as system analysis.6 This commentary will provide an example to illustrate the use of systems analysis in an important problem of environmental public health workforce development: university recruitment and enrollment in environmental health (EH) programs.

This systems analysis addresses the problem of declining and unstable enrollment in an EH program. The systems analysis identifies the underlying long-term systems processes and behaviors influencing enrollment of students in EH. A nearly four-decade-long EH program at East Carolina University was used as a model for this analysis. Peter Senge’s process archetypes7 were identified in the analysis, using data from interviews of current and past faculty, staff, and students at East Carolina University in undergraduate EH and master of public health programs. To “tell the story” of the workforce and enrollment problem in EH, and increase the visibility and identity of the discipline, this commentary presents a method of systems analysis to engage stakeholders and assist in solving the problem.

● Background of the Issue for Analysis

Environmental health programs at accredited universities are a main source of degree-holding curriculum-specific EH specialists for county health departments. While a condition of available jobs exists, and a backlog of work for current professionals is typically found, the existence of EH programs at universities is frequently unknown by students. There are currently 28 universities in the United States that provide an accredited degree in EH.8 The health community and the public want intelligent, qualified workers doing EH work, but unfortunately universities are often unsuccessful in attracting students into these rewarding government jobs.

Historically, EH professionals were charged with preventing public health problems by ensuring sanitation of public places, water supply, food supply, sewage, and institutions. Today, this work continues, with an addition of terrorism prevention and hazard response. The pressures of responding to hazards add to a current US EH workforce crisis and consequently provide impetus to devise new interventions in the enrollment problem, to ensure a continuing supply of well-trained EH professionals.9 Essential services of EH10 include monitoring a wide range of environmental conditions, services that are aligned with 2002 Health Department Accreditation legislation in North Carolina.11 Responsibilities now include more than food inspection and issuance of septic tank permits within the local health department.

One of the reasons for enrollment declines in EH programs has been the persistent problem of portraying EH work to the public because of its multidisciplinary nature.

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Logic model included events and the following stakeholders: graduate students, undergraduate students, academic departments, faculty, university resources, and community needs.

EH includes the effects of the environment on the health of the people and the people on the environment. Nearly all public health departments have an EH section but not many individuals in the United States can identify what EH is or what its practitioners do. This method of systems analysis “tells the story” of workforce and enrollment declines in a university EH program. The goal is to provide understanding of the issue, and to help provide a means to increase EH visibility and identity.

**The Steps in Systems Analysis**

**Trends graph**

The first step in this analysis was to construct a chart of events, derived from participant interviews, in the form of a logic model (not included). Logic models outline the inputs, stakeholders, actions, and outcomes included in a problem situation. Second, a trends graph of the logic model over time was made. Figure 1 shows a graphic comparison of some historic events and enrollment. When interruptions in the growth of enrollment occurred, coincident historic events are illustrated. The history of the EH program enrollment at this university is depicted over three decades. Enrollment started in the early 1970s, and began to see enrollment declines for the first time in 1980s when the political climate in the United States changed regarding the environment. In the 1990s, enrollment fluctuated because of changing leadership in the program. Following these changes, college funding was reduced, which, in turn, started a serious decline. A return of the past leadership to the program, along with a transfer to a second college, boosted enrollment. This change plus the reassignment of department leadership led to the third decline in enrollment, and the new college prepared to eliminate the program due to low enrollment numbers. A final return
of the original leadership and a third college reassignment saved the program and started a recovery.

Following the depiction of the EH program history in the trends graph, a focusing question for the problem was formulated. A focusing question is a synthesis of the parts of the problem into an actionable statement. All inputs and stakeholders’ needs and actions and the relationships of the events and enrollment fluctuations are considered. This information is stated as a specific question with an action implied: How can enrollment be increased to a level that is sustainable?

**Current reality and vision**

An important step at this point is to analyze the current reality seen by all of the stakeholders in the issue through focus groups and interviews. Often the current reality can be obscured by each individual’s stake in the organization, by other emotions, values, or other tensions. Once a current reality is agreed upon (often requiring a professionally facilitated discussion), a vision for the future of the organization, encompassing a solution to the current problem, is created and both are included in the analysis (Figure 2). In this analysis, the desired purpose and vision was “Sustainable 50+ graduates with service hearts.” The current reality was “Undergraduate enrollment of 30–40, and survival by accepting continual crises.” The tension between the two statements, the current reality and the vision statement, gives the organization motivation and impetus to change. The direction of change is guided by processes analysis in causal loops.

**Systems archetypes**

Systems archetypes were used in this analysis to gain an understanding of the process gaps between the current reality and the vision of sustainable enrollment. These archetypes were developed into diagrammatic feedback loops of typical organizational process traps. Table 1 lists typical process archetypes used by Senge.

Two of these archetypes were combined in this analysis to depict the events, interactions, and feedback loops present in this problem area of the EH program.
As new faculty members are hired, new subject matter is emphasized in the curriculum, and often the curriculum is changed on the basis of each faculty member’s expertise. These actions are intended to improve the curriculum, make it more relevant, and increase enrollment, but often the action has the unintended consequence of adding to overall faculty workload, reducing student contact time, and having a negative effect on enrollment.

### Reinforcing and Balancing Loops, Mental Models

Loops are labeled with R and B as reinforcing loops and balancing loops. Reinforcing loops often slow down the forward progress of the organization by causing a continuation of nonproductive behavior. Balancing loops provide forward motion because successful behaviors and actions are not tied to unintended consequences or other pitfalls.

The effects of human attitudes on organizational behavior are illustrated in this analysis by including mindsets or “mental models” in bubbles above the processes of the model. These can be attitudes that perpetuate a reinforcing loop, or they can be rationalizations, cultural norms, or habits that drive the loops in the analysis. In this analysis, mental models driving the “shifting the burden” loop included “My Hero” and “Faculty do not recruit.” Others in the analysis are “I don’t have time,” “This will solve all our problems,” “Bigger is better,” “There’s no use,” and “No problem.” These mental models were derived from informal interviews and conversations with past faculty and students.

To change unproductive behavior, it is important to identify and assist individual stakeholders to recognize these operating mental models. Thus, careful application and organizational discussions of accurate mental models are needed to break up resistant (B) or (R) loops to help the organization move forward.

Once the model has been constructed and illustrated, management is apprised of the results, and discussion of the parts of the model can begin. As the group of management and staff are brought into discussions of the analysis, a set of solutions in the form of recommendations can be formulated. The discussion and communication of the analysis is one of the most important steps in the entire process, and can take considerable time. Important psychological behavioral blockages are often a part of organizational progress issues, so providing time to allow recognition and realization is necessary. Everyone must “buy into” the analysis as well.

Using the Senge archetypes and mental models facilitates this. If the stakeholders are not involved or do not see the current reality or share the common vision,
more work needs to be done to resolve this step of the process. All steps in the systems analysis process are iterative; in fact, continuous revisiting of parts or all of the analysis may be necessary as growth and progress occurs.

Results of the Analysis and Recommendations

In 2002, the Centers for Disease Control and Prevention initiated a program to improve EH leadership. Part of this program was a workshop on systems analysis by Bridgeway Partners, Inc, a management consulting firm. The current analysis was one of the assignments conducted with individual consultation from Dr. Stroh, a management consultant and partner of Peter Senge. With the help of this consultant, the university EH recruitment process problem in this case was found to be an actual reliance on the “wildfire” management system. Because wildfires were occurring on a regular and rapid basis, the department had fallen into a pattern of expecting and actually relying on crisis leadership. Leadership development and long-term plans had been replaced by necessary short-term fixes. The short-term fixes of curriculum changes, related to the addition or change in faculty, actually had set up a reinforcing loop of more crises. Other events illustrated on the causal loop diagram (Figure 2) adding to the “internal confusion” of crises included departmental reorganization, renovation of the building, and faculty additions.

The vision of the program was stated as “a stable enrollment and graduation of service-hearted students.” One of the recommendations for management in this analysis was to present this vision and continue to discuss it as the stakeholders reflected on the analysis and recommendations.

Other recommendations were to carefully consider any further curriculum changes, and to curtail the constant change of courses and curriculum so that an identity for the program develops and becomes known. Leadership in recruitment, finally, had to include not only one person’s activities but a shared set of activities, a shared attitude, and a shared responsibility.

Systems analysis, as illustrated in this case study, is a thoughtful way to visualize relationships and processes that may be slowing or stopping a desired forward trajectory of an organization. It is a valuable and proven tool, but requires time and active participation of the organizational group. The “complexity and difficulty of the process” that Trochim found as a constraint on systems analysis may have been an inability or unwillingness of the organization to devote time to the process. People can work together to find relationship and behavior pathologies in their plans, procedures, problems, and processes and ultimately change, but time and patience are required to involve all the people in the organization. When the gaps and reinforcing negative loops are finally recognized and understood, changes required are more acceptable, and ultimately more successful. The benefits of spending time to include all stakeholders, to analyze organizational processes, to identify archetypes that restrain progress, and to continuously discuss the changes needed are an organization that has a solid identity, an entrenched vision, and a desire to reach that vision. In the EH field, a clear vision and identity will help ignite recruitment and enrollment.

REFERENCES