

Design thinking in medical education: from key features to practical application

Short title: Design thinking in medical education

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Design thinking in medical education: the key features and practical application

Abstract

Design thinking is a process that applies both creativity and innovation to iteratively develop and implement a new product. The design thinking process also enhances design thinking skills that are essential for personal and professional life in a complex world. Healthcare is increasingly being faced with complex problems and the education of current and future doctors in design thinking is an important curricular challenge for all medical educators. Medical educators will need to enhance their own design thinking skills to enable them to effectively respond to this challenge.

KEYWORDS

creativity; curriculum development; design based research; design thinking; educational design research; innovation; medical education

Introduction

Many problems that health professionals experience in their personal and professional lives are complex, with no easy answers. Often there is frustration when simple solutions are tried in an attempt to resolve these types of problem since there are a variety of inter-related factors contributing to the problem.¹ This frustration is likely to resonate with all medical educators, such as when struggling to develop and implement a new curriculum. Similar frustrations are also found in the provision of healthcare.²

There is often confusion between the terms creativity and innovation but understanding the difference has a practical relevance in the response to a complex problem.³ Creativity is a mental process that is characterized by divergent thinking to produce new ideas in response to a problem. Innovation refers to when there is convergent thinking to focus on these new ideas for identifying the most appropriate new potential solution to the initial problem and for subsequent implementation of the potential solution.

Design thinking combines creativity and innovation in a structured approach.⁴ The origins of design thinking are in product design, from household appliances to buildings. A tangible output is the product and this approach has been increasingly adopted for the design of both goods and services, such as service improvement in business and healthcare.⁵ Schools and colleges have also started to enthusiastically adopt design thinking as an educational process to prepare students for living and working in a complex world.⁶ More recently this trend in design thinking has been applied to medical education.⁷

In this Commentary we will discuss the key features of design thinking and how these have been applied to medical education. Our intention is to highlight the importance of design thinking in medical education, discuss the key features of design thinking and offer recommendations for maximizing the potential of design thinking in medical education. We will provide illustrative examples, based on our own experience, of applying design thinking to medical education, including curriculum development and educational design research.

The key features of design thinking

The basic combination of creativity and innovation highlights two key features of design thinking, which are thinking broadly about a problem (creativity) followed by putting the new ideas in action (innovation).⁴ Both of these features have been further expanded in the several models that have been proposed for design thinking. In addition, having a design thinking mindset is a key feature of design thinking.

Design thinking models

The origins of design thinking models are from product designers, with the intention to capture the creativity and innovation processes that they use when developing a new product. These models present the design thinking process as a series of stages, with one or more related to creativity and innovation, and offer a structured framework that can be readily applied to other contexts.

The three most widely used design thinking models are those presented by Tim Brown, the Design Council and Stanford University. These models will now be discussed to highlight the key features of design thinking, with each model having a slightly different emphasis on the creativity and innovation processes.

Tim Brown's design thinking model was presented in the Harvard Business Review and has been widely applied, especially for organizational and service development. The model comprises of 3 stages ⁷:

1. Inspiration
2. Ideation
3. Implementation

This model closely aligns to the creativity and innovation key features of design thinking, with turning ideas into action.

The design thinking model from the Design Council in the UK has 4 stages ⁸:

1. Discover
2. Define
3. Develop
4. Implement

This model is very similar to Tim Brown's model and has been applied to a variety of contexts.

The design thinking model from the Hasso Plattner Institute for Design at Stanford University has been widely applied, especially in school and university educational settings. The model has 5 stages ⁹:

1. Empathize
2. Define
3. Ideate
4. Prototype
5. Test

This model emphasizes the importance of fully understanding the nature and scope of the problem from the experiences of all the individuals involved, including the essential emotional aspects. For example, certain aspects of the complex problem may be very frustrating and are of high concern to the individuals. Clearly defining this

priority for consideration provides a more specific focus to be creative, with new ideas for potential resolution of the problem. These new ideas can inform a prototype, which is an initial potential approach to resolve the problem. There is a recognition that the resolution of the complex problem will require further refinement by testing the prototype, both with the individuals who are faced with the problem and in the real-life setting of the complex problem. Several cycles of the five stages may be required to effectively resolve the problem, or applied as the problem evolves over time.

Design thinking mindset

A design thinking mindset is an important key feature that is required for both creativity and innovation. The mindset encompasses being inquisitive and seeking new learning, empathic to the needs and context of other individuals (including potential users of the intervention), valuing diversity in opinions, collaborative working, acceptance of uncertainty and the associated risk, and the desire to make a difference.¹¹

Use of design thinking in medical education

A recent scoping review of design thinking in medical education identified only a few studies,¹² but an internet search readily identifies numerous descriptions of how design thinking has been used in medical education. There appears to be two main uses of design thinking in medical education. First, with an intention to only develop a specific new product and second, with an intention to develop a way of thinking about problems by engaging in a project to develop a new product.

Product development

Design thinking has been used to develop and implement a variety of specific products, which range from creating a new medical school to curriculum reform. Examples include using design thinking for a new medical school at Penn State University,¹³ and curriculum reform at Harvard Medical School.¹⁴

Both of the examples highlight the importance of a user-centered participatory approach throughout the iterative process of developing and implementing the product. Although there are limited studies of design thinking being used with a structured model in medical education there is a wealth of evidence from other studies that describe the importance of collaborative and participatory approaches for curriculum development and implementation, including new teaching and learning methods and tools.¹⁵

A way of thinking about problems

The acquisition of ‘thinking skills’ for problem-solving in complex situations have become increasingly promoted as essential skills that should be acquired through medical education, including basic and postgraduate medical education.^{16,17} The promotion of thinking skills is aligned to the increasing educational interest in developing the four core ‘Twenty-first Century skills’ of critical thinking, communication, collaboration and creativity.¹⁸ These core skills are considered to be essential to enable individuals, and the various social organizations in which they are a member, to flourish and be successful within the complex social and workplace environment that is characteristic of the twenty-first century. In addition, individual resilience to cope with the uncertainty of living and working in complex environments appears to be increased when there are higher levels of creativity.¹⁹ Engaging in the complexity of the real-world of design thinking for product design is a powerful approach to foster the acquisition of ‘Twenty-first Century skills’ skills.²⁰

Examples of using design thinking to promote thinking skills include engaging undergraduate medical students to apply design thinking for healthcare challenges at Sidney Kimmel Medical College,²¹ and participation in the postgraduate Pediatrics Leadership for the Underserved Residency (PLUS) program at University of California at San Francisco.²²

A case study of design thinking in medical education

An illustrative example of the use of design thinking is for the development of a new community service learning placement for second year medical students. The two main challenges for the medical school were the different perspectives of the various

stakeholders (including medical students, academic teaching staff, medical school administrators, community voluntary organizations) and the introduction of an extra weekly activity within an established curriculum. The Design Council model was used to structure the design thinking.⁸ Representatives from all the stakeholder groups participated in a whole day event that commenced with the Discover stage. During this stage, the groups of similar stakeholders were asked to imagine their ideal community service learning placement and to draw a picture that visually represented this ideal placement. The Define stage commenced when each group presented their picture in turn and the facilitator supported all of the participants to identify areas of consensus, including the feasibility for making the change in the context of the full curriculum. During the Develop phase, two larger mixed groups of all stakeholders produced a prototype of the placement and the facilitator supported the participants in developing a single prototype. The Delivery phase involved distributing the prototype to a wider audience of all the stakeholder groups who would be involved in each placement to obtain feedback, that was subsequently used to iteratively modify the prototype for implementation in each placement.

This example highlighted the importance of an overall participatory process which respected the different perspectives, needs and contexts of each stakeholder group. By working through each of the stages in turn, and the allocation of a time limit for completion of each stage, the model provided the necessary focus and momentum to achieve an output by the end of the day. Facilitation was essential for providing the supportive atmosphere and to maintain the time limits for each stage.

Recommendations for using design thinking in medical education

Our recommendations have a focus on four inter-related main areas: development of design thinking skills for future application in healthcare, curriculum development, faculty development and design based research and scholarship

Development for future application in healthcare

Design thinking has been increasingly used to improve healthcare for patients by driving innovation in the complex system of healthcare, such as improved delivery of

a clinical service.²³ The structured design thinking process promotes an increased awareness and empathy of the patient's perspective to inform a multi-professional team of healthcare workers about how to transform the patient's experience.²⁴ We consider that future healthcare professionals will require competence in using design thinking for similar product development and implementation but also to increase their essential "Twenty-first Century skills" for living and working in the complex healthcare environment. The challenge for medical educators is how to provide opportunities for all learners to develop design thinking skills. This has implications for curriculum development in basic and postgraduate medical education.

Curriculum development

Implementing design thinking in the curriculum through teaching and learning activities may initially be unfamiliar to medical educators. However, in our experience, most medical educators will be familiar with activities that foster creativity, such as brain-storming, but may be less familiar with innovation promoting activities, such as developing prototypes and the use of iterative approaches. There are many excellent sources of practical information on creativity and innovation activities that can be adapted by medical educators and readily employed in their educational activities.^{25, 26} Most undergraduate and postgraduate curricula are already full of content and activities and, from our experience, we recommend that design thinking is integrated into existing curricula instead of an additional bolt-on activity. We have found that this approach increases the implementation of design-thinking but also highlights the adaptable use of design thinking skills across different curricular themes. For example, design thinking has been successfully integrated into medical student ethics teaching about organ transplantation,²⁷ and inter-professional learning about ageing and disability.²⁸

Faculty development

Medical educators will need to have a design thinking mindset if the full potential of design thinking is to be fully realized in medical education. Research in school teachers has raised concerns that some teachers consider that creativity is an innate attribute or personality trait of the individual and that it can only be nurtured through

artistic activities, such as painting or pottery.²⁹ However, the current educational viewpoint considers all learners to have ‘creativity potential’ that can be developed by repeated opportunities to be creative in a supportive environment.³⁰

We recommend that medical educators begin to develop their expertise in design thinking and the facilitation of design thinking workshops by being active participants themselves in faculty development activities that use a design thinking model. An essential step of the design thinking process is to empathize and increase our understanding of the learner and to re-consider that education is for, and by individuals, with diverse backgrounds. An important aspect of faculty development is collaboration with colleagues who have greater experience, such as from healthcare service innovation or product design backgrounds, and to have collaborative discussions about the increasing number of practical examples of design thinking that are being published in medical education journals.

Design based research and scholarship

A more in-depth faculty development approach would be to utilize design based or educational design research, in which working through the stages of a design thinking model not only creates and innovates a new product but there is also the generation of new theory.^{31,32} Theory in this context can be considered to be the new insights and understanding that are generated, including about the self, others and the nature of education, by reflection after each iterative stage of design thinking.³³ These new insights and understanding after each stage are essential to inform the next stage of the product development to ensure that the product is appropriate for its intended purpose within the specific context.

An illustrative example of design based research is a PhD study with a focus on developing of a new personalized feedback model for improving clinical decision making in real-life clinical contexts.³⁴ The feedback model was developed using the three main phases of educational design research (preliminary, development and assessment). During the preliminary phase, a literature review was performed to inform the development phase. During the development phase, the key design

thinking features of creativity and innovation were used to collaboratively develop a prototype feedback model with the clinical teachers. This prototype was iteratively refined in two further development phases by obtaining user assessments of the potential usefulness and ease of use from the clinical teachers and learners in the clinical context. In addition to producing a new feedback model there was the generation of theory, with a greater understanding of how to integrate a new medical education intervention into existing educational practices. This new insight can inform future medical education interventions in other contexts.

The design thinking and research processes are an important aspect of being a reflective medical education professional and are very similar to the educational scholarship approach that has been adopted in medical education.³⁵ The scholarship of discovery and creation is similar to the initial stages in design thinking, and the scholarship of integration, application and education to the later innovation stages in the design thinking process.

Conclusions

Design thinking in medical education has never been more important than at the present time. Healthcare is increasingly being faced with complex problems, from control of viral diseases to effective systems for managing health in an ageing population. The education of current and future doctors in design thinking is an increasing curricular challenge and a complex problem for all medical educators. Medical educators will need to enhance their own design thinking skills to enable them to effectively respond to these challenges .

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Conflicts of interest: None declared

Funding: No funding

Authorship: Both authors made a substantial contribution to the concept or design of the work; drafted the article and revised it critically for important intellectual content; approved the version to be published; take public responsibility for appropriate portions of the content.