

Embodied Cognition and Critique of Cartesian Dualism in Design Learning

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Abstract

This research explores the relationship between mind and body in the design learning environment. The research focuses on design learning, embodied cognition, mind-body relationship and Cartesian dualism. In the research, the role of embodied cognition in design learning process is drawn attention. The traditional mind-body dualism of Cartesian theory is criticized by embodied cognition in design learning. In the design learning process, it is pointed out that the mind-body dualism of the Cartesian theory becomes dysfunctional. In this research, the concept of reflection-in-action is considered as a type of design learning. It is explained how the epistemological origins of this concept reject Cartesian theory. In this research, mind-body-environment harmony and embodied cognition which are used in reflection-in-action, is explained as the solution of the design problem which has an 'ill-defined' problem type. As a result of the research, the importance of mind-body-environment harmony in design learning process is emphasized. Moreover, it is pointed out that the embodied cognition which occurs with this harmony is an important parameter in the design learning process. Finally, it is possible to conclude that in design learning process, embodied cognition rejects Cartesian dualism, and thus the distinction between theory and practice.

Keywords: Embodied cognition, design learning, cartesian dualism, mind-body relations, reflection-in-action

1. Introduction

In design learning, the mind-body relation is a highly important parameter. During the design learning process, the mind, the body, and the environment are inseparable, thus the learner shapes his/her design learning process through such interaction. The theory of embodied cognition provides a theoretical framework to explain this interactive system of learning. Unlike the Cartesian mind-body dualism in the history of philosophy, embodied cognition argues that mind and body are inseparable. This research presents a critique of the mind-body dualism of Cartesian theory in the design learning process through embodied cognition. The aim of this research is to discuss the mind-body and the environment relationship in the design learning process and the role of embodied cognition resulting from this relationship in this process.

Design problems are referred to in the design literature as 'ill-defined' problems (Rittel, 1987). Solving and defining this type of problem is a difficult process. The difficult definition and complex nature of the design process make it difficult to learn and teach the design process. One of the things that help the designer in this process is cognitive abilities. The human cognitive system offers abilities such as reasoning, learning, thinking, imagining, etc. to solve design problems. Designers solve these problems by using these abilities and also tools (environment) that support them. In other words, the design problem is solved by the interaction of mind, body, and environment. In problem solving process, alternative solutions are produced with tools of representations such as sketch, technical drawing, model, computer model, etc. The appropriate solution is chosen from these alternatives. The selected solution is developed and the resulting product (design) is created (Goldschmidt, 2007).

Design learning activity is based on learning-by-doing (Schön and Wiggins, 1992). In learning-by-doing, mind, body, and environment interact in a collective work. A cognitive process begins by mutual interaction of mind, body and environment. This cognitive process points out embodied cognition and design learning process. In embodied cognition, mind, body and environment interact; thereby embodied cognition allows the designer to acquire new knowledge (Lakoff, 2012). The embodied cognition states that perception and interpretation are inseparable activities (Boroditsky, 2000). The mind-body separation, which is the cornerstone of Cartesian theory and the role the body plays in perception, are questioned in embodied cognition (Lakoff, 2012). On the other hand, according to Descartes' dualistic approach in Cartesian theory, human being is a union consisting of physical substance (body) and mental substance (mind) (Kim, 1971). Two different substances in this theory have come together in human being (Alanen, 1989). Such way of thinking, consisting of two different ideas of substance, contrasts with the dynamics of the design learning process. Design learning is a process shaped by embodied cognition. The learning activity through embodied cognition can be explained with Schön's reflection-in-action concept (Schön, 1983). In contrast to Cartesian dualism, in reflection-in-action that Schön argues the mind and body are in unison (Kinsella, 2007) and that learning could not be separated into theory and practice.

In this research, concepts mentioned above, such as embodied cognition, reflection-in-action, and Cartesian dualism will be explained in subtitles to provide a framework for the research. The basic framework is shaped on the relationship between mind and body.

2. Mind-Body Relationship in Cartesian Theory

Mind-body problem has been discussed in many fields including philosophy and various arguments have been developed on the problem. The discussion still continues today and is included in the studies as the subject of further scientific research.

In this research, the mind-body problem is discussed through Descartes' Cartesian theory. The most lasting heritage of Descartes' philosophy is his doctrine that mind and body are distinct. He explains this doctrine with his famous philosophical position; "Cogito ergo sum" - "I think, therefore I exist". In Cartesian dualism, one first realizes his/her mind, and then the mind realizes the existence of the body (Alanen, 1989: 402). Descartes reaches this doctrine by arguing that the nature of the mind is different from that of the body, and so, he claims that it is possible for one to exist without the other (Broadie, 2001). According to Descartes' dualistic approach, a human being is a union consisting of both physical substance (body) and mental substance (mind) (Kim, 1971). Two different substances in this theory have come together in human being (Alanen, 1989). Descartes interprets mind as a substance different from body and he states that the source of all real knowledge can be formed by concepts that arise with the direct perception of the mind (Alanen, 1989).

Cartesian dualism claims mental substance (mind) is independent of physical substance (body) (Bates, 2013). According to Cartesian theory, human nature has abilities such as doubt, understanding, acceptance, denial, imagination, and perception and also human as an objectless mind can do these abilities (Alanen, 1989). In addition to this, in Cartesian theory, it is claimed that the concept obtained with the mind comes before it is acquired from the body, and therefore the separation between mind and body manifests itself at this point as the superiority of the mind over the body (Alanen, 1989). According to Descartes' dualism, there is no concept that people can know more easily than in their minds (Alanen, 1989).

In Descartes' theory, even if the mind is united with the body, it differs from the body in function (Kim, 1971). Furthermore, according to this theory, the fact that these two are together does not mean that they can coexist (Kim, 1971). Descartes' mind view is the difference between the thinking substance and the emotional substance (Alanen, 1989). The 'thinking' thing is called 'I' is separated from the body and can exist independently from it (Bates, 2013). Descartes describes the mind and the body as a substance against each other in his philosophy (Alanen, 1989). The reason is that according to Descartes, mind, and body are not only different as a structure but also as proportion they contrast each other (Alanen, 1989). On the other hand, the most important challenge of Cartesian dualism lies in explaining the relationship between mind and body, which are completely disconnected from each other (Bates, 2013).

There are both supporters and critics of Descartes' approach. One of the philosophers who reject the Cartesian dualism of Descartes is Gilbert Ryle, the pioneer of the approach that formed the epistemological basis of Schön's learning concept (reflection-in-action) in this study (Kinsella, 2007). Ryle rejects the mind-body dualism of Cartesian theory and he argues that the reason Descartes' dualism is due to misunderstanding the activities of the mind (Banciu, 2013). According to Ryle, seeing the mind as an embedded 'non-bodily being' in the body is to argue that there are two separate substances, one is abstract and the other one is concrete (Banciu, 2013). With this argument, Ryle's dogma 'ghost in the machine',

which represents the separation of mind and body, emerges (Kinsella, 2007). The ghost that Ryle defined in this dogma is mind, and the machine is body (Kinsella, 2007). According to Ryle, if the human body is an entity which is arranged in a complex structure, the human mind is another entity which is arranged in a complex structure, and they are created only from different kinds of substance and different structures (Banciu, 2013). Although Cartesian theory argues that it has only a spatial quality by reducing matter to a single substance, Ryle argues that it has both a spatial quality and a mental quality based on the activity of matter (Banciu, 2013). With this argument, the mind is defined not as a separate or spiritual substance, but as a type of substance (Kinsella, 2007).

3. Mind-Body Relationship in Embodied Cognition

Embodied cognition is a theory in cognitive science that describes the effects of the body and the physical environment on cognition, mind, and behavior (Lakoff, 2012). The embodied cognition is a response to Descartes' Cartesian Dualism and it rejects the basic principles of the mind-body dualism (Kinsella, 2007). Contrary to the view that Cartesian dualism defends, embodied cognition asserts that body and mind are not separable (Lakoff, 2012).

According to embodied cognition, cognitive activity is not only something that happens internally but also involves a continuous interaction between mind, body and environment (Pouw, van Gog and Pass, 2014). The embodied cognition theory argues that all the concepts that humans have are based on bodily experiences (Thelen et al., 2001). According to Lakoff (2012), concepts which people use to think and express their thoughts are shaped by the gestural features of the body. For example, when we talk about understanding something in all aspects, we use the verb 'grasp' which also means holding it tightly (Rosch, 1975). Further, examples such as can be listed. According to Lakoff (2012), abstract thinking and reasoning abilities are shaped by the abilities of the body and the physical environment.

Gibson (1987) argued that the mind can never be separated from the body and physical environment and also he argued that perception is a success of the mind-body-environment system. The main view underlying this argument is that perception is not a passive process, but an active action (Gibson, 1987). According to Gibson (1987), no one passively expects visual knowledge to reach the eyes and then the brain and turn into perception. On the contrary, people are on the move at any time they perceive (Thelen et al., 2001). It is this state of motion that creates the visual knowledge and enables to perceive the world (Mallgrave, 2014).

According to Thelen et al. (2001), sensory and motor abilities are inseparably linked and what is called cognition is shaped by the experiences acquired through these sensory and motor abilities. The body is not a puppet of the mind; on the contrary, it plays an active role in the emergence of cognitive processes (Lakoff, 2012).

4. Mind-Body Relationship and Embodied Cognition in Design Learning

Designing and learning are closely related to styles of interrogation. Learning is an activity based on the acquiring, understanding, assimilating and using of knowledge. In the learning process, previously acquired knowledge and acquired knowledge in the process are used

together. When looking for a solution to a design problem, designers transform their knowledge and experience they have learned and continue to learn by combining it with other interactions in the process.

In design, there is various kind of knowledge in different domains. Knowledge that is structured according to knowledge accumulation is called 'knowledge structure' (Galambos, Abelson and Black, 1986). The knowledge about the design is not limited to the knowledge previously acquired. Each process and experience restructure this knowledge. Knowledge structures inform about understanding, archiving, recalling, and implementation of knowledge (Galambos, Abelson and Black, 1986).

According to Goldschmidt (2005), the design process, after determining the problem, is shaped by the designers through interpreting the problem. However, the designer is not objective in this interpretation process. The reason for this is that any field-specific knowledge and skills are based on 'background knowledge' that people have had in their previous education and life experiences. Moreover, each person has his or her 'own knowledge' with their own cognitive and personal characteristics. When faced with a design task, the designer thinks through the process together with the 'background knowledge' and 'own knowledge' (Goldschmidt, 2005). These two types of knowledge are obtained by mind-body-environment interaction.

At the beginning of a new design, the first solution proposal that the designer can produce for the design problem is produced with knowledge from designer's mind (Goldschmidt, 2007). It is possible to express this knowledge as internal representation. Designers often express their representations in their minds either verbally or visually. These representations are called 'mental model' in literature. Mental model is defined as an internal representation that provides to identify and predict objects, conditions, phenomenon, and people (Goldshmidt and Surasky, 2011).

Design learning activity is based on learning-by-doing (Schön and Wiggins, 1992). In learning-by-doing, mind, body, and environment interact in a collective work. A cognitive process begins by the interactions of mind, body, and environment. This cognitive process points out embodied cognition and design learning process. According to embodied cognition, effective learning depends on abilities which learners conduct their cognitive activity in accordance with bodily and environmental resources (Pouw, van Gog and Pass, 2014). In embodied cognition, mind, body and environment interact; thereby embodied cognition allows the designer to acquire new knowledge (Lakoff, 2012).

During the design process, there are stimuli that evoke visual image or conceptual knowledge from memory and make them active in memory. Generally, analogical sources can provide external stimuli that are searched by designer in design activity (Casakin and Timmeren 2015). The stimuli are considered to be an appropriate source of inspiration as they can support the development and change of the design idea (Cardoso and Badke-Schaub 2011). According to Goldschmidt (1995), designer remembers the forms found in memory with the help of stimuli, which is called recall. Most of the recall activity is initially done mentally. In addition to that, recalling is done synchronously with an intuitive search for matching the problem in hand and stored images (Goldschmidt 1995). Knowledge stored in memory can be accessed with the help of stimuli. These stimuli can be external analogical sources. The knowledge obtained through these sources can be used to

generate new ideas (Goldschmidt 1994). In other words, new knowledge in design process is created through interaction of mind-body-environment as embodied cognition.

Embodied cognition argues that knowledge is based on sensory and motor abilities and also experiences (Pouw, van Gog and Pass, 2014). Schön defines the type of learning based on learning-by-doing as reflection-in-action in his study (Schön, 1983). Schön also refers to some views about the mind-body, which form the epistemological basis of this learning concept in his study (Schön, 1983). Schön's views are based on Gilbert Ryle's anti-dualistic approach. Further, Schön with this anti-dualistic approach put forwards the positivistic learning theories of the time by way of criticizing the separation between theory and practice especially in fields such as design learning.

In this part of the research, Schön's view about the concept of reflection-in-action and mind-body, which plays an important role in the design learning process, will be presented.

4.1. 'Reflection-in-action' as Design Learning

According to Schön (1983), every profession has a body of esoteric knowledge. This knowledge is used during the practice of the profession. This specific esoteric knowledge can be verbal or practical (Schön, 1983). Esoteric knowledge is learned in the operational process and it is also called tacit knowledge. Such knowledge is called 'procedural knowledge' in the literature (Crowder, 1993). According to Eastman (2001), studio instructors generally present this procedural knowledge in design studios.

At the beginning of the design learning process, design students are 'novices'. Therefore, they do not have any conceptual or procedural knowledge about design (Schön, 1983). Novice designers do not know esoteric knowledge because they are inexperienced in practice (Schön and Wiggins, 1992). The knowledge is used in design context relates to design movements in which it is involved (Schön, 1983). According to Schön (1983), the importance of design movements depends on the knowledge used to reflect upon them. For this reason, esoteric knowledge is an important part of the reflection-in-action process (Schön, 1983).

According to Schön (1983), there is a certain way to obtain procedural knowledge in design learning and that way is reflection-in-action. According to Schön (1983), this knowledge is obtained in the context of the virtual world (design studios) by the collaboration of the novice and coach (student-instructor). In this process, the coach (instructor) carries out the teaching action with the esoteric knowledge (procedural knowledge) which he/she transfers to the novice (student) through representations. According to Schön (1983), this learning style is defined as the reflection-in-action process. The novice learns procedural knowledge in this process. Experiences in this process are reflective practices (Schön, 1983).

This learning process is a result of the embodied cognitive process. In reflection-in-action, students (novice) learn procedural knowledge with the embodied cognitive process by way of undertaking the specific tasks in interaction with the mind, body, and environment (instructor, paper, sketch ... etc.). Embodied cognition provides students the opportunity to learn complex concepts with a practical and meaningful way, thus concepts (procedural knowledge) are learned through experience (Kinsella, 2007). Each student shapes his/her knowledge with his/her own experience and so, they realize their learning process. The

mind-body and environment trio provide learning by combining senses, perceptions and previous experiences (Matlock, 2004). Students learn in a social context in which they interact with materials, experts, and novices to create his/her own knowledge (Kinsella, 2007).

The fact that the mind, body, and environment form 'embodied cognition' and the realization of learning activity with this cognition explains Schön's reflection-in-action concept (Schön, 1983). Different from Cartesian Dualism, reflection-in-action in Schön's study argues the mind-body union (Kinsella, 2007).

4.2. Mind-Body Relationship in 'Reflection-in-action'

The general definition of Schön's reflective practice and his action understanding critique the Cartesian dualism of Descartes (Kinsella, 2007). Schön defines reflective practice (union of the mind-body activities) in a different way, in contrast to the dualistic perspective (Kinsella, 2007). According to Schön, doing and thinking are complementary activities (Kinsella, 2007). In experimental action, doing extends feedbacks that reflect on doing, thinking and its results (Kinsella, 2007). Each of these actions feeds each other (Kinsella 2007). According to Schön (1983), what triggers reflection is the result of the action and also what ends the reflection is the production of a satisfactory action. Schön argues that in reflective practice, individual does not escape from action to think; rather, continuity in practice occurs through the interaction of thinking and doing (Schön, 1983). Therefore, Schön argues that there is continuity between thinking and doing, as opposed to interpreting the mind-body as dualistic concepts (Kinsella, 2007). It is possible to define this continuity in the sketching process, which is one of the most common actions of the design process.

According to Goldschmidt (1991), sketch as a representation tool externalizes either an abstract thought or an object. Further, the interaction between a student and a design instructor occurs through constant sketching (Goldschmidt, 1991). A sketch is a tool for discussion, thinking, and exploring. Hence, the designer has the possibility of finding something different and interpreting it differently on each line drawn. Each line can invoke a different idea and object (Suwa and Tversky, 1997). In other words, sketches provide 'feedback' to the designer. In this way, sketch establishes a dialectical link between the abstract and the mental, and the concrete and the bodily (Goldschmidt, 1991). Therefore, sketch, unlike other external representation tools, epistemologically eliminates Descartes' mind-body dualism in the sketching process (Dogan, 2009). The use of sketches in the design process indicates a representational sphere where the mental and the non-mental are in constant communication and change each other constantly (Dogan, 2009). Sketching is always open to reinterpretation as a representation of an idea or an object (Goldschmidt, 1991). Sketch as a memory tool is both a remembering and a forgetting tool (Goldschmidt and Porter, 1999). With a sketch, the designer creates a mind that can nurture or change his/her own thinking. Sketching in the design process emphasizes the distortion of the distinction between mind and perception is imposed by rationalism and empiricism since the sketch process includes both interactively perceptual and mental activities (Dogan, 2009).

5. Conclusion

In this research, Cartesian dualism is criticized by embodied cognition and reflection-in-action concept in design learning. The aim of the research is to emphasize the mind-body union in the design learning process and also to present the union of mind-body and cognitive activities, unlike Cartesian dualism.

Within the scope of this research, it is presented that the structure of the design problem and the solution process are solved by the union of mind and body. It is explained that the design learning process requires mind-body union and this process is defined as reflection-in-action in Schön's study (Schön, 1983). Procedural knowledge that novice designers need to learn in the design learning process can only be obtained through an interaction of mind-body-environment (Schön, 1983). Therefore, mind-body cannot be considered separately from each other in this learning process. The reflection-in-action, Schön mentioned in his study is one of the ways to get this procedural knowledge (Schön, 1983).

In contrast to the Cartesian theory, embodied cognition argues that mind, body, and environment are an inseparable (Lakoff, 2012). The mind-body separation, which is the cornerstone of Cartesian theory and the role of the body plays in perception, are questioned in embodied cognition (Lakoff, 2012). It is presented in the research that embodied cognition and design learning process are closely related.

In the design process, knowledge creation or knowledge recalling plays an important role. During the design process, there are stimuli that evoke visual images or conceptual knowledge from memory and make them active in memory. Stimuli which help creating new knowledge, new form, and new concept, can be recalled from long term memory. Stimuli serve as a source of inspiration for a new image. Stimuli can be an image, a word, or a sense. However, designers prefer to use visual sources because of its compatibility with visual simulation (Hanington, 2003). These stimuli affect the mental models of people. Mental model is defined as an internal representation that provides to identify and predict objects, conditions, phenomenon, and people (Goldshmidt and Surasky, 2011). Goldschmidt (2017) argues that people acts on the basis of mental models that guide behavior and thought. In the design environment, the mental models owned by each designer are transferred to each other by externalizations. The interaction of representations and shared mental models brings new knowledge and creative results (Rouse and Morris, 1986).

In the design process, the type of representation that has the most interaction with the designer is sketching. Hence, sketching, which is frequently used in the design process, is the most common example of design learning and design process. The sketch which is used in the design process, occurs by repeating actions of doing and thinking due to its nature (Goldschmidt, 1991). A line is drawn and this line evokes something to the designer. During the sketch process, this event continues in a loop. Therefore, mind-body-environment (line, pencil, paper...etc.) are the main parameters of the process.

In short, the transformation of the design problem from the ill-defined problems to well-defined problems occurs through an embodied cognitive process shaped by the union of mind-body-environment. This is because of the nature of the design process and design learning; this process continues with reflection-in-action. Reflection-in-action is a way to obtain procedural knowledge that is necessary for problem-solving in the design process.

Taking into account all of these, embodied cognition rejects Cartesian dualism, and therefore the separation between theory and practice, in the design learning process.

Declaration of Competing Interest

The author has declared that no competing interest exists.

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Biography

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She is PhD student in architecture at Izmir Institute of Technology (IYTE). She graduated from IYTE with a Bachelor of Architecture degree in 2015, as second-degree student of The Faculty of Architecture. She completed the minor program of City and Regional Planning in 2015. She began the master program of IYTE in 2016, and graduated with a Master of Science degree in Architecture in 2019. Her areas of research include architectural design, design cognition, and design learning.