The Five Discourses of Design and Educational Technology

Benjamin Scragg
Melissa Warr
Punya Mishra

Contact: punya.mishra@asu.edu

Office of Scholarship and Innovation
Mary Lou Fulton Teachers College
Arizona State University

August 2018

Draft: Please do not cite or quote without permission

In 2014, *The Atlantic* carried an article titled, "Why Tech Still Hasn't Solved Education's Problems" (Meyer, 2014). The article specifically referenced e-learning and the failed promise of MOOCs. This question (and its variants) have been asked of educational technology for decades. In fact, we could argue that the history of educational technology is littered with stories of how the advent of a new technology (and its potential for learning) leads to a significant level of hype about how it would transform education. Then, when these extravagant promises are not met, we despair that all technology is useless.

For instance, consider this statement about a new technology:

> The modern school is forced to meet the demands of a rapidly changing civilization. Today the world of the learner is almost unbounded. He must acquire facts relating to a bewildering variety of places and things; he must acquire appreciations of far-reaching interrelationships. The curriculum and methods of teaching must undergo a continuous appraisal. New subject matter and new devices for instruction are being scrutinized for their potential contributions to the learning process.

What is interesting about this quote is not *what* it says but rather *when* it was written. This statement is not referring to the "net generation" or even to the first "computer generation." This statement was written in 1933 about the use of moving pictures (film) in the classroom (see Devereux, Engelhardt, Mort, & Stoddard, 1933)! It is interesting to note just how well this statement resonates even today. They go on to write:

> The introduction of the use of the talking picture into education may prove to be an event as epochal as the application of the principle of the wheel to transportation or the application of steam power to the industrial age. No development in education since the coming of the textbook as held such tremendous possibilities for increasing the effectiveness of teaching as the educational talking pictures. (Devereux, Engelhardt, Mort, & Stoddard, 1933)

Even though technologies have changed drastically since 1933 (imagine 'educational talking pictures' vs. YouTube), the discourse around technology has not changed. Mishra, Koehler, and Kereluik (2009) would argue that the above statement proclaiming revolutionary changes in education resulting from a technological advance is not unique. They note similar arguments made for other technologies:

> The overhead projector was "opening new doors for teaching science" (Schultz, 1965) by offering new ways to present information to students with new technology. Edison thought that movies would mean the death of textbooks . . . Others claim that networking technologies will make "men into bandwidth angels," that will allow us to fly, "beyond the fuzzy electrons and frozen pathways of the microcosm to boundless realm . . ." (Gilder, 2000). (pp. 48-49)

As designers of educational technology, we must consider this cycle between hype of a new technology and despair of technology's inability to drastically reform education. We suggest that one reason educational

technologists have not been successful at changing education is because they have not developed a systems view of the problem at hand. The solutions we come up with are narrow, and we rarely consider the surrounding systems and cultures. We argue that developing a deeper understanding of design and design theory can help us begin to address the underlying systems and cultures of education, enabling more impactful approaches to designing and implementing learning technologies.

Design plays a crucial role in the success of any learning technology solution. However, design as traditionally conceived, focuses on the designed artifact or occasionally a designed scenario, process, or experience. *In this paper, we offer a framework for conceptualizing the design of learning technology solutions.* The framework we offer can help designers consider the broader context in which they design, pushing towards deep, systemic changes that can truly impact education.
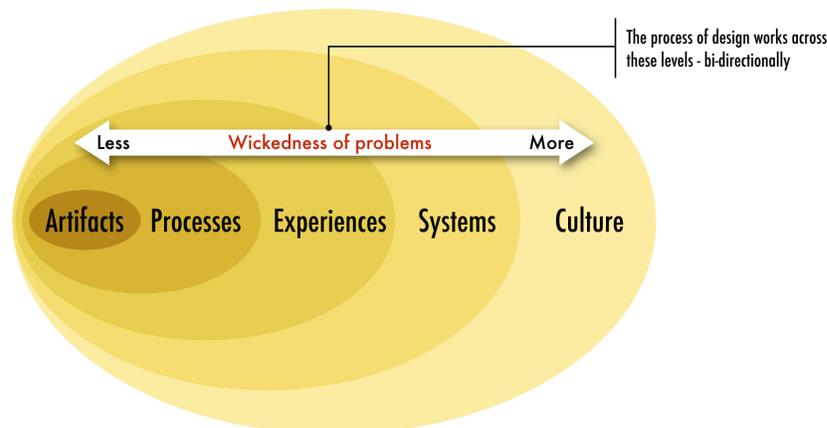
Our approach is consistent with how design theorists such as Richard Buchanan (1992, 2001) and Donald Schön (1987) described designers as reflective, action-oriented practitioners, akin to Deweyan concepts of inquiry (see Schön, 1992). Numerous others (Gallagher & Thordarson, 2018; Goldman & Kabayadondo, 2017; Jordan, 2016; Nelson & Stolerman, 2014; Scheer, Noweski, & Meinel, 2012) also wrote about the strong connection between design and educational practice. Thus, the idea that education and learning is an iterative and reflective form of practice that happens within complex, service-oriented systems of interaction and inquiry would seem to suggest a strong linkage between the fields of design and education.

We base our understanding of design on Herbert Simon's (1969) foundational definition: "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones" (p. 111). *We see the educational landscape as a complex social system where educators are designers who operate at multiple levels.* We argue that educational technologists have not been sensitive to the multiple roles design plays in the success or failure of the tools and technologies we create.

In the framework presented here, we consider design as it plays out across different levels of the educational process. Each of these levels has its own discourse—hence, the *Five Discourses of Design* in educational technology (though the argument could also be applied to the broader field of education). Discourses, we suggest, are larger world-views, or ways of seeing, speaking, being, and doing that circulate in each time, place, and context. Discourses constrain what is possible to say, do, and think. We take inspiration from previous work in design theory articulating *orders* of design (Buchanan, 2001; Lockwood & Papke, 2017) as spaces for conceptualizing and enacting design practice.

Discourses also occur at multiple levels (macro, institutional, micro/everyday) as a constellation of words, images, and signs that are saturated with meaning. We are also deliberate about our use of the phrase *discourses of design* placing dialogic and communicative practices at the center of design practice. A dialogic approach is in line with Buchanan's (2001) description of a fundamental shift in design thinking and practice around the turn of the 21st century, from a discipline based on logic to a discipline centered on rhetorical and dialectical practices. Discourse also highlights design as a conversation between various stakeholders, between the designer and the artifact being constructed, and between idea and reality (Schön, 1987).

Figure 1: The Five Discourses of Design

The process of design works across these levels - bi-directionally

Less   Wickedness of problems   More

Artifacts   Processes   Experiences   Systems   Culture

The Five Discourses of Design (as shown in Figure 1) are represented below (Table 1):

	Discourses of Design	Examples
1	Artifacts	Curricular materials, tools, websites, software, interactives, presentations, videos
2	Processes	Lesson plans, curricula, learner support, instructional design
3	Experiences	Sequencing, activities (and activity types), celebrations, events, learning communities
4	Systems	Non-profit/for-profit, registration, payment & certification systems, degree or non-degree programs, teacher/student evaluation systems, partnerships with other organizations, policies=
5	Culture	Perception of the technology, of education broadly, openness vs. closed mentalities, values, mind-sets, ways of being

The framework allows us to address some key questions: *who* does the designing, *what* is designed, *when* does it happens, *where* it occurs, and *how* it is done. Discourses have specific and universal elements, such as practices, tools, skills, techniques, and mind-sets, (which we call PETS for Practices, Elements and ToolS). For instance, designing an artifact such as a website or instructional video has very different PETS than devising an admission policy or a framework for technology integration.

That said, considering work in each level as acts of design means that there are some key elements that are common across them. In each case, we are satisfying Simon's (1969) dictum that we are engaged in devising "courses of action aimed at changing existing situations into preferred ones" (p. 111). Scholars of design argued that the core of all design activity is certain universal mindsets (designerly ways of being; see Cross, 2006; designerly ways of inquiry; see Dalsgaard, 2017*)* such as openness, empathy, creative confidence, optimism, learning from or through failure, willingness to iterate, and so on.

There is also a change in the *nature* of the problems being considered as we move across the figure from artifacts on the left to culture on the right. Problems go from being relatively structured to being ill-structured, or "wicked." Wicked problems, as first theorized by Rittel and Webber (1973), are a particular class of social problems that cannot be definitively formulated or exhaustively solved for. Not only does the nature of wicked problems make problem solving difficult, the problems themselves are hard to understand, making it difficult to identify the precise approach with which to solve them. As Stolterman and Nelson (2014) noted, the characteristics of wicked problems "are the result of the limits and paradoxes of reason when applied to real-world situations in human affairs that are unique, contingent, unpredictable, and complex" (p. 16). The system or cultural issues of educational technology are imbued with more wickedity across the spectrum of discourse than those involving solely artifacts.

Finally, successful design requires us to understand both the top-down factors as well as the way artifacts and processes influence experiences, systems, and cultures. This means that the boundaries between the discourses are permeable and fluid. In other words, changes in design affects factors in both directions: from artifact to culture and from culture to artifact.

It must be added that these discourses, though essential, can also be a barrier to communication and understanding. People working at one level rarely understand the impact the other levels have on their work. This lack of understanding limits effectiveness of any technology or intervention. For instance, consider the TPACK framework (Mishra & Koehler, 2006). It is clearly one of the dominant theoretical frameworks for technology integration in teaching. The significance of this framework can be gauged by the fact that in the past decade or so there have been over 900 journal articles, 240 book chapters, almost 300 dissertations and 27 books published around this framework (Harris, personal communication). This proliferation speaks both to the richness of the framework as well as the way it has been accepted by practitioners and researchers the world over. That said, there has been little change in the way technology is integrated within the educational system due to this framework. Changes, if there are any, have mostly been at the level of individual teachers and classrooms.

We argue that the lack of TPACK at scale is due to two key limitations of the framework. First, it focuses exclusively on teacher knowledge at the level of the individual teacher. Second, even at the level of the individual, the framework offers no discussion of teacher knowledge of systems and organizations. The Five Discourses of Design framework suggests that large scale systemic and system-wide change requires a lot more than knowledge of technology, pedagogy, and content. The framework highlights that the TPACK framework, laudably, goes beyond artifacts and into processes—but not much further. It sees the teacher as a designer but doesn't place the teacher as an intrapreneur.

In conclusion, we argue that part of the reason for the cycles of hype and despair is that, as educational technologists, we have not considered the role of design across multiple levels. We focus our work on artifacts and processes: on designing them, evaluating their impact on learning and motivation, redesigning them, and so on. Perhaps there is some consideration given to the experience level of design—but this is few and far in between. We rarely discuss how our tools and technologies play out within the systems they reside in and the broader culture within which they work.

The framework presented here provides us with some new ways of moving forward and thinking about these issues. First and foremost, we, designers, need to think as much about broader systems and contexts as the tools working within them. This requires going beyond seeing ourselves as designers of artifacts and processes. We must consider ourselves intrapreneurs who are seeking to bring about systemic and cultural change. This framework also has significant implications on how we educate the next generation of educational technologists and scholars. We need new kinds of research paradigms that allow fluid movement across the levels of discourse. We need methods of communicating findings to multiple audiences and discourse communities. We believe the framework introduced here is the beginning of a broader conversation about the many roles of design across the spectrum of educational technology research and practice.
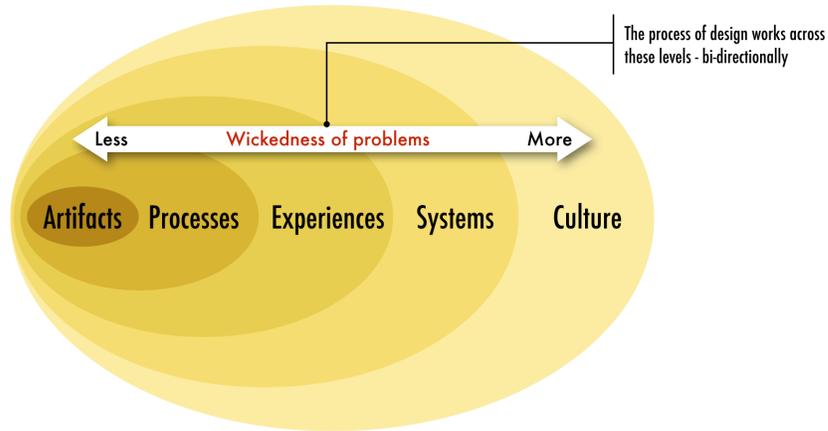
References

Buchanan, R. (1992). Wicked problems in design thinking. *Design Issues, 8*(2), 5–21.

Buchanan, R. (2001). Design research and the new learning. *Design Issues*, *17*(4), 3–23. https://doi.org/10.1162/07479360152681056

Cross, N. (2006). *Designerly ways of knowing*. London: Springer.

Dalsgaard, P. (2017). Instruments of inquiry: Understanding the nature and role of tools in design. *International Journal of Design*, *11*(1), 21–33.

Devereux, F. L., Engelhardt, N. L., Mort, P. R., & Stoddard, A. J. (1933). *The educational talking picture*. Chicago, Ill.: University of Chicago Press.

Gallagher, A., & Thordarson, K. (2018). *Design thinking for school leaders: Five roles and mindsets that ignite positive change*. Alexandria, VA: ASCD.

Gilder, G. (2000). *Telecosm: How infinite bandwidth will revolutionize our world*. New York, NY: Simon and Schuster.

Goldman, S. and Kabayadondo, Z. (2017). Taking design thinking to school: How the technology of design can transform teachers, learners and classrooms. In *Taking design thinking to school: How the technology of design can transform teachers, learners and classrooms*. New York, NY: Routledge, 3-19.

Jordan, M.E. (2016). Teaching as designing: Preparing pre-service teachers for adaptive teaching. *Theory Into Practice*, *55*(3), 197-206.

Lockwood, T., & Papke, E. (2017). *Innovation by design*. Wayne, NJ: Career Press.

Meyer, R. (2014, August 12). Why tech still hasn't solved education's problems. *The Atlantic*. Retrieved from http://www.theatlantic.com/technology/archive/2014/08/why-tech-still-hasnt-solved-educations-problems/375879/

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, *108*(6), 1017–1054.

Mishra, P., Koehler, M. J., & Kereluik, K. (2009). Looking back to the future of educational technology. *TechTrends*, *53*(5), 49.

Nelson, H. G., & Stolterman, E. (2014). *The design way: intentional change in an unpredictable world* (2nd ed.). Cambridge, MA: The MIT Press.

Rittel, H., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4, 155–169.

Scheer, A., Noweski, C.& Meinel, C. (2012). Transforming constructivist learning into action: Design thinking in education. *Design and Technology Education: An International Journal, 17*(3), 8-19.

Schön, D.A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. San Francisco, CA: Jossey-Bass.

Schön, D. A. (1992). The theory of inquiry: Dewey's legacy to education. *Curriculum Inquiry*, *22*(2), 119–139. https://doi.org/10.2307/1180029

Schultz, M. J. (1969). *The teacher and overhead projection. A treasury of ideas, uses and techniques*. Englewood Cliffs, NJ: Prentice-Hall.

Simon, H. A. (1969). *The sciences of the artificial* (3rd ed.). Cambridge, MA: MIT Press.

Nelson, H. G., & Stolterman, E. (2014). *The design way: Intentional change in an unpredictable world* (2nd ed.). Cambridge, MA: The MIT Press.

Figures and Tables

Figure 1: The Five Discourses of Design

The process of design works across
these levels - bi-directionally

Less   Wickedness of problems   More

Artifacts   Processes   Experiences   Systems   Culture

Table 1: Examples of the Five Discourses of Design

	Discourses of Design	Examples
1	Artifacts	Curricular materials, tools, websites, software, interactives, presentations, videos
2	Processes	Lesson plans, curricula, learner support, instructional design
3	Experiences	Sequencing, activities (and activity types), celebrations, events, learning communities
4	Systems	Non-profit/for-profit, registration, payment & certification systems, degree or non-degree programs, teacher/student evaluation systems, partnerships with other organizations, policies=
5	Culture	Perception of the technology, of education broadly, openness vs. closed mentalities, values, mind-sets, ways of being