

## THE SYSTEMS THINKING CASE FOR THE LIBERAL ARTS

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This paper makes a case for using a systems thinking approach to teaching the liberal arts. The authors believe the current siloed, reductionist disciplinary approach to technical challenges is insufficient to prepare students to address the complex adaptive system challenges. We propose that an interdisciplinary systems approach will better prepare undergraduates for the messy real world into which they will enter.

Keywords: Systems Thinking, Liberal Arts, Adaptive challenges.

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Significance & Public Understanding – Preparing students for the real world they will enter would appear to be the most important goal of a higher education system. The authors argue that the current system in higher education is antiquated and must be updated to include training in systems thinking to be effective.

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## 1. Introduction

Much is being written about the need for higher education to produce more STEM students, deliver more job skills training, and provide more specialization to ensure employability and success in the workforce, which are critically important for continued economic success. Ron Heifetz calls these technical challenges (1997). The following article asks a related question: what about the interdisciplinary clashing of societies, ideologies, beliefs, economic theories, political parties, cultures, etc.—the great clanging and banging that is humanity? How should we prepare our students for that reality? These, Heifetz refers to as adaptive challenges. We believe the current siloed, reductionist disciplinary approach to technical challenges is insufficient to address these adaptive challenges. Journals have had a robust treatment of the familiar idea of teaching the liberal arts (e.g. Kovačević, Dekker & van der Velden, 2023; Trinidad, Raz & Magsalin, 2021). The same can be said about interdisciplinarity (e.g. Turner, Cotton, Morrison & Kneale, 2022; Rashid, 2021; Hegna & Ørbæk, 2021; McCune, Tauritz, Boyd, Cross, Higgins & Scoles, 2021). We see a gap, however, in applying what is known as systems thinking. We propose that an interdisciplinary systems approach will prepare undergraduates for the messy real world.

## 2. The universal paradox

The world and everything associated with it is too complex for humans to address all at once, and no one could possibly understand all of the complexity and dynamics associated therein. Consequently, humankind has used reductionist thinking to attempt to understand the world in and around us. Reductionist thinking is a way of understanding complex phenomena by breaking them down into smaller and simpler components. The idea is that by reducing a system or concept to its most basic elements, we can better understand it and make predictions about how it

will behave. Reductionist thinking is used to understand the behavior of complex systems by studying their individual parts. Margaret Wheatley (2006) explained that such an approach to understanding the world was fruitful for quite some time in the natural sciences, and it still is; but since Sir Isaac Newton, the natural sciences have added an appreciation for the encompassing reality as well – that is, the relationships within which those parts operate. One reason for this transition was that reductionist thinking can and often does, lead to oversimplifying complex phenomena and ignoring the emergent properties that arise from the interaction of individual components. In other words, reductionism focuses on the parts rather than the whole and may miss important aspects of the larger system. It can also foster a partisan, siloed worldview. The 1983 publication *A Nation at Risk* had noticed this trend. It says that “where there should be a coherent continuum of learning, we have none, but instead an often incoherent, outdated patchwork quilt.” Alas, little has changed. In fact, the disciplinary lines and filters seem to have become more pronounced and granular. Peter Knight (2001) observed that undergraduate education is incoherent. Whatever coherence exists must be supplied by the students (p. 371). This is not because there are no voices on behalf of coherence (p. 372). The problem lies in adopting a simple, linear model of education that emphasizes outcomes (and not processes), discrete learning objectives (and not entire programs), and classroom activities (and not the learning that comes about in community). What these failed efforts overlook is the complexity of higher education that must be understood instead as a system, a system to understand systems. The paradox is that in our efforts to institute coherence, we cannot understand and contemplate the whole, so we reduce it to component parts, yet the thing of it is, there are in fact no separate components. In her lucid introduction to systems thinking, Donella Meadows offered the following insight:

In the real world, boundaries don't exist. There are only boundaries of thought, perception, and social agreement—artificial, mental-model boundaries. There are no separate systems. The world is a continuum. Where to draw a boundary around a system depends on the purpose of the discussion  
*(Meadows, 2008, p.95)*

Based on Meadows's caution, the reader should see the need for an interdisciplinary approach. There are in reality no separate closed systems! All we can hope to do is prepare students for the complex, multifaceted conversations we have to have across systems – legal, political, economic, commercial, and so forth. Specialization in any one system overlooks the many points of intersection with other systems.

### **3. Enter Systems Thinking**

Systems thinking was and always has been a reaction to this reductionist approach. "Systems thinking is the discipline that integrates the disciplines" -- Peter Senge's famous quote (1990) rides on the shoulders of the early proponents of systems thinking, such as von Bertalanfy, Ackoff, Churchland, and Checkman. All of them implored their colleagues (and us) not to forget the whole. Yes, the parts are critical, and understanding them is crucial, but they exist only as part of an integrated whole.

Meadows' sparse, simple, yet powerful definition of a system reads like this: "A set of elements or parts that is coherently organized and inter-connected in a pattern or structure that produces a characteristic set of behaviors, often classified as its 'function' or 'purpose' (2008, p. 2)." This definition - elements, interacting, on purpose - encompasses almost all human activities. Human beings create a communications system, an interstate system, a weapons system, or a school

system for a purpose. We create political parties and nations for a purpose. We interact with the economies and the environment on purpose. People are purposeful, and we seek to align with systems that align with our purpose. Using Meadow's definition, each of us is, in fact, a system ourselves. Expanding outward, we interact with natural systems – social movements, markets, forests, weather patterns, tides, lunar cycles, and many more - all day, every day. It follows that it would be essential to understand systems at a fundamental level and comprehend the educational implications inherent in their ubiquity.<sup>3</sup>

Leadership and followership are the defining activities that shape or manage the human-made versions of these systems (systems-of-systems really) or decide humanity's response to the dynamics unleashed by natural systems, such as hurricanes, pandemics, and climate change. Our individual and collective responses hold the key to the interactions that define systems large and small, human-made or natural, and our response to these systems when they control us. We need participants who can understand and manage these dynamics. When problems such as these are systemic, we must all think systemically. It follows that we should, therefore, train in systems thinking.

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<sup>3</sup> A number of academic councils have been recommending systems thinking for some time. In 1994, for instance, the President's Council on Sustainable Development urged systems thinking as a key discipline to address the environment. The American Council for the United Nations University adopted State of the Future at the Millennium encouraging schools and universities to adopt systems thinking (Glenn & Gordon, 2000). Since 2008, the National Research Council of the National Academies has repeatedly urged systems thinking as a key job skill. To cite a recent example, the Accreditation Council for Graduate Medical Education recently urged educating medical professionals on systems based practice (see Holmboe & Iobst, 2020). What appears is only a representative sample.

#### 4. Types of Systems

Michael Jackson, a British systems scientist, provides a useful distinction concerning systems.

Jackson classifies systems as human-made **bounded** - unitary, pluralist, and coercive - and **unbounded** – both human-made and natural (Jackson, 2003). To add clarity to Jackson's distinctions, here are some examples of the system types and comments on each.

- Bounded Unitary – In these types of systems, the enterprise is the system of interest, and it has clear, unitary governance that establishes a coherent purpose. Note: clear governance may or may not imply good governance.
- Bounded Pluralist – Examples of these types of systems are partnerships, joint ventures, universities, HMOs, associations, communications networks, etc. where there are multiple governance inputs but a generally aligned purpose.
- Bounded Coercive – Examples of these systems include treaty organizations, political blocs, international agencies, etc. These systems are characterized by governance inputs that are bound together but not necessarily coherently governed and often at cross purposes.
- Un-Bounded, Human-Made – Social movements, the economy, drug epidemics, poverty, etc. There is no governance construct that can span the system; we can only hope to align the system of system governance to deal with the dynamics and impacts of the system.
- Un-bounded Natural – The environment, weather, biological, and ecological systems. No governance can steer these systems; we can only hope to coordinate our response to such system dynamics.

If we are all inexorably connected in these systems, bounded and unbounded, why can't we all get along? First, few students are taught systems thinking. Second, often, we are at cross-purposes with one another, or we focus on only one little part of a larger whole.

So why don't people – and especially educators -- embrace systems thinking? Herbert Simon's bounded rationality is a concept in behavioral economics and cognitive psychology that suggests that individuals have limited cognitive abilities to make rational decisions (Simon, 1972; see Griffiths, 2018). In other words, individuals cannot always make fully rational decisions due to cognitive limitations such as time constraints, incomplete information, and cognitive biases. Bounded rationality suggests that individuals make decisions that are "good enough" rather than optimal, and that are primarily self-centered. This is especially true if they have not been made aware of the greater systemic dynamics and interactions in play. This means that individuals may use heuristics or mental shortcuts to simplify decision-making processes, and may not always consider all possible options or outcomes. Bounded rationality has important implications for understanding human decision-making and for designing policies and interventions that consider cognitive limitations and societal differences. It suggests that individuals may benefit from decision-making tools and support that help humanity overcome these limitations and improve the quality of their decisions.

## **5. What Neuroscience Reveals**

Recently, neuroscience has taught us that the human brain is an energy hog, constantly seeking ways to expend less, so it can go do other things (see Swart, Chisholm & Brown, 2015). Toward this end, the brain welcomes shortcuts and other heuristics. In other words, it accepts less strenuous methods and makes its share of mistakes accordingly. Trying to comprehend a complex system requires a different way of knowing. If the brain can limit its responsibility to

mastering only one portion of the whole, it saves energy. So, we have some indication of why people are attracted to reductionistic solutions<sup>4</sup>.

Enter systems thinking and the liberal arts, for without understanding the whole and the different approaches and perspectives and gaining some form of rational “thought, perception, and social agreement—artificial, mental-model boundaries” we are bound to be at “cross-purposes.”

Let us take a look at one archetypical problem that requires a systems approach. The tragedy of the commons is a term coined by ecologist Garrett Hardin (1968; see Quartz, 2018) to describe a situation where multiple individuals or groups use a shared resource for their own benefit, but do not consider the negative impact this use may have on the resource itself or on other users. As a result, the resource is depleted or damaged, leading to negative consequences for everyone involved. The term "commons" originally referred to a public pasture where livestock owners could graze their animals, but it has since been applied to a wide range of shared resources, including water sources, fisheries, public parks, etc. – so much so that we might look at the entire planet as our “commons” (see e.g. Zeihan, 2022). The tragedy of the commons occurs because individual users have a personal incentive to maximize their own use of the resource, while the negative effects of this use are spread among all users. For example, a fisherman may have an incentive to catch as many fish as possible, even if this leads to overfishing and the depletion of the fish population for all other fishermen. The tragedy of the commons is often used to illustrate the importance of collective action and cooperation in managing shared resources. Solutions to the tragedy of the commons include the creation of regulations, such as quotas or taxes, that limit the use of the resource, or the establishment of private property rights that encourage individual

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<sup>4</sup> Knight (2001) added that many critics of higher education blame professors who pursue their limited interests, because that is all that they know and all that the institution rewards (p. 371).

owners to manage the resource sustainably. Overall, the Tragedy of the Commons highlights the challenges of managing shared resources in a way that benefits all users and underscores the importance of considering the long-term impact of our actions on the environment and on others.

## **6. CASTs**

Both bounded and unbounded human systems fit the description of a complex adaptive, socio-technical system, a CAST system. This is a meaningful connection, yet CASTs are notoriously hard to understand, manage, and lead. As Mobus and Kalton (2022) have indicated, this is because the CAST elements are characterized by networks of relationships that emerge and develop complex dynamics that are not always obvious as to source and reason. Secondly, CASTs are also constantly adapting through the interactions of "intelligent" agents. People and entities within the CAST are adapting, but the level of intelligence can vary dramatically. Each agent can and will develop its own perspective on the system. The collective view may differ, leading to elements of the CAST being at cross purposes, a common state in the world today. This intelligence variability means that the CAST elements evolve and develop at different rates and scales, leading to potential friction and turbulence. A second-order effect of this phenomenon is that transfers of information among and within the CAST and the encoding of knowledge occur at different rates and times, further complexifying the dynamics. Finally, these differing dynamics drive different levels of energy and passion within the CAST, leading to variable emotional states where elements of the system may over time come to be at cross purposes, leading to damaging dynamics, again a common refrain in the world today (Mobus, 2022).

## **7. Paramount reality**

Paramount reality presents us with complex problems requiring complex responses. Even if a person were to want a more holistic vision in order to appreciate the complexity, it will be difficult to see. This is why, as systems thinkers, our students (like their professors) must develop their powers of interpretation. They must engage in something called hermeneutics.

Hermeneutics is the theory and practice of interpreting and understanding texts, other forms of communication, and cultural artifacts. It is concerned with how we interpret meaning in written and spoken language, as well as in cultural practices and social norms. Hermeneutics is often associated with the interpretation of philosophic and religious texts, but it has broader applications in fields such as law and the social sciences. Overall, hermeneutics provides a framework for interpreting and understanding complex linguistic and cultural phenomena. It suggests that the interpretation of a text is a circular process, in which the understanding of individual parts is shaped by the understanding of the whole, and vice versa (Packer & Addison, 1989; Shklar, 2004).

Back to our paradox and the need to embrace both the reductionist, disciplinary approach and a holistic, systemic approach. As we interpret these individual parts, which is something done by the academic disciplines, our understanding of the encompassing context may be revised or refined, leading to a deeper and more nuanced interpretation of the phenomena as a whole. This, in turn, leads to a deeper understanding of the individual parts, as the context in which they were produced becomes clearer. The hermeneutic circle can also be understood as a dialogue between the interpreter and the phenomenon or concept being interpreted. The interpreter brings their own perspective and assumptions to the interpretation process, which can shape their understanding. At the same time, the phenomenon itself may challenge or revise the interpreter's assumptions,

leading to a more nuanced and complex interpretation. Overall, the hermeneutic circle emphasizes the dynamic and iterative nature of interpretation and highlights the importance of context and perspective in shaping our understanding<sup>5</sup>. These skills of interpretation are commonly taught in the arts and humanities. That is to say, not only do wicked problems require the application of multiple disciplines, including the liberal arts, but they also require leaders who know how to integrate those multiple disciplines into some kind of coherent response, which calls for a special skill set available from the liberal arts.

### **8. What Should Educators Do?**

Given the tremendous complexity and dynamism of the world in which we live, it seems almost criminal to leave undergraduates groping for understanding to connect the dots themselves. So, what can we as educators do?

J. William Fulbright, the founder of the Fulbright Scholarship, said, "Our future is not in the stars but in our own minds and hearts. Creative leadership and liberal education, which in fact go together, are the first requirements for a hopeful future for humankind" (1989.) A liberal arts education is an educational approach that provides students with a broad and well-rounded education in a variety of subjects, including humanities, social sciences, natural sciences, and mathematics. The primary goal of a liberal arts education is to develop a student's critical thinking, communication, and analytical skills, which are essential for lifelong success. In a liberal arts education, students are required and encouraged to explore a wide range of subjects and practice a wide range of methods. This approach helps students develop a broad base of

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<sup>5</sup> Knight (2001) emphasized the importance of context in learning. So much happens during the interstices of an education – in the hallway, at ball games, over lunch. Furthermore, the context at one institution is not identical to the context at another institution, such that our reforms must be adaptable to the context, just as the context must be made adaptable to our purpose.

knowledge and skills that they can apply to a variety of fields and situations, including the workplace. Liberal arts education also emphasizes the development of important life skills such as ethical decision-making, leadership, followership, and effective communication. By studying history, literature, and philosophy, students gain an understanding of human culture and society, which helps them to navigate the complex social and political issues of our time. Overall, a liberal arts education is designed to provide students with a well-rounded education that prepares them for a variety of opportunities and helps them to become thoughtful, engaged citizens of the world. Systems thinking promises to help these students assemble such varied disciplines into some kind of coherent whole<sup>6</sup>; but more importantly, the liberal arts prepare students to interact with other people in search of that coherence. Put this another way: Not only must students struggle to integrate their own understanding; they must struggle to integrate multiple understandings with other people. And that takes leadership and robust, engaged followers. In the decades to come, what does a great liberal arts university experience and education look like?

1. It seems obvious that we must teach systems thinking as a fundamental part of the undergraduate experience. The World Economic Forum has identified systems thinking as one of the most important skills to make the world better (Meadows, 2008). We concur.
2. We must be much more intentional about integrating our disciplinary curricula and highlighting the overlaps, interconnections, and interconnectedness, rather than leaving undergraduates frustrated and confused.

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<sup>6</sup> Knight (2001) emphasizes the value of making the curriculum's coherence transparent to students (p. 377f).

3. Faculty must work more closely together with one another to reflect and model the interdisciplinarity the world exhibits.
4. We must double down and elucidate critical thinking. One of the authors has been conducting an informal poll for almost three decades in which they ask students if their institution(s) have been telling them that they are being trained to become critical thinkers. Inevitably, they all responded yes. Yet, when asked if they have ever been provided with clear definitions, frameworks, and descriptions of critical thinking, the universal response is no! Let's be more explicit about teaching critical thinking. Toward this end, universities ought to expand the teaching of interdisciplinary problem-solving and analytical skills.
5. Furthermore, we must expand the use of the flipped classroom allowing for class time to be applied, case studies, simulations, discussions, etc. A philosopher named Michel Serres argued a number of years ago that students are different today (2015). They function in a different kind of world. They have developed a different kind of proficiency, given the ubiquity of technology. They require a different kind of education. Perhaps it comes as no surprise that given their abilities to locate knowledge easily, what they have trouble doing is making sense of this knowledge and especially doing so *with other people*. No device can answer the question, So what? We must learn how to answer this question together.
6. It might even be advisable to redesign our workspaces for more interdisciplinarity. The classic lecture format may be effective for some content and purposes, but perhaps not all.

7. The goal should be to turn the entire campus into a learning laboratory - connecting academics, residence and campus life, sports, administration, and the surrounding communities into a seamless learning experience. In other words, make the systems we all occupy manifest. Let students get used to systems thinking, rather than compartmentalizing their education into Algebra at 9:00, French at 10:00, and Organic Chemistry after lunch.

To be fair, articles on various kinds of systems in use by higher education abound in the pages of higher education journals: for instance, there are articles on learning management systems (Marachi & Quill, 2020); Mijatovic, Cudanov, Jednak, & Kadijevich, 2013), grading systems (Dahlgren, Fejes, Abrandt-Dahlgren, & Trowald, 2009), and student feedback systems (Tee & Ahmed, 2014; Bailey & Garner, 2010; Moore & Kuol, 2005). Occasionally, articles widen the aperture to use the terminology of systems in order to describe higher education in general. It would appear that very few refer to the university itself as a system, which is our purpose here. Clearly, there are systems of one kind or another at every magnitude of higher education. Nevertheless, the concern is that scholars use the term “systems” without devoting much explanation about what systems thinking is and how it works. This is not to say that such books and articles have not appeared elsewhere (see e.g. Coleman, Uzhegova, Blaher, & Arkoudis, 2023; Doolittle, 2014).

## 9. Conclusions

If we do not do the things suggested here and instead leave it up to young aspiring undergrads to make these connections themselves, why don't they just take the content online in their pajamas and then collide with the world on their own to connect the dots by osmosis or trial and error? Another way of saying this takes the form of a rhetorical question: if we are not helping students

integrate their knowledge, what do they need us as faculty for? The discrete answers are already in their mobile devices. However, the answers to the world's wicked problems, as they are dubbed by systems thinkers, will not be so easily accessed on their mobile devices. As the Cabrerias and others point out, the world our students will enter is volatile, uncertain, complex, and ambiguous (VUCA), and yet our students want it to be easy. We train them for a linear, anthropocentric, mechanistic, and ordered (LAMO) world that doesn't exist. The authors recognize that embracing systems thinking is hard, but teaching it does not have to be. Derek and Laura Cabrera, in their masterful work, *Systems Thinking Made Simple: New Hope for Solving Wicked Problems*, offer a compelling tool for helping students grasp and explore systems thinking – DSRP. DSRP stands for Distinctions, Systems, Relationships, and Perspectives. This simple tool can help students stop and ask if the distinction they are making, or defending is universal. If not, they must acknowledge that there are other distinctions and views, and perspectives (Cabrera, 2018) that must be included, a systems perspective.

Wicked problems are complex and difficult-to-solve problems that are typically characterized by a high degree of uncertainty, ambiguity, and multiple, interconnected causes and consequences (Churchman, 1967). These problems are often systemic in nature and can have significant social, economic, and environmental impacts. Some examples of wicked problems include climate change, poverty, inequality, healthcare access, and political instability. These problems often involve a wide range of stakeholders with diverse perspectives and always implicate a wide range of disciplines – social science, economics, politics, science, technology, business, health care, etc. - making it challenging for everyone to agree on a single solution. Wicked problems often require innovative and collaborative approaches that involve ongoing experimentation and adaptation over time. Overall, wicked problems are challenging to address, and solutions are

often elusive. However, by acknowledging the complexity and interconnected nature of these problems and working collaboratively, it is possible to make progress toward addressing them.

Enter Cabrera's DSRP!

Dennis Bushnell, the Chief Scientist at NASA, Langley, writes that we are currently one-half of a planet shy of providing basic needs to all humankind – shelter, water, electricity, etc. He continues that if we bring all global citizens up to the current Western standard of living, we will be at least two whole planets shy. He ends with an observation that man has found extra planets in short supply and very hard to access (Bushnell, 2010). But he offers hope by continuing that as a species we have already identified all the technologies we need to overcome these challenges. To be sure, there are hard technical and engineering challenges ahead, including difficult trade-offs, but he is convinced humankind can solve those technical challenges – coming up with solutions is relatively easy, as it happens, he says. The hard part is that we do not have the social, political, and economic will to affect the technical solutions and systems to spare us. The only way humankind is going to address the wicked problems that we all face is through systemic, coordinated, interdisciplinary work. Let's prepare our students for that eventuality.

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