

What Do We Mean When We “Design” e-Learning Solutions? An Analysis of the Discourses on Education and Design

Melissa Warr
Mary Lou Fulton Teachers’ College
Arizona State University, USA
mcwarr@asu.edu

Danah Henriksen
Mary Lou Fulton Teachers’ College
Arizona State University, USA

Punya Mishra
Mary Lou Fulton Teachers’ College
Arizona State University, USA

Abstract: Creators of e-learning solutions often call themselves “designers,” but what does it mean when they “design”? The broader educational research literature has recently seen an increase in interest around design, but the meaning of design across discourses is unclear. For example, design can refer to a process of creating something, the resulting product, or characteristics of effective products. Without a clear meaning behind the word design, designers from different disciplines struggle to communicate and integrate research findings. To better understand this issue, we conducted a content analysis of the educational research literature’s use of design in publication titles. Our analysis revealed several areas specifically related to instructional design and e-learning. In this presentation, we share the results of our analysis on the many uses of design as it pertains to e-learning and instructional design. We propose that clarifying what we mean when we use the word design can lead to a more clear and effective discourse.

Introduction

Over the past decade, a proliferation of publications centered on design have appeared in education literature. Scholars and practitioners have suggested that education connects with the domain of design, and that the field of teaching can be informed by “designerly ways of knowing” (Cross, 2006). Educational research and practice have both seen growing calls for design-based approaches. These calls range from highlighting the role of design in teacher education (Kirschner, 2015), to scholarship on learning by design (Kafai & Resnick, 1996), to the application of design theory to teaching (Koehler & Mishra, 2005), to specific practitioner tools or approaches for design in teaching and learning, including development of e-learning tools (Watson, 2015). Clearly, design applications for education have captured the interest of the field. But what do we mean when we use the word “design” when we talk about education? And what does increasing interest in design mean for instructional design and e-learning?

The applications and terminology of the idea of “design” in education vary widely by context, meaning, and application, and it is often difficult to know what scholars mean when they connect design to education. This has implications for design in terms of instructional design and e-learning in particular because connections to design are often applied to this arena by different areas of scholarship. The meanings and uses of design in this space are distinct from each other and represent important areas in the field. Topics range from instructional design (Gagne, Wager, Golas, Keller, & Russell, 2005; Reiser & Dempsey, 2012) to the design of games and artifacts for teaching and learning (Gee 2009; Kafai, 2006) to universal design for learning (Katz, 2013; Meyer, Rose, & Gordon, 2014), and more. Additionally, design itself is used in numerous ways in the educational technology literature, such as to describe a process model or as a type of active problem solving (Boling & Smith, 2012). In this paper, we explore these many meanings of design in education with a focus on what design means for e-learning.

Analysis and Method

To study the uses of design in education, we engaged in analysis of uses of design in scholarly literature. To begin, we conducted a search of the ERIC database (eric.ed.gov) for journal articles published between 2007 and 2016 with “design” (including “designer,” “designing,” “designerly,” and “designers”) in the title. The database pulled 5,301 articles; however, some articles were exact duplicates of others. After removing these duplicates, 4,805 articles remained. See the Table 1 below for the number of publications by year. Significantly, the number of publications drawing upon design increased from 2,184 in 2007-2011 (an average of 437 articles per year) to 2,578 in 2012-2016 (an average of 516 articles per year). Furthermore, the number of publications grew from 349 in 2007 to 606 in 2016. This demonstrates, at a basic numerical level, the way that design has risen in interest and scholarly applications in education more broadly across the past decade. This is interesting and relevant for research in teaching and learning to be sure, but it is still a snapshot examination that does not directly tell us how this plays out for educational technology research.

Year	Count
2007	349
2008	320
2009	453
2010	535
2011	527
2012	544
2013	552
2014	369
2015	507
2016	606
Total	4762

Table 1. Count of Publications Year

“Design” in Educational Technology

To further explore these trends, we conducted a search for the most common phrases that included the word “design.” We parsed the phrases in our search by isolating various combinations of words directly before and after the word design. We counted the occurrences of each phrase and compiled a list of the top uses of the word design in the publication titles (see Table 2 for the top phrases identified), thus providing an initial sense of how the concept of design is woven into educational research and scholarship.

The phrases listed in Table 2 represent branches of design in education, products of design, and words commonly associated with design. For example, instructional design and design-based research are distinct sub-disciplines of education and research methods. Depending on how the terms are used in research contexts, design education, design research, and engineering design could also be considered major branches. Common design products represented include games, research, learning, curriculum, and courses. In terms of teaching design, there are design processes, design thinking, design principles, design courses, design students, and design studios. There are also types of design: experimental design and universal design for learning. Finally, other words commonly found with design include implementation, development, art, and technology.

Phrase	Count
Instructional Design	312
Course Design	156
Design Education	148
Learning Design	146
Engineering Design	142
Curriculum Design	141
Universal Design	139

Design and Implementation	121
Universal Design for	104
Design for Learning	102
Design Research	96
Design Process	89
Design-Based Research	75
Design Course	74
Design and Development	73
Design and Implementation of	72
Game Design	71
Experimental Design	69
Design Principles	65
Research Design	56
Design Studio	53
Design Students	52
Design Thinking	48
Art and Design	46
Design and Technology	45

Table 2. Top 25 Phrases by Number of Publications

Several of these terms are particularly relevant to e-learning. In addition to the phrase “design and technology,” instructional design and game design clearly reflect trends in this arena. Several other phrases, including learning design, design and development, design and implementation, and universal design for learning also include frequently-seen applications of design for e-learning. However, more analysis is needed before drawing conclusions about how these terms are related to the educational technology field. Next, we will discuss each of the terms most relevant to e-learning. As the term “instructional design” is closely related with a large branch of educational technology research and practice, we begin with a more extensive description of this field as well as its use of the word design. This is followed by brief discussions of “game design,” “design and technology,” and other potential applications to design in e-learning.

Instructional Design

Instructional design is a commonly used phrase to describe work in the field also called instructional or educational technology. In our analysis, uses of the term “instructional design” in journal articles come primarily from three journals: *Educational Technology Research and Development*, *TechTrends*, and *Educational Technology* magazine, all published by the Association for Educational Communication and Technology (AECT). As the central professional organization of the instructional design-related branch of educational technology, the AECT strives to bring definition and cohesion to its field, but the broadness of the field makes this task challenging. AECT published different names and/or definitions of the field in 1963, 1970, 1977, 1994, 2008 (Reiser, 2012), and a soon-to-be-published 2018 definition (AECT, n.d.). In this paper we associate the topic of “educational technology” in a broad sense, while the field associated with instructional design is perhaps narrower. To reduce confusion, we will use “instructional technology” to specify the AECT-centered branch of educational technology research.

Definitions of the instructional technology field provide insight into why the word “design” is commonly used in its name. First, in 1977, AECT published a lengthy description of the field. The introduction stated:

Educational technology is a complex, integrated process involving people, procedures, ideas, devices, and organization, for analyzing problems and devising, implementing, evaluating, and managing solutions to those problems, involved in all aspects of human learning. (p. 1)

This statement seems to closely relate to many current uses of the word design. In particular, the description of a “complex, integrated process” that focuses on “analyzing problems” to “devise, implement, evaluate” solutions to those problems describes what many have identified as central components of design. This definition labels design as one of the “Educational Development Function,” which includes “Research-Theory, Design, Production, Evaluation-Selection, Logistics, Utilization, and Utilization-Dissemination” (AECT, 1977, p. 1). Thus, here design seems to be viewed as a step in the systematic development of learning materials.

Recently, AECT formed a new committee to define the field. The proposed definition is:

Educational technology is the study and ethical application of theory, research, and best practices to advance knowledge as well as mediate and improve learning and performance through the strategic design, management and implementation of learning and instructional processes and resources. (AECT, n.d.)

This definition places design as parallel and distinct from management and implementation. However, in comparison with the 1977 definition, the three activities of educational technology (design, management, and implementation) replace the five domains of “design, development, utilization, management, and evaluation.

Reiser (2012) used the term design directly in his description of the instructional technology field. He labeled the field as “Instructional Design and Technology,” and defined it as “encompass[ing] the analysis of learning and performance problems, and the design, development, implementation, evaluation, and management of instructional and non-instructional processes and resources intended to improve learning and performance.” He noted that “instructional design” is a shortened label for “the use of systematic instructional design procedures” Thus, as described by Reiser, the use of “design” in the title of instructional design seems to point to a systematic process of creating and/or enabling learning.

Smith (2008) outlined three levels of design commonly used in the instructional technology field. First, design is used to describe the overall design process (as in “instructional systems design”). Second, design labels a component of instructional systems design. Finally, within the design component are specific types of production work such as graphic design or lighting design. Smith asserted that these three uses of design are often used without specification, leading to confusion in the discourse.

Game Design

The prevalence of discourse concerning game design in education originated primarily with the writings of Lloyd Rieber (1996) on serious play; James Gee (2003) on the relevance of games and game design to education; and Sasha Barab’s work on video games, motivation, and social context (see, for example, Barab, Thomas, Dodge, Carteaux, & Tunzun, 2005). Referring to game design specifically, Gee (2009) explained:

Game design is not accidentally related to learning, but, rather, that learning is integral to it. Game design is applied learning theory and good game designers have discovered important principles of learning without needing to be or become academic learning theorists. (p. 47)

Gee highlighted several elements of games that are particularly relevant to education: providing clear goals including some personal choice in setting those goals, use of levels or leveling up, effective feedback, and reflection and interpretation. Game design, he explained, goes beyond the immediate game to also include the “socially-shared practices like FAQs or strategy guides, cheats, forums, and other players” (p. 47). Game design, in this example, is used as a noun—a unique arena unto itself—to describe specific characteristics that make games effective or a group of techniques used to create games.

Coming from an instructional technology perspective, Shute, Reiber, and Van Eck (2012) framed games as a form of situated problem-based learning and, in addition to outlining many of the same features of games as Gee (2009), also discussed “problem design” as it relates to games. Shute, Reiber, and Van Eck (2012) emphasized the need to use learning theory and systematic processes (for example, the design theory of 3C3R) in designing problems for games. This demonstrates the instructional technology field’s focus on the process of design, or more specifically, models of the process.

Others, such as Yasmin Kafai (2006) and Papert (1980), studied educational outcomes of creating or designing for learning. Their work came from a constructionist perspective and hypothesized that the process of creating games or other artifacts would facilitate knowledge construction. For example, Kafai (1997) characterized

“children as designers” (p. 117) when she reported on a study of elementary school students’ work creating interactive multimedia science games for younger children. Kafai (2006) later explained:

The greatest learning benefit remains reserved for those engaged in the design process, the game designers, and not those at the receiving end, the game players. After all, the game player is not partial to the discussions involved in developing valid instructional game ideas, designs, and strategies. What finds its way into the final designs is only a substrate of those discussions. (p. 39)

In this passage, Kafai uses design to describe a process, a person engaging in an activity, and a created product. Her comments center on constructionist learning theories: children build and express knowledge through creating. This creating is a complex endeavor of pulling together different ideas and concepts and putting them back together in some type of product. Design as applied here is that complex process, those who do the process, or the final result. Kafai’s, Papert’s, and others’ work in this area have been central to another core branch of design in education, often termed learning by design—a view of how learners construct or develop knowledge about subject matter by working through the process of design. This particular branch of educational design literature often overlaps with educational technology in its frequent focus on games or the design of artifacts and tools for learning.

Other Related Terms

Digging deeper into content analysis of design in educational literature may reveal a multitude of understandings and connections, and more work is needed to better understand how the field understands and uses the term “design” and what we mean when we use it. For example, another common phrase in educational research journal titles is “design and technology.” This phrase seems to be closely related to instructional design. Further analysis of the phrase shows that nine instances of “design and technology” are actually occurrences of the phrase “instructional design and technology,” the term Reiser (2008) used to describe the instructional technology field. The close association between design and technology begs further investigation of the nuances of the relationship between these terms.

Several other terms identified in our analysis may also be related to e-learning, though more analysis is needed before a clear connection can be made. For example, in some cases learning design may refer to creating e-learning products or systems. Development and implementation could describe the development and implementation of technological tools. Finally, the phrase “universal design” is often used as a part of “universal design for learning,” a framework that focuses on creating flexible learning environments that are effective for diverse types of learners, particularly for those with disabilities. Universal design for learning has numerous applications for designing effective educational technologies and could be directly applied to e-learning development.

Conclusion

Understanding the many meanings of design is important to clear discourse in the field of instructional design and e-learning, as well as in educational research in general. Clarifying what we mean when we talk about design is important if we are to communicate effectively and build upon the existing discourse. Additionally, exploring different meanings of design may provide insight into new ways of utilizing design in various branches of education. For example, understanding design as a scientific, systematic process, as is common in the instructional technology field, could suggest new ways to think of design as it pertains to universal design for learning. On the other hand, instructional designers could borrow from the use of design as a set of effective characteristics, akin to a common meaning behind game design, in describing the characteristics of an effective process for creating instruction instead of emphasizing specific design process models such as ADDIE (see Branch, 2009) or 4C/ID (Van Merriënboer & Kirschner, 2017). This cross-pollination of ideas could open new avenues for educational research and practice. We suggest that increasing an understanding of how we are using design in educational research in general, and in e-learning research and development in particular, can lead to a more focused and effective discourse.

References

- AECT Task Force on Definition and Terminology (1977). *The definition of educational technology*. Washington, D.C. Retrieved from <https://files.eric.ed.gov/fulltext/ED192759.pdf> Association for Educational Communication & Technology. (n.d.). Retrieved January 15, 2018, from <http://aect.site-ym.com/>
- Barab, S., Thomas, M., Dodge, T., Carteaux, R., & Tuzun, H. (2005). Making learning fun: Quest Atlantis, a game without guns. *Educational Technology Research and Development: ETR & D*, 53(1), 86–107.
- Boling, E., & Smith, K. M. (2012). The changing nature of design. In R. A. Reiser & J. V. Dempsey (Eds.), *Trends and issues in instructional design and technology* (3rd ed., pp. 358–366). Boston, MA: Pearson Education, Inc.
- Branch, R. M. (2009). *Instructional design: The ADDIE approach*. New York, NY: Springer US.
- Cross, N. (2006). *Designerly ways of knowing*. London: Springer.
- Gagne, R. M., Wager, W. W., Golas, K. C., Keller, J. M., & Russell, J. D. (2005). Principles of instructional design. *Performance Improvement Advisor*, 44(2), 44–46.
- Gee, J. P. (2003). What video games have to teach us about learning and literacy. *ACM Computers in Entertainment*, 1(1), 20–20.
- Gee, J. P. (2009). Video games, learning, and “content.” In *Games: Purpose and potential in education* (pp. 43–53). Boston, MA: Springer.
- Kafai, Y. B. (2006). Playing and making games for learning: Instructionist and constructionist perspectives for game studies. *Games and Culture*, 1(1), 36–40.
- Kafai, Y. B., & Resnick, M. (1996). *Constructionism in practice: Designing, thinking, and learning in a digital world*. New York, NY: Routledge.
- Katz, J. (2013). The three-block model of universal design for learning (UDL): Engaging students in inclusive education. *Canadian Journal of Education / Revue Canadienne de L'éducation*, 36(1), 153–194.
- Kirschner, P. A. (2015). Do we need teachers as designers of technology enhanced learning? *Instructional Science*, 43(2), 309–322.
- Koehler, M. J., & Mishra, P. (2005). What happens when teachers design educational technology? The development of technological pedagogical content knowledge. *Journal of Educational Computing*, 32(2), 131–152.
- Meyer, A., Rose, D. H., & Gordon, D. T. (2014). *Universal design for learning: Theory and practice*. CAST Professional Publishing.
- Papert, S. (1980). *Mindstorms: Children, computers, and powerful ideas*. New York, NY: Basic Books, Inc.
- Reiser, R. A. (2012). What field did you say you were in? Defining and naming our field. In R. A. Reiser & J. V. Dempsey (Eds.), *Trends and issues in instructional design and technology* (3rd ed., pp. 1–16). Boston: Pearson Education, Inc.
- Reiser, R. A., & Depsey, J. V. (Eds.). (2012). *Trends and issues in instructional design and technology* (3rd ed.). Boston, MA: Pearson.
- Rieber, L. P. (1996). Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games. *Educational Technology Research and Development*, 44(2), 43–58.
- Shute, V. J., Rieber, L. P., & Van Eck, R. (2012). Games...and...learning. In C. M. Reigeluth & J. V. Dempsey (Eds.), *Trends and issues in instructional design and technology* (3rd ed., pp. 321–332). Boston: Pearson Education, Inc.
- Smith, K. M. (2008). *Meanings of “design” in instructional technology: A conceptual analysis based on the field’s foundational literature*. Indiana University. Retrieved from <https://www.learntechlib.org/p/122255/>
- van Merriënboer, J. J. G., & Kirschner, P. A. (2017). *Ten steps to complex learning: A systematic approach to four-component instructional design*. New York, NY: Routledge.
- Watson, A. D. (2015). Design thinking for life. *Art Education*, 68(3), 12–18.