

# SEARCH FOR A NEW CONCEPTUALIZATION OF THE RELATIONSHIP BETWEEN THEORY AND PRACTICE IN ARCHITECTURAL DESIGN EDUCATION

Nezih Ayiran

Department of Architecture, Faculty of Fine Arts,  
Cyprus International University  
Nicosia, North Cyprus

## Abstract

*Although the relation of theory praxis is deemed as a very complex, problematic and contentious philosophical issue similar to the chicken and the egg polemic, the operational model of “ordinary sciences” is insistent on the chicken getting out of the egg. As natural sciences are assumed to be the supreme and exemplary type of activity and due to theory’s instrumental role in leading to successful achievements in this realm, theory also gains prominence in other fields. Consequently, the basic concern of a great number of instructors and numerous scholarly papers in many applied disciplines including architecture is “integrating,” “connecting,” “linking” or “bridging a gap” between theory and practice. Despite all attempts from past to present, there is not much progress for a sufficient solution of the relationship between the theory and practice “problem” in architectural design and its education. This has given rise to the thought that it is probably a pseudo- problem in the context of architectural design. Thus, it is necessary to establish a new sort of relationship between theory and practice which will lead to the successful outcome in architectural design processes, instead of dealing with a pseudo- problem. This paper aims to conceptualize a new relationship between theory and practice on literature searches and the inferences acquired from them.*

*The conceptualization of this new relationship in architectural design education is the autonomy of both theory and praxis as is the case of the separation of powers principle in political science instead of acknowledging theory as know-how for better design achievements. It is also part of the checks and balance capability of each other’s power from which they should mutually benefit. A conclusion has been reached that a most important secret of attaining successful designs in architecture and consequently in architectural design education should be related to the proficiency of discovering the exact distance in which theory and practice can most intensely balance each other. I call this the designerly way of understanding the relationship between theory and practice.*

**Keywords:** theory, practice, architectural design education, pseudo- problem, autonomy of theory and practice, generative tension

## 1. Introduction

The role of theory is generally assumed, from a certain way of understanding, as theory as an instrument or know-how that would lead practice to an appropriate and successful outcome. Consequently, the basic concern of a great number of instructors and numerous scholarly papers in many applied disciplines including architecture is integrating practice to theory. As a matter of fact, this seems as a “pseudo- problem” because the disparate circumstances of natural science and design are overlooked. While the essential mission of natural sciences is to reveal the “hidden pattern” (Simon, 1996) in nature, the essence of architectural design is the bringing of a hidden pattern into being (Ayiran, 2011). Thus, it is necessary to establish a new sort of relationship between theory and practice which will lead to the successful outcome in architectural design processes, instead of dealing with a pseudo- problem. This paper aims to conceptualize a new relationship between theory and practice on literature searches and the inferences acquired from them

## 2. Common Comprehension of the Relationship between Theory and Practice

As the natural sciences are assumed to be the supreme and exemplary type of activity and due to theory’s instrumental role in leading to successful achievements in this realm, theory also gains prominence in other fields. The solution of any “ordinary science” problem or explanation of an event is made under the guidance of theory. Theory is important and the history of science can even be written as the history of theory (Lenoir, 1988).

Despite all attempts from past to present, there is not much progress for a sufficient solution of the relationship between the theory and practice “problem” in architectural design as is the case in almost all applied disciplines. This has given rise to the thought that it is probably a pseudo- problem in the context of architectural design. Mohanty (1995) states, theory is frequently comprehended in a very strict sense: “There is a certain way of understanding the relation between theory and practice, which is that practice is the application or use of theory” (p. 8). It is evident that this apprehension assumes the relationship between theory and practice as uni-directional. As long as it is perceived this way, it seems that the relationship between theory and practice always continues to be problematic. Indeed, in many applied disciplines including architecture, the basic concern of numerous academic papers is “bridging,” “integrating,” “linking” or “connecting” the gap between theory and practice since it is widely acknowledged that theory is an instrument which should necessarily guide practice to a successful end. Yanchar, South, Williams, Allen and Wilson (2010) affirm this belief that “Scholarship in the field of instructional design and technology has traditionally emphasized theory. Theories are viewed as the principal mechanism for advancing research and understanding” (p. 39).

### 3. Problematic Aspects of Common Comprehension

It is seen that theory is frequently referred to as an authoritarian argument of truth. The current architectural education system generally assumes that accurate practice can only be achieved through the guidance of correct theory (Snodgrass, 2000). Schön (1983, p. 30) declares that:

...in the second half of the twentieth century we find our universities, embedded not only in men’s minds but in the institutions themselves, a dominant view of professional knowledge as the application of scientific theory to the instrumental problems of practice. (p. 30)

One of the incentives which generally directs design education to such a conception is avoiding risks. But at the same time, this is an attitude which alienates design education from its essential purposes; because every type of real learning process inevitably includes the unpredictable and requires experimentation and risk taking (Claxton, 1984). Especially a “learning by doing” process like architectural design education requires taking risks and coping with the unpredictable more than other fields. Operating under the guidance of theory is a reductionist attitude although it ensures a comfortable design process by eliminating the “unpleasant” unpredictable. Consequently, it leads to a schematic result since such an attitude excludes the unpredictable which is a very important factor that cannot be codified verbally. In the most commonly accepted sense, Martín Hernández (2008) remarks that theory plays a role in the design process by setting out of rules for comprehension and interpretation of multiple realities with relatively fewer instruments.

Feyerabend (1987) is quite critical of the leading role of the theory. According to him, this approach is very synthetic and shallow which reduces the complexity of ideas, facts and actions formed through the fermentation of rich values to arid and abstract concepts. Theoreticians exclude profound epistemological problems encountered when human nature is being defined. Our emotions evoked when some music is listened to or an architectural space is experienced and a meaning reflected on human face cannot be fully described by words (Eraut, 2005) can be given as examples pertinent to Feyerabend’s referred view. Such a practical knowledge based on personal experience is a reality and we cannot renounce this critical factor which should give its essential meaning to design just to remain within a restricted theoretical framework. Popper (1959) points out that the authenticity of these kinds of experiences as follows: “Only in our subjective experiences of conviction, in our subjective faith, can we be absolutely certain” (p. 280).

As Pallasmaa (2013) explains, architecture which frames the human experience and enhances his world of meaning has never arisen from purely material, climatic and economic conditions or pure rationality through out history. Revealing a meaning in architecture and then criticizing it is more difficult than designing within a framework of a prescriptive rational principle. However, unless this meaning is created, the most essential intention of architecture remains unfulfilled. As Pérez-Gómez (1987) remarks, “Architecture is not embodiment of information; it is embodiment of meaning” (p. 57). However, almost all of the other tasks of architecture seem possible to be achieved by other disciplines, especially engineering, by some means or other. In fact, architecture has devolved many of its tasks to other disciplines over time. Hence, the profession of architecture will eternally survive because of its indicated essence task which can never be endorsed to other disciplines.

Architecture as a branch of visual arts is essentially sensual and “...poetic image lies at the heart of architecture. And the only source possible for poetic images is the experiential world” (Walker 1987, p.86), because the experiential world has concomitantly encapsulated all existential dimensions of human beings in which architecture can gather its natural mode of understanding. As Jean-Paul Sartre (1993) states: “Essences and facts are incommensurable, and one who begins his inquiry with facts will never arrive at essences. [...] understanding is not a quality coming to human reality from the outside, it is its characteristic way of existing” (p. 9). In this respect, the

current tendency of architecture, which seeks its own existential truth and comprehension in other realms, seems to have an inappropriate attitude. Based on the designated view of Sartre, Pallasmaa (2013) posits that the very essence of architecture is the contours of the consciousness and externalization of the mind which has to address all dimensions of human beings as in all other artistic activities, and needs to pursue an understanding that is congenial to its own existential priorities. Subsequently, Pallasmaa (2013) reaches the conclusion that the true essence of architecture does not originate from theoretical knowledge. In a sense, Heidegger (1971) affirms this claim, since according to him, the essence of architecture is related to how we live in the world. In a similar vein Diggelen and Overdijk (2009) indicate that theory does not generate a better design and during the design process it can solely play a modest role; it is also necessary to refrain from “top-down” and prescriptive approaches in design education. Martín-Hernández (2008) claims that theory no longer plays an instrumental role in general and immutable knowledge in architecture. Schön (1983) points out that thinking and doing cannot be separated and the construction of a new theory is required for each unique case instead of using certain theories and techniques during design processes. As theory is a generalization, it does not have any capability of leading to successful designs. Because theoretical terms are exclusively related to generalizations and can blind us, we cannot see the uniqueness or particularity of any practical problem (Jecker, 2004). This is a crucial problem since “Design ideas are personal and they are unavailable for general scrutiny” (p. 131) as indicated by Coyne and Snodgrass (1991). According to Pallasmaa (2009), we think with all our senses and grasp the aspects of the dimensions of life that cannot be easily expressed with words. As long as theory based on verbal expression guides design education, it will be confronted with the unattainability of using all human capacities that are needed to be achieved for the generation of efficient design that will meet the existential imperatives of human beings.

In this regard, the essential problem of architects is how to realize a meaningful environment considering their existential priorities which widen human beings’ experiential realms. Because of the role of theory in natural science which is indexed to the existent, architects will be confined to the borders of the conventional when theory is rigorously appropriated to architecture. It will lose the possibility of revealing a “vivid” innovation which expands the sensational, intellectual and imaginative world of human beings.

#### 4. Theory’s Differing Roles in Natural Science and Design

Science is related to an extant form, situation or event and is based upon observation. Architecture, on the other hand, is an activity creating a very new situation which was defined as “secondary nature” by Marcus Tullius Cicero more than two millenniums ago. Science is an epistemological event, its theory and practice is sequential; knowledge and theory lead to the praxis (Snodgrass and Coyne, 2006). Although the relation of theory and praxis is deemed as a problematic and contentious philosophical issue similar to the chicken and the egg polemic, the operational model of ordinary sciences is insistent on the chicken getting out of the egg. Other disciplines, including architecture, initiate the establishment of a bridge between the theory and practice gap or a quest for a valid theory for their disciplines imitating the theory’s critical instrumental or prescriptive role in natural sciences. The point that is generally missed in these types of initiatives is that architecture is an activity radically different from science. A designer cannot realize her/his design only based on the rationalization process (Collins, 1998). Cunningham (2005) declared: “Architecture is a distinct epistemological category, a practical art occupying its own cultural territory” (p. 343). Design can be characterized as a discipline that sometimes has the mission of covering contradictory purposes and is associated with notions such as inexpressibility, vagueness, ambiguity, instability, contingency and interrelatedness (Ledewitz, 1985; Wakkary, 2005). The task of natural science is to reveal the “pattern hidden” in nature (Simon, 1996, p.1). Designing, on the other hand, is the bringing of a hidden pattern into being (Ayiran, 2011). Science is fact-oriented while design is a value-oriented activity (Cunningham, 2005). Winkelman (2001) states “Science starts with the specific case and diverges to the general; design starts with the general and produces a specific instance” (p. 54). In other words, scientists and designers work in opposite directions. The situation pointed out by Lawson (2005) as “while most professions rely extensively on theoretical or semantic knowledge, architects are much more reliant on experiential or episodic knowledge” (p. 387) can be interpreted as the result of this adversity.

Architecture is an activity of creating new situations; not observing the existing ones. It can be easily predicted when theory plays a role in architectural design which is similar to its role in natural sciences, architecture will remain indexed to existing, and within the framework of the conventional.

Architects are assumed to have accomplished their essential mission of expanding the boundaries of experiential realms of human beings solely when they construct such environments. Ideas, approaches and methods developed in design are generally based on the definition of design as being “a form of problem solving,” which has been adapted from the definition of science. This definition of design expresses the main reason for the belief of the existence and necessity of a theory for solving design problems. The problematic situation or dilemma in taking a problem as a key term when defining architectural design activity is that a design “...problem cannot be known until solution is accepted” (Norton, 2002, p. 194). This is due to the complex character of design and competitive interests and

values constantly changing during the design process. It is not very meaningful to expect solving the problem under the guidance of theory when the problem cannot be exactly defined (Usher and Bryant, 1987). In close respect to this, Snodgrass and Coyne (1997) point out, "In the design process we often do not fully know what the goal is until we have reached it" (p. 87). The meaning and function of theory in an architectural design activity related to open-ended situations, when the problem and the aim cannot be exactly known from the beginning, appear to be fundamentally different from its meaning and function in science. Related this problematic situation of the term problem in architectural design, Dorst (2006) reasonably indicates, "This leads to some very pertinent methodological questions. Can we still describe design in terms of problem-solving theories if we have to abandon the idea that the 'design problem' can be identified at all?" (p. 10).

As various desperate attempts in design history have proven, no theory should be functioning as "know-how". Nor are there any direct guiding principles in such an activity as in the case of science because the essential factors of design that cannot be codified verbally in these attempts are excluded. For this reason, it seems that all attempts remain futile for bridging the gap between theory and practice, linking or integrating or connecting them in design processes. No matter how faithfully the designers wish to behave within the framework of certain static, theoretical principles and rules during dynamic design processes, when the designer gets through to the design's own territory, her/his mode changes and deviation from the theory becomes inevitable. The guidance of theory in the sense of know-how cannot absolutely meet frequently contradicting intentions of a very complicated architectural design process and cannot remain perfectly loyal to the theory from the process' beginning to the end. In a real design situation, as Buchanan (1998) indicates, "By focusing on concrete problems and practical situations...design shifts attention away from ideology and theory...towards action and production" (p.18). Contradictory aims should necessarily be realized during the dynamic design process at the same time. Schneider (1981) defines the designers' desperate position since any theory could not be helpful at this "pregnant movement", by saying, "theoretically there is no theory in architectural theory" and defines this as "timeless dilemmas" (p. 14). Harries (1983) shares the same opinion: "Problems of building and dwelling cannot finally be resolved by theory...without commitment there is no escape from arbitrariness" (p. 20). From a relatively different point of view, the situation which is defined as "arbitrariness" by Harries (1983) is pertinent to the design subject and can be thought of as an architect's wide freedom area for interpretation.

## 5. Questioning Priority and Supremacy of Theory

Because of its generally accepted role as "master" or know-how or "prescriptive" and contingently its association with divinity due to its roots, theory is considered to be prior to and superior to practice. Although theory seems to have priority and supremacy in natural sciences regarding its guidance for practice, in some instances observation and experimentation can be done without having any relation to a theory. As Lenoir (1988 points out,

...scientific paper is not the transcription of a previously planned investigation designed to test a theory set out in advance. Lavoisier, for example, did not have a theory of respiration which initiated his experimental work and provided its logical grid throughout. (p. 8)

When the airfoil wing enabling planes to fly was invented, the fact that no machine heavier than air could fly had been newly "proven". Its aerodynamic properties were understood only after planes started to be used. This demonstrates that the aerodynamics theory did not contribute to the construction of wings with an airfoil section but the invention of these made a substantial contribution to aerodynamics theory (Alexander, 1964). Another example which shows that practice is more important than theory in some cases is the fact that thermodynamics owes much more to the steam engines than steam engines owe to thermodynamics (Price, 1986).

Some examples from architecture can also be given. When Frank Lloyd Wright's Johnson Wax Building was designed, theoretical knowledge at the time was not sufficient to make static calculations of mushroom columns. As a result, a mathematical model could not be established. It is known that the static strength of these columns was tested with a model constructed with real material in actual size, and construction was realized after successful testing. Another example is Jørn Utzon's Sydney Opera House.

The existing theoretical knowledge was insufficient to solve the proposed structural system of this building at the time but through long and arduous endeavors, the required theoretical knowledge was formed. In Richard Rogers' New Lloyds Building, the theoretical knowledge was also incapable of completion of the design as projected by the architect. So as Jencks (1988) indicates, knowledge was gained through specific research. In all these examples, practice transcends the inefficiency of theoretical knowledge and behaves autonomously. Consequently, architecture's experiential realm and the boundaries of theoretical knowledge are expanded. These arguments illustrate that the relationship between theory and practice is not uni-directional; it is bi-directional and in some cases practice leads theory even in science. In other words, sometimes the chicken has the ability to bring about the egg.

Pallasmaa (2009) points out that there is widespread confusion concerning the relationship between architectural theory and praxis in architecture and criticizes the current fashion of assuming a prerequisite of a philosophical statement for a valuable architectural design. Impropriety of the current tendency of accepting an instrumental role of theory in architectural design can be set off by paradoxically referring to philosophy since most scholars refer to philosophy especially to Heidegger to imply that theory is more eminent than praxis. As a matter of fact, Heidegger himself seems on the opposite pole of these academics because he revives the notion of praxis (Güneş, 2011). He considers practice is more eminent within the Greek "theoria" concept with these words: "It is not their wish to bring practice into line with theory, but the other way round: to understand theory as the supreme realization of genuine practice" (Heidegger, 1993, pp. 31-32). It is evident that the consequences of all these arguments, the problem of integration of theory and practice, can never be solved in one way or another in architectural design. Therefore, it is certainly a pseudo- problem.

From the point of view of Knapp and Michaels (1985), theory is merely an attempt to avoid practice. It seems that theory could not exist anywhere other than practice. Although modern architecture does not go any further to claim that it is completely science, it assumes itself to be a very rational, analytic and objective activity and a product of theory (Walker, 1987). However, Einstein (1954), regarded as the last century's most important scientist claims that: "Theories are speculative to a much higher degree. They not only are... not directly connected with complex sense of experience... The principles and concepts of theories are therefore entirely 'fictitious' " (p. 294). Longino (2002) states that a single theory will remain insufficient for all physical and biological processes and, more than one theory is required for these distinct realms. In this respect, theory's capability to be a single and absolute guide even for science is disputable. The central idea of Dewey's pragmatism is that there is no epistemological difference between theory and action because action should already be performed on the basis of philosophical considerations (Maaranen and Krokfors, 2008). Related to Dewey's ideas, Biesta and Burbules (2003) claim that:

...it is not that theory can tell us how things are and that practice merely has to follow...if knowledge is indeed human factor in human action, then theory no longer comes before practice, but emerges from and feeds back into practice. (p. 105)

In order to compensate for its deprivation of any instrumental valid theory, architectural education unnecessarily tends to appropriate theories from other disciplines such as philosophy, mathematics, natural sciences and humanities uncritically at the expense of interrupting its ties with its unique existential necessities. The "nomad theories" appropriated from these disciplines are regarded as know-how or an instrument that is considered as the sanctuary of the legitimacy of architecture and directed to more "impeccable" and more "accurate" architectural achievements. However, there are two points seemingly overlooked in such appropriations. Firstly, the theories in these disciplines are assumed to be conceptually pure (Ostwald, 1999). Yet, a conceptually pure theory is just an assumption. Feyerabend (1987) points out that there are few theories in complete harmony with the accepted phenomena in natural sciences. Secondly and more importantly, these disciplines have almost no concern with the essential issues of architecture such as space and form. Linder (1992) expresses this vigorous criticism to the attempts at theorizing architecture with nomad theories imported from other disciplines:

...it is usually understood, architectural theory is not a theory that is architectural, but is an attempt to make architecture theoretical. But it seems that being theoretical means to borrow the "discipline" of the scientist or the philosopher, and while this may be enlightening or potentially very sophisticated, it ignores the fact that architecture does not share all the features of philosophy or science. (p. 167)

The generation of architectural meaning, which is the essence of design activity, in a sense is to grasp the existential desire of human beings and the lived reality, and mediate between consciousness and the world. The sufficiency of this meaning depends on the success of this mediation task. Architects can never endorse this task of mediation to the nomad theories imported from other disciplines, because it means rejecting the essential responsibility of this profession.

## **6. Autonomies of Theory and Practice**

With respect to the arguments discussed so far, another important point is that theory and practice could have autonomy at least temporarily and this autonomy could be beneficial for both practice and theory. Mohanty (1995) explains this situation: "The practical 'path' does not follow the theory, but is added on to it, and must have a different and independent origin" (p. 10).

Hacking (as cited in Lenoir 1988), remarks that both theory and experimental practice could have their own autonomies. "Every 'good' scientific theory is prohibition: it forbids certain things to happen..." (p. 36) says Popper (1963). In this respect, acting under the guidance of theory means accepting limitations in advance.

Objection of an existing theoretical system leads to the dilemma of creating new theoretical frameworks and thus, new restrictions.

For instance, Le Corbusier (1965), considered to be the most effective theoretician of modern architecture and the designer of buildings in the crystallized form of modern architecture's idea says, "architecture is stifled by custom" (p. 92). It is apparent that Le Corbusier was referring by these words to the restrictions of a theoretical establishment in architecture at the time. He systematically criticized the existing theoretical establishment in his influential book, *Towards a New Architecture* and shifted the architectural paradigm. However, the remarkable point here is that his new theory paradoxically stems from practice since he inspires machines which are the practical outcomes of the Industrial Revolution. This situation seems closely related to Popper's (1970) statement indicating a dilemma:

...at any movement we are prisoners caught in the framework of our theories; our expectations; our past experiences; our language. But we are prisoners in a Pickwickian sense: if we can break out our framework at any time. Admittedly, we shall find ourselves again in a framework, but it will be a better and roomier one; and we can at any moment break out it again. (p. 56)

In a similar way, Le Corbusier saved himself and a few generations of architects from being prisoners of an existing theoretical system, but he built a new, different and probably better and "roomier" one, but still a prison. However, as he considered his sentence in this roomier prison as sufficient for himself, he sneaked out of the prison of this theoretical framework or he generated a practice which claims its autonomy through the theories he has "designed". Thanks to this autonomy, he designed Ronchamp, one of the architectural masterpieces of the 20<sup>th</sup> century. For the sake of the breathtaking spatial and visual quality of this building, Le Corbusier's serious contradiction with the ideas in his book *Towards a New Architecture* is neglected by people except those who perceive the relationship between theory and practice very rigorously. In this sense, the prison of a theoretical framework in architecture and the fact that the search for escaping this prison leads to a new and hopefully more roomier and comfortable prison is an eternal dilemma which has existed so far and will continue to exist.

## 7. Conclusion: New Conceptualization of Theory and Practice Relationship

Theory is required because it is not possible to design in an intellectual vacuum. The designer should essentially have certain knowledge and a theoretical basis. While theory is needed, it contradicts with the essential intention of design if the theory is taken as a prescriptive principle for successful design activity since this process ends up with a product that does not bring any novelty. This is one of the most fundamental dilemmas of this discipline. As a matter of fact, at least from a pragmatic point of view, this is not a dilemma to be resolved because it has the potential of generativity and innovation as in the case of Le Corbusier.

The designer who inherently aims at extending the knowledge, imagination and experiential realms of human beings and their limits of existence is in a position to oppose being a slave to theory even if it was established by her/himself and every sort of restriction which would obligate her/him to be entirely dependent on it. Therefore, during the design process, there is a tense and dialectical relationship between theory and practice in which neither accepts the dominancy of the other. A successful design process preserves the autonomy of both theory and practice and at the same time allows for their regeneration through interaction with each other. When the theory and practice integration ideal which has been ambitiously pursued up to now in architectural design is realized, this generativity terminates. It is a necessity of this generative tension in the architectural design process and depends on autonomy of both theory and praxis as is the case in the separation of powers principle in political science. It is also part of their checks and balance capability of each other's power from which they should mutually benefit. Perhaps a most important secret of attaining successful designs in architecture and consequently in architectural design education should be related to the proficiency of discovering the exact distance in which theory and practice can most intensely balance each other. I call this the *designerly* way of understanding the relationship between theory and practice.

## References

- Alexander, C. (1964). *Notes on the synthesis of form*. Cambridge, MA: Harvard University Press.
- Ayiran, N. (2011). Designerly way of understanding the role of theory. In E. Duyan (Ed.), *ARCHTHEO 11 / Theory for Theory Sake Symposium, 23-26 November 2011, Conference Proceedings*, Vol II, , Istanbul: Dakam Publishing, pp. 290-300.
- Biesta, G.J.J., & Burbules, N. C. (2003). *Pragmatism and educational research*. New York: Norman and Littlefield.
- Buchanan, R. (1998). Branzi's dilemma in contemporary culture. *Design Issues*, 14 (1), pp. 3–20. doi: 10.2307/1511825

- Claxton, G. (1984). *Live and learn: an introduction to the psychology of growth and change in everyday life*. London: Harper and Row.
- Coyne, R., & Snodgrass, A. (1991). Is designing mysterious? Challenging the dual knowledge thesis. *Design Studies*, 12 (3), pp. 124–131. doi: 10.1016/0142-694X(91)90020-W
- Cunningham, A. (2005). Notes on education and research around architecture, *The Journal of Architecture*, 10 (4), pp. 415–441. doi: 10.1080/13602360500285542
- Diggelen W. V., & Overdijk, M. (2009). Grounded design: design patterns as the link between theory and practice. *Computers in Human Behavior*, 25, pp. 1056–1066. doi: 10.1016/j.chb.2009.01.005
- Dorst, K. (2006) Design problems and design paradoxes. *Design Issues*, 22 (3), pp. 4-17. doi: 10.1162/desi.2006.22.3.4
- Einstein, A. (1954). *Ideas and opinions*. New York: Random House.
- Eraut, M. (2005). Knowledge creation and knowledge use in professional context. *Studies in Higher Education*, 10 (2), pp.117–133. doi: 10.2753/EUE1056-4934190142
- Feyerabend, P. (1987). *Farewell to reason*. London: Verso.
- Güneş, I. (2011). *Aristotle's notions of theoria and praxis in early Heidegger and its reverberations in Gadamer and Arendt* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3472393).
- Harries, K. (1983). Thoughts on a non-arbitrary architecture. *Perspecta*, 20, pp. 9–20. doi: 10.1017/CBO9780511777998.010
- Heidegger, M. (1971). Building dwelling thinking, in *Poetry, language, thought* (A. Hofstadter, trans.), pp. 141-160. New York: Harper and Row.
- Heidegger, M. (1993). The self-assertion of the German University. In R. Wolin (Ed.), *The Heidegger controversy: a critical leader* (pp. 29-39). New York: MIT Press.
- Jencks, C. (1988). The battle of high-tech: great buildings with great faults. *Architectural Design*, 58 (11–12), pp. 18–39.
- Jecker N. (2004). The theory and practice of professionalism. *The American Journal of Bioethics*, 4 (2), pp. 47–48. doi: 10.1162/152651604323097790
- Knapp, S., & Michaels, W. B. (1985). Against theory. In W. J. T. Mitchell (Ed.), *Against theory: literary studies and the new pragmatism* (4<sup>th</sup> ed.), (pp. 11-30). Chicago and London: University of Chicago Press.
- Lawson, B. (2005). Oracles, draughtsmen, and agents: the nature of knowledge and creativity in design and the role of IT. *Automation in Construction*. 14, pp. 383-391. doi: 10.1016/j.autcon.2004.08.005
- Le Corbusier. (1965). *Towards a new architecture* (9<sup>th</sup> ed.), (F. Etchells, trans.), New York: Dover Publications.
- Ledewitz, S. (1985). Models of design in studio teaching. *Journal of Architectural Education* (1984- ), 38 (2), pp. 2–8. doi: 10.1080/10464883.1985.1075854
- Lenoir, T. (1988). Practice, reason, context: the dialogue between theory and experiment. *Science in Context*, 2 (1), pp. 3–22. doi: 10.1017/S0269889700000478
- Linder, M. (1992). Architectural theory is no discipline. In J. Whiteman, J. Kipnis & R. Burdett (Eds.), *Strategies in architectural thinking* (pp. 166–179). Cambridge, MA: The MIT Press.
- Longino, H. (2002). *The fate of knowledge*. Princeton: Princeton University Press.
- Maaranen, K., & Krokfors, L. (2008). Researching pupils, schools and oneself: teachers as integrators of theory and practice in initial teacher education. *Journal of Educating for Teaching*, 34 (3), pp. 207–222. doi: 10.1080/020607470802213825

- Martin-Hernández, M. J. (2008). For (a) theory (of architecture). *The Journal of Architecture*, 13 (1), pp. 1–7. doi: 10.1080/13602360701865357
- Mohanty, J. N. (1995). Theory and practice in Indian philosophy. *Australasian Journal of Philosophy*, 73 (1), pp. 1–12. doi: 10.1080/00048409512346351
- Norton, B. G. (2002). Building demand models to improve environmental policy process. In L. Magnani, N.J. Nersessian & P. Thagard (Eds.), *Model-based-reasoning: science, technology, values* (pp. 191-208). New York: Kluwer Academic / Plenum Publishers.
- Ostwald, M. (1999). Architectural theory formation through appropriation, *Architectural Theory Review*, Vol. 4, No.2, pp. 52-70. doi: 10.1080/13264829909478370
- Pallasmaa, J. (2009). *The thinking hand*. Chichester: Wiley.
- Pallasmaa, J. (2013), Mental and existential ecology. In R. Bhatt (Ed.), *Rethinking aesthetics, the role of body in design* (pp. 214-230), New York: Routledge.
- Pérez-Gómez, A. (1987). Architecture as embodied knowledge. *Journal of Architectural Education (1984- )*, 40 (2), pp. 57–58. doi: 10.1080/10464883.1987.10758435
- Popper, K. R. (1959). *The logic of scientific discovery*. London: Hutchinson.
- Popper, K. R. (1963). *Conjectures and refutations*. London: Routledge and Paul Kegan.
- Popper, K. R. (1970). Normal science and its dangers. In I. Lakatos & A. Masgrave (Eds.), *Criticism and the growth of knowledge* (pp. 51-58). Cambridge: Cambridge University Press.
- Price, D. S. (1986). Of sealing wax and string: a philosophy of the experimenter's craft and its role in the genesis of high technology. In D. S. Price (Ed.), *Little science; big science...and beyond* (pp. 246-258), New York: Columbia University Press.
- Sartre, J. P. (1993). *The emotions: An outline of a theory*. (B. Frenchtman, trans.), New York: Carol Publishing.
- Schneider, P. (1981). Conundrums: Reflections in architectural theory. *Journal of Architectural Education*, 34 (4), pp.14–15. doi: 1080/10464883.1981.10758664
- Schön, D. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books.
- Simon, H. (1996). *The science of artificial* (3<sup>rd</sup> ed.), Cambridge, MA: MIT Press.
- Snodgrass, A., & Coyne, R. (1997). Is designing hermeneutical? *Architectural Theory Review*, 1 (1), pp. 65–97. doi: 10.1080/13264829609478304
- Snodgrass, A. (2000). On 'theorising architectural education'. *Architectural Theory Review*, Vol. 5, No.2, pp.89-93. doi: 10.1080/13264820009478402
- Snodgrass, A., & Coyne, R. (2006). *Interpretation in architecture*. Abington and Oxon: Routledge.
- Usher, R. S., & Bryant, I. (1987). Re-examining the theory-practice relationship in continuing professional education. *Studies in Higher Education*, 12 (2), pp. 201–212. doi: 10.1080/03075078712331378181
- Wakkary, R. (2005). Framing complexity, design and experience: A reflective analysis. *Digital Creativity*, 16 (2), pp.65–78. doi: 10.1080/14626260500173013
- Walker, G. (1987). Architecture, method and poetic image. *Journal of Architectural Education (1984-)*, 40 (2): 86–87. doi: 10.1080/10464883.1987.10758447
- Winkelman, P. (2001). *Beyond science: an exploration of values in engineering education* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3089924).
- Yanchar, S. C., Joseph, B. S., Williams, D. D., Allen, S., & Wilson, B. G. (2010). Struggling with theory? A qualitative investigation of conceptual tools use in instructional design. *Educational Technology Research and Development*, 58, pp. 39–60. doi: 10.1007/s11423-009-9129-6