Learning by Doing in Architecture Education: Building Science Course Example

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Abstract

With the development of technology, the living conditions and needs of individuals has also changed. These changes, which affect the personality traits, values, expectations and trends of the generations, require a revised and continuous review of architecture education. In architecture education studies carried out in this direction in recent years, it is seen that the concept of education of the architect is at the forefront. It is aimed to gain lifelong learning ability in the education of the architect who is not limited to the school and is expected to adapt to the developments by continuing after the education he / she has received. On the other hand, the features of the generation gain importance in the methods to be used in today's learning environment in which generation Z individuals take part as learners. Considering that increasing the integration of informal educational environments and formal education will contribute in mentioned point of views, learning by doing method is tried in building science compulsory courses at GTU Department of Architecture. This study, which aims to examine the results of this experimental method applied to the Z generation learners, is limited to the 2018-2019 spring semester building science I course. According to the study results of the wall workshop and the feedback form made afterward, it has been observed that new generation learners prefer to learn by doing, by experiencing rather than by listening or drawing.

Keywords: Architecture education, generation Z, workshops as an informal education, learning by doing method, building science courses at GTU architecture

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1. Introduction

Changing living conditions with developing technology affects personality traits of individuals, concepts of value, expectations and their trends. These changes observed in individuals also affect the whole society. Education has an important role to form the society, too. Because of its location at the intersection of science and social disciplines to cover theory and practice, architecture education also needs to change or develop, too.

Architecture education includes techniques and also various notional concepts such as, imagination, intuition, flexibility and creativity. It is beneficial for architect candidates to start from their own design experience in learning abstract concepts that are self-learnable rather than taught (Tuğlu Karslı and Özker, 2014). In this respect, studios are used as learning environments instead of classical classroom education known in architectural education. Architect candidates are expected to integrate the skills acquired in formal-obligatory and elective courses while producing their own designs in studios. In this way, their ability to interpret can be improved by combining existing data with their ability to think abstractly.

Today, architecture education is often discussed in national and international environments. In such discussions, the concept of architectural education turns into the concept of 'education of the architect'; in the education of the architect, the concepts of 'sustainability in education' and 'flexibility' and gaining or redound 'lifelong learning' ability come into prominence (Aydınlı, 2009). In addition to formal education, the integration of informal education with the education of the architect is thought to contribute in these aspects. In learning abstract concepts that have the feature of being self-learnable rather than being taught, it is beneficial for individuals to start from their own experiences (Tuğlu Karslı and Özker, 2014). It is known that informal education has positive results in experiencing abstract design knowledge and developing design thinking skills, intuitive knowledge and creativity (Polatoğlu and Vural, 2012). It is thought that increasing informal education environments and integrating them with formal education will enable the architect to learn through experience in his / her education.

It is seen that today's learner of architecture education is generation Z. Individuals from generation Z have basic features related to technology. Technology or technological developments give them various advantages or disadvantages which change with their position in their whole life. For example, they are capable of performing multiple skills simultaneously. By this feature, they can save time at work. However, they can easily bore and cannot focus on their work easily. Because of these features, formal lessons such as building science in architecture education becomes more difficult to focus on.

Related to generation Z individuals features as above, it is suggested that today's learner generation Z individuals should learn by experience (Erden, 2017). Learning by experience or by doing method is seen that a method generally used in architecture education (Erbil, 2008; Gür and Yüncü, 2010; Şahin, 2013; Köse Doğan and Noraslı, 2019). Starting from this point of view, the learning by doing method is tested in building science compulsory courses at Department of Architecture of Gebze Technical University (GTU).

On the other hand, this study is limited to the 2018-2019 spring semester building science I course at the Department of Architecture of GTU. As an informal education way, a 'wall

workshop' with learning by doing method was arranged in the formal lesson in this semester. By this manuscript, discussing the results of the workshop and the method applied to generation Z learners in building science I lesson is aimed. It is thought that the findings from this study may be beneficial for the educators who are still trying to bring professional abilities to generation Z learners in architecture education. The educators may use similar methods including individual experiences, while studying with generation Z students.

2. Architecture Education and Learning by Doing Method

Architecture is the art of embodying the necessary spaces, aesthetic, functional requirements, technical and managerial obligations in order to facilitate people's lives and to carry on their activities such as housing, entertainment, working and resting (Hasol, 1998). Architecture solutions, designed and made mostly in response to a number of existing problems, may reflect functional, social, economic, political or symbolic intentions (Ching, 2007). In this respect, it is seen that the discipline of architecture is among the science and social disciplines, including theory and practice (Ciravoğlu, 2014).

Today, architecture education is widely discussed in various national and international architecture meetings (such as MOBBIG-Communication Group Meeting of Heads of Departments of Architecture Schools, Architecture and Education Congress, UIA-International Union of Architects Congress). In addition, organizations such as the National Accreditation Board for Architecture (MIAK), the National Architectural Accreditation Board (NAAB-America) and the Royal Institute of British Architects (RIBA-England) on an international scale carry out studies on architecture education.

It is observed that the concept of architecture education has evolved into the concept of 'architect's education' (Aydınlı, 2009). In the education of the architect, the concepts of 'sustainability in education' and 'flexibility' and gaining or redound 'lifelong learning' ability come into prominence. In this sense, it is considered as the most basic conditions of lifelong learning for graduates to be able to constantly update their architectural knowledge, to gain flexible thinking skills and to have a critical point of view for this purpose (Aydınlı, 2009). In addition to formal education, integration of informal education with the education of the architect is thought to be important in gaining and updating such knowledge, skills and competencies. Informal education means out-of-class education with no hierarchy between the learner and the teacher outside the existing system and rules (Yürekli and Yürekli, 2004). In this type of education, which is not restricted to the school, all environments can be used as a training and observation area for candidates of architects (Tuğlu Karslı and Özker, 2014). Informal education is recognized to have positive results in "experiencing abstract design knowledge and developing design thinking skills, intuitive knowledge and creativity" (Polatoğlu and Vural, 2012: 480). It is known that informal trainings such as workshop, seminar and conference have important gains for architect candidates in terms of developing thinking ability, providing learning by doing, motivating, acquiring intuitive knowledge and gaining self-confidence. This situation, which is directly related to the fact that informal education is away from successful and unsuccessful evaluation, is seen to involve flexibility. Such trainings are thought to be effective in ensuring sustainability in the education of the architect in order to facilitate access to current information.

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On the other hand, a 'wall workshop' was integrated and applied in building science I course at GTU Architecture in 2018-19 spring semester as an informal education way. With this study, it is aimed to transfer the theoretical information in the course to professional practice. For this reason, learning by doing method is used in this workshop.

Learning by doing method is defined as a method that covers the learning activities and experiences of the students by living and feeling them (Erbil, 2008). By this way, it offers an educational environment that allows students to learn the building area, structure, material and material handling in practice (Şahin, 2013). For this reason, construction is a part of the design process. Learning by doing method is based on such topics as: Thinking and doing, cooperation (teamwork, unity of purpose, awareness of responsibility), service to the community and communication skills (Şahin, 2013). In this respect, it is thought that the method is suitable for the education of generation Z. Gür and Yüncü (2010) call 1: 1 learning for this method and they emphasized that 'the method is neither simulation of professional architecture nor the application of theoretical knowledge received directly in the field. 1: 1 learning is an architectural education environment with its unique tools and learning outcomes'. As it is seen that the method is generally used in 1/1 scale in architecture education (Köse Doğan and Noraslı, 2019), learning by doing method in the workshop applied in 1/10 scale and with appropriate mock-up materials, because of the limited duration and environment conditions of building science I course.

3. Generation Z and Its Features

The concept of generation is defined as "a group of people who were born in approximately the same years, shared the conditions of the same age, and therefore similar troubles, destinies, and were obliged to do similar tasks" (Turkish Language Society, 2019). The generations classified according to the years in which individuals were born are defined as 'Generation X' between 1965 and 1979, 'Generation Y' between 1980 and 1999, and 'Generation Z' after 2000 (Taş et al., 2017: 1035). As it is known that the generation Z is a learner of the current architecture education. For this reason, the features of generation Z individuals are summarized in this section of manuscript.

The generation Z individuals were born with technology. For this reason, this generation is also referred by various names such as 'internet generation, digital generation, millennium generation'. Z generation individuals are said to be individuals who integrate technology with their lives, have social network affiliations, have a fondness for virtual games, have an interest in global issues and have high adaptability. It is also mentioned that this generation is open to innovation, optimistic, talented, goal-oriented, well-educated, self-confident, easily bored and capable of performing multiple skills simultaneously (Erden, 2017). The individuals of this generation, also called learners of the digital age, are stated as individuals who learn knowledge fast, prefer graphic expression, prioritize winning and are competitive (Ardıç and Altun, 2017).

The passions of the members of the generation Z in the current higher education environment to the learning tools they can access whenever they want, means that the generation does not want to have difficulty in accessing information (Eğitimpedia, 2019). It is stated that their high self-confidence can cause them to be perceived as narcissistic, their quick withdrawal from work as lazy, and their desire for rapid rise and aggressive behavior

can cause them to clash with the generations before them (Erden, 2017). Generation Z individuals are also seen as individuals who enjoy activities that allow production, who have the ability to animate their long-term memories with games, storytelling and enabling them with dreams (Altunbay and Bıçak, 2018).

The following are examples of suggestions for people who will work with generation Z individuals and educators who will take part in the educational life of the individuals (Eğitimpedia, 2019; Erden, 2017).

- To reveal their entrepreneurship by giving them a free environment,
- Being motivated by rewards,
- Making them feel that they are important in solving problems or sharing information and establishing face-to-face communication instead of communication by message,
- Net sharing of the learning outcomes of the course with Z generation learners and their results,
- Taking suggestions for course content and course processing methods from them under possible circumstances,
- Giving them reading notes and encouraging them to take notes,
- Enrich the course with classroom activities, engaging visuals and team games that are directly related to the subject; in this way the student will be able to experience and learn,
- Giving simple and clear messages in ensuring their focus.

On the other hand, it is one of the important issues to consider in education today that the teacher tries to establish the balance of giving and receiving in a way that allows the learner to receive.

4. An Example of Learning by Doing Used in Building Science I Course in the Department of Architecture of GTU

As of the 2018-2019 academic year, three workshops consist of the method of learning by doing were conducted in the building science courses at the Department of Architecture in GTU. Due to the high number of students enrolled in the course and the physical environment impossibilities, arranged workshops do not include real life one-by-one. In this part of the manuscript, one of the workshops held in the building science courses was explained. The results of the 'wall workshop' from the 2018-2019 spring term of building science I course and its feedbacks are transferred.

MIM 142-coded building science (BS) I course, in the course plan of the undergraduate program of the Department of Architecture of GTU, is a compulsory course maintained at the 2nd semester of 1st year (spring) level. As of the 2017-2018 academic year, according to the updated course plan; BS I course is 4 hours with 2 (theory) + 2 (practice) + 0 (laboratory) and 5 ECTS credits. The attendance requirement of the course is 80%, which consists of theory and practice sections. BS I course includes the explanations and applications of the basic principles and their homework for the design of sub-systems such as components, parts and materials that form foundation, wall, floor building elements and also windows and doors. In addition to the theoretical explanations on reinforced concrete and masonry construction systems, wood and steel structural systems are included in the

last weeks of the BS I course. The courses are conducted with a group of faculty members, which varies with the semesters. In the lessons, theoretical information is conveyed mostly by the lecturer and the courses are completed with the applications carried out by the research assistants. The BS I course was conducted with one faculty member and four research assistants, which was opened in the spring semester of 2018-2019 academic year. A total of 130 students attended to this course in this semester. Most students were born in 2000 and later in the group as a generation Z member. In this respect, based on the suggestions of increasing the class activities mentioned for the generation Z individuals and enhancing them with team games directly related to the course subject, , a 'wall workshop' was organized in the 2018-19 spring semester's building science I course. It was also aimed to enable the student to learn through experience by the workshop.

The workshop was held in the last week of the semester (14th week) on the day and time of the lesson, which was taken four hours duration. The method of learning by doing was adopted to the workshop. Despite 130 students were seen on buildings science course, only 56 of them had taken part in the workshop. Groups of five students had worked as teams in the workshop and the students had chosen their team-mates by themselves.

The students worked on a 1/10 detail scale in the workshop. During the scale determination, previous workshop experiences, the number of existing students in the lesson and the duration of the workshop were taken into consideration. A section that contains the combination of ground floor and exterior wall elements in the air zone in a residential building was given to the students as a detail problem. This section was expected to be treated as close to the ground zone of building (Figure 1).
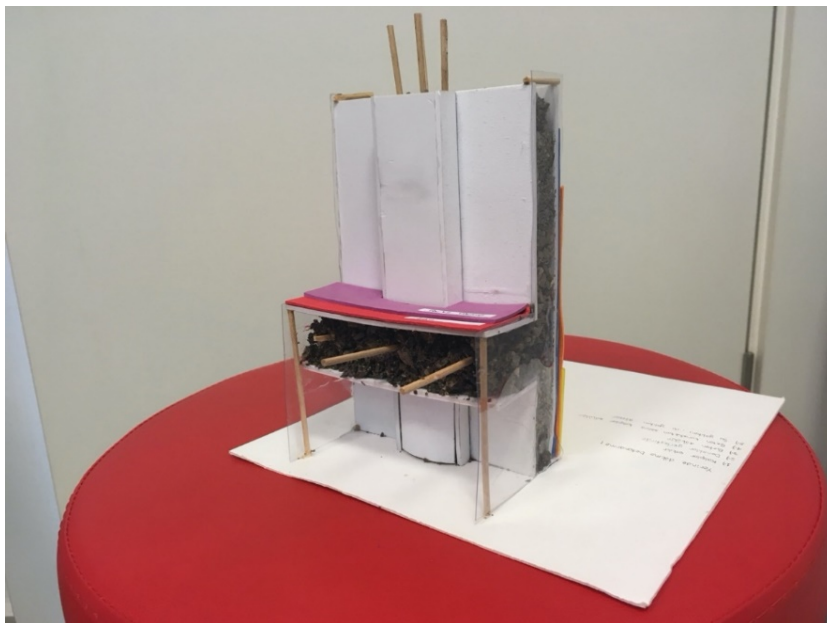
Figure 1. 1/10 scaled detail mockup - working area

Prior to the workshop, various preparations were carried out by the tutors of the course. In this sense, a total of 26 (130/5) research titles about wall materials were determined and given to the students as research subjects. In addition to traditional wall materials such as mudbrick and stone; such modern techniques as gabion, led screen, green wall, and moving wall were presented to the student groups in the 5th week of term, when the theoretical expression of the wall element had been explained (Figure 2; Figure 3). The teams, who chose what they wished from these research subjects, were asked to submit their

assignments digitally at the end of two weeks after the fifth week of term. By this way, after the theoretical explanation of the wall element, the students were provided to prepare the research items related to their detail section, which had been produced in the workshop.

Figure 2. 1/10 scaled detail mockup – led screen wall surface

Figure 3. 1/10 scaled detail mockup – concrete wall

In the 13th week of the course, in which the last theoretical lecture was finished, students were informed about the workshop which was held the following week. Students were asked to bring their wall research assignments and mock-up materials that they wanted to use in accordance with their research subjects in this lesson. They were also told to bring drawing tools and equipments for the workshop day. In the last week of the lesson, four hours were fully passed for the production of mock-ups in the workshop. Students used various materials that they thought which were suitable for their chosen subjects. The plan of the wall workshop and its pre-works are given in Table 1.

Table 1. The process plan of wall workshop, which was held in 2018-2019 spring semester

WEEK	4	5	7	13	14
PROCESS	Determination of student working groups	Giving students wall research homework topics	Digital submission of research papers	Latest theoretical explanation and informing about the workshop	WALL WORKSHOP Production

A flexible working and producing environment were provided by the workshop, where an informal education environment was intended to be integrated with formal education (Figure 4; Figure 5; Figure 6; Figure 7; Figure 8).

Figure 4. Wall workshop working medium – 1

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Figure 5. Wall workshop working medium – 2

Figure 6. Wall workshop working medium – 3
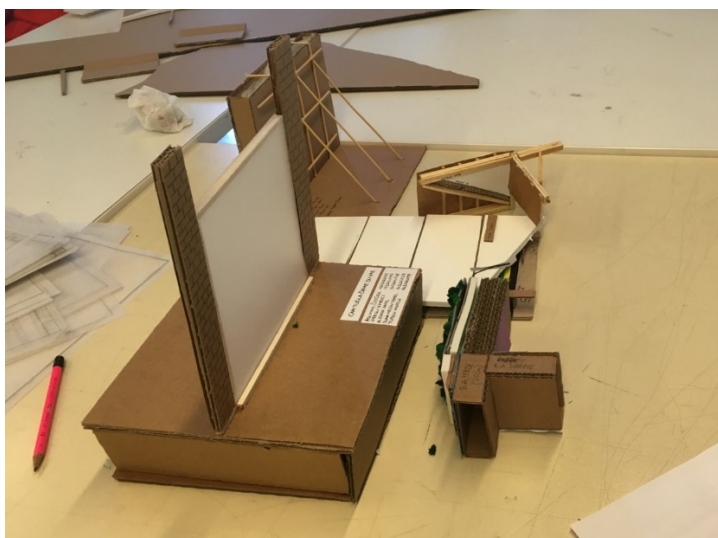
Figure 7. Wall workshop working medium – 4

Figure 8. Wall workshop outcomes

At the end of the workshop, the participants were asked to answer the feedback form which consists of six questions for the evaluation of tried training method. The first four questions had the options as 'I absolutely disagree, I disagree, I'm precarious, I agree, and I absolutely agree', which are listed as below:

- I enjoyed producing in the workshop environment,
- I think I learned by doing in the workshop environment,
- I think the workshop environment is useful for improving my ability to work as a team,
- I think that the workshop is useful for me to reach up-to-date information and for my application.

The last two of the feedback form questions were arranged as open-ended questions, which were asked about the teaching method of building science course and suggestions about the wall workshop.

5. Findings and Discussion

Table 2. shows the outcomes of the 'wall workshop' feedback form answers as below which was applied in building science I course of 2018-2019 spring semester.

Table 2. Findings of wall workshop, which was held in 2018-2019 spring semester

QUESTIONS	I enjoyed producing in the workshop	I learned by doing in the workshop	the workshop is useful for working as a team	the workshop is useful for reaching up-to-date information and application	open-ended questions
ANSWERS	47% yes	48% yes	49% yes	38% yes	17% return
	41% no	31% no	33% no	44% no	
	12% precarious	14% precarious	18% precarious	18% precarious	
		7% no participation			

The following interpretations can be made based on the outcomes shown in Table 2: It is seen that the majority of students enjoy producing in the workshop environment, which was informally added to formal education. However, the feedback amount of student group who had not found the working environment enjoyable, reminds for the easily bored mentality of generation Z members. In this sense, it is thought that a four-hour workshop period may have been perceived long. This perception can be differentiated by creating an interactive working environment.

It was observed that the students agreed with the idea that they learned by doing. This result may be related to the fact that the generation Z members are individuals, who enjoy productivity activities. However, it is seen that a 7% student group never answered this question. It is thought that the reason may be related to the feature of the next generation not to want to have difficulty in accessing information.

Students stated that the workshop environment improved their ability to work as a team. It can be said that this result is important for the architectural profession that needs teamwork. In addition, it is ensured that individuals who have the feature of team building mostly in social networks can be gathered for a common purpose in real life.

It was concluded that the students thought that the workshop was not useful in terms of accessing and applying updated information. Regarding the solution of this situation, which is associated with being goal-oriented, the subject of study, purpose and result can be conveyed briefly and clearly.

The fact that very few of the students had returned to open-ended questions and the majority did not answer this question shows that the generation Z members respond to optional questions and prefer to report their suggestions orally rather than in writing. It is thought that this may be related to their pre-undergraduate educations. For this reason, searching about this education term should be useful for the educators.

As a conclusion of the workshop, some of the mock-up outputs were selected at the end of the workshop and exhibited as lecture outcomes at the 2019-2020 fall semester exhibition. This sharing studies with the students application can also be associated with the competitiveness features of the generation Z students. Lastly, students were asked to

use the methods of thinking and producing by drawing in the workshop. However, it has been observed that students mostly had produced their solutions solely by doing so.

6. Conclusion

When the results of 'wall workshop' in building science I course at Department of Architecture of GTU and the data from feedback forms applied at the end of the workshop were discussed, it was observed that the new generation of architecture students preferred to learn by doing and experiencing rather than listening and/or drawing, under the impact of the digital environment in which they were born and grew up. It was also concluded that the tried method of learning by doing can be improved by integrating analog-to-digital tools. It is foreseen that this may also contribute to the issue of reaching up-to-date information.

In addition to this, it can also be said that the duration of workshop experience was not found enough by the generation Z membered students. As it was mentioned in section 3, they can be bored easily and not focused on their works easily, too. For this reason, future workshops should be arranged with long duration times. As an informal education, a summer school workshop by a 1/1 scaled learning by doing method may be more productive and instructive for generation Z learners. Al so, if an integrated informal education will be held in a formal lesson, the duration of the workshop should be taken in consideration. In this respect, acceptable participation numbers and physical environments should be provided.

Declaration of Competing Interest

The authors have declared that no competing interest exists.

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Biographies

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She received her Bachelor and Master degrees from Yıldız Technical University (YTU) in 2005 and in 2007. She completed her PhD at Mimar Sinan Fine Arts University (MSFAU) Building Science Programme in 2015. She worked as a research assistant at Gebze Technical University between 2012 – 2017. Since January 2017, she has been working as an assistant professor in the same department. Her research interests mainly lie in the fields of building elements, architectural

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She received her Bachelor degree from İstanbul Technical University (ITU). She completed her Master and PhD thesis at Trakya University (TU). After she finished her educational processes, she worked in various universities and institutions at different academical and administrative positions. Since 2002, she has been working at Gebze Technical University (GTU) Department of Architecture. She has also been continuing her administrative duties as a Dean and a Vice Rector at the same department and GTU nowadays. Her research interests mainly lie in the fields of construction and demolition waste management, building production, building and construction quality and mass housing. She is also interested in architecture education in relation to generation Z