Teachers as Designers: Many Threads of Meaning

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Abstract

Design has been described as a process of decision making to move from what is to what could be (Simon, 1969), an epistemology (Cross, 2006), and a union of thought and action demonstrated through practice (Schön, 1983). According to these definitions, teaching practice can be considered a design practice, and many scholars have positioned it as such. This paper provides an analysis of the most highly cited literature on teachers and design from 2007–2017. After identifying top publications, interpretive content analysis was used to understand clusters of publications around teachers and design. Analysis revealed 10 core clusters of work around teachers and design, with each cluster providing a unique description of how, what, and why teachers design. Findings provide a foundation on which future research on teachers and design can be built.

Teachers as Designers: Many Threads of Meaning

What does it mean for a teacher to be described as a designer, or for the act of teaching to be considered an act of design? Scholars in several fields of educational research offer descriptions of teachers as designers of learning and instruction (e.g., Carlgren, 1999; Koehler & Mishra, 2005; Könings, Brand-Gruwel, & van Merriënboer, 2005). The discourse includes various applications of design to teachers' work and explores the relationship between teaching and design by applying a range of terms or constructs. For example, scholars describe "learning design," "participatory design," "curriculum design," and "design thinking." Some of these phrases share a surface-similarity, such as "learning design," "design for learning," and "learning by design." Some authors use these terms interchangeably, while others use the same term but seem to define it differently. Even the word "design" itself is applied inconsistently (Holmberg, 2014).

Each of these approaches, by focusing on one aspect of teachers and design, provides a *specific* perspective on the topic, but often ignores or misses others. A broader picture of the research on teachers and design, one that accounts for the diversity of work in this area, would enhance our understanding of what, how, and why teachers design. Furthermore, a comprehensive perspective on teachers and design might reveal new directions for research, teacher learning, and practice.

In this paper, we construct a broad representation of the current literature on teachers and design by identifying and comparing strands of literature on this topic. We conducted a wide search for literature on teachers and design, resulting in 40 of the most-cited publications on the topic. Then, we performed an interpretive content analysis of the articles and identified 10 primary strands of work around teachers and design. We identified similarities as well as differences in research approaches, taxonomies, and paradigms. We believe the resulting synthesis can assist us in developing a broader understanding of teachers as designers.

Literature Review

What is Design?

Scholars offer several definitions of design, but in this paper, we focus on three prominent descriptions: Simon's notion of a science of design, Cross's idea of design culture (a type of knowledge), and Schön's idea of reflection-in-action. Simon (1969), in his seminal book *The Sciences of the Artificial,* described design as a process of rational decision making intended to change something from how it is to how it "ought to be." He explained, "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones" (p. 111).

Cross (2006) extended Simon's definition to frame design as an epistemology. Contrasting design with science and the humanities, he sees design as "the conception and realization of new things" with "its own distinct 'things to know,' ways of knowing them, and ways of finding out about them" (p. 1). Designerly ways of knowing include striving to understand others, rapidly identifying and testing ideas, and adjusting practice based on the results.

Donald Schön (1983) also described design as an epistemology based on the union of thought and action, one that is embedded in social practice. Schön (1992) described the core of design as being "reflection-in-action," a process where designers adjust practice based on feedback from the environment, often in a tacit manner. Schön (1983) applied his theories to

education by discussing how design, particularly framing teachers as designers, can bridge research and practice.

Why Teachers and Design?

Since the publication of Schön's work, research centered on teachers and design has expanded significantly (Goodyear & Dimitriadis, 2013). There are a range of reasons for the attention given to teaching and design in the recent past, including:

- *An emphasis on design in the broader world*, including a rise in the application of design principles to a range of fields (Kimbell, 2011). The idea of design has permeated the world of business, entrepreneurship, and marketing, and in some ways has become part of the broader zeitgeist—thus diffusing into the world of education as well. The wide-spread application of design may be because of design's ability to address complex, or "wicked problems" (Buchanan, 1992). Furthermore, design-based organizations such as Ideo and The Stanford d.School have actively pushed a particular design-based paradigm (Design Thinking) into the educational space.
- *A push for integrating technology into the classroom*, requiring the construction of physical and/or digital artifacts. Integrating technology into the classroom successfully requires a shift in pedagogy (Fullan, 2013; Hokanson & Hooper, 2004), which implies new learning designs (Hauge, 2014) and a consideration of innovation implementation (Brown, 2008; Zuiker, Piepgrass, & Evans, 2017).
- *The need to document and share learning strategies* (including methods or lessons) across teachers. This is similar to how other design fields, such as architecture and user interface design, create representations of designs that externalize the ideas of practitioners, thus enabling reflection, sharing, and adaptation (Dalsgaard, 2014; Dorst, 2010; Kimbell, 2012).
- *The current push for 21st century learning pedagogy* (Koh, et al., 2015) which identify certain core competencies such as subject matter, learning and innovation skills, informational technology skills, and life and career skills. Developing these competencies requires new pedagogical methods, and many scholars propose teacher design work as an approach to developing and implementing 21st century learning (e.g., Beetham & Sharpe, 2013; Razzouk & Shute, 2012).

In this paper, we summarize the results of a literature review on teachers and design by describing various strands of work around the topic. The different approaches are connected by the same key words (teachers/teaching, designers/design), but provide different descriptions of teachers and design, apply different research approaches, and often share their work through different journals and conferences. Thus, the approaches have developed somewhat independent of each other, preventing cross-pollination and the development of new syntheses and insights. After briefly presenting the literature search and analysis methods, we provide a summary of 10 strands of research on teachers and design, including comparing how they describe teachers and design. Finally, we discuss the benefits of describing teachers as designers, including what the broader design literature can add to current understandings of teacher development and practice.

Method

The first author conducted a review of the top-cited articles from 2007-2017. To be included in the analysis, publications must have (1) discussed design approaches or techniques to

solve educational problems, (2) focused on K-12 educators and placed teachers as central designers, and (3) included a complete definition or description of design or design-related construct. The criteria excluded most of the design-based research and instructional design literature, as in those fields the design work is primarily performed by researchers or specialists. We searched Scopus, Microsoft Academic, and Web of Science to identify articles and selected publications with at least 12 total citations, or more than five citations if published after 2013, for preliminary review. We limited the literature in this way because here we are interested in the overall structure of current work in the field, and the most impactful literature likely anchors that structure. Although citation counts are not a perfect index of impact (Tight, 2008), it is reasonable to assume that, on average, higher citations do provide a general indication of importance (Dawson & Gašević, 2014; Waltman, van Eck, & Wouters, 2013). A total of 234 abstracts were reviewed, and the full texts of 74 selected for full text review. After the full text review, 40 articles met the criteria for inclusion in this study.

The first author analyzed the 40 publications through interpretive content analysis (Krippendorff, 2019) and network analysis (for full methods and analysis, including method and results of an accompanying network analysis, see Warr & Mishra (under review)). Interpretive content analysis included identifying constructs and definitions, definitions of design, and how design was used by teachers. The analysis resulted in strands of research on various aspects of teachers and design. Within each strand, authors used similar constructs and definitions. Additionally, network analysis of co-authorship and citation practices supported the identified strands.

Strands of Research: The What, Who, How, and Why

Our analysis resulted in 10 strands of research on teachers and design. Strands were named based common constructs used within the strands, with adjustments made to reflect differences across strands. Table 1 presents the literature by strand and table 2 summarizes the 10 strands. Each strand provides a different perspective on what teachers design, who they design with, and the reasons for studying teachers as designers. Note, for clarity, we italicize strand names in our descriptions below.

What Do Teachers Design?

Our analysis described teachers designing teaching and learning: what to teach, how to teach it, tools for teaching, uses of new technologies, and development of learning environments. Additionally, the *Pedagogical Design Capacity* and *Reflective Design-Based Research* strands addressed how teachers constantly adapt to student needs. Goodyear and Dimitriadis (2013) offered a narrower frame by outlining three things teachers design: tasks, physical architecture, and the social architecture of learning.

The *Learning Design* strand provided a more explicit description of what teachers design. Paramount to *Learning Design* was documenting and sharing designs, requiring a consistent design language and documentation format. Some authors proposed creating general patterns for learning that could be adapted to different pedagogical approaches (for example, Laurillard, 2012), while others asserted that learning designs that described a specific approach, such as problem-based learning, might better support teachers in adopting new pedagogies (Miao, Ally, Samaka, & Tsinakos, 2014).

Who Do Teachers Design With?

Most of the literature analyzed here described teachers designing with others. For example, *Collaborative Curriculum Design* emphasized collaboration of teacher teams (often with subject-matter experts, pedagogical experts, or researchers). *Learning Design* and *Participatory Design* also described teachers designing with others. In *Participatory Design*, teachers worked with a variety of stakeholders, including architects, students, administrators, and technology specialists, to design effective learning tools or environments. Teachers can also design independently. Individual teachers might adapt instruction to student's needs (*Pedagogical Design Capacity*) or use design approaches to meet the needs of a 21st century classroom (*Design Thinking*).

Why Frame Teachers as Designers?

The literature presented here provided various reasons for studying teaching as designing. First, authors in *Collaborative Curriculum Design*, *Learning Design*, *Learning by Design*, and *Reflective DBR* described design as an effective strategy for teacher development. In particular, *Collaborative Curriculum Design* emphasized *what* teachers learned through design: they developed technology integration skills (Boschman, McKenney, & Voogt, 2014), a better understanding of new pedagogies (Agyei & Voogt, 2012; Penuel & Gallagher, 2009), and shifts in educational practice (Voogt et al., 2011). The *Learning by Design* strand also emphasized pedagogical development, specifically with regards to addressing new knowledge processes. Holmberg (2014) positioned reflection on design decisions as an important teacher development and research tool. Finally, several authors from the *Learning Design* field discussed the benefits of teachers engaging in design work, particularly for developing new expertise (Miao et al., 2014; Mor, Warburton, & Winters, 2012).

The second rationale for positioning teachers as designers was to develop more effective learning products. Scholars in *Learning Design* and *Collaborative Curriculum Design* noted that when teachers design, the results are more aligned with classroom practice, better implemented, and can result in more effective learning.

A third reason for teachers and design was because a design approach can help teachers address the needs of the 21st century classroom. This line of reasoning was particularly evident in the *Design Thinking* literature: teachers need to meet changing student needs and *Design Thinking* can help them do so.

Fourth, some authors positioned teaching as inherently a design profession; thus, design research can enable scholars to better understand teacher work. This position was particularly evident in *Pedagogical Design Capacity* and *Reflective Design-Based Research* which considered how teachers used tacit knowledge, artifacts, and/or technology to design instruction. Finally, the *Participatory Design* strand argued teachers should be part of the design process because it gives them a voice in educational reform.

New Perspectives on Teachers and Design

The articles analyzed here described design as a core part of teacher's work. Whether or not we call teachers designers, their work is akin to what Simon (1969) described as a science of a design, what Cross (2006) labeled as a distinct culture of human knowing, and what Schön (1983) called reflection-in-action. By explicitly studying teachers as designers, scholars can draw upon the corpus of design literature for new perspectives on teacher development and practice.

Of particular interest is design literature related to expertise, design processes, collaboration, and design education.

Additionally, the design literature suggests new directions for teacher design work. The literature on teachers and design discusses teachers designing lessons, curriculum, artifacts, and sometimes learning environments or school buildings. However, current design literature moves beyond design of physical artifacts to the design of experiences, systems, and culture (see, for example, Buchanan, 1998; Golsby-Smith, 1996; Mishra, Scragg, & Warr, 2018). Considering this broader view of design might enable new considerations for how to professionalize and empower teachers, leading to more effective educational systems.

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*Denotes publications analyzed in literature review

Tables

Table 1. Strands of Research on Teachers and Design

Construct	Number of Publications	Publications
Teachers as Designers	4	Kali, McKenney, & Sagy, 2015; Kirschner, 2015; McKenney, Kali, Markauskaite, & Voogt, 2015; Svihla, Reeve, Sagy, & Kali, 2015
Pedagogical Design Capacity	3	Brown, 2011; Davis, Beyer, Forbes, & Stevens, 2011; Matuk, Linn, & Eylon, 2015
Learning Design	11	Conole, 2013; Laurillard, 2012; McKenney & Mor, 2015; Miao, Ally, Samaka, & Tsinakos, 2014; Mor & Craft, 2012; Mor, Craft, & Hernández-Leo, 2013; Mor, Ferguson, & Wasson, 2015; Mor, Mellar, Warburton, & Winters, 2014; Mor & Mogilevsky, 2013; Mor, Warburton, & Winters, 2012; Persico & Pozzi, 2015
Collaborative Curriculum Design	7	Agyei & Voogt, 2012; Moschman, McKenney, & Voogt, 2014; Mschman, McKenney, & Voogt, 2015; Huizinga, Handelzalts, Nieveen, & Voogt, 2014; Penuel & Gallagher, 2009; Voogt, Laferrière, Breleux, Itow, Hickey, & McKenney, 2015; Voogt, Westbroek, Handelzalts, Walraven, McKenney, Pieters, & de Vries, 2011
Participatory Design	6	Bang & Vossoughi, 2016; Cober, Tan, Slotta, So, & Könings, 2015; Könings, Bovill, & Woolner, 2017; Könings, Seidel, & van Merriënboer, 2014; Severance, Penuel, Sumner, & Leary, 2016; Woolner, 2010
Design Thinking	4	Burdick & Willis, 2011; Koh, Chai, Benjamin, & Hong, 2015; Koh, Chai, Wong, & Hong, 2015; Razzouk & Shute, 2012
Learning by Design	2	Cope & Kalantzis, 2015; Yelland, Cope, & Kalantzis, 2008
Reflective DBR	1	Holmberg, 2014
Design for Teaching and Learning	1	Hauge, 2014
Design for Learning	1	Goodyear & Dimitriadis, 2013

Table 2. Summary of Strands of Research on Teachers and Design

Strand	Description	What	Who	How	Why	Key Literature
Teachers as Designers	**Teaching *is* design:** summative descriptions on teachers as designers	Primarily technology-enhanced learning	Teachers, sometimes diverse stakeholders	Varies	Integrate technology, professional growth, more effective instruction	Kali, McKenney, & Sagy, 2015; McKenney, et al., 2015
Pedagogical Design Capacity	**Adapting tools**: how teachers adapt tools to local context.	Adaptive instruction	Teachers	Individually, often while teaching	Reflect on and evaluate practice	Brown, 2011
Learning Design	**Patterns for learning:** creating lessons or lesson patterns and creating a common design language to enable sharing	Artifacts describing effective patterns for units, lessons, etc.	Teachers, researchers	Sometimes in teams	Create a system of sharable artifacts, professional growth	Conole, 2013; Laurillard, 2012; Mor & Craft, 2012; Mor et al., 2014; Mor & Mogilevsky, 2013
Collaborative Curriculum Design	**Creating curricular reform together:** teachers work with each other, researchers, and subject-matter experts to create new curricular materials	Units, lessons	Teachers, researchers, subject matter experts	In teacher teams assisted by researchers	Professional growth, effective implementation of new curriculum	Penuel & Gallagher, 2009; Voogt et al., 2015; Voogt et al., 2011
Participatory Design	**Making-sense together:** engaging diverse stakeholders in projects to disrupt power relationships	Curriculum, buildings	Teachers, researchers, students, community	Multi-stakeholder teams	Give teachers equal voice, create more effective designs that reflect realities of practice	Bang & Vossoughi, 2016; Könings, Seidel, & van Merriënboer, 2014; Woolner, 2010
Design Thinking	**Design epistemology**: design as a type of thinking and learning	Lessons, units, artifacts, learning environments	Teachers	Varies	Create new approaches to education	Koh et al., 2015; Razzouk & Shute, 2012
Learning by Design	**Designing pedagogy**: teaching for multiple knowledge processes	Instructional framework	Teachers	Individually or in teacher teams	More effective lessons, teacher development	Yelland, Cope, & Kalantzis, 2008
Reflective Design-Based Research	**Process research**: Researching the process of teachers developing an artifact	Development of intervention or artifact	Teachers with research support	Teachers and researchers reflect on design process	Improve research-practice connection	Holmberg, 2014
Design for Learning/ Design for Teaching	**Facilitating learning**: designing situations for learning and adjusting in context	Opportunities for learning	Teachers, learners	Varies	Align (or understand connection between) teaching and learning	Hauge, 2014
Design for Learning	**Settings for learning**: Designing the teacher role, objects, and activities to enable learning	Learning experiences: tasks, social and physical architecture	Teachers	Varies	Address complex educational problems in sustainable ways	Goodyear & Dimitraidis, 2013