Tasarım Odaklı Düşünme: Tanım ve Uygulamaların Gözden Geçirilmesi

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Özet

Tasarım odaklı düşünme eğitsel alanyazında öne çıkan bir terim olmakla birlikte, tasarım odaklı düşünmenin sınıftaki rolü eğitsel araştırmalar için önemli bir konu olarak görülmektedir. Tasarım odaklı düşünme, teknolojik veya ticari problemlerin üstesinden verimli ve etkili bir şekilde gelmek için bir tasarımcının yöntem ve duyarlılığını kullanan genel bir yaklaşımdır. Eğitsel bağlamda tasarım odaklı düşünme, öğrencilerin yaratıcı güveni geliştirmeye odaklanan bir öğrenme yaklaşımı olarak görülmektedir. Tasarım odaklı düşünme fikrinin ortaya çıkmasından önce de, "tasarım" anahtar kelimesi eğitim araştırmalarının en çok kullanılan terimlerinden biriydi. Tasarıma dayalı öğrenme, tasarlayarak öğrenme, yansıtıcı tasarıma dayalı öğrenme ve tasarlayarak teknoloji öğrenimi söz edilen bu duruma birkaç örnek olarak verilebilir. Bu nedenle, tasarım odaklı düşünme fikrinin eğitimciler için tamamen yeni bir olgu mu yoksa söz edilen önceki tasarımla ilgili öğrenme yaklaşımlarının bir benzeri mi olduğunun anlaşılması gerekmektedir. Bu ihtiyaçtan yola çıkarak bu çalışmada, alanyazında tasarım odaklı düşünmenin tanımı ve güncel konumu ile bu yaklaşımın alanyazında hali hazırda var olan tasarımla ilgili öğrenme yaklaşımları ile ilişkisi tartışılmıştır. Yapılan alanyazın araştırması tasarım odaklı düşünmenin yeni bir olgu olduğunu işaret etmekle birlikte, bu fikrin eğitimciler için tamamen yeni bir yaklaşım olmadığını, tasarım odaklı düşünme ile alanyazındaki tasarımla ilgili diğer eğitsel çalışmalar arasında gerek kuramsal gerekse uygulamadaki kullanımları bakımından bir çok benzerlik taşıdığını göstermektedir.

Anahtar Kelimeler: Tasarım odaklı düşünme, tasarım tabanlı öğrenme, yaratıcı güven, iyi tanımlanmamış problemler

Revisiting Design Thinking: A review of Definitions and Implications

Abstract

Design thinking is a rising term in educational literature and the role of design thinking in the classroom is now a key area for research. Design thinking is a general approach that utilizes the designer's methods and sensibility to overcome problems in an efficient and effective way in terms of technological and commercial considerations. In the educational context, design thinking is seen as a learning approach that mainly focuses on developing the creative confidence of students. In educational literature, before the emergence of design thinking, design as a keyword was one of the most used terms in educational research. Design-based learning, learning by design, reflective design-based learning, and learning technology by design are several examples. Therefore, it is necessary to recognize whether design thinking is an entirely new phenomena for educators, or just replication of previous design-related learning approaches. In this study, the definition and current position of design thinking in the literature, and the relationship between design thinking and previous design-related learning approaches is discussed. Results show that design thinking is the phenomena of current interest, yet not a completely new approach for educators, having several theoretical and practical similarities to earlier design-related educational studies.

Keywords: Design thinking, wicked problems, design-based learning, creative confidence

Giriş

Educational research studies are looking for ways to enhance student learning and to equip students with the skills necessary to meet 21st century demands (Retna, 2016). Ease of access to information and a high degree of technologization makes lives easier, yet the definition of a successful student and the significant factors necessary for a successful academic and professional life have also changed. The skills required for success in 21st century society and professional life are called "21st century skills", which differ from traditional school outcomes in terms of not only being content-based knowledge. Critical thinking, creativity, communication, and collaboration have been proposed as the Four Cs of 21st century learning by the US-based Partnership for 21st Century Skills, a non-profit organization founded in 2002 (Partnership for 21st Century Learning, n.d.).

Educators and academicians try to improve students' 21st century skills through the application of different learning approaches. Science–Technology–Engineering–Math (STEM) education is one such approach. STEM education contains skills, knowledge and beliefs that are collaboratively constructed at the intersection of more than one STEM subject area (Çorlu, Capraro, & Capraro, 2014). Several studies related to different thinking skills such as critical thinking, computational thinking, and analytical thinking have been conducted under the label of higher-ordered thinking skills to improve learning outcomes and prepare students for the era in which we live. Utilizing design thinking is one higher-ordered thinking skill and is a rising approach in the educational context. Proponents of design thinking argue that thinking like a designer should be taught to students in order to enhance their creativity, and to create better understanding of the process of innovation (Retna, 2016).

Before the emergence of the term "design thinking", design as a keyword was one of the most common terms in educational studies under labels such as design-based learning (DBL), learning by design (LBD), and reflective-design-based learning (RDBL). Several studies have been conducted to examine the efficiency and effects of these learning approaches. In this current study, a generic term is proposed for such studies, namely "design-related studies" as a means to collect all these similar terms under a single framework and to provide a better reading experience. Based on the literature, this current study discusses what design thinking is and the relationship between design thinking and design-related studies.

Design and Design Thinking

Learning a new field requires a definition of the field and design is no exception (Buchanan, 2001, p. 7); defining the design process is an essential part of understanding design thinking and design-related studies. Owen (1993) defined design as the creation process through which an individual employs language and tools to invent institutions and objects. Miller (2005) simply summarizes the essence of design with his definition as a thought process that encompasses the creation of an entity. Although design has been defined many times over by designers, writers, academicians, and artists, there is uncertainty about a defined characterization of design. Buchanan (2001) says that frankly contrasting and sometimes contradictory definitions of design can be found in the literature, yet fields that settle on a single definition tend to fade where inquiry no longer offers challenges to what is accepted as truth.

Solving problems through design is concerned with design thinking. A specific pattern of problem solving in design was introduced in Herbert Simon's book, The Science of the Artificial (Simon, 1969). Then, the idea of design thinking came in 1987 with a book by Peter Rowe titled Design Thinking (Rowe, 1987), who described how architects and urban planners could approach design problems. Popularization of design thinking then started with Buchanan's book, Wicked Problems in Design Thinking (Dam & Siang; 2017). In the mid-2000s, design thinking started being applied in business and management education and in professional life (Kimbell, 2011).

Design thinking is a multidisciplinary process and as engineers, designers, architects, business people and educators use design thinking (Brown, 2008), it has gained popularity and is seen as an exciting new paradigm for solving problems in sectors such as business, IT, medicine, and education (Dorst, 2011). Yet, each of these disciplines have developed their own approaches based on their own mentality, tools, and skills (Agogino et al., 2015) and there is still no detailed description of design thinking encompassing this diversity (Kimbell, 2011). It is simply defined as using a designer's approach to try and solve a problem; however, the characteristics of a designer are open to interpretation so to define design thinking is not straightforward (Kurokawa, 2013).

Design thinking is also gaining importance in educational context. The aim of using design-thinking approach in education is to develop children's creative confidence. In other words, using learners' imagination to solve problems is central to design thinking education (Carroll et al., 2010). Design thinking is taught in workshops, courses, and degree programs worldwide. Montessori Schools, d.school of Stanford University, Coursera and edX are online platforms with certified training programs, and the Interaction Design Foundation are examples of educational institutions having adopted the design-thinking approach.

The Institute of Design at Stanford University (d.school) is leading universities in the teaching of design thinking. The aim of d.school is to help students develop their creative abilities since they state everyone has the potential to be creative. Creative confidence is a term used to define the process of how people think about themselves and their ability to have an impact on the world. It is stated that a person can improve their creative confidence through design thinking education. Five phases of design thinking are proposed by d.school, as shown in Figure 1. The process starts with understanding human needs and defining existing problems in a humanistic way. Then, design thinkers create ideas through the ideation session, which is followed by prototyping and testing phases. However, the design-thinking process is not a linear process and stages are not always sequential; design thinkers do not always need to follow a specific order. This model is grounded on Simon's classical approach (Simon, 1996). Montessori Schools which are another institute that adopt design thinking approach have a different perspective about the use of design thinking in educational context. Unlike d.school and other certificate programs, whose aim are to develop learners' design-thinking skills with design-thinking training, Montessori Schools integrated this approach into their existing curricula. They define design-thinking skills as the ability to use a systematic approach to understanding people and situations and to define and overcome problems through innovative solutions. They use design challenges in order to enable students to build up their self-confidence and creativity and to make a positive change in the world (Montessori.org, n.d.).   From their definition, it would be inferred that their perspective toward to design thinking education is quite similar to design-based learning approach.

Figure 1. Five Phases of Design Thinking (d.school, n.d.)

These two examples of design thinking practices in educational field have confirmed that there are several alternative attempts to adopt design thinking approach into educational context. Some scholars and institutions are trying to teach design-thinking skills with trainings and some online or traditional courses, while others are trying to adopt this approach into their existing curricula by using design challenges or ill-structured problems. This distinction in practice has stemmed from uncertainty about definition of design thinking and which skills would be included design thinking skills framework. A number of necessary skills to be a design-thinker are given under next title yet; there is still no set of skills essential to be design-thinker from educational perspective.

Being a Design Thinker

Design-thinking skills are an umbrella term used for the description of skills essential to design thinking. Simply, an individual is required to be equipped with design-thinking skills in order to be design thinker. However, this doesn't mean mastering design principles and art classes, since attending design schools are not a compulsory condition of being design thinkers (Brown, 2008). In other words, being a designer does not necessarily mean thinking like a designer (Brown, 2009).

Brown (2008) listed the profile characteristics of design thinkers as empathy, integrating thinking, collaboration, optimism, and experimentalism.

- ✓ Empathy (human-centered): Design thinkers have imaginative ability from multiple perspectives and take a "people first" approach.
- ✓ Integrative Thinking: Design thinkers have the ability to see all noticeable and contradictory aspects of a problem and create novel solutions that are beyond existing alternatives.
- ✓ Optimism: Design thinkers always believe there to be at least one solution better than the existing alternatives in a challenging and constrained condition.

✓ Experimentalism: Design thinkers ask questions and explore the constraints of a given problem.
✓ Collaboration: Designer thinkers not only work with other disciplines, but also have experience in more than one of them.

Plattner, Meinel, and Leifer (2011) also mentioned design thinkers as a collection of design-thinking rules; "the human rule", "the ambiguity rule", "the re-design rule", and "the tangible rule". The first is similar to Brown's (2008) empathy rule and suggests creating an atmosphere of empathy, placing people at the center. The ambiguity rule emphasizes that ambiguity is mutable; allowing creativity. Therefore it is suggested that design thinkers must preserve their ambiguity and energy in order to see things differently. The re-design rule says that most human needs have been met already, and so the design thinker should know the history of a solution and think about its future applications. The last rule relates to making ideas tangible and facilitating human communication. Design thinkers should know that there are better ideas in the world as a whole than just inside their own head. Reflective statements of the rules of design are as follows:

✓ All design activity is ultimately social in nature: Never go hunting alone.
✓ Design Thinkers Must Preserve Ambiguity. Never Go Home Empty Handed.
✓ All Design Is Redesign. Take the Big Idea Home. It Has Been Done Before.
✓ Make Ideas Tangible. Facilitate Human Communication. (Plattner et al., 2011)

Design-Related Educational Studies

In this section, learning approaches that utilize design challenges such as design-based learning, learning by design, reflective design-based learning, and learning technology by design are explained successively.

Design-based learning (DBL) is an educational approach whereby students collect and apply theoretical knowledge in order to solve design problems (Gómez Puente, van Eijck, & Jochems, 2014). Mehalik and Schunn (2006) emphasize that DBL activities engage students in solving authentic design problems as an instructional method. DBL applies pedagogical insights to problem-based learning (PBL), though the problem scenario takes the form of design assignments (Gómez Puente, Van Eijck, & Jochems, 2013). The difference between PBL and DBL is explained that PBL learning activities start with the problem and follow an inquiry model; whereas in DBL, the starting point is the product, which can be a system, material or process, and the orientation of students is towards creating a product in DBL (Gómez Puente, Jongeneelen, & Perrenet, 2012).

DBL activities are commonly used in secondary education to teach science subjects (Apedoe, Reynolds, Ellefson, & Schunn, 2008) and help students improve their analytical and problem-solving skills (Gómez Puente et al., 2014). Active learning methods such as Learning by Design (Kolodner, 2002) and Design-Based Science (Fortus, Dershimer, Krajcik, Marx, & Mamlok-Naaman, 2004) are at the root of the DBL approach in secondary education. In higher education, DBL is based on the principles of PBL to develop inquiry skills integrated with theoretical knowledge by solving ill-defined problems (Kolodner et al., 2003).

The Learning By Design (LBD) approach can be defined as a former version of the DBL approach, and is grounded on problem-based learning (Barrows, 1985) and case-based reasoning (Kolodner, 1993). LBD is a project-based inquiry approach for science education, where middle school students learn science content and skills by achieving design challenges (Kolodner, Crismond, Gray, Holbrook, & Puntambekar, 1998; Kolodner, 2002; Kolodner et al., 2003). The LBD approach provides motivating activities that keep the students' attention and helps them reflect their thoughts and experiences through an iterative process. Repeated use of concepts and the practice of skills in LBD result in a better learning performance (Kolodner, 2002).

TPACK is a framework built on Shulman's (1986, 1987) work describing Pedagogical Content Knowledge (PCK) by integrating technology into this framework. Learning technology by design was announced as an alternative approach to foster teachers' understanding related to educational technology usage skills. The similarity of this approach and existing learning approach is also mentioned in their works (Koehler, Mishra, & Yahya, 2007). "Philosophically and pragmatically, this approach is closely related to constructivist and project-based approaches such as learning-by-doing, problem-based learning, collaborative learning frameworks, and design-based learning" (Koehler et al., 2007, p. 744). The authors argued that their approach extends existing design-related learning approaches to a consideration of authentic design problems for developing teachers equipped with educational technology usage and reasoning skills.

Reflective Design-Based Learning (RDBL) is another design-related learning framework developed to explore how to teach digital literacy and design-thinking skills to children. Description of diverse factors that play a role in developing design-based learning solutions for the school environment originate from formal learning settings (Bekker, Bakker, Douma, van der Poel, & Scheltenaar, 2015). RDBL is built on the DBL model of Gomez et al. (2013) who developed a set of elements for higher engineering education by describing DBL for primary and secondary education students and adding a specific reflective (the R in RDBL) component specific to the role of digital materials in a DBL approach.

Design-related learning approaches briefly summarized in this section share points of commonality. Students are required to solve design problems and it is expected that this process will result in better learning through this learning approach. Although each design-related learning approach is proposed to teach different subjects, all they suggest educators give design problems/challenges to learners.

Comparison of Wicked Problems and Ill-Defined Problems

Types of problems are known as well-defined or ill-defined, simple or complex, long-term or short-term (Arlin, 1989). As mentioned earlier, ill-structured or ill-defined problems are components of design-based and problem-based learning activities in the field of education. The term "wicked problems" has a quite similar meaning to ill-defined problems and is often used in design literature. These two terms have similarities in terms of their descriptions and characteristics.

The term "wicked problems" has been used in the design discipline since the 1960s, when the idea was formulated by Horst Rittel, who argued that most problems addressed by designers are wicked problems (Buchanan, 1992). Wicked problems are defined as " a class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing" (Churchman, 1967, p. B141). Ten properties of wicked problems were identified by Rittel (1972) as follows:

- ✓ Wicked problems have no absolute formulation;
- ✓ Wicked problems don't have stopping rules;
- ✓ Solutions of wicked problems are not true or false, they can be good or bad solutions;
- ✓ There is no exhaustive list of admissive operations when solving wicked problems;
- ✓ Every wicked problem has always more than one possible explanation in the intellectual perspectives of designers;
- ✓ Every wicked problem is actually symptomatic of a higher-level problem;
- ✓ Solutions and formulations of wicked problems do not have a definitive test;
- ✓ Solving wicked problems is a one-shot procedure, there is no room for trial and error;
- ✓ Every wicked problem is unique;
- ✓ Solvers of wicked problems have no right to make a mistake; they are responsible for their actions.

Chi and Glaser (1985) termed ill-defined problems as where information necessary to solve the problem is not given in the statement, where situations are not well-defined, and descriptions of the problem are not clear. Instructional design problems are typical examples of ill-structured problems and some of the characteristics of ill-defined problems are summarized as follows (Jonassen, 1997):

- ✓ Problem elements are unknown;
- ✓ Have more than one solution or no solution at all;
- ✓ Have multiple criteria for the evaluation of solutions;
- ✓ Learners need to make judgments about the problem and defend them;
- ✓ Ill-structured problems do not present general rules or principles for prediction and description;
- ✓ Relationships between concepts, rules, and principles are inconsistent;
- ✓ Uncertainty about which rules, principles, and concepts are significant for solutions and how these term should be organized;
- ✓ Parameters of problems are less manipulable.

It is obvious that characteristics of ill-defined problems and wicked problems have common points. Having more than one solution and uncertainty about problem elements and solutions steps and dependence of the solution to their solvers' are examples of these points. The main difference between wicked problem and ill-defined problems is that wicked problems are naturally available in the design and production settings while most of ill-defined problems are adapted or created for educational purposes. Similarly, solution of wicked problems is served to commercial and practical issues, while solving ill-defined problems serves educational purposes.

Discussion

Design thinking is a rising approach in several disciplines, including educational studies. Educational institutes have aimed to improve students' design-thinking skills to prepare their students for success in 21st century society and in their professional lives. Educational research studies have been conducted with this purpose; however, there is no clear description of design thinking in an educational context, nor a definition for design-thinking skills. Questions remain unanswered as to which characteristics are necessary for a design thinker or whether all learners need to be equipped with design-thinking skills.

In educational literature, before the emergence of design thinking, design as a keyword was one of the most used terms in educational research. Design-based learning, learning by design, reflective design-based learning, and learning technology by design are several examples. Therefore, a generic term "design-related studies" is proposed to collect all similar terms under a single framework at the beginning of current study. After various design-related learning approaches have examined, it is founded that design thinking shares common points with previous design-related learning approaches. The first common point between design-related educational research studies and design-thinking studies is that they both use design challenges, and generally encourage students to collaborate and work as a team. Design-thinking studies focus on the process of solving wicked problems; while design-related learning approaches are grounded on solving ill-defined problems. These are also parallel terms. In the educational context, the term ill-defined problem refers to a problem not well-described and information necessary for the solution to the problem is unclear. Similarly, wicked problem is a term used in design literature to describe ill-defined problems where there is more than one decision-maker and information is unclear about the components of the whole system.

In summary, a design-thinking approach to learning is not an entirely new phenomena to the educational literature, as learning with design challenges/activities has been in use for several years. Creative confidence is a new term associated with design thinking. It has emerged as a concept likely to be heard much more of in the future. Future studies are necessary to identify the description of the design-thinking paradigm and design-thinking skills from the perspective of education, since existing descriptions have been largely created for the disciplines of design and business. Moreover, comparative studies are required that make clear the distinction between design-related learning approaches and design-thinking studies. Researches focused on the effectiveness of improving design-thinking skills in an educational environment are also crucial in order to evaluate whether or not students need to improve their design-thinking skills. Researches and a detailed description of the newly-identified concept of creative confidence are also needed.

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