

Review

Design Thinking for Education; Conceptions and Applications in Teaching and Learning

Title:	Design Thinking for Education; Conceptions and Applications in Teaching and Learning		
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Publisher:	Springer		
Price:	eBook	£72.00	
	Hardback	£91.00	
ISBN:	eBook 978-981-287-444-3		
ISBN:	Hardback 978-981-287-443-6		
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This book is another from the Springer stable of titles which relate to Design and Technology as a subject, either conjoined or separately. In this case, as alluded to in the title, it explores how design thinking vocabulary can be interpreted and employed in educational contexts. The authors clearly define the aims of the text as being to further the debate amongst teachers, teacher educators and educational researchers on the theoretical development of design thinking within the context of educational settings.

The book follows a logical journey presented through eight chapters each with its own reference list of cited work. The text commences with an introduction to the theoretical foundations of design thinking (Chapters 1, 2 & 3). This is followed by chapters that consider design thinking from the perspective of children, then pre-service teachers, or teachers in training, and cumulating with the thoughts of in-service teachers (Chapters 4, 5 & 6). Finally it concludes with an examination of the issues associated with methods for fostering and assessing design thinking and some overall conclusions suggesting future directions for the incorporation of design thinking into educational settings (Chapters 7 & 8).

Chapter 1, Design Thinking and Education; this chapter successfully sets the ground work for the rest of the book. It details the main characteristics of design and design thinking within the context of school age education through what is essentially a systematic literature review. Considering design thinking in the broadest sense, it grounds the concept in the application of design as a means to solve real-world problems. It is well referenced,

and takes the reader through the work of relevant theorists from the middle of the last century, to those who work and research in design and design education in the more modern age. Ultimately, this chapter concludes by aligning the position of design thinking with essential skills necessary for the twenty first century.

Chapter 2, Critical Perspectives on Design and Design Thinking... Whereas chapter one presented the journey of design thinking in education, this chapter is more analytical in its undertakings. Grounded in the work of scholars such as Simon, Schön and Cross it offers a critical, sometimes highly critical, perspective on what could be argued are some leading theorists' conceptions of design. For example, it raises some significant questions about the validity of certain aspects of Cross' work, determining that Cross attempts to; "...impose an alien concept on professionals with respect to their self-understanding..." This chapter is likely to leave the reader with more questions than answers, but if the purpose of the text is to encourage discourse and debate – then it most certainly achieves this here.

Chapter 3, Design Thinking and 21st Century Skills; this chapter introduces the idea that pedagogically design thinking is prevalent in classrooms through a teacher's reflective practice. It goes on to focus on the competencies needed by teachers to engage in the design of 21st Century learning experiences. In so doing, it highlights some models which have been devised to promote design thinking, such as ASSURE and "Understanding by Design" but these do not get close scrutiny. Instead, much of the chapter is spent discussing a

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number of frameworks developed to help identify and promote skills that education systems need to develop in students. Following which, a model is presented that considers *artefact design* as a concept which can be divided into a series of interlinked episodes; which in turn are explored further throughout the chapter. It concludes by surmising that teachers need to develop epistemic resources to support the process of developing design thinking amongst their students.

Chapter 4, Design Thinking and Children. This is the first of three chapters which specifically considers design thinking from the perspective of one group of stakeholders; in this case children. It commences by presenting a review of published literature gleaned via means of interrogating three online databases of published works; Web of Science, Education Research Complete and ERIC. It then presents an interesting case study situated in a Singaporean primary school, where four classes of students with an average age of 9.6 years were given a focused intervention to engage their STEM knowledge in a localised design context. It presents the impact, and effectiveness, of this work determined by a number of data collection methods including semi-structured interviews and questionnaires. Outcomes are validated statistically by applying a number of standard tests and the summary outcomes from these are also presented. Interestingly it concludes by determining that students' recapitulation of their learning experiences, in relation to design, could be categorised into; cognitive, metacognitive, technological and social-cultural dimensions – all of which are exemplified in the chapter.

Chapter 5, Design Thinking and Pre-service Teachers. This chapter commences with an exploration of why it is important to help pre-service teachers develop design thinking skills. For the reader who is working outside of the subject this provides a valuable context for this chapter, and likely it reaffirms the thoughts of readers who work within it. Sharing similarities to the previous chapter, it then introduces case study evidence in relation to pre-service teachers' thoughts and opinion around design thinking and how they introduce this into their lesson planning and teaching. Data collection methods, analysis and ultimately statistical validation is again presented in a format somewhat similar in approach to that established in the preceding chapter. Whilst acknowledging some limitations in the case studies, the final section also presents a summary of 'next steps' which could be undertaken with regard to further clarifying the thinking in this group of stakeholders. It is likely that those engaged in teacher education will see similarities in the thinking of many of the aspirant teachers they work with, or have worked with which align with elements presented in this chapter.

Chapter 6, Design Thinking and In-Service Teachers. In what is now established as a pattern in the midsection of this text; this chapter commences with a literature review of relevant work leading into a case study. In this chapter, much is made of "*design framing*" and the role it has in explaining the relationship between the "what" and the "how" of determining a viable solution to a problem via designing. Although this is well-articulated, and easy to follow, it does portray the process of design as one which is easily structured in a framework; the concept of such a constriction may be alien to some readers. This chapter does present a good discussion around the complexities faced by the in-service teacher as they try to reconcile the profession of teaching with the advancement of their own pedagogical understanding.

Chapter 7, Developing and Evaluating Design Thinking. In this chapter the author's review the conceptions of design-thinking competencies in an educational context. They propose how it can be developed from this starting point for the benefit of both teachers and students. The chapter progresses with comparisons between the way expert and novice designers think about, and implement, design practice. This section of the chapter seems to align more easily to the practices of industrial designers, but parallels are drawn with those who work in the classroom. From this point it moves sequentially through an almost predictable process commencing with the process of designing learners' design experience into how best to enact it and further their understanding, to a conclusion with how best to evaluate design thinking.

Chapter 8, Conclusion. The final chapter brings together the work presented previously in the book and it rounds off by posing the question; "*What is Design Thinking in Education?*" it then offers answers from the perspective of students and teachers. It also reflects on the use of previously presented models in furthering design thinking and knowledge. Final conclusions consider the complexities of defining design and design thinking and there are some suggestions for further work, some of which apply to the individual, and others which apply to the work the authors have undertaken as an investigative study.

Overall this is a very thought provoking text, some elements of which will almost certainly cause the reader to self-reflect on their own views about design thinking and the process and place it has in education. There is no doubt about the timeliness of its publication, and it contributes the ongoing debate about the place design has in education, raising some pertinent questions along the way.

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Each chapter is succinct, well referenced and logical in both layout and order. This all contributes to the flow and journey the authors take the reader on throughout the book. As already highlighted, there are certain chapters that work well together and have a natural coherence, as such these would certainly be best read together, or at least in sequence. There is an excellent balance between grounding chapters in pre-existing literature and the use of case studies to gather empirical data to validate those literary findings.

The text has some nuances which are localised to the countries in which the case studies were undertaken, but the principals are likely to be relevant to all working within the field of education design, irrespective of their geographical location. As such, this is a book that would hold appeal for all of those with an interest in design thinking in an educational context, irrespective of their position; educational researcher, pre-service teacher, in-service teacher or teacher educator.

The major reservation I have with this text is its cost, which for many will be inhibitive, however, it is envisaged that many will access this text via libraries or central collections rather than by purchasing their own volume. Taking all of these things into account, I recommend this text as essential reading for all interested parties. It is certain to raise questions and increase the discourse around the area of design thinking in relation to education and the teaching of design thinking for, and in, education.