# The Relationship between Students' Mimetic Approaches and Learning Styles in Architectural Design Education

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## Abstract

Architects' attitudes most likely get from the common values obtained during their education and these values are acquired within the period of architectural education i.e., from the first year to the last year. In this sense, design problems are mostly defined with the help of mimetics and it is believed that thinking through mimetics enables the student to explain and understand an unknown situation relative to a familiar situation. So, believing that each student in the design studio uses certain language codes and develops them with knowledge, in this paper the design preferences of four architecture students at three different stages of their education are cross-sectionally analysed using the method called "Metaphorical Reasoning: Context and Depth" and the design approaches of each student are revealed. As shown in this study, some students have an excellent ability to use abstract concepts and have been able to switch between resources (between-domain sources and within-domain sources) very boldly. In the process, the accumulation of knowledge and education changed their mimetic behaviour, and the abstract concepts of some novices became more complex as their education progressed. On the other hand, some other novices who took tangible design approaches remained almost unchanged until the end. Considering that these different mimetic approaches of students are related to their learning styles, Kolb's Learning Style Inventory (LSI) method was used and learning styles of four students were revealed. The learning styles of the students obtained by Kolb's Learning Style Inventory (LSI) method support all the findings.

## Keywords

architectural education, mimetic approach, learning style, analogy, abstraction

## 1 Introduction

Studies focusing on a student's design approach to understand how freshman perceive and understand an environment differently from pre-architects are numerous in the literature. However, any difference of appreciation of architecture students cross-sectionally at different stages of their education – that is, differing interpretations of the same students through their years of architectural education – has not been studied much. Wilson and Canter (1990) and Wilson (1996) have shown some changes in visual choices of architectural students and the conceptual mutation that takes place through each year of professional training. These studies might be defined as *cross-sectional*, but their concentration is completely on how each student evaluates existing design images, not on a design problem that each individually tried to solve. The current study was carried out to fill the gap in *cross-sectional* related works lacking in the literature. Four students (all male) were monitored over three different semesters (not consecutively but skipping a semester each time). In this way, the complexity of the use of *mimetics* by an architectural student in a particular design problem, the creation of goals and constraints for each student, and the application of contextual relationships to a design problem were examined.

As Antoniades (1990) mentions the potential of *mimetics* has been recognized by some architectural instructors mentioning it as *the bedrock of imagination*. According to Heynen (1999), *mimesis* is a not direct imitation, but rather touch on general affinities and differences, specifying common forms of resemblance. As Fez-Barringten (2012) states, everything between each other and our environment is almost related to the mimetics (Lakoff, 1993). Casakin (2004; 2006; 2007; 2012) has conducted a range of empirical studies on *mimetics* and design problem solving. According to Casakin (2004),

*mimetics* in the architectural design studio can contribute particularly to have an idea about metaphorical reasoning. In the design studio (Casakin, 2007), *mimetics* help designers understand unknown design problems by combining them with known situations. Casakin (2006) has determined that *mimetics* were a bit more useful and less difficult in the early stages of the design process known as conceptual design. Thinking through *mimetics* (Casakin and Goldschmidt, 1999) help novices to notably improve their thinking ability. Novice designers tend to perform poorly at the beginning of a design process – especially in the creation of design concepts – while using metaphors (Casakin, 2004; Casakin and Goldschmidt, 1999). Finally, Casakin (2012) has shown that the fifth-year architecture students also developed metaphors that played an important role in the final stages of design.

The aim of the work is to show how a novice designer changes design attitudes - while using *mimetics* through different steps of his/her architectural education. As Welling (2007) defines, a mimetic approach is realized through metaphorical reasoning operations. Accordingly with this study, the architectural preferences and differing interpretations of four students throughout their years of architectural education, starting from second year-second term, M202 as freshmen and through the fourth year-second term- Graduation Project as a pre-architect were *cross-sectionally* analysed using a method called "Metaphorical Reasoning: Context and Depth" (Akalın, 2018; Özkan Yazgan and Akalın, 2019). Besides the curiosity to discover the truth underlying different mimetic attitudes led the researchers to relate the findings to Kolb's Learning Style Inventory (LSI). In Kolb's (1984) view learning is defined as the creation of knowledge through the transformation of experience. In this process, students continually perceive and process information, as they learn by doing, as well as by reflecting on their actions. The details of the methods are given below.

## 2 Methodological structure of the study
### 2.1 Metaphorical Reasoning: Context and Depth
There is general agreement that metaphorical reasoning involves the transfer of relational information from a domain (source or base) that already exists in memory to the domain (target) to be explained (Vosniadou and Ortony, 1989). Some researchers see the distance between source and target as an important element changing the outcome of metaphorical reasoning (Christensen and Schunn, 2007). The level of complexity in accessing and transmitting a *mimetic approach* largely depends on how close or far the distance between the target and the source is (Johnson-Laird, 1989). As Casakin (2004) notes, with the *mimetic approach*, students are mostly associated with *within-domain sources* (context related where context and source and target are embedded in the same or very close domain). On the contrary Vosniadou and Ortony (1989) have argued that a successful *mimetic approach* could be used between any two items in the same domain (*between-domain sources*). According to Casakin (2004) *between-domain sources* are based on textural commonalities and are therefore harder to structure. However, when structured, they lead to important metaphorical relations. As he mentions, compare to novices, experts mostly create their context where the source and the target belong to diverse domains (more likely *between-domain sources*). Similarly, Bonnardel and Marméche (2004) have found that experts invoke more *between-domain sources* than *within-domain sources.* In contrast, Christensen and Schunn (2007) have found that experts use both *within-dom*ain and *between-domain analogies*, but primarily *within-domain*, when trying improvements to existing structures. In this work, using the *domain sources* in conjunction with the metaphorical reasoning operations of Welling (2007), which are analogy, abstraction and combination, a conceptual framework is structured:

- *Analogy* refers to the transfer of a conceptual structure from a habitual context to another innovative context. (Welling, 2007). In terms of analogy, when there is a **direct connotation** the form itself emulates something (tangible or abstract) (e.g.: design emulating a tower, a bazaar range, fashion street, a square, etc). When there is **indirect connotation** emulation is based on a reference (e.g. tower/bazaaar oriented design).
- *Abstraction* has been described by Root-Bernstein (1991:p.87) as a simplification and elimination of unnecessary details to reveal the underlying order, model or structure. That is, once the relationships between the entities are discovered, they can be shown more clearly in a simplified presentation, leaving the details not needed (Welling, 2007). Piaget (1968) distinguished between **empirical abstraction** – focusing on objects – and **reflective abstraction** – focusing on concepts, events and actions but mostly the absent ones those who are lost but live in memories.
- Lastly Simonton (1999) has defined **combination** as the merging of two or more concepts into one new

idea. Mumford et al. (1991) have stated that creative thinking comes from new combinations of old ideas. In addition, they state that the combination can be achieved not only by blending different concepts in advance, but also by rearranging the elements in an existing concept. Similarly, Antoniades (1990) believes in the originality of the combination and states that it is not ideal to rely only on tangible metaphors or intangible metaphors and introduces a third category of architectural metaphors: the *combined metaphor*. It is the one that conceptual and visual ones' overlap as components of the origin, that is the combination of both tangible (analogy) and abstract metaphors.

Both *within-domain sources* and *between-domain sources* are mainly based on different depths (*surface features* and *deep structures*) which are explained based on the experience. Beauregard (2003) states that *surface features* include the settings, events and objects mentioned in the problem. Blessing and Ross (1996), as one of the authors working on the sources showed significant correlations between problems with similar *surface features* and *deep structures*. Although experts often focus on the *deep structure* of a problem, they claimed that the same experts use *surface features* to access a source problem. Casakin (2004) has shown that both experts and novices can use *deep structures* from existing visual sources and structure successful *mimetics* (Table 1).

## 2.2 Kolb's Learning Style Inventory and metaphorical reasoning

Kolb (1984) developed a measurement LSI (Learning Style Inventory: all the versions) tool has twelve multiple choice questions which have four different responses. In the new version of KLSI (Version 4.0.), there are 20 items in this format-12 that are similar to the items in the version 3.1. (and all previous versions) and 8 additional items that are about learning in different contexts. These 8 items are used to assess learning flexibility (Kolb and Kolb, 2013). In this research, we used version 3.1. to identify the students' learning styles. In version 3.1., each of the questions the respondent asked to rate four sentence endings to describe his/her learning performance best. The calculation of four scores has been done using the test key. These scores are classified under 4 modes of the Kolb's Learning cycle as **CE** (*Concrete Experience*), **RO** (*Reflective Observation*), **AC** (*Abstract Conceptualization*) and **AE** (*Active Experience*). After subtracting the score of the CE from the score of the AC and subtracting score of the RO from the score of the AE, two combined scores are determined the position of the individual learner in two bipolar scales. The two scores mean the different ways which students learn; the first (AC-CE) axis shows the students' perceiving new information or experience, the second (AE-RO) axis shows the way of students' processing the information. With the combines of these scores indicates the students' learning

**Table 1** Metaphorical Reasoning: Context and Depth

| | DEEP STRUCTURES | SURFACE FEATURES | | |
|---|---|---|---|---|
| | a different setting-concept/other related historical examples | highlighted item(s) in anywhere | an event can be anywhere/ momentarily events | |
| BETWEEN DOMAIN SOURCES | | | | Analogy |
| | | | | direct connotation and indirect connotation |
| has its own context | | | | Abstraction |
| | | | | empirical abstraction and reflective abstraction |
| | urban setting/ historical past | highlighted item(s) of the site | context related event | |
| WTHIN DOMAIN SOURCES | | | | Analogy |
| | | | | direct connotation and indirect connotation |
| context related | | | | Abstraction |
| | | | | empirical abstraction and reflective abstraction |

style preferences. Four quadrants of the learning cycle reflect Kolb's four learning styles (Kolb, 1999):

1. *Diverger* (watching and feeling),
2. *Assimilator* (watching and thinking),
3. *Converger* (acting and thinking) and
4. *Accommodator* (acting and feeling).

The place of any individual both in the vertical and horizontal axis on "Nine Region Learning Style Type Grid" represents the exact learning style of that individual. Each learning style has its own strengths and weaknesses but that does not mean that one is better than the other (Demirbaş and Demirkan, 2003:p.442). Besides Kolb's four learning styles, Abbey et al. (1985) identified four additional learning styles as *Northerner* (feeling, acting and reflecting), *Easterner* (reflecting, feeling and thinking), *Southerner* (thinking, acting and reflecting) and *Westerner* (acting, feeling and thinking). In addition to that *Balancing* (thinking, feeling, watching and acting) learning style was identified by Mainemelis et al. (2002). According to them, people who have balanced learning profiles in both dimensions of the LSI are more adaptively flexible learners as measured by the Adaptive Style Inventory (ASI) (Kolb and Kolb, 2005). In balancing learning style, it balances concrete experience, abstract conceptualization, active experimentation and reflective observation. Kolb and Kolb (2017) identify the balancing style as: "adapting by weighing the pros and cons of acting versus reflecting and experiencing versus thinking." (Kolb and Kolb, 2017:p.24). "The Balancing style is characterized by the ability to adapt weighing the pros and cons of acting versus reflecting and experiencing versus thinking" (Kolb and Kolb, 2017:p.24). They think, feel, watch and act.

Thus, Kolb's four learning styles were expanded to nine distinct styles (Kolb and Kolb, 2005) and Fig. 1 (Demirbas and Demirkan, 2007) illustrates the nine-region learning style and experiential learning model cycle.

## 3 The design studio model and analysis of the students' studio projects

This research focuses on the projects of four students who studied at department of architecture. Using a cross-sectional study, the projects of the students at three different stages within three years (second semester 2016-2017, second semester 2017-2018 and second semester 2018-2019) have been examined. Regarding these three semesters, which each last 14 weeks, different contexts were studied in each term. Many and various types of projects
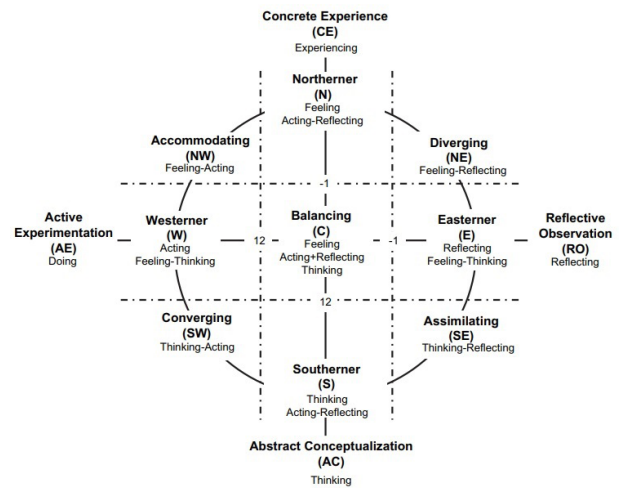


**Fig. 1** Nine Region Learning Style Type Grid (reprinted from Demirbas and Demirkan (2007:p.348, Fig. 2) © with permission from Elsevier)

were experienced by the students during these studios – from conservation to adaptation within existing heritage to new-build projects to reuse developments. In addition, the architectural context of the students' projects differed from a traditional/local character to a more contemporary urban environment.

In order not to restrict the creativity of students, often the project site alternatives are roughly set by the instructors, but never strictly demarcated. Based on the first-hand experience, they are motivated to read the site and develop a sensory relationship with it, rather than merely link it with site plans or photos. In the first two studio examples, possible sites were offered to the students, and they were left free to decide which one they would use. In the third studio project, the building to revitalize was certain, but the students were free to pick the sites in the near vicinity to use for their scenarios.

Generally, after the site visit, teachers and students start discussing the site's *characters* (Norberg-Schultz, 1980) in the studio lasting for almost two or three lectures. The students are inquired to write a report of their feelings in the field. This report is substantial for understanding how each student perceive the site, what details and experiences are collected. The relationship of the project site at the urban scale/context is individually examined and the potentials and the problems of the site are discussed in the studio as a group. To enhance the cultural consciousness of the students, analytical discussions take place about the characteristics of the site, the values, etc. Throughout architectural design education, they are expected to sense the context first and then create designs that can be merged with the context.

Before explaining the student projects, the site details and the requirements of each site are introduced below.

*First studio example (M202- 2nd term, 2016-2017):* The design problem for all students is to propose a visitor centre for an ancient settlement in northwest Anatolia. A well-preserved Hellenic temple, a stadium-theatre, a portico street, agora and gymnasium are some of the landmark elements at the site. The present texture of the settlement consists of a mixture of these ancient remains and a combination of traditional residences from the 20th century. The students are expected to design a meeting place for first time visitors that would also include cultural and recreational areas for the local residents. A draft spatial program issued to the students – for guidance only – included a main foyer with presentation-communication kiosks, venues for audio-visual presentations, a brochure-map-guidebook section, an exhibition hall, seminar hall(s), commercial units and a café. Regarding the needs of the local community, students can freely develop facilities by adding or excluding them for valid reasons. In this way, some other programs are expected from the students to help organize the meeting place and the nearby area.

*Second studio example (M302- 2nd term, 2017-2018):* The main design problem for students is to suggest a performance centre for all kinds of activities that affect them in the Istanbul, neighbourhood of Galata and provide something they think is missing in the city. The program has to be for both local residents and tourists. Besides, depending on the performance, alternatives for variety of uses has to be offered.

*Third studio example (M402- (The Graduation Project) 2nd term, 2018-2019):* The basic design problem concerns the revitalisation of a shopping mall and its immediate surroundings in Turkey's capital city, Ankara. There is not a basic theme given. Instead, the students are expected to offer a program not only for the existing building but also for the land to the south of it. Each student is encouraged to develop reuse proposal(s) for the existing building and to build revitalization scenario(s) for the site considering the potentials of the area, especially the green axis extending in a southeast–northwest direction. In addition, the students are also requested to solve the functional difficulty caused by the difference of twenty meters between the project site and the main boulevard in the north-east direction.

It was believed that some novice designers who tend to feel the space at the high level of *authentic insideness* (Relph, 1976) would relate different domains perfectly in the later stages of their education. But, in general, most of the abstract approaches of novices would change to more complicated mimetic thoughts (analogy) in the later periods of their education. Considering that these different mimetic approaches of the students are related to their learning styles, the learning style of four students was revealed using the Kolb method. The details of the projects of four students analysed using the "Metaphorical Reasoning: Context and Depth" method and the Kolb method results obtained for each student are as follows.

### 3.1 Mimetic findings
### 3.1.1 Student M
*Project M202:* By interpreting the importance of different layers at the site, the main concern is to knit all the existing layers into each other (WITHIN DOMAIN SOURCES / abstraction-*reflective abstraction* and DEEP STRUCTURES / historical past**:** nested mesh of the historical past and the future).

*Project M302:* In a performance art centre, the tension between the physical boundaries of the body and the space is defined by the interlocking masses (BETWEEN DOMAIN SOURCES / abstraction-*reflective abstraction* and SURFACE FEATURES / an event can be anywhere: nested tension), and a flowing public square is designed towards the tower (WITHIN DOMAIN SOURCES / abstraction-*reflective abstraction* and SURFACE FEATURES / highlighted item(s) of the site: the square).
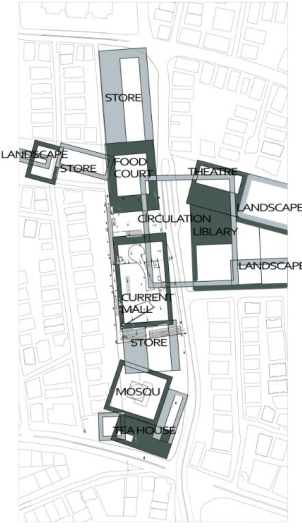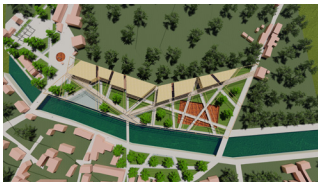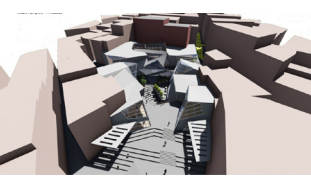
*Project M402:* Fluid spaces intertwined with a chain metaphor concept for the solution of physical and functional disconnection/discontinuity in the field (BETWEEN DOMAIN SOURCES / abstraction-*reflective abstraction* and DEEP STRUCTURES / a different setting-concept: nested chain), and a bazaar concept from the memory of the site is revived (WITHIN DOMAIN SOURCES / abstraction-*reflective abstraction* and SURFACE FEATURES / context related event: revived bazaar) (Table 2).

### 3.1.2 Student N
*Project M202:* By interpreting the archaeological features of the area with an integrating shell design that encompasses and integrates historical structures and ruins, the design starts from the soil and ends in the soil (WITHIN DOMAIN SOURCES / abstraction-*reflective abstraction* and DEEP STRUCTURES / historical past: integrating shell).

*Project M302:* an abstract urban interspace connecting different levels (WITHIN DOMAIN SOURCES / abstraction - *empirical abstraction* and DEEP STRUCTURES / urban setting:  urban interspace) and with the effect of
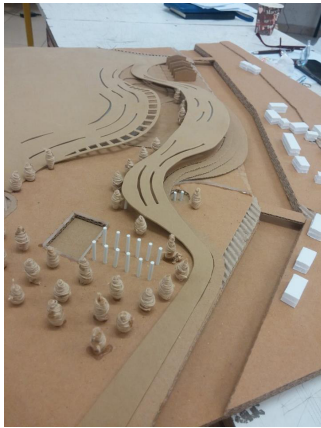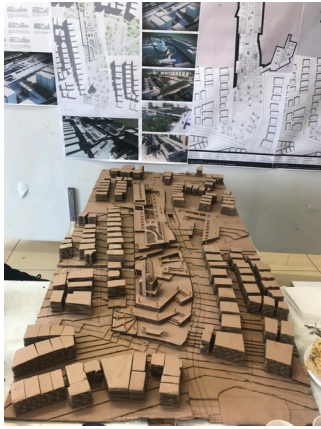
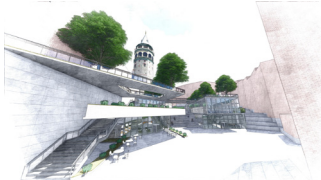**Table 2** Metaphorical reasoning, student M

| Student M | DEEP STRUCTURES | | SURFACE FEATURES | |
|---|---|---|---|---|
| | a different setting-concept / other related historical examples | highlighted item(s) in anywhere | an event can be anywhere / momentarily events | |
| | | | | Analogy<br>direct and indirect |
| BETWEEN DOMAIN SOURCES | M 402<br>reflective abstraction<br>(nested chain) | | M 302<br>reflective abstraction<br>(nested tension) | Abstraction<br>empirical and reflective |
| | the urban setting/historical past | highlighted item(s) of the site | context related event | |
| | | | | Analogy<br>direct and indirect |
| WITHIN DOMAIN SOURCES | M 202<br>reflective abstraction<br>(nested mesh) | M 302<br>reflective abstraction<br>(the flowing square) | M 402<br>reflective abstraction<br>(revived bazaar) | Abstraction<br>empirical and reflective |

being affected by the surrounding squares, the student proposes new squares that rise at different levels and surround the tower in the centre (WITHIN DOMAIN SOURCES / analogy - *direct connotation* and SURFACE FEATURES / highlighted item(s) of the site: the square).

*Project M402:* As homage to the industrial past of the area, the project emphasizes the industrial history and its immediate surroundings by proposing a transportation design school in different levels, as if different layers of history considering the flow of the users in streets (WITHIN DOMAIN SOURCES / abstraction-*reflective abstraction* and SURFACE FEATURES / context related event: layers of industrial past) (Table 3).

**Table 3** Metaphorical reasoning, student N

| Student N | DEEP STRUCTURES | SURFACE FEATURES | |
|---|---|---|---|
| | the urban setting / historical past | highlighted item(s) of the site | context related event |



M 302
analogy-direct connotation
(the square)

Analogy

direct and indirect

WITHIN
DOMAIN
SOURCES



M 202
reflective abstraction
(integrating shell)



M 402
reflective abstraction
(layers of industrial past)

Abstraction

empirical and
reflective



M 302
empirical abstraction
(urban interspace)

### 3.1.3 Student C

*Project M202:* The design emphasizes the archaeological axis and values in the field with an analogical concept (WITHIN DOMAIN SOURCES / analogy - *indirect connotation* and SURFACE FEATURES / highlighted item(s) of the site: the archaeological axis and the values)

*Project M302:* By designing platforms wrapping around the tower, the main concern was to have a radial form preserving the tower at the core (WITHIN DOMAIN SOURCES / analogy - *indirect connotation* and SURFACE FEATURES / / highlighted item(s) of the site: the tower).

*Project M402*: A radiant design crowns the mosque at the centre of the site, and a curved axis continues until the other edge of the site (WITHIN DOMAIN SOURCES / analogy - *indirect connotation* and SURFACE FEATURES / / highlighted item(s) of the site: the mosque) (Table 4).

**Table 4** Metaphorical reasoning, student C

| Student C | DEEP STRUCTURES | SURFACE FEATURES | |
|---|---|---|---|
| | the urban setting/historical past | highlighted item(s) of the site | context related event |
| WITHIN DOMAIN SOURCES | |  M 202 indirect connotation (the archaeological axis, the values)  M 302 indirect connotation (the tower)  M 402 indirect connotation (the mosque) | Analogy direct and indirect |
| | | | Abstraction empirical and reflective |

### 3.1.4 Student O

*Project M202:* The main concern was to take people up to a roof for a better sightseeing experience of the temple and an inner alley is designed inside the project connecting the village square to an unearthed temple (WITHIN DOMAIN SOURCES / analogy - *indirect connotation*: and SURFACE FEATURES / / highlighted item(s) of the site: the temple).

*Project M302:* After being influenced by the symbolic attraction of the tower, a cube focusing to communicate visually with the tower is proposed (WITHIN DOMAIN

SOURCES / analogy - *indirect connotation* and SURFACE FEATURES / / highlighted item(s) of the site: the tower).

*Project M402:* After being influenced by the symbolic attraction of the mausoleum, which is a very important image in the nearby, a green axis heading through the mausoleum is designed (WITHIN DOMAIN SOURCES / analogy - *indirect connotation* and SURFACE FEATURES / / highlighted item(s) of the site: the mausoleum) (Table 5).

**Table 5** Metaphorical reasoning, student O

| Student O | DEEP STRUCTURES | SURFACE FEATURES | | |
|---|---|---|---|---|
| | the urban setting/historical past | highlighted item(s) of the site | context related event | |



M 202
indirect connotation
(the temple)



M 302
indirect connotation
(the tower)

WITHIN DOMAIN SOURCES

Analogy

direct and indirect



M 402
indirect connotation
(the mausoleum)

Abstraction

empirical and reflective

### 3.2 Mimetic findings and Kolb's learning styles
According to the analysis, among the projects in three semesters, only one student (Student M) used *abstract* concepts combining sources both in the same domain (within domain) and between domains. This student had the talent of picking up the contextual details and combining them in different *mimetics*, that is *deep structures* or *surface features*. He was very confident in blending the clues of the context into his context. Similarly, another student's (Student N) *mimetic* attitudes were mostly abstract all three semesters but limited only with *within domain sources*. He works partially with *direct connotations* in the middle of the education but returned to the *reflective abstractions*. The remaining two students (Student C and Student O), on the other hand, worked only with *indirect connotations* in the same domain (*within-domain sources*) and did not change at all their design attitudes all through three semesters.

To clarify the reason behind the mimetic behaviour of each student the questionnaire form of Kolb was administered to the students who completed the Graduation Project at the end of the fourth year. The results of all four students were located into the "Nine Region Learning Style Type Grid" (Fig. 2) which gives detailed analysis of the learning styles of each student.

### 3.2.1 Student M
*Kolb's "Nine Region Learning Style Type Grid" analysis:* Student M is in the quarter between *reflective observation* (RO) and *abstract conceptualization* (AC). His learning



◉ Student M,  ✿ Student N,  ◆ Student C,  ▲ Student O

**Fig. 2** Results located on "Nine Region Learning Style Type Grid" (adapted from Demirbas and Demirkan (2007:p.348, Fig. 2) © with permission from Elsevier)

style is *Assimilating* which is combination of *reflective observation* and *abstract conceptualization* phases. According to Kolb, people with this learning style are best at understanding a wide range of information and able to convert it into concise, logical form. (Kolb and Kolb, 2005). Assimilating learners experience the world symbolically and transform it to information through thought. This kind of people are less interested in people and more concerned with abstract concepts but are less concerned with the practical use of theories (Smith and Kolb, 1996).
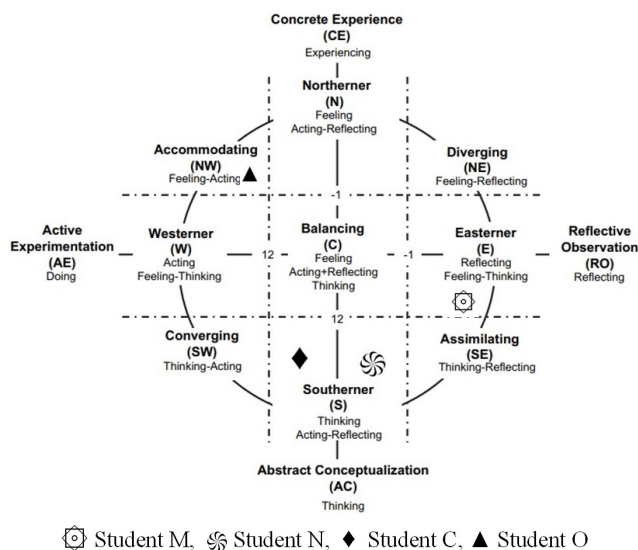
In addition to that, in detail Student M is an Easterner which is good at a deep reflection but might have trouble putting plans into action since he spends much time in thinking and reflection. The learning strengths of this style are "a capacity for deep reflection informed by the ability to be both feeling oriented and conceptual" (Kolb and Kolb, 2005:p.197). The persons with an Easterly pattern have trouble putting plans into action. Consequently, they spend much time buried in thought. Because the action is short circuited, their thoughts are about their feelings rather than about their direct actions; this imbalanced cycle lacks the rejuvenation provided by actions (Hunt, 1987:p.155).

*Mimetic behaviour:* Student M's design approaches match up with his learning style. He perceives information abstractly and processes it reflectively. He prefers to learn by watching and thinking. When we look at his mimetic behaviour through his learning life, he always uses *abstraction-reflective abstraction* and *deep structures*. He has the talent of viewing issues from different perspectives, and prefers watching while he learns, observes carefully before making judgements. He prefers watching and thinking while learning and looks for the meaning of things and prefers learning by thinking. This means analyses ideas logically, plans systematically and acts on an intellectual level.

### 3.2.2 Student N
*Kolb's "Nine Region Learning Style Type Grid" analysis:* Student N is in the quarter between *reflective observation* (RO) and *abstract conceptualization* (AC). His learning style is partially *Assimilating* but he is much closer to Southerner. In Southerner learning style, they have combination learning skills of assimilating and converging learners. Their reflection is mechanical and in the design process they do not act with their emotions (Demirbas and Demirkan, 2007). They think, watch and act.

*Mimetic behaviour:* Student N mostly uses abstract concepts but limited only with *within domain sources*.

He works partially with direct connotations in the middle of his education but returns to the *reflective abstractions*.

### 3.2.3 Student C

*Kolb's "Nine Region Learning Style Type Grid" analysis:* Student C is in the quarter between *abstract conceptualization* (AC) and *active experimentation* (AE). His learning style is partially *Converging* that means his learning abilities heavily rely on logic and organization. He is much closer to Southerner. They are pragmatic thinkers characterized by having hypothetical deductive reasoning. They do extremely well at practical applications of theories and ideas. Hsu (1999) states that converging learners bring a logical, pragmatic and unemotional perspective to any situation. Converging learners are more concerned with the relative truth than absolute truth. The knowledge of converging learners is organised, so that through hypothetical deductive reasoning, they can focus their knowledge on specific problems (Smith and Kolb, 1996:p.14). According to Smith and Kolb's (1996) description, converging learners are unemotional and prefer to deal with things rather than people.

*Mimetic behaviour:* He works only with indirect connotations in the same domain (*within domain sources*) does not change at all his design attitudes. His approach to the design problems is pragmatic and unemotional.

### 3.2.4 Student O

*Kolb's "Nine Region Learning Style Type Grid" analysis:* Student O is in the quarter between *active experimentation* (AE) and *concrete experience* (CE) and close to *Accommodating* (NW). **Accommodating learners'** learning tendencies are based on practical experience. These types of learners find pleasure in taking risks and challenges. They are unsystematic, they also prefer to act according to instincts and intuition and learn by trial and error (Tezel and Casakin, 2010:p.266). The greatest interest of accommodating learners lies in doing things (Kolb, 1984; Smith and Kolb, 1996). As Hsu (1999) states accommodating learners grasp their environments concretely through their feelings and utilize action to transform information obtained. Accommodators prefer concrete experience and active experimentation and learn best from hands-on experience. Individuals with this style handle challenging activity easily, take risks, and solve problems practically (Kara, 2009).

*Mimetic behaviour:* He works only with indirect connotations in the same domain (*within domain sources*) without changing the design attitudes all through the semesters.

## 4 Conclusion

Continuity and change have become important issues not only for the built environment, but also in the education. Incorporating built-in heritage values into studio-based design education poses challenges that require new didactic perspectives. As mentioned earlier, the type of project – from conservation to adaptation within existing heritage to new-build projects to reuse developments – has implications for the education of the students. Consequently, relying on the architectural context of the projects in three semesters (from traditional/local character to the contemporary urban environment), "Metaphorical Reasoning: Context and Depth" method was used to understand the contextual attitudes and the language codes of each student. As Strickfaden and Heylighen (2010) define, students gradually adopt language codes, stylistic preferences, and the rituals of architects, and gradually move away from laypeople identity. Similarly, Downing (1992) has defined these codes in the form of an image bank that helps students codify and order the endlessly complex world of human experience with "known" experience through which the "unknown" is explored. Ortony (1993) explains that thinking through *mimetics* makes it possible for a student to explain and understand an unknown situation according to a familiar situation. So, each student in the design studio believe to use certain language codes and improved them with more and more accumulated knowledge.

Wilson (1996) has conducted an analysis in order to examine the hypothesis that architectural education slowly teaches different standards of judgements, which is the characteristic of architecture. He has shown some changes in the preferences of architecture students during five different stages of education. As he noted, there are two different structural systems to consider: conceptualization and evaluation. The first is basically a system of descriptive, objective and non-evaluative concepts for organizing and understanding architecture, and the second guides subjective evaluative judgments. Wilson explains that during education, students develop increasingly intangible concepts, which is becoming more complicated, with the length of education. Similarly, in another work Wilson and Canter (1990) have made the conceptual transformation occurring in every year of education visible, believing that the concepts used by architects were developed during their education. In their work, in every five-year architectural education, seventy-five students have been asked to rank examples of contemporary architecture according to their own created structures. They have shown that with increasing training time, the concept definition becomes

more complicated, and the types of structures used show progress towards the more complex, abstract concepts. However, none of these studies above have been examined cross-sectionally, in other words, none of them is based on the follow-up of the mimetic approaches of the same student in the education process. There is a serious deficiency in the literature in this regard. Therefore, the findings in this article do not completely coincide with Wilson's findings. As shown in the analysis, all three semesters, some students (Student M and Student N) had the perfect talent of using abstract (intangible) concepts that was very simple at the beginning but complicated at the end of the third semester. Student M managed to switch very confidently between both *between domain sources* and *within-domain sources*. Interestingly Student N was tangible (analogy) in the middle, but mostly continued with complicated abstract thoughts in the later periods of the training. To summarize, the abstract concepts of these students started very pure and simple but have become more complex as their training progressed. In other words, the accumulation of training with knowledge in the process changed their mimetic behaviour from simple to complex design approaches. These students on the right side of the *Abstract Conceptualization* (AC) – *Concrete Experience* (CE) vertical axis is different in their perceiving new information or experience compared to the left side. They think, act, feel and reflect. Interestingly the other students (Student O and Student C) on the left side of the axis, however, adopt tangible design approaches (indirect connotations) almost till the very end of their education. They think-act and feel, but do not reflect. The reflection, here, is the key talent which comes with abstraction. These research findings show some parallels with the study of learning styles in architecture conducted by Newland et al. (1987). They found that architecture students prefer a combination of reflective observation and abstract conceptualization, which is called the assimilative learning style by Kolb.

Heynen (1999) has explored the mimesis concepts of Walter Benjamin and Theodor W. Adorno, and recalls, Adorno's dual character of art: "art has a double character:

on the one hand, it is fait social and socially determined [heteronomous]; on the other hand, it is autonomous and obedient only to its own styling principles" (Zarzar, 2008:p.9 cited Heynen, 1999:p.188). However, not only professional architects but also students of architecture must learn the potential use of *mimetics* in design, both in autonomous and heteronomous moments. The final point here is that while mimesis has been accepted by many academics as a method of production or as a tool in the design studio, there are almost no studies examining the cross-sectional process of a student's education over the many years it takes place. For that aim, more cross-sectional works need to be carried out, combining both autonomous and heteronomous moments in design. Besides more design studies need to be done with the mimetic findings coincided with learning styles. Individuals learn in different ways; therefore, every student has different learning styles. The more an academic understands students' differences in learning, the better the opportunity to increase success in architectural education. Ward et al. (2004), for instance, have demonstrated that encouraging abstract thought results in increased authenticity. Getting to know students with intangible design skills in the early stages of design education would be an advantage in terms of which method the educator has to follow in discovering the authentic. As mentioned earlier each learning style has its own strengths and weaknesses but that does not mean that one is better than the other (Demirbaş and Demirkan, 2003). To summarize, the findings in this paper is important for educators to discover the relationships between students' mimetic design approaches and learning styles while they are still at the learning stage. In general, the findings are to emphasize the strengths and weaknesses of each student in advance in order to take some precautions in terms of design education.

## Acknowledgements

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