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THE DEVELOPMENT OF INTERNET WEB 1.0 TO WEB 3.0 AND ITS EFFECTS ON ARCHITECTURAL EDUCATION

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ABSTRACT

The World Wide Web has quickly become one of the primary resources of information that comes to mind for many people in many fields. The development of the internet, which has more and more application areas, is grouped as Web1.0, Web2.0 and Web 3.0. Today, the web, which started with Web 1.0, has become a virtual world where people can actively participate. With this development of technology and its effect on every aspect of our lives, educational practices have also begun to change. Especially with the pandemic, the tools of Web 2.0, online learning opportunities, internet resources and communication platforms have been better understood and started to be used more efficiently in education. Architectural education, like many other fields, has been affected by the spread of the internet and its being a source of information. In the light of these data, the study focuses on the reflections of the learning opportunities and resources that have developed with the internet on today's university students. For this purpose, formal and informal online internet-based learning environments examined in this study. In order to collect data in the research, an online internet survey prepared and applied to a group of architecture and interior design students within the limitation of Eskişehir Technical University. Questions were asked about expanding resources, tools, deficiencies in education and what their dream education is like. In the study, the evolution of the internet, the changing needs of architectural education, the offers and demands of teachers and students in different generations, students and the evolution of the internet were investigated by considering generational differences. As a result of the study in which 47 students participated, the current state of architectural education was determined from the eyes of the students in the light of the answers given.

Keywords: Web1.0, Web2.0, Web 3.0, Architectural Education

1. INTRODUCTION

In recent years, Internet is one of the main sources of information where it can be accessed rapidly. Today, the internet is in every aspect of our lives. The development and change experienced by the Internet are also classified as Web 1.0, Web2.0, Web3.0 and Web4.0. Web 1.0 describes the period in the early days of the internet, when the contents on static web pages were read like newspapers or books and the interaction was one-way [1]. Web 2.0, is describes a situation in which communication is versatile, the internet is the follower and guide of social life, and the user becomes a productive content producer, not passive. Web 3.0 refers to an internet where the user reads, writes and manage. It is predicted that access to information will be faster, easier and error-free in Web 3.0, which is built on semantics, artificial intelligence, block chain and cryptology, 3D experiences and games, spatial web, digital copies and decentralized structures. It is envisaged that the interaction to be established with the Internet Web 3.0 will be beyond the screens of computers or mobile devices, in 3D environments supported by virtual and augmented reality, in environments where all senses of the human can be involved and where speaking and touching can be used as easily as seeing and hearing [2]. It is not possible to make a clear date and distinction in determining the development status of the Internet. The process continues with an evolutionary change, and the rate of change and the impact area in different areas are also different. Today, it is possible to see Web 1.0, 2.0 and 3.0 applications together. Web 4.0,

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on the other hand, is still experimental. Web 4.0 is defined as a symbiotic network in which the human mind interacts with machines [3].

While the development of the Internet continues at such a rapid pace, the way generations perceive and benefit from this development shows differences. In recent years, there are many studies investigating the differentiation in terms of values, attitudes and characteristics among human communities that were born in different periods and experienced technological developments in different ways[4]. Events, tendencies and developments in the life span of people born in a similar time period (15 years at the upper limit) can change the attitudes and behaviors of people[5]. When classified in the social dimension, it can be said that these generations, called the X, Y and Z, have experienced the most remarkable technological changes. For X generation, television and telephone were indispensable technologies, who were born between 1965 and 1980, they met mobile phones and the Internet when they lived in their twenties and thirties. Generation Y, born between 1981 and 1996, witnessed the development of the internet and the inclusion of mobile technologies, and experienced the development of social networks in their childhood and youth. Generation Z, who was born between 1997 and 2012, and is also in their twenties today, is living a period in which social media has completed its development and is a full part of life and has become indispensable with the freedom provided by mobile technologies. The acquisition and transfer of knowledge has gained great momentum and changed, especially in the last 30 years. Three different generations, who experience the internet in different ways, also have differences in the way they use the internet. It was also different for these different generations to include the Internet in their education. The potentials of the internet in the field of education have evolved over time. Differentiating internet usage habits of generations have also affected this situation. In today's world, where the internet is perceived as one of the main sources of information, the reflections of internet development in education are also an important issue that needs to be examined. In this scope of study, the resources used by the active web user generation Z were investigated. Moreover, opinions on the deficiencies of today's education and the provision of a better education have been obtained.

1.1. Reflections of Web Development on Education

Development of web has affected education in different ways in every period. **Web 1.0** was the first implementation of the web and it lasted from 1989 to 2005[6]. It was referred as the first generation of World Wide Web, which was defined as “read-only” Web. It was the static pages and content of the era delivery purpose only. In other words, the early web allowed us to search and read information. It did not offer people anything different from books. One of its most important features was that it created an online presence and make their information available to anyone at any time.

Web 2.0, on the other hand, allowed users to provide content and interact with other users and radically changed the appearance of the internet in a very short time [7]. With Web 2.0, the internet itself has become a learning platform. These platforms have provided the innovative learning opportunities of Web 2.0 [8]. With Web 2.0, the concept of e-learning and learning environments defined as learning 2.0 have emerged. Web 2.0 technologies and contents can be summarized as social bookmarking, wikis, shared document creation, blogs, microblogs, presentation tools, image creation and editing, podcasts, audio use, video editing-sharing, screen recording, mind mapping and digital storytelling [9]. It briefly explains these contents of Web 2.0, first of all it is to start with wikis. Wikis are one of the most used Web 2.0 technologies. Many wiki tools like Wikipedia, Pbwiki Wikispaces etc. are free and available to everyone. Wikis allow educators to not only organize and interrelate information for their students, but also more importantly allow students to co-construct knowledge [9]. Social bookmarking is used to share liked web pages with others. Shared document usage tools allow users in different places to make edits and write comments on the same document. Google Docs, Writeboard, and Buzzword are good examples. Blogs allow individuals or groups to share, rate, and organize information on the web. Microblogging tools such as Twitter enable instant communication and follow-up of events. With Web2.0, presentation tools have also started to diversify. Apart from Microsoft PowerPoint and Apple's Keynote, different online alternatives of presentation have started to be used. Software such as CoolIris,

Prezi, Slideshare, Vcasmo provide opportunities for non-linear organization of information that can be directed in multiple directions at various scales, and for sharing different multimedia. Image creation and editing programs allow the online drawing and sharing of diagrams such as flowcharts and architectural drawings. Podcasting and the use of audio, on the other hand, gave people the opportunity to make sound recordings and share them easily. The exchange and use of video has become a mainstream phenomenon in recent years. It is possible to find a video on every topic, especially on YouTube. Video is an especially effective way of representing procedural information, as it provides a synchronized flow of audio and visual information. Screen-recording software can create a powerful mechanism when shared online using sites like YouTube. Learning contents created for various software are made with screen recordings. Mindmapping and digital storytelling platforms encourage people to present important elements of a concept, idea or reflect on their relationships. These can also help develop different understandings of the problem.

In order to understand the educational potential of Web 2.0 technologies, it is important to examine and understand the possibilities they offer to users. These possibilities are: 1) Presence, 2) Modification, 3) User-generated content, and 4) Social participation [10]. Presence is to ensure that Web 2.0 users are active in that environment through their profiles, identities or avatars. The active presence occurs when the user updates, interacts with other users. Modification refers to allowing users to customize their profile pages. User-generated contents refer to the fact that users both produce and consume them. Social participation means that the content produced and consumed by the users makes them social participants. Although the platforms and potentials that Web 2.0 provides for education are grouped in this way, initially Web2.0 environments were not designed for educational purposes. Their educational potential has been discovered and spread over time. The distance education process experienced with the COVID-19 at the end of 2019 and the inclusion of the potentials of the Internet in formal education has accelerated. In recent years, the high potentials of Web 2.0 platforms in formal education, adult education and distance education have been discovered, and many studies have been carried out in these areas [8–14].

Web 3.0 is defining as intelligent web or semantic web with technologies like cloud computing, 3D visualization, artificial intelligence, big data, augmented reality and more. It makes passive learner into active learner in the learning process [3]. Today, Web 3.0 and Web 2.0 technologies are used together. On the fact that Web 3.0 active learning systems are not yet concentrated in learning environments, the study will investigate the effect of Web 2.0 on learning environments. The study focused on the effects of web development, Web 2.0 and technology on architectural education.

1.2. The Change of Architectural Education with the Effect of the Internet

The development of the web has also shown its effects in the field of architecture. With Web 1.0, websites, that are accessible available to anyone at any time, have also emerged in the field of architecture. With the help of these websites, current projects, competitions and theoretical discussions in the field of architecture can be followed worldwide. This information on the internet have also been a reference source for architectural education. With Web 1.0, architectural resources have become accessible and up-to-date for everyone. Architecture schools from all over the world have had the chance to incorporate up-to-date knowledge into their education system.

With Web 2.0, architects had the opportunity to exist and comment on websites that are sources of information, to produce content about their own projects, and to take part in discussions on current issues. It has provided an opportunity for those who practice the discipline of architecture, educators and students to come together easily. The Internet has become a platform that brings together different professionals and amateurs in the discipline of Architecture. Web 2.0 have enabled not only information source and communication, but also important lectures in architectural education to be carried to the internet in an interactive way.

Today, online resources and e-learning methods have an important role in architectural education. Many platforms allow students to interact with peers and lecturers [15]. Research on the potential of using social media-based learning in design education supports this idea. There are many studies where social media platforms such as Facebook are actively used in design studios[12,13, 16,17]. This is supported by the intensive use of computers in architectural design practices. There are studies investigating how the integration of Web 2.0 tools into learning inside and outside of education can be handled within the framework of the architecture discipline [15,18,19]. The adaptability of Web 2.0 applications for education has emerged even more creatively during the COVID-19 pandemic. This uncertain and sudden development with COVID-19 has created an environment where the compatibility of traditional architectural design studios with distance education models is questioned.

Web 3.0 opportunities are being tried to be integrated into architectural education in this time more. Virtual reality, augmented reality and game technologies become more important and critical. It is possible to see that it benefits from some technological infrastructures used in computer games in architectural research [20–22]. It is not known what resistance and support the innovations that will come to our lives with Web 3.0 and Web 4.0 in the near future will encounter.

2. MATERIALS AND METHOD

The study was designed as a qualitative research. A survey consisting of open-ended questions was preferred. First, it is planned as a process that includes data collection and coding (data analysis). Open-ended questions are questions that do not provide participants with a predetermined set of answer choices, instead allowing the participants to provide responses in their own words [23]. For this reason in the study, students were expressed themselves in their own sentences and to answer in the length they wanted. In the study, open-ended response formats adopted, and the data collection process was built on noninteractive way[24]. An online internet survey was applied and no interaction was made with the participants. Within the scope of the study, this method was preferred so that they could freely evaluate their web usage and education processes and be more comfortable and critical, and limited demographic information was requested from the participants. For participants, architecture and interior design students were selected. It was expected that students' awareness of methods, resources and educational processes would be better. For this reason, students in 3rd and 4th grades were chosen as survey participants.

The open-ended survey carried out within the limitation of Eskişehir Technical University. The study is a pilot study to determine what kind of resources today's architecture and interior design education uses, and what the reflections of the development of the Web are on education. 47 students, 25 (M:8, F:17) architecture, 22 (M:5, F:17) interior design students, participated in the survey. All of the participants who are in 3, 4 or more years of undergraduate education are born between 1995-2001. 8 open-ended questions directed to architecture and interior design students were discussed mutually within the framework of the answers they gave. The questions asked were grouped under three main headings. First group resources, tools, and methods in education. Five questions were asked in this group. Most of the answers given by the students in this group were common, the results were evaluated qualitatively in order to be more understandable.

Second group is related to deficiencies in the inclusion of technology in education. Two questions asked in this group. Last group is about the technologies they imagine and see potential are the questions asked. The answers given in these two groups were divided into themes and evaluated with illustrative quotations.

3. RESULTS AND DISCUSSION

3.1. Resources, Tools, and Methods in Education

In this part, five questions were asked to the participants in order to identify the resources, tools, methods and platforms that were expanding in the architectural education. **First of all,** it was asked which websites and social media platforms they used for to take information about the educational processes, research, keep up to date with architecture, examining the sample projects, etc. The answers given to the question in which the participants could give common answers by both groups are shown in Figure 1 as the number of answers from the number of participants and websites.

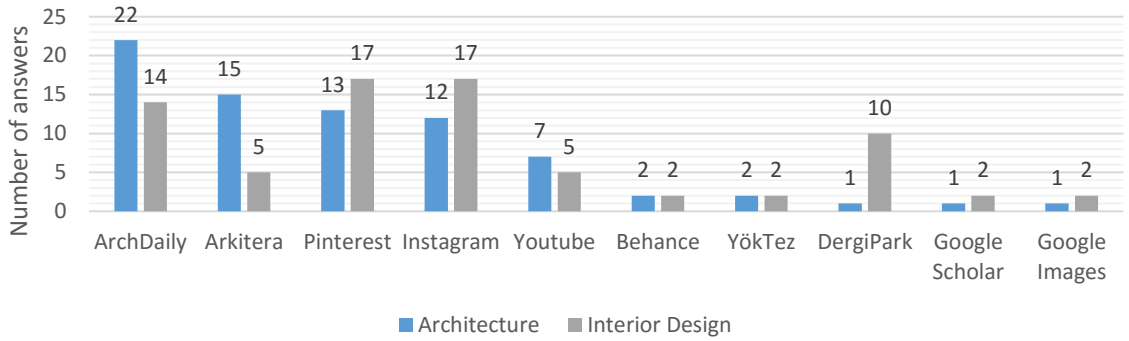

Figure 1. The answers given to the question of the internet resources that Architecture and Interior Design students use in their undergraduate education (figure source: author)

The answers given are examined, we see that the most basic resources for architecture students are ArchDaily, Arkitera, Pinterest and Instagram. For interior design students, we can say that Pinterest and Instagram are ahead of ArchDaily. In addition, we can say that interior design students use DergiPark more as a resource in their studies. For architecture students stated that they also benefited from sites such as Arkiv (6 participants), Twitter (3 participants), Mimarizm (2 participants), and Reddit (2 participants). In the study, e-book (1 participant), online access journals (1 participant) or digital library (2 people) were written as a resources.

The fact that social media platforms such as Instagram, Twitter and Youtube have become a source of information is based on the shares made by professionals in these fields and the social media accounts of the preferred websites. It has been stated that ArchDaily, Pinterest and Instagram are used specially to examine the images of sample projects, while resources such as DergiPark, YökTez, Google Scholar are used to obtain information about the architectural project.

In the second question, it has been investigated in which courses and for what purposes internet resources are used. When the answers given are examined, it is seen that these resources are used extensively in the project courses. According to the answers of the architecture students, 72% (18 participants) used internet resources in project courses, 13% (3 participants) in urban design courses, and 6% (1 participant) in construction courses. %9 (3 participants) of them stated that they used internet resources in all courses. In interior design students answer, 50% (11 participants) used internet resources in project courses, 33% (7 participants) in Furniture design course, and %17 (3 participants) of them stated that they used internet resources in all the courses.

The fact that the courses, which are the basic courses of architecture and interior design education, and the answer to 'all of the courses' came to the fore, show that internet resources are included in every process of formal education.

In the third question, the participants were asked which devices they use more for projects, assignments and exams in their undergraduate education. While all of the participants stated that they

used computers, it was seen that the computer and mobile phone options were mostly given together. All of the students of the architecture gave the computer answer. In addition to the computer, mobile phone (92%, 23 participants), tablet (20% 8 participants) and printer (8% 2 participants) responses are also given. All the interior design students gave the computer answer too. In addition to the computer, mobile phone (86%, 17 participants), tablet (23% 5 participants) and virtual reality glasses (4% 1 participants) responses are also given.

Computers have an important role in architecture and interior design education. Design, drawing, presentation etc. used effectively in many situations. The fact that mobile phones are an important tool can be dated to a short time ago. Programs developed with smart phones are in an important position for education. Due to their advantages such as internet connection, ease of sharing and communication, easy portability and accessibility at any time.

In the fourth questions, considering that communication between students and educators has an important in design education, it was asked which digital platform, applications or social media tools they used to communicate with their friends and lecturer. According to the results summarized in Figure 2, Whatsapp, Instagram, Zoom are the prominent answers. Responses were also received from the participants, such as Trello, AirBridge, Canva, Microsoft Teams.

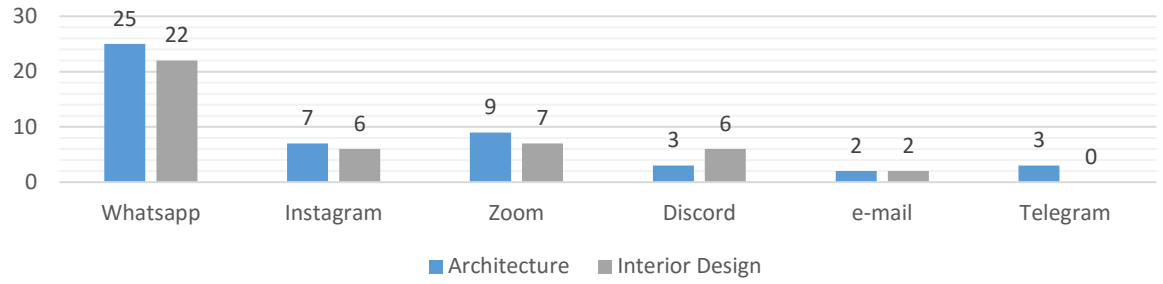

Figure 2. Resources used by architecture and interior architecture students for communication in their education (image source: author)

Participants, who stated that Whatsapp groups were established for many courses, provide instant communication with these groups. It is thought that the images, comments or opinions shared in these groups contribute to the educational processes of the students.

Finally, the participants were asked which drawing and modeling programs they used and how they learned about these programs. The most used programs are summarized in Figure 3, and the learning methods for these programs are summarized in Figure 4.

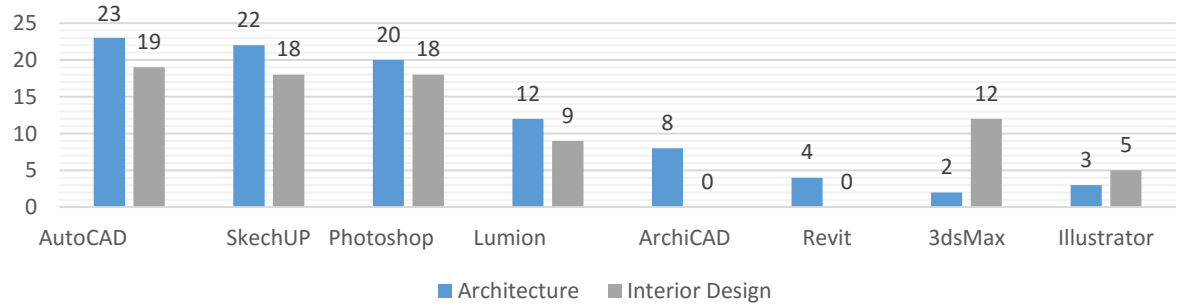

Figure 3. Programs used by Architecture and Interior Design students in their education (image source: author)

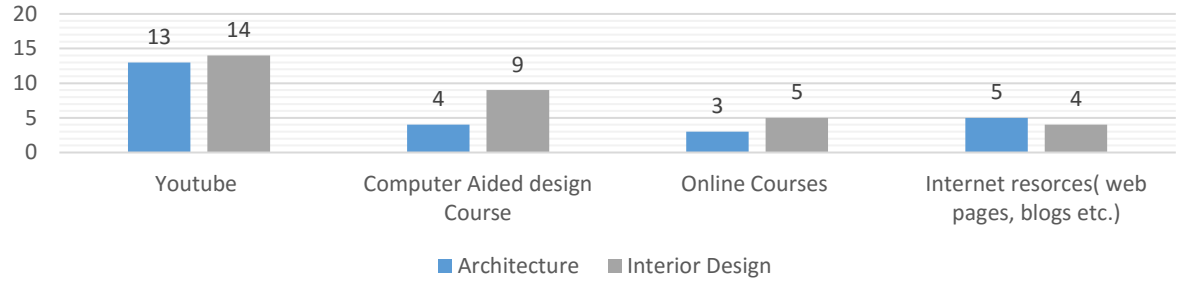

Figure 4. The resources from Architecture and Interior Design students learn about the programs they use in their education (image source: author)

It was seen that both groups use AutoCAD, SketchUp and Photoshop programs intensively. Most of the students learned the programs using YouTube or online learning platforms and internet resources. In this sense, it was seen that Computer Aided Design courses are supported by internet resources and even got behind.
It is seen that the internet and technology are actively used in many places such as obtaining information, program competence, communication in architecture and interior design education.

3.2. Deficiencies in the Inclusion of Technology in Education

In this part of the study, the participants were asked about the deficiencies they felt while doing research on the internet, whether their undergraduate education was sufficient to follow current technologies, and the problems. It can be grouped as the lack of resources and qualitative problems, the difficulty to find Turkish resources, and the difficulty in finding reliable sources. Explanatory quotations and themes are given in Table 1. The open-ended answers were grouped according to the themes, and the identified themes were supported with explanatory quotations.

Table 1. The answers given by the students on the deficiencies they felt while doing research on the internet.

Deficiencies	Architecture students Illustrative quotations	Interior Design students Illustrative quotations
“Internet resources are few and have qualitative problems”	“I have difficulty in reaching project details.” “Drawings that need to be studied in detail can be of low image quality.”	"Project details are hard to reach... I can't find quality details." “While doing research on a site, sometimes healthy results do not come out depending on the keywords.”
“Difficulty in finding Turkish resources, foreign language problem”	“Inability to reach correct information due to lack of Turkish resources” “Lack of Turkish content about some programs.”	“Foreign channels videos are getting better in this regard; Turkish channels have deficiency. Turkish resources are insufficient” “The language of the required sources is not Turkish.”
“Difficulty in finding reliable sources”	“Too much misleading and unclear information. Limited and inaccurate access to correct information” “Too many irrelevant answers”	“I can't find enough reliable sources when researching. The resources I can find while doing research are very limited and informational.”

In the study, the participants were asked whether the undergraduate education was sufficient to follow the current technological developments. And it was requested to indicate the deficiencies observed. The answers given are examined, the majority of the participants find their education insufficient in terms of following the technological developments. 55% of these answers stated in a negative way that they found it insufficient. On the other hand, 19% of the participants think that their undergraduate education is sufficient to keep up with the latest. Other answers have a recommendation rate of 26% and focus on deficiencies and what needs to be done. This group is classified as undecided. When the answers given by architecture and interior design students are compared, architecture students find their education more inadequate. The answers are summarized in Table 2 with explanatory quotations.

Table 2. Responses on whether the Undergraduate Education is sufficient to follow current technologies.

Opinions	Architecture students Illustrative quotations	Interior Design students Illustrative quotations
"Participants who found it insufficient""	"No. They do not do exciting activities that will encourage learning. But competence is also expected from the student." "Undergraduate education is insufficient to follow technological developments. Information from years ago is always presented in the lessons." "I think it is an education based on the past rather than the future use of architecture in technology"	"I don't think it was included. More opportunities should be offered. Technologies such as artificial intelligence, virtual reality and augmented reality should be included more often." "I don't think it was included. New developments, competitions, new projects should be included more."
"Participants who found it sufficient	"Yes, I think it was included"	"I think it is enough because all of our professors are researchers and competent."
"Undecided participants"	"Teachers have an effort towards these technologies, but I don't think it's enough." "Some software's are taught, ready answers are given to us, however, when I encounter a problem in these environments while designing, I discover myself how to find a solution to it, most of the time, I feel like there is a superficial technology approach."	"It is partially included, but there are so many technological developments today that we are not fully taught or followed." "We use technological tools such as computers, but we cannot use the latest technology (such as 3d printers, VR glasses)."

3.3. Technologies That Can Make Architectural Education Better

Finally, the participants were asked a question about the technologies that you think will make your undergraduate education better quality, and the education of their dreams. With this question, it is aimed to determine the foresights and expectations of the participants. The answers given by architecture and interior design students are united in the theme of "virtual, augmented and extended reality technologies".44% (16 participants) think that virtual reality and augmented reality technologies should be included in their education. The opinions of the participants are given in Table 3.

Table 3. Responses on technologies you think will make your Undergraduate Education better.

Featured theme	Illustrative quotations
"Virtual, Augmented and Extended reality technologies"	"It could be virtual/augmented reality. We can examine our projects and designs better. During the design process, our instructors put a lot of emphasis on the experience in the space. We can better understand this experience with these technologies and transfer it to our designs." "Virtual reality applications can be included. It can be very enjoyable and instructive to experience our projects and the spaces we design with virtual reality glasses." "Virtual Reality technology can add quality to education during the creation and presentation."

3.4. Discussion

In the light of the questions and answers asked to the participants within the scope of the study, we can say that architectural education has many extra resources apart from its formal resources. It is seen that the possibilities of Web 2.0 are used in this sense. It is seen that the Z generation participants are aware of and demand Web 3.0-enabled applications such as augmented reality, virtual reality, artificial intelligence, machine learning, and Metaverse. The prominent comments in the light of the answers given at the end of the study:

- The potential of Internet resources, which are mainly used for project courses, which is the basic course of architecture and interior design departments, should be investigated for other courses as well. It should be researched which websites can be helpful and supportive resources for which courses.
- In the study, it was seen that mobile phones are one of the most actively used tools. This shows that mobile phone active learning methods can be used easily in education. It should be considered that especially augmented reality and virtual reality technologies can be used actively on smart phones should be increased.
- Online communication platforms, which enable the communication of students and instructors and whose importance is better understood with the pandemic, can be changed according to the course. The full potential of these environments should be investigated.
- An important point in the study that should be underlined is the difficulty in finding reliable sources, although the internet is a resource in many areas. Considering the information pollution in the internet, it is necessary to find reliable sources, reference checks, bibliography review, etc. Students should be informed about the issues.
- The problems experienced in finding Turkish resources can be explained by the inadequacy of foreign language education specific to the university. However, many projects made in the departments of architecture and interior design are not published on the internet. At this point, in addition to making use of internet resources, producing internet resources is an issue that needs to be addressed and thought about.
- One of the themes that stand out among the inadequacies in the follow-up of current technologies is the progress of education depending on the past and away from the current. Educators need to follow current developments and include them in the lessons.

- In the study, it was seen that students especially wanted to experience virtual reality and augmented reality in their education. Studies on virtual reality and augmented reality technologies should be done in departments and deficiencies should be determined. It is an issue that needs to be investigated how much potential studies on these technologies have for which courses.

4. CONCLUSION

The close relationship of architecture with digital technologies does not reflect architectural education. Changes in the internet, which is now the center of information, communication and interaction, contain more potential for architectural education than in many other fields. The educational environment has expanded with the possibilities of the Internet. In the study, it has been seen that the internet is an important resource in many fields of education, even in a limited participant universe. Also according to this study; the internet has an important place in many subjects such as resource research, learning software, and educator-student or student-student communication. It has been seen in the distance education process during the pandemic period that connections between students and educators can be provided without being connected to the school, thanks to different internet sites and educational resources. In this context, the effect of school, which is one of the three components of formal education, has become questionable. The increase in educational platforms and resources and the fact that students are exposed to information at every moment of their lives through the internet have made the student-educator relationship more interactive. In this situation, where both sides will transfer information to each other, it shows that we are in a period where the educator is not only the main source of information, but one of the main sources of information. With the internet, educators become more open to current interaction. As a result of the study, ideas were obtained on the tools, learning methods, and websites that are the source of education of the generation who spend most of their time with the media and devices that connect to the internet. Considering that Web 3.0 opportunities will enter our lives and education in the near future, we can predict that the student expectations obtained in the study may be realized in the near future. It is important to increase the number of similar studies and to determine the positive and negative effects of the internet and the potential of technologies in architectural education.

CONFLICT OF INTEREST

The author(s) stated that there are no conflicts of interest regarding the publication of this article.

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