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DESIGN INSTRUCTOR'S PERSPECTIVE ON THE ROLE OF COMPUTERS IN ARCHITECTURAL EDUCATION: A CASE STUDY

Ela ÇİL and Oya PAKDİL

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This paper reports the findings of a case study aimed to explore the design instructors' opinions on the role of computers in architectural education. A qualitative research, incorporating a survey and semi-structured interviews, have been conducted. The objective of the research is to explore and identify the instructors' conceptualizations and evaluations of the relationship between design and computers in education. We aimed to understand whether there is a certain divide among the design faculty between those who see computers merely as representational tools and those who see them potentials for a different design thinking and mechanism. Specifically, we seek to understand the possible sources of the instructors' resistance to CAD. Having described the findings of the survey, the paper concludes by a discussion on the possible relations among the answers given to survey and the literature reviewed.

INTRODUCTION

The focus of the discussions on the role of computers in design education in the last decade has been on the transforming logic of the design process and their integration to the current curricula. Especially, the discussions on the logic of digital design thinking incorporates experiments done in the architectural studio aimed at exploring, as coded by Andia, (2002) the new architectural imagination from conceptualization to production, and the pedagogy of teaching computational design (Çolakoğlu, 2006; Kvan, et.al., 2004; Oxman, 2006a; Özkar, 2005). The studies done on the comparison of digital and conventional media during different design phases (Bilda and Demirkan, 2003; Coyne, Park, and Wiszniewski, 2002; Iordanova and dePaoli, 2005) also extend these discussions.

Although the discussions on the role of computers in design education deepened recently with the possibility of encountering a new design content and vocabulary, it is still possible to talk about a certain divide among the design faculty around the world between those who see

computers merely as tools and those who see them as parts of a different design thinking and mechanism fostered by the digital media. This paper is motivated by this, observable but not yet fully explored, division on the role of computers perceived in the academia. In that sense, our aim is less on contributing to the discussions on the nature of change that is possible with computers in the architectural studio or how to integrate such changes with the conventional education. We have rather attempted to understand and describe the common atmosphere within which such transformations may occur. Taking a case study approach, we think that it is significant to explore the aforementioned issues in a school of architecture where the first graduate program specializing in CAD was established in Turkey.

We think that the opinions related with computers in education are inseparable from the opinions related with the design process in general and architectural design education in specific. Our argument is that, an exploration on the role of computers in design education would reveal not only the conceptualization of the design process, but also the rooted beliefs on the cognitive aspects of the design education. Specifically, our contribution will be in mapping out the possible sources of the instructors' resistance to computers in the design process.

INSTRUCTORS' PERSPECTIVE ON COMPUTERS IN EDUCATION: A LITERATURE REVIEW

Although there is a growing literature on the role of computers in education in general, few of these studies focus on the perspective of the educators in architecture. The research that focuses on the educators' perspective in higher education is mostly in fields other than architecture or related with high-school education. Furthermore, the research in the field of architecture has been mostly conducted on how students perceive CAD and how their attitudes differ according to their experiences with computers.

A review of studies done on computer related attitudes in fields other than architecture shows that the issues related with attitude, such as technology acceptance, rather than competence level come into the front view. These studies particularly aim assessing teachers' pedagogical opinions on digital media. Computer experience, gender, ease of access to technology, and cognitive orientation of the teachers are the main factors that have been used in order to understand their attitudes. (Albirini, 2006; Antonietti and Giorgetti, 2006; Korukonda, 2007; Robertson, et al., 1995)

Emphasizing the importance of guiding the implementation of technology by research and evaluating attitudes related to technology in education during the process, Albirini (2006) claims that the idea which has been commonly acknowledged as the teachers' lack of computer competence is the main barrier to their acceptance and support of technology in education has been wrong. In fact, he states that computer competence is the result of teachers' attitudes. Interrogating the factors that effect teachers' attitude, Antonietti and Giorgetti (2006) state that the crucial aspect of the teachers' acceptance of technology is related with the level in achieving desired outcomes that a new tool induces in the students. Moreover, in line with Albirini's findings, they report that the amount of use and ease in access to computers do not play a significant role in teachers' opinions. Rather, it is the type of experience that is important.

If the type of experience is accepted as amount of computers use, it is possible to state that a consensus has built up among the scholars over

the years on the irrelevance of the correlation between the amount of computers use and teachers' level of confidence (Robertson, et. al., 1995; Garland and Noyes, 2004). Instead of experience, Robertson et al.(1995) suggest three explanations for the teachers' negative attitude toward computers: 1. conservatism; 2. anxiety at changing their teaching content and method; 3. seeing computers differently than the students.

Although founded by data collected from students not teachers, Korukonda's research (2007) is worth mentioning here since it attempts to categorize the variables that constitute attitude. Korukonda defines the variables as: 1. personality (neuroticism, extrovertedness, openness, agreeableness, conscientiousness); 2. math skills; 3. verbal skills; 4. cognitive orientation (flexibility, facility with financial information, technical orientation, cautiousness in decision making, tactical orientation, interpersonal relation choice); and 5. computer experience. Interestingly, he concludes that the significant variables that effect, what is termed as, computer anxiety are apart from math level and verbal skills, as openness and agreeableness, and most importantly flexibility in decision making.

It should be pointed out that, although scholars working on these questions supply us with valuable information on the correlation of these factors, they typically focus on the IT side of the digital media than the design side. Moreover, it should be emphasized that the date of research is crucial, as technology changes fast and experience of instructors may transform with it (Garland and Noyes, 2007).

Looking at the instructors' perspective from the architectural domain, Basa and Şenyapılı (2005) report on the insecure position of the design jury toward computer generated presentations, and conclude that instructors see computers problematic when students' authenticity and identity are considered. In addition, they report that the proficiency of the instructor on various topics including computer aided design is also significant. They interrogate the role of digital media in teachers' assessment and attitude toward the student presentations. A significant finding is the inconsistency between students' and instructors' perspectives on a certain matter. They state that although students think that their instructors seem to favor hand-drawing techniques over computer drawing in the juries, instructors state that they do not make a significant choice in between the two media. A similar tone from students is found out by Taşlı-Pektaş and Erkip (2006).Exploring only the students' attitudes related with computers in architectural education, they mention that the students' perception of their instructors' attitude toward computers are negative. Furthermore, students tend to think that their studio instructors believe that computers kill creativity. Stating that there is a tension between traditional design tools and CAD in schools, Taşlı-Pektaş and Erkip think that, among other factors, this tension is related with the studio instructors' reluctance to incorporate computers with design teaching. They conclude that the institutions of design education "should regard the use of computers as a socio-cultural rather than merely a technical issue."

In a similar study, Şenyapılı and Basa (2006) state that the tension that they observe between hand-drawn and digitally produced drawings is related with the situation of architecture as a field caught inbetween science and art. However, a similar exploration in the field of arts shows that there is the same oscillation among the art faculty between computers –or using digital technology- and hand techniques in education (Wood, 2003). Wood states that art teachers appreciate computer in students' creative process

as they think it fosters experimentation with tools that enable testing ideas quickly and spontaneously. Additionally, art teachers also think that computers offer an alternative to those students who have poor eye-hand coordination. The problem that the teachers point out is that, as Wood reports, although these potentials lift the anxiety of mistakes from the students, they also erase the human-touch. These viewpoints are parallel to the issues pointed out by Şenyaplı and Başa (2006). Based on the students' perspective computers are seen as tools that are more advantageous over hand drawing especially in terms of practicality, economizing of time, and using less physical effort. Nevertheless, students feel more designerly and enjoy drawing more when it comes to hand skills.

These views, coming both from fields of art and architecture and from students and instructors, set the basis for investigating the conceptualization of computers in the design process. Being comparatively a new tool, computers are stuck at the level of efficiency and their assessment has been linked to the comparison of digital and non-digital techniques in terms of the process and psychology of representation. Perhaps the questions that are pending to be answered are on whether the nature of the design problems and design approach (both conceptually and technically) in the studio are transforming as the computers or the logic imbedded in the creation of computers are used more and more in architectural education. However, this study focuses on the role of computers as perceived by design instructors who do not claim to be promoting digital design thinking in the studio. In that context, we have not included a review of the literature interrogating digital design thinking in architectural education. Nevertheless, comparison of the motivations and attitudes of the instructors who are closer to the digital/computational approach, such as systematic or algorithmic approach to design process, with the instructors who do not claim to be as such should construct the facets of any future research related with these issues.

THE CASE STUDY: OBJECTIVES OF THE INQUIRY, DATA COLLECTION, AND FINDINGS

Based on the literature reviewed and our framework stated in the introduction we developed four specific questions that can help us deepen our main research question aiming at mapping out the commonalities in the instructors' evaluations of computers in architectural education:

1. Can we talk about a resistance to computers established within the educational community of architecture and if there is, can we identify the possible sources of such resistance?

2. Do design instructors acknowledge computers only as tools facilitating drawing and representation that should be used after the "thinking" phase of design?

3. Have certain concepts related with CAD and digital design thinking filtered to the design faculty in a school where the graduate program specializing on this area has been active for twelve years?

4. Is there a relationship between the instructors' familiarity with certain CAD software and their pedagogical opinions related with the use of computers in the architectural design studio?

In order to explore these questions, we conducted a survey composed of open ended questions. In addition, we conducted semi-structured interviews with five faculty members with more then ten years of

experience, which helped us interpret and deepen some of the findings of this survey. A qualitative approach was used in the present study as the main objective was to provide insight about the instructors' opinions and the intent was not to make statistical claims and generalizations. Instead, our main goal has been to illustrate some possible patterns and commonalities in conceptualizations and evaluations of the design instructors. The answers given to the survey were content coded according to the frequency of words used. These codes were then categorized under certain themes and concepts. The objective of the method has been to reach descriptive accuracy rather than constructing causal explanations. While coding helped us distinguish individual words, the interviews helped us in matching and contextualizeing them. We think that understanding the concerns of the people under study through their conceptualizations is as important as understanding the categories already developed by the literature; an integration of the two is crucial.

The survey is composed of nine open-ended questions, two multiple-choice questions, and six terms about which the instructors were requested to write their associations (**Table 1**). The nine questions were related with the everyday use of computer of the instructors'; the role of computers during the design process in general, in architectural education, and during professional practice; and behaviors of the instructors within the design studio. While one multiple-choice question was prepared to understand the CAD level of the instructors specific to the design programs, the other was prepared in order to understand the design perspective of the instructor. The six terms, related with the logic and design approach of computers were asked thinking that they would give us a clue in understanding the conceptualization of computers and their uses in design as well as the level of filterization of the new terms and concepts among the faculty.

Table 1. Survey Questions.

	Questions in the Survey:
1	How often and with what purpose do you use computers?
2	Please mark the appropriate statement related with the computer program:
	AutoCad / Revit / ArchiCad / 3DMax / Maya / Sketch Up
	I have not heard of / I have heard of but have not used it / I have limited command of it / I have a good command of it
3	What is your opinion on the use of computers during architectural design?
4	What is your opinion on the students' use of computers?
5	What is your opinion on the use of computers in architectural education in general?
6	What is your opinion on the year computers should be included into the architectural education?
7	What is your opinion on the use of computers in architectural practice?
8	What would you think if one told you that from 25 years on design will be only by computers?
	Please mark the statement(s) that best fits your opinion:
9	>designing incorporates both intuitive and logical steps in the process >designing is a systematical process in which one can explain the steps taken. >designing is a rational process consisting of a ruled base system >designing is an intuitive process and one cannot explain this process. >one learns how to design through trial-and-error in the process. >even though one attempts to explain one's design process, there may be something hidden in the black box.
10	What is your opinion on the qualities that an architectural studio instructor should have?
11	How can an architectural studio instructor achieve the desired outcomes from students during studio time?
12	Please write the associative terms or phrases next to the phrases below:
	Parametric design; shape grammars; computational design; algorithms; design in computerized environment; virtual architecture

We surveyed twenty-six of the fifty-two faculty members in the department, including the those from non-design fields, those who instruct design studios, and eight instructors who belong to the CAD unit in the department. The answers of these eight faculty members were not included in the findings of this paper. We aim to increase both kinds of samples in the future from different universities in the country for a comparative analysis. No statistical analysis was used at this point since the objective was identifying and defining different perspectives on CAD, as well as the formed concepts on the role of computers in design education among the instructors. We think that the findings of this preliminary research will be the conceptual foundation of an analysis measured quantitatively. This exploration was done through open-ended questions thinking that this method gives less room for manipulations and more freedom in answering. Moreover, in order to sound neutral, rather than the terms, digital or computational design, computer was used throughout the survey.

The categorization of the answers was made according to the number of answers rather than the number of respondents participated in the survey. Thus, the sample for each area of investigation differs according to the ideas and concepts formed within the respondent. This, we believe, is akin to a qualitative exploration, which incorporates all the possible associations related with the question and tries to leave no idea outside a pre-constructed classification.

The relationship between the instructors' computer use during their own design processes and their opinions about the role of CAAD were investigated with the correlation of two questions in the survey: one, on their everyday computer use and the other on their familiarity and command of several CAAD software.

The forty-nine answers given to the question related with the everyday computer use of the instructors' show that computers are primarily used for communication and research (19 out of 49), followed by for text and course preparations (15 out of 49), for drafting and presentation (11 out of 49), and finally for design (4 out of 49) (**Table 2**). The question investigating the instructors' command of several CAD tools (AutoCAD, Revit, ArchiCAD, 3DMax, Maya, and Sketch Up) manifests that the majority of the instructors have heard of the programs but have not used them yet. Ten of the 26 instructors define themselves to be in good command of AutoCAD; 3 of them define themselves as users of 3DMax; and 2 define themselves as users of Sketch Up (**Table 3**).

Question 8 explored reactions to the idea that "after twenty years later and on, there would be no other means but computers used in design". The answers given were split into two. When 10 respondents stated that this may happen, another 10 stated that it is improbable; four respondents stated that realization of such a situation would make them unhappy, two respondents left the question unanswered.

The following five direct questions asked for the instructors' opinions: on the role of computers during architectural design process, on their observations on students' use of computers, on the role of computers within the architectural education, on the role of computers within the architectural practice, and on which year of an undergraduate education should CAAD be introduced to the students.

The majority of the answers (19 out of 33) to the question asking the instructors' opinion on the role of computers during architectural design process focused on the technical ease and speed that computers bring

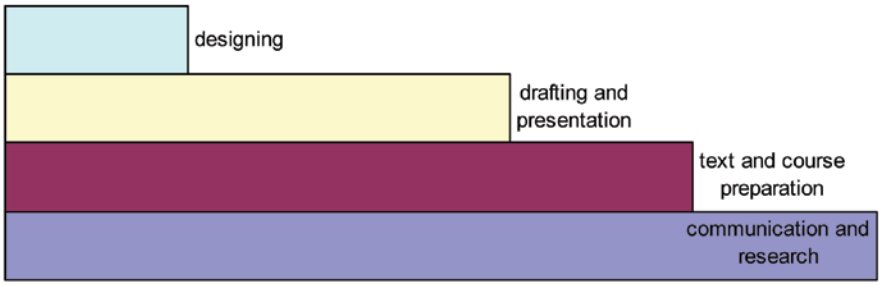

Table 2. Everyday Computer Use of the Instructors.

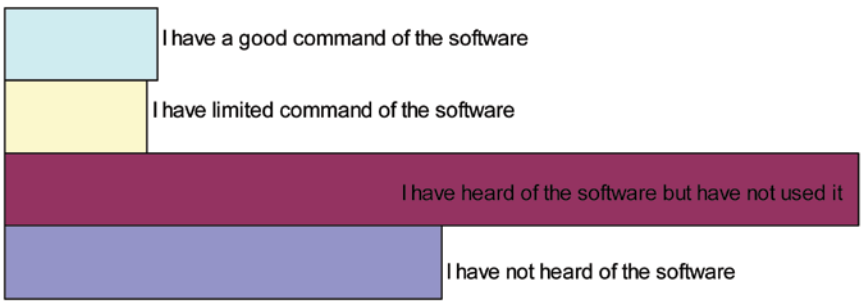

Table 3. Instructors' design software command level.

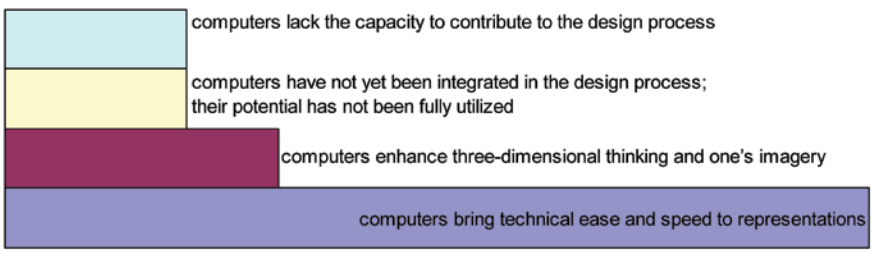

Table 4. Instructors' opinion on the role of computers during architectural design process.

to architectural representations. 6 out of 35 answers claimed that the computers enhance three-dimensional thinking and thus one's imagery. While four instructors stated that computers have not yet been integrated in the design process and thus, their potential has not been fully utilized; four instructors claimed that computers lack the capacity to contribute to the design process (**Table 4**).

When we asked the studio instructors' opinion on students' use of the computer (**Table 5**), 11 out of 30 instructors stated the importance of students' "mindful use" of the computers. Six of the 30 answers state that it would be better if students and teachers of CAAD should acknowledge computers only as a drafting tool used long after the design phase. Five of the answers mentioned that it would be better if CAD software were taught as early as possible in the architectural education so that it would be better integrated with the design process and students' drafting weaknesses would be less. Three answers were brief and only stated that their observations were "positive". Two of the answers mention that students do not use the potential of the computers to the fullest. One state that students are not directed well in their use of the computers, and one respondent state the help of computers in three-dimensional thinking. Finally, one state that computer use hinders the cognitive abilities that one can develop only through sketching. Although this statement is written only by one

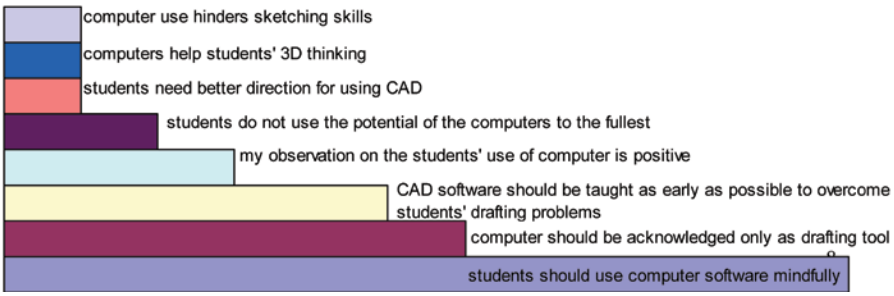

Table 5. Instructors' opinions on the students' use of the computers during design.

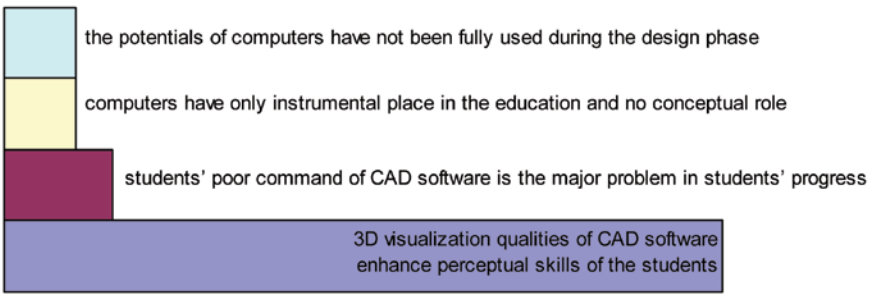

Table 6. Instructors' opinion on the role of the computers in architectural education in general.

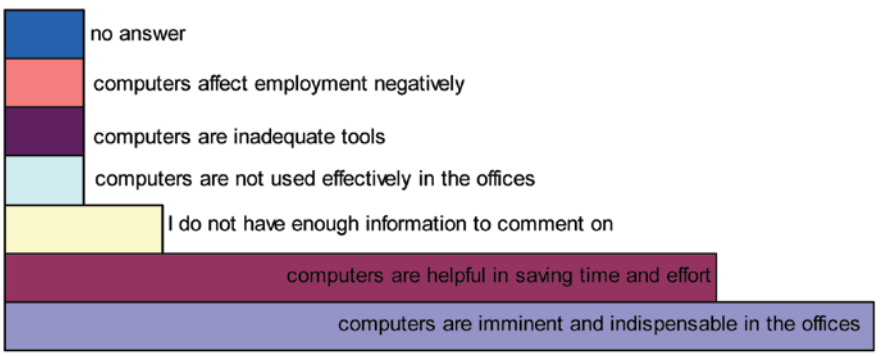

Table 7. Instructors' opinions on the role of computers in architectural offices.

respondent, our face-to-face interviews with four faculty members reflect similar tones.

The question asking respondents to state their opinions about the role of the computers in architectural education in general received 28 responses (**Table 6**). The majority of these responses (20 out of 28) indicated that the three-dimensional visualization qualities of CAD software enhance perceptual skills of the students. Eleven within these twenty also mentioned the importance of sketching by hand and that teaching of CAD should not impede teaching and the place of sketching by hand in education. Two responses emphasized that computers have only instrumental place in the education and no conceptual role. However, another two instructors acknowledged that the potentials of computers have not been fully used during the design phase. Three answers were comprised of statements that mentioned opinions similar to the ones given to the previous question, stating that the students' poor command of CAD software is the major problem in students' progress.

Majority of the instructors (11 out of 25) stated that computers were imminent and indispensable in the offices; 9 stated that computers were very helpful in saving time and effort in the office (**Table 7**). Two stated

that they did not have enough information to comment on. One instructor mentioned that computers were not used effectively in the office and another mentioned that computers were inadequate as tools. Finally one instructor claimed that computers in offices effect employment negatively.

The following question asking in which year of the undergraduate education CAD should be introduced to the students, received twenty-six answers: 11, 10, and 4 instructors stated that third or the fourth years, the first year, and the second year would be appropriate, respectively. One instructor stated that there should be no courses related with CAD in the first year.

Two indirect questions related with the architectural design studio explored the instructors' role within the design process and the sphere in which the students perform in the studio. We believed that instead of asking direct questions on instructors' opinions of the design process, these two questions would reveal more on the level of freedom and being open to the new. Thirteen answers to the question on the role of the instructors in the design studio stated that pedagogical adequacy was important, eleven stated that being able create a democratic and open atmosphere in the studio was vital, and ten instructors stated that instructors' level of knowledge was crucial.

Majority of the instructors stated that pedagogical adequacy was the most important factor effecting the performance of the student within the design studio (11 in 26). Nine answers stated the importance of the experiential and open atmosphere in the studio. Parallel to the answers above five instructors stated that the intellectual competence was important. Additionally four instructors mentioned that the students' cognitive capacity and his/her level of interest were also crucial. Only one stated that preparing the objectives of the studio time was significant in the performance level of the student.

In the following section of the survey we asked the instructors to mark the statements which they thought were closest to their opinion (**Table 8**).

It is possible to observe that the fourth and the fifth statements become marginal among the other opinions on design process. The first statement with its neutral tone seems close to all the respondents.

Our final question in the survey specifically explored how certain concepts related with computation in design education has been received by the instructors (**Table 9**). Parametric design, shape grammars, computational design, algorithms, design in computerized environment, and virtual

	Statements:	# of marks
1	designing incorporates both intuitive and logical steps in the process	26
2	designing is a systematical process in which one can explain the steps taken	16
3	designing is a rational process consisting of a ruled base system	7
4	designing is an intuitive process and one cannot explain this process	3
5	one learns how to design through trial-and-error in the process	3
6	even though one attempts to explain one's design process, there may be something hidden in the black box	10

Table 8. Statements related with the design process and number of marks.

Parametric Design

13	no answer
1	three dimensional design
1	computer
1	model
1	variable quantity
1	optimization
1	designing with alterability
1	designing with rules
1	a design that is derived from rules
1	criteria
1	blob architecture
1	to be relational
1	design with multiple dimensions
1	design tied to parameters
1	fibrous structures
1	has no architectural equivalence

Shape Grammars

7	no answer
3	modulation
2	geometry of forms
2	limitation
2	morphological and typological analysis
1	unity of forms
1	rules on how forms should get together
1	add-remove operations
1	different configurations
1	form and language relationship
1	architectural language
1	form search
1	architectural reading
1	architectural possibility
1	generation
1	fractals
1	cocoon
1	has no architectural equivalence
1	it is possible

Computational Design

17	no answer
1	computer aided design
1	restricted design
1	numeric forms
1	mathematical values
1	analytical design
1	question mark
1	design mathematics
1	it is not possible
1	has no architectural equivalence
1	it is not possible
1	has no architectural equivalence

Algorithm

14	no answer
2	design steps
2	a route for a solution
1	decimal order
1	thinking process following a yes-no path
1	functions
1	flow charts
1	solution process through bringing together the parts of a whole
1	space geometry
1	mathematics
1	has no architectural equivalence

Design in Digital Environment

4	no answer
4	design in a virtual environment
4	CAD
2	ease in representation and drafting
2	three dimensions
1	provoking creativity
1	speed
1	design related with a tool
1	being born from nothing
1	interaction with the non-existing
1	a research unit
1	Frank Gehry
1	presentation techniques
1	repeatable spaces
1	the end of the mechanic paradigm
1	those who cannot go beyond tools
1	not possible
1	has no architectural equivalence

Virtual Architecture

11	no answer
2	fictional design
2	computerized environment
2	Peter Eisenman
1	space in cyberspace
1	geormetry of the non-existing
1	space experience with 3D glasses
1	Zaha Hadid
1	virtual house
1	tendency of the contemporary architectural education
1	sound space
1	an opportunity for ideas that have not realized
1	space without place

Table 9. Terms related with the role of computers in design and instructors' conceptual associations.

architecture were the phrases that we asked the respondents for their associations. The following are lists of terms given to each phrase.

If the tendency of replying each phrase is interpreted as having a certain idea on the terms' meanings, it is possible to state that for the instructors

the idea of computational design is the remotest of all, followed by algorithm and parametric design which received equal to or less answers than the half of the respondents. In that sense, design in a computerized environment and shape grammars are the phrases with which the instructors are more familiar. If we search whether there is any negative reaction to the phrases in the list, computational design and design in a computerized environment receives four answers (4 in 9 and 4 in 25, respectively) toward negative tones.

DISCUSSION ON THE FINDINGS AND DIRECTIONS FOR FUTURE WORK

The findings of the survey portray some answers to our four research questions stated before as well as informing us about issues that are not considered within them. We think that the survey enables us to talk about a resistance to computers established within the educational community. Interestingly, instructors' statements reveal issues related with different sources of resistance than the ones we reviewed in the literature. While, from the instructors' perspective, issues related with the students' computer use in their designs, such as proficiency in CAD, authenticity and identity are problematic, cognitive skills are seen to be at stake in this case. When we compare the results of **Table 4, 5,** and **6**, we can state that almost one-fourth of all respondents, state their concerns on computers as they see them as a threat to perceptual and representational skills that an architectural student should have. In fact, these views are parallel to the view of the respondents in Taşlı-Pektaş and Erkip's study (2006), in which students think that their instructors see computers as a threat to creativity.

Complementary statements, which help us expand our understanding, are made by the instructors during the interviews. Instructors claim that students fail in basic drafting skills that could be developed with hand-based techniques. The tendency to think that the computers are the first among many reasons for the failure of the students in their studio work partially explains why instructors in this particular setting may resist to computers in design studio. We think that these issues are significant for they are closely related with visual thinking, which underpins design communication between one and others as well as with oneself (Goldschmidt, 1994; Oxman, 2002). Such cognitive issues are also relevant for discussing whether the computer shifts the emphasis from the left hemisphere of the brain to the right (Wood, 2003) and whether computer hinders spontaneity and eye-hand contact.

Majority of the instructors (66%) state that the potentials of computers in design are not fully incorporated either by the students or their CAD instructors. In contrast only few statements among all (19%) include opinions that computers lack the capacity to contribute to the design process and have only an instrumental role. We conjecture that the statements regarding potentials of computers are not solely related to the competence level of the students in operating the programs. Parallel to the split suggested by Cao and Protzen (1999), findings of this survey convey the split between opinions on the use of computers during design, such that it is restricted with the issue of when and where to employ the technique. At this stage, we can claim that the design faculty sees the computer as a drafting tool and as an aid for visualization and three-dimensional modeling. Nevertheless, the statements emphasizing that the potentials of computers in (91%) design are not fully used, manifest openness for understanding new possibilities in design. This, we believe,

related with our third research question, also shows that new concepts and processes of digital design have either not filtered among the instructors or they have not yet convinced the instructors with the nature and quality of the studio work.

When we explore the correlation of the question related with the role of the computers in architectural practice with the two questions exploring the role of the computers in architectural education and in architectural design, we observe that the conceptualization of the computers as tools reach a climax in the instructors' opinions on practice. Would this echo the discussion on the split between practice and theory or thinking and making that has been on the table for a long time? Clearly, such distinctions are not solely about computational design versus "traditional" design, but also about the epistemological foundation of how one perceives designing, and in that channel, of the relationship among the parts of the whole constellation of design thinking. If instructors think that computers are necessary, almost inevitable, in professional practice, but skeptical of their use in education, then it is tempting to claim that instructors perceive professional practice and education as two separate worlds in terms of design processes. Although this separation may be necessary for didactic reasons, we still think that it is necessary to deepen this issue in the future work by discriminating and categorizing different uses of computers in the interviews.

It is also critical to understand whether instructors search for the human touch and authenticity in students' representation as suggested by Başa and Şenyapılı (2005), or they reflect their fear, as Shu (2000) suggests, that one day, parallel to computers' take over, the need for practioners with traditional skills will be obsolete. In one respect, equally divided opinions given to the eighth question in our survey related with a projection to twenty-years later suggest such fear. Clearly the issue has to be investigated deeper through interviews.

Although there is little detail on what constitutes pedagogical adequacy, claimed to be important by the instructors in the questions related with the studio atmosphere, their belief in the importance of democratic and open atmosphere in the studio indicates that there is a foundation for experimentation on design process and pedagogy.

Our last area of exploration was on the relationship between the instructors' familiarity with CAD software and their pedagogical opinion. When we compare **Table 2** and **Table 3** we can conclude that few instructors can be accepted as proficient on certain CAD software and use computers during the design process. Nevertheless, we observe marginal resistance and more caution and skepticism in their statements. We read their sentences as statements of expectation both from the students using computers and from the instructors teaching CAD.

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Anahtar Sözcükler: bilgisayar; mimarlık eğitimi; mimari tasarım atölye yürütücüleri.

ATÖLYE YÜRÜTÜCÜLERİNİN BİLGİSAYARIN MİMARLIK EĞİTİMİNDEKİ ROLÜ ÜSTÜNE DÜŞÜNCELERİ: BİR ÖRNEK ÇALIŞMA

Bu makale, bilgisayarın mimarlık eğitimindeki rolüne ait atölye yürütücülerinin görüşlerini örneklemektedir. Bu amaçla ucu açık sorular ve söyleşileri içeren niteliksel bir araştırma atölye yürütücülerinin tasarım ve bilgisayar ilişkisini nasıl değerlendirdiklerini ve kavramsallaştırdıklarını tanımlamak ve açımlamak amacıyla yapılmıştır. Bir yandan, stüdyo yürütücüleri arasında bilgisayarın tasarım sürecindeki rolüne dair keskin ayrımlar yapılıp yapılamayacağı araştırılırken, diğer yandan, varsa, yürütücülerin bilgisayara karşı dirençlerinin nedenleri anlaşılmaya çalışılmıştır. Makale, araştırmanın bulgularını sunduktan sonra farklı sonuçların arasındaki ilişkiyi konuyla ilgili literatür bağlamında tartışmaktadır.