DEVELOPMENTS OF WEB TECHNOLOGIES AND THEIR REFLECTIONS TO EDUCATION: A COMPARATIVE STUDY

Assist. Prof. Dr. Mehmet Tekdal
Cukurova University - Turkey
tekdal@gmail.com

Resrch. Assist. Şenol Saygıner
Mustafa Kemal University - Turkey
senolsayginer@gmail.com

Assist. Prof. Dr. Fatih Çağatay Baz (Corresponding Author)
Osmaniye Korkut Ata University- Turkey
fatihcagataybaz@gmail.com

Abstract
The aim of this research is to provide detailed information about Web technologies and their educational implications with a comparative review of these technologies. In this context, the document analysis method applied with a variety of sources using Web 1.0, Web 2.0, Web 3.0, Web 4.0 and 5.0 technologies are examined. In accordance with the results obtained, a comparison of the Web technologies has been conducted. According of the results, Web 2.0 and Web 3.0 technologies are used predominantly today, while Web 4.0 and Web 5.0 are technologies that will be encountered in the coming years. Educational materials have also changed due to improvements in web technologies. In addition, the technological process that started with Web 1.0 and that users are passive-consumer is among the other results that will be delivered to emotionally loaded robots in the coming years.

Keywords: Web services, Web technology, Web application, Web and education.

INTRODUCTION

Since 1989, when the Internet began to be widely used, many developments and changes have occurred in the web technologies. In the first years of the Internet, the Web is called with HTML (Hyper Text Markup Language) (Alabay, 2014). In these years, HTML is a structure in which texts are included and texts are intended to be presented one-sidedly to the service of users. It is the basis of Web 1.0 technology. Web 1.0 was developed by Tim Berners-Lee in 1989 (Naik and Shivalingaiah, 2008).

The users of Web 1.0 were passive and consumer and then shaped towards from the web programmer to users as the forward one-way in technology. This situation has limited the user interaction with the content and therefore increased the need for the development of a new Web technology. Figure 1 shows information about the historical development of web technologies.
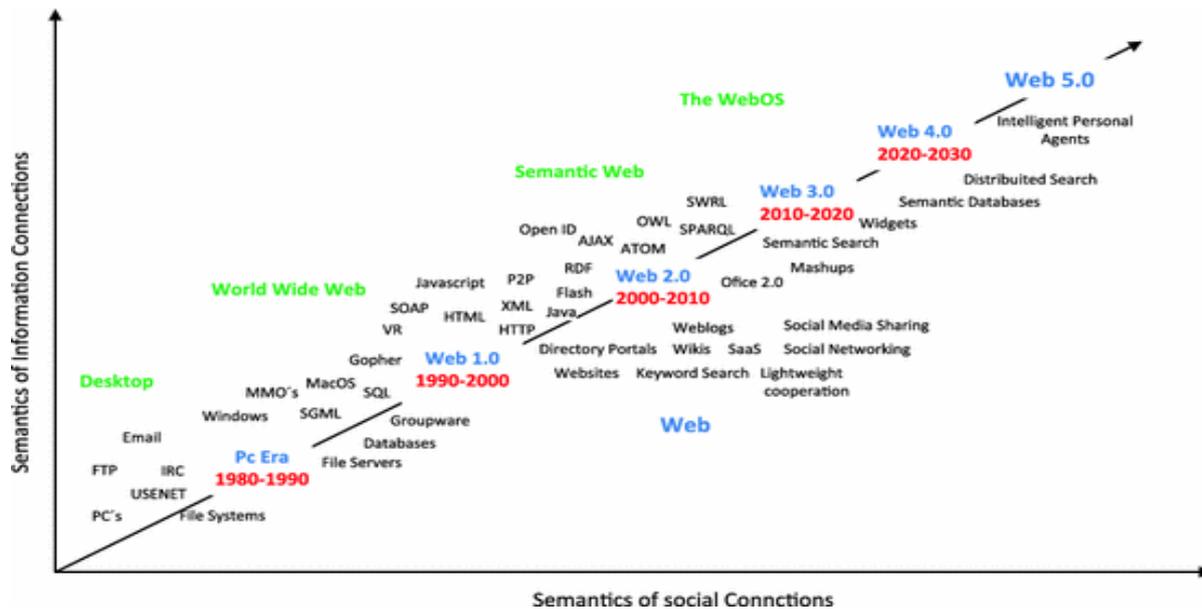
Figure 1: Historical Development of Web Technologies (Benito-Osorio, Peris-Ortiz, Armengot and Colino, 2013)

The technological process that started with Web 1.0, which forms the basis of the world-wide network structure, has evolved from static to dynamic, or Web 2.0. With this transformation, there has been a transition from a document-oriented structure to a human-focused structure in Web systems. In this context, social networks, weblogs and video sharing sites have been developed that emphasize mutual interaction. As of 2010, Web technology has been updated to Web 3.0 as an innovation. Until 2010, internet or web technologies, which is under the management of the user, has become a self-managing structure. That is, the transition to semantic web technology has taken place.

Today's internet users are using Web 2.0 and Web 3.0 technologies. However, it is thought that the coming of new web technologies, namely Web 4.0 and Web 5.0 in the near future, will lead to confusion in the minds, even if these technologies are not fully understood and adapted. From this point of view, the aim of this work is to make a detailed description of Web technologies from Web 1.0 to Web 5.0. In addition, the differences between Web technologies have been tried to be compared comparatively.

METHOD

In this research, it is aimed to provide information about web technologies and to compare these technologies according to their characteristics. In this context, document analysis technique was used in this study. Document analysis includes analysis of materials that contain information about the events for which the investigation is targeted (Yıldırım & Şimşek, 2013).

There are a number of stages to follow while analyzing the document. These are (1) reaching documents, (2) checking authenticity, (3) understanding the documents, (4) analyzing the data and (5) using the data (Forster, 1995). In this direction, firstly, a literature research was made on digital databases, websites and blogs using keywords such as "Web X. Y., Web technologies, Web services". The information obtained at the end of the scan was also tried to be compared with other sources to reach the correct information. The report was made separately by 3 researchers and tried to obtain consistent results.

18

RESULTS

Web 1.0

Web 1.0 is a one-way Web technology developed by Tim Berners Lee (WWW), a one-way Web technology that creates the first time networking technology around the world and users can only access information (Patel, 2013; Ekren, 2015). In this technology, which is regarded as the first period of the internet, users can only get the existing information and access the content provided by various Web servers. Because web pages are created in static structure, there is no possibility for users to comment, contribute or produce content. The interaction on the web sites is limited to the user navigating only through links between pages. That is, users have a passive and consumer role. Developed Websites are based on Hyper Text Markup Language (HTML) and require HTML code information to make a new Web site. In Figure 1, the general structure of Web 1.0 is presented. In Figure 2, the general structure of Web 1.0 is presented.
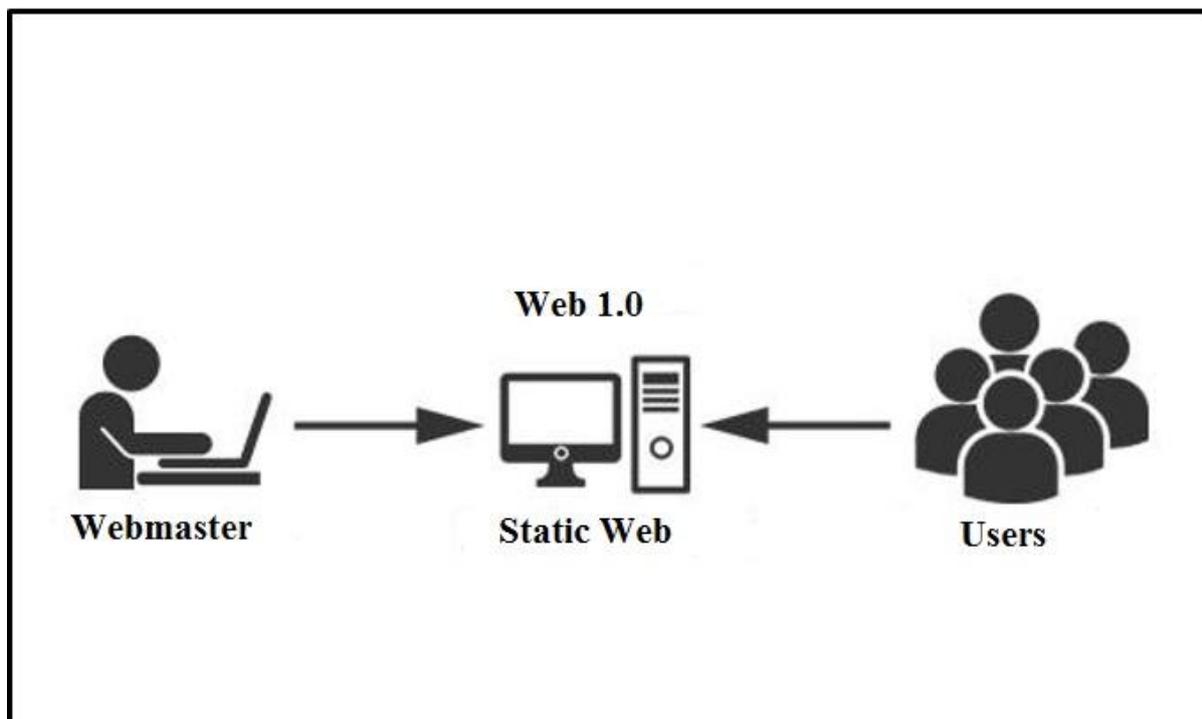

Figure 2: The general structure of Web 1.0

Web 1.0 technology is the first period of the internet (Yıldırım and Akıllı, 2013). The negative side of this period is that the data on the Web was read-only. This situation led to the inability of the users to obtain the data they requested in time, the inadequacy of the contents presented or the inability to intervene in these contents. In addition, with the widespread use of the Internet towards the 2000s, the need to create, share and interact with other users has increased and this has become the basis of Web 2.0 technology. In other words, the necessity of a read / write web environment is increased instead of a read only environment.

Web 1.0 technology is used for information access and information retrieval in education. Web 1.0 tools only provide information. They allow users to search for the information they include and provide membership and user-specific fields. They can not provide the right to contribute to users in the field of education. For this reason, it offers the possibility to read the information presented in a whole by the deductive approach in the field of education.

Web 2.0
User-based content and broad social interaction have been innovations made possible by Web 2.0 technology. Video sharing, chat, hosted services, Web applications, voice over IP, e-mail, instant messaging, podcasting, image sharing, web logging and many other online interactions have been realized through Web 2.0 technology (Naik and Shivalingaiah, 2008, Solanki and Dongaonkar, 2016). Figure 3 provides information on the working architecture of Web 2.0 technology.
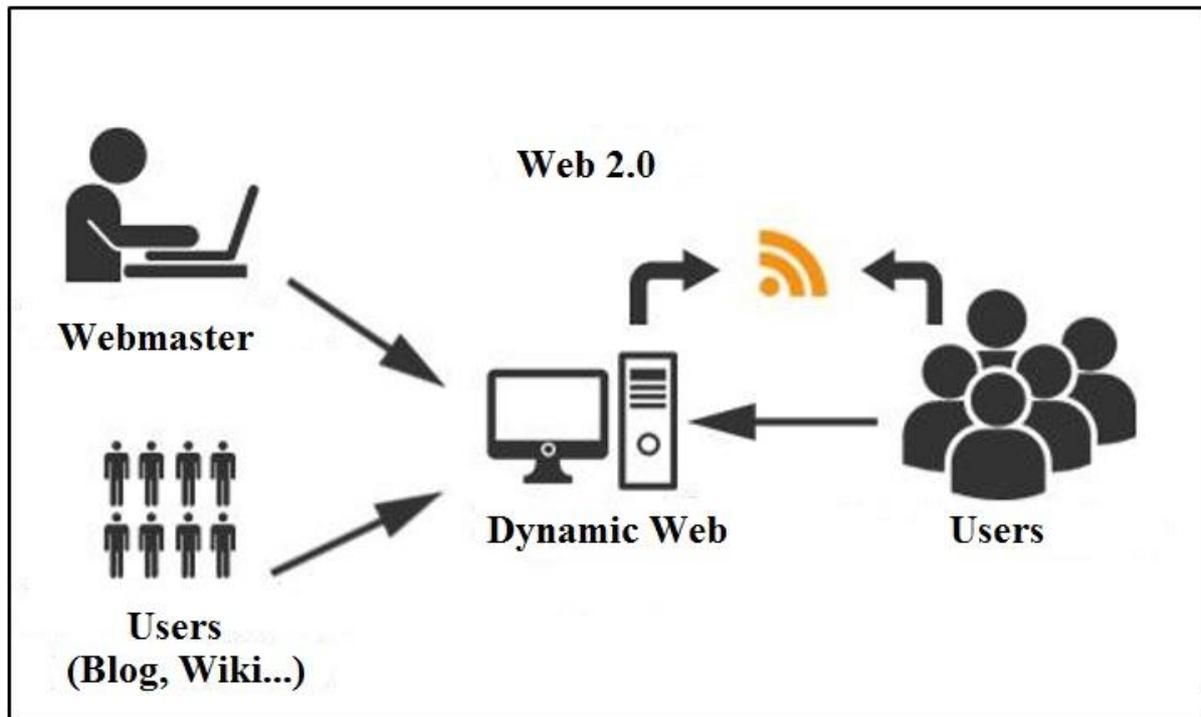

Figure 3: Web 2.0 Technology

Web 2.0 is a web technology spoken by O'Reilly Media in 2004. Web 2.0 technology describes the web sites on which they actively contribute. Thanks to Web 2.0 technology, users have become both writable and readable web technology.

The following three factors have influenced the transition to Web 2.0 technology in web technologies (Easley and Kleinberg, 2010):
- The growth of web authoring styles for many people to create and maintain shared content,
- The movement of personal online data (including emails, calendars, photographs and videos) from your own computers to the services that large companies will host and host,
- Growth of link styles that emphasize online links between people, not just between documents.

Web 2.0 technologies have provided many benefits in education. With Web 2.0 technology, the opportunity to realize constructive learning activities in the field of education is recognized. Students can follow how probing approaches, how to solve, and how to configure. Web 2.0 tools have changed the way classical learning has evolved. While previously printed publications are being scanned, web resources are now being scanned to obtain information. The students or teachers who want to access the information reach the person who is the specialist who is interested in them via e-mail, instant messaging, wikis or web diaries (Ünver, 2017). Web 2.0 can be described as human interaction on the web. Dialogues, interpersonal networks, individualization and similar concepts can all be considered in

20

this context. Web 2.0 has made positive contributions to the conditions of learning environments with innovations in technology design, interaction and multimedia dimensions (Şendağ, 2008).

Web 3.0
Nath and Iswary (2015) pointed out in recent years on the web, social networks have gained great popularity by people and societies in different ways. People can share their feelings, thoughts and ideas through Web 3.0 technology, rather than merely documenting them as in previous web technologies. With this technology, the social web is seen as an effective way to connect people around the world.

Lassila and Hendler (2007) have defined Web 3.0 technology, which is called Semantic Web, as a methodology for machine interpretable metadata and a vision for a new software era. From the simple presentation of the web to this day, the Semantic Web has become a state that supports "Open" data and emphasizes information rather than processing it.

Web 3.0 can be described as a third generation web, provided by the convergence of several emerging technology trends. These are Pal and Abide (2015) as follows:
1. Connect everywhere
2. Network communication
3. Open technologies
4. Open identity
5. Smart web

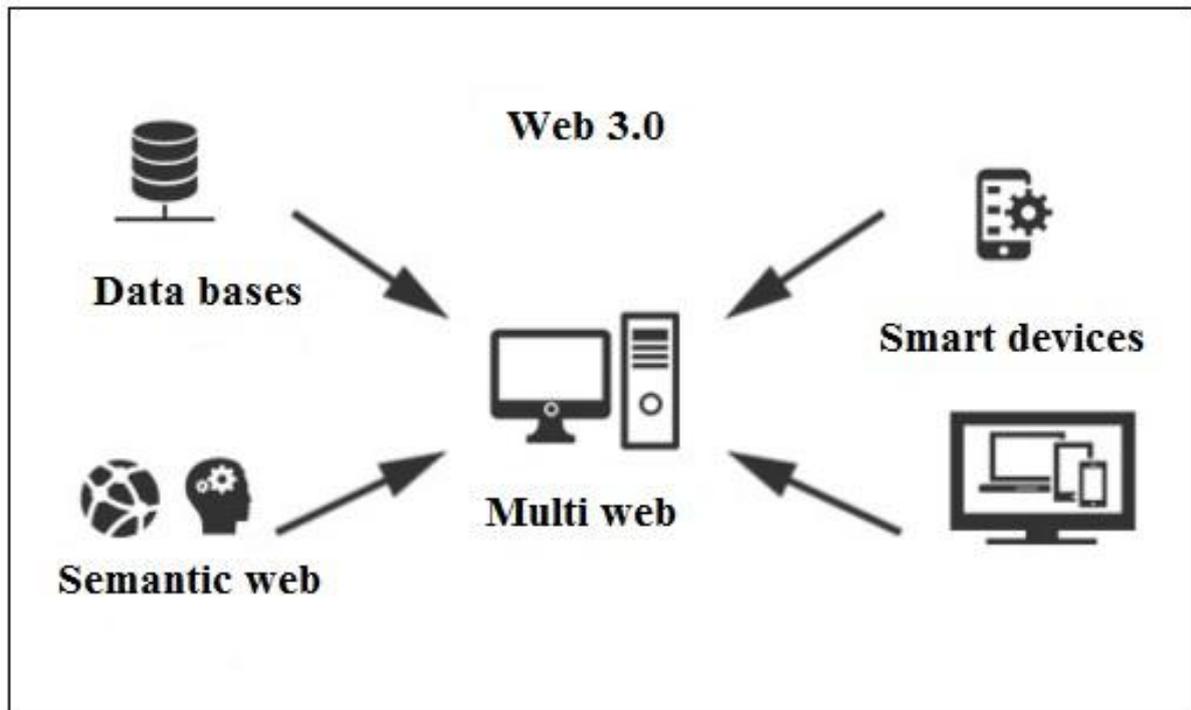Figure 4 provides information on the working architecture of Web 3.0 technology.

Figure 4: Web 3.0 Technology

As shown in Figure 4, Web 3.0 "Semantic Web" technology interacts with databases and smart devices. Web 3.0 technology is a writable, readable, and programmable web technology. It is also a

21

web technology that perceives what is relevant to what users are interested in and generates content based on them.

One of the best examples of semantic web technology is undoubtedly Wolfram Alpha. Wolfram Alpha (wolframalpha.com) is an advanced search engine with Web 3.0 technology, meaning semantic network (Durmaz, 2012). The most important feature of the system is that the user can make advanced calculations according to the search criteria entered and can create meaningful relationships. In other words, the results page Wolfram Alpha brings to the screen is not a ready page on the web, but a result produced by the user. For example, when "Ankara Istanbul" is written in the search part, the information such as the location of the two cities on the map, the population, the instantaneous time, the instantaneous weather, and the distances to other cities are reflected on the screen. When you take 1/2 kilo of tomato at 1/4 kilo of chicken at lunch time, it tells you how many calories you get at that time, how many percent is protein or fat. Another feature of intelligent web technology is its ability to perform advanced mathematical calculations.

Semantic and three-dimensional web technologies that came with Web 3.0 have created new and effective environments in the field of education and have opened up new projects and projects in the field of education / training (Lal, 2011; Morris, 2011; Reynard, 2010; Chisega- Negrilă, 2012; Shivalingaiah, 2008; Victor & Mohammed, 2016). As a result, with the aid of three-dimensional environments and increased reality applications, teachers can use new virtual environments in their classroom where similar interactions are found in the real world. Thus, it is possible to bring the environments of every part of the world to the class environment. For example, students can navigate a museum in a three-dimensional environment at any point in the world without leaving their classroom. This leads to new horizons and possibilities in the field of education and training. For example, where there is no real laboratory environment, students can work in a three-dimensional laboratory environment or visit remote locations that are not normally accessible (Warburton, 2009).

On the other hand, some of the most significant challenges that the Web 3.0 environment will bring to education and training are; three-dimensional vikipedia and the use of three-dimensional virtual encyclopedias, three-dimensional virtual worlds and learning with avatars, intelligent search engines and online three-dimensional virtual laboratories / advanced training laboratories / simulations, or using three-dimensional webs. The wikipedia that many users have developed collaboratively provides a rich source of information. The fact that these sources are in three-dimensional format can contribute to better teaching of education. One of the first studies on this area is the Copernicus project. The Copernicus project is funded in part by Enterprise Ireland and Science Foundation Ireland and aims to develop a useful and effective three-dimensional web user interface design (http://copernicus.deri.ie/) where bridge text and three-dimensional graphics can be found and connected simultaneously. Three-dimensional Wikilpedials can provide a rich and effective environment for all the media and animations for learners because learning and information are presented to the senses more often.

Avatar is an electronic image that represents a virtual space, such as a computer game or an online shopping site, that can be manipulated by a computer user and interacts with other objects in the enclosure. (https://www.merriam-webster.com/dictionary/avatar), the use of avatars in three-dimensional worlds has opened new horizons in the field of education. In this context, various three-dimensional virtual web environments such as Second Life (http://go.secondlife.com/landing/education/) and Active Worlds (https://www.activeworlds.com/web/index.php) have been created and Students and teachers. These environments, where visuality and interaction are front-line, can be a significant influence on the students' interest in the lesson and conception of the lesson.

22

Finally, the Semantic Web, a product of Web 3.0 technology, will continue to provide educational tutoring with personal assistants, intelligent agents, 3D games, virtual worlds, open educational resources and opportunities for better knowledge management. With the help of intelligent agents and personal assistants, people will be able to organize their own learning, set their own goals and make decisions about learning content.

Web 4.0

In Web 3.0 technology, communication between computers outside the user's control has been moved to a new dimension with Web 4.0. With Web 4.0, defined as "Symbiotic Web" and stated as the technology of the post 2020, people will be able to interact with machines and the virtual world (Kambil, 2008; Aghaei, Nematbakhsh & Farsani, 2012). In other words, with the development of the Internet, nanotechnology and artificial intelligence applications, the machines will be able to read the commands from the user in the reaction and vice versa. This process is defined as "read write concurrency web" (Sindhu & Chezian, 2016). For example, Web 4.0 improvements: "The refrigerator that informs you about the food that passed the expiration date" or "smart cars that run the heating system by letting you know how long you'll be home afterwards". It is also expected that Web 4.0 will benefit from Augmented Reality technology (Biçen, 2016; Kaya, 2016). For example, students can use today's technology slides in applications such as Prezi and PowerPoint, while Web 4.0 allows for Augmented Reality or 3D presentations. In addition, educators will be able to use intelligent artificial intelligence robots during their lectures.

Web 4.0 definitions include artificial intelligence based intelligent systems as well as virtualization and cloud storage systems. With online intelligent operating systems built entirely on virtualization, users can perform all their operations without installing any operating system on their computers. In this context, it can be stated that EyeOS or GlideOS are the basis of Web 4.0. These systems allow users to use operating systems and software services over the Internet without installing software on the computer. In addition, Web 4.0 will come to the fore in cloud computing in order to avoid problems caused by local disk usage. Users will be able to store all their personal data, files or content in online cloud environments.

It can be stated that web 4.0 technology will also bring significant innovations for education environments. For example, students prepare their course presentations in applications such as Prezi and Power Point. However, with Web 4.0, these presentations will be available in augmented reality or 3D environments. In addition, educators will be able to use artificial intelligence robots during lectures. Students and educators will be able to run programs without install any software in the lessons thanks to intelligent operating systems and will be able to access information from anywhere using online storage services. All of this can be predicted to lead to the transfer of learning to informal environments and seamless learning process. It is also stated that Web 4.0 technology will effectively use agents for e-learning environments. (Nedeva and Dineva, 2012). These agents or digital assistants identify the user's needs and characteristics in the e-learning environment and offer suggestions to the users (Nedeva ve Dineva, 2012).

Web 5.0

Web 5.0 technology, which is expected to have all devices connected to the Internet, is called emotional or telepathic web (Sindhu & Chezian, 2016). With this technology, advanced artificial intelligence robots, avatars and 3D virtual environments are expected to take place in everyday life. In addition, with Web 5.0, hologram systems can be used for daily meetings, through the headset, users can interact with the web content and the data will be shaped according to the user's face expressions.

Web 5.0 is a technology that makes sense of the emotional change in the person (Kambil, 2008). For example, www.wefeelfine.org, which is being used today, may be an indicator of the innovations that Web 5.0 will bring. With the software on the site (www.wefeelfine.org), blogs are scanned for phrases that start with "I feel" or "I am feeling". This system, which has accumulated emotions since 2005, scans the sentences every few minutes for words like "angry, cheerful, sad, frustrated, etc." from newly posted blogs consisting of "I feel" and "I am feeling" expressions around the world. Later, the site classifies these data according to various variables such as demographic information, country and weather. Emotional classifications such as "How does Europeans feel happier than Americans?", "Does rainy weather affect how we feel?", "What are the most decisive feelings of women in their 20s and New Yorkers?", "What do people in Turkey feel now?", "The happiest cities in the world, what are the countries?" can be made in this obtained data. With Web 5.0 technology, these emotional expressions can be transferred from the web environment to robots or intelligent devices with artificial intelligence.

Comparison of Web Technologies from Web 1.0 to Web 5.0
A comparative review of Web technologies from Web 1.0 to 5.0 is presented in Table 1.

Table 1: Comparative Review of Web Technologies from Web 1.0 to Web 5.0

Web 1.0	Web 2.0	Web 3.0	Web 4.0	Web 5.0
It was developed by Tim Berners Lee and covers the years from 1989 to 2004.	It was developed by Tim O 'Reilly and covers the years from 2000 to 2010.	It was developed by Tim Berners Lee and covers the years from 2010 to 2020.	Web 4.0, which is described as intelligent systems, covers 2020-2030.	Web 5.0, which is described as the technology of your future, covers the end of 2020.
Static Web technology.	Social Web technology.	Semantic Web technology.	Ultra Intelligent or Symbionet Web technology.	Emotional or Telepathic Web technology.
Only static content - Text / graphics screen output.	Dynamic content - Video display, 2D materials.	3D portals, all media environments.	Intelligent personal agents, Internet of things, 3D virtual animations.	Advanced technologies like robots, avatars, intelligent systems, holograms.
Search engines, FTP, Yahoo, Netscape	Blog, Twitter, Facebook, YouTube, Flickr	Semantic database, Widgets, Semantic Wiki, Semantic Blog	Intelligent objects: Smart home, smart car. Intelligent operating systems: EyeOS, GlideOS.	Emotional robots, wefeelfine.org
Read only.	Read and Write	Personalization	All	All
Experts, code developers	People	Services and Sensors	Agents	Artificial intelligence robots

Reflections to education: One-sided access to educational information provided by the programmer.	Reflections to education: Speed and convenience (Social media environments, email, instant messaging, wikis etc.) in accessing the information.	Reflections to education: Smart course contents and search engines, semantic web applications, virtual training laboratories, 3D educational games, virtual worlds and avatars, 3D encyclopedias, semantic digital libraries etc.	Reflections to education: Artificial intelligence robots, intelligent educational agents, augmented reality and 3D course materials, online storage and softwares that does not require any installation etc.	Reflections to education: Educational technologies that make sense of emotional change in person, hologram practices in lessons etc.

DISCUSSION AND CONCLUSION

In this study, information about the types of Web technologies in the development process of the web is presented. In addition, a comparative review of the Web technologies that are expected to continue from Web 1.0 to Web 5.0 has been carried out.

Web technologies, which started in the 1990s and have a long history of development, will face different new concepts in the near future. Thanks to the predicted Web technologies, Web 4.0 and Web 5.0 technologies, which are described as intelligent systems, will create added value in many different areas of the daily life from entertainment to education. This process is thought to bring many advanced technology products such as intelligent personal agents, robots, intelligent homes and smart cars.

Web technologies are named after new applications introduced by Web technologies. Starting with Web 1.0, this process continues with Semantic Web. With Web 4.0 and Web 5.0, new insights can come to life as research, advertising, commerce, shopping, information platforms and many other innovations are already under way.

The rapid progress in web technologies is progressing in the field of education with the same acceleration. It is foreseen that the teaching strategies and methods which are based on computer networks and applied methods will progress rapidly from day to day. This, in turn, indicates that new concepts in the field of education and training will enter into our lives.

From results of this study, it has been seen that the developments in Web technologies are educational reflection and provide important contributions to this field. Especially the use of semantic web and 3D environments in education environments has opened new horizons and gives the impression that many more possibilities and new teaching methods will be possible in the future.

Cloud storage, artificial intelligence-based intelligent systems and virtualization systems, starting with web 4.0 in particular, provide significant contributions to education and training environments. Because of the infrastructure provided by these technologies, the software is no longer required to install on a computer. Thus, with these on-line intelligent operating systems, teachers and students

25

will be able to perform all their operations on their computers without installing any operating system or training / education application software.

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