Examining the Intersection Between Instructional Design Decision-Making and Problem-Solving of Ill-Structured Problems through Bounded Rationality

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The theory of bounded rationality suggests that individuals engage in solving problems by making decisions by relying on their own cognitive abilities and limitations, information available to them at the time of deciding, and time constraints associated with making a decision. In this paper, I will argue that bounded rationality provides a necessary theoretical construct to further examine the intersection between decision-making and problem-solving of ill-structured problems in the field of learning, design, and technology.

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The process of decision-making requires an individual to make "a commitment to a course of action that is intended to yield result that are satisfying for specific individuals" (Yates, 2003, p. 24). To make a choice that meets optimization of a situation, individuals must gather information, identify possible solutions, weigh the advantages and disadvantages of each possibility, and move forward with a resolution (Skyttner, 2001). Decisions can be classified as rational or dynamic. Rational decisions typically allow for more time for individuals to identify problems, establish criteria, search for solutions, consider advantages and disadvantages, generate alternatives, and arrive at a solution (Klein, 2008). Dynamic decisions are often associated with time constraints, requiring an individual to make decisions quickly and with information available to them at a given time (Jonassen, 2010; Klein, 1998).

Instructional designers often find themselves engaging in designing solutions for ill-structured problems. These problems vary in structure, complexity, dynamicity, and abstractness (Jonassen, 2010). Ill-structured problems are dynamic in that the situation and its associated contextual factors are not static; they change over time (Jonassen, 1997, 2008). Ill-structured problems are often complex and present several issues that can be addressed by a variety of different solutions. Complex problems that are time-sensitive warrant dynamic decision-making where instructional designers need to make effective decisions efficiently.

The theory of bounded rationality was first introduced by Herbert Simon in 1955 as an alternative method to mathematical and economic modelling of decision-making. During this time, the mathematical and economic models that were used to guide decisions in economics and political science assumed that all individuals were rational agents engaging in decision-making to maximize utility (Simon, 1955, 1957). A fundamental limitation to the pre-existing models is that they assumed perfect rationality. Simon argued that human beings are unable to approach decision-making practices with perfect rationality; rather, they operate within a bounded rationality.

In this paper, I will argue that Simon's (1955) bounded rationality provides a necessary theoretical construct to further examine the intersection between decision-making and problem-solving of ill-structured problems in the field of learning, design, and technology. I will provide examples of how the theory of bounded rationality can be applied by researchers in the field. Lastly, I will advocate for how bounded rationality, as a theoretical lens, can help forward the vision and mission of AECT.

Bounded rationality suggests that individuals engage in solving problems by making decisions relying on their own cognitive abilities and limitations, information available to them at the time of deciding, and time constraints associated with making a decision (Simon, 1955, 1969). Bounded rationality, a rationality that is consistent with our knowledge of actual human choice behavior, assumes that the decision maker must search for alternatives, has egregiously incomplete and innocent knowledge about the consequences of actions, and chooses actions that are expected to be satisfactory" (Simon, 1997, p. 17).

The theory of bounded rationality is grounded in three premises:

> *1. Human decisions should not be assumed a priori to follow logical, statistical or any other formal model;*
>
> *2. There are three factors to take into account in decision making: the type of task, the characteristics of the environment, and the distinct features of the cognitive system that make the decision;*
>
> *3. Only in conjunction with the collection of empirical data should formal computational models of decision-making processes be developed, and their predictions should be compared with human behavior.*

(Campitelli & Gobet, 2010, p. 355).

Ill-structured problems prevalent in instructional design include, but are not limited to, addressing the existence of social inequities when designing instruction; designing within budgetary and time constraints to meet project deadlines, fostering interaction and engagement amongst learners in different instructional settings, and promoting inclusive design that makes learning accessible, affordable, and sustainable.

Scholars have recognized that learning, design, and technology projects are complex and ill-structured, often requiring instructional designers and researchers to engage in problem-solving and decision-making activities amidst ambiguity and uncertainty (Jonassen, 2012; Warr et al., 2020). Instructional designers engage in design conjecture to make decisions based on constrained information (Murty, 2010; Stefaniak et al., 2018; Stefaniak et al., 2022).

The premises of bounded rationality can support scholars in the field of learning, design, and technology by helping them to establish parameters around their design space in order to engage in dynamic decision-making practices (Stefaniak & Xu, 2020a; Stefaniak et al., 2021). By establishing parameters to frame design space, instructional designers can explore solutions that meet particular criteria (Dorst, 2019).

Proponents of bounded rationality recognize this as a viable construct because it recognizes and accounts for the imperfections of human decisions. The argument that human decisions should not be assumed a priori to follow a model contributes to the growing criticism in our field that that there are significant limitations to our current instructional design models (Gibbons, 2014; Moore, 2021; Stefaniak & Xu, 2020b).

Current instructional design models fail to address the systemic implications of design decisions (Kowch 2019; Nelson, 2020; Stefaniak & Xu, 2020b). Instructional design models are limiting in that they do not provide the necessary structure to address the dynamicity present in most design situations. If the goals of instructional design are to design solutions that are effective, efficient, and provide sustainable mean to support learning, instructional design scholars must attend to the systemic implications of their design decisions.

Approaching instructional design through bounded rationality empowers instructional designers to accept the realities of situated contexts associated with their designs, establish parameters, and give themselves permission to focus on satisficing design problems rather than seeking perfection. It provides a mechanism to support dynamic decision-making to identify approach solutions to satisfy ill-structured problems.

Recognizing bounded rationality as a theory relevant to the field of learning, design, and technology will further support AECT's vision to be the premier international organization in educational technology that others refer to for research and best practices. This theory can be leveraged to assist researchers and scholars with realistically considering the systemic implications of their scholarly activities. It enables them to establish parameters around their design space and consider contextual factors and stakeholders that will significantly influence their project outcomes.

Designing instructional interventions within a bounded rationality also helps instructional designers create viable and sustainable solutions that are an accurate and realistic reflection of situated contexts at any given time. By prioritizing this theory over others, scholarly organizations such as AECT can cultivate the next generation of instructional designers by providing them with guidance on how designing within bounded rationality can further support scholars who engage in decision-making and problem-solving activities for ill-structured problems in the field. It provides a mechanism to understand the realities that instructional design scholars and professionals face on a regular basis when engaging in ill-defined design projects.

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