

## Computer's Place in Teaching and Learning for University Students in the Web of Science Database

<https://doi.org/10.3991/ijet.v16i19.26057>

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**Abstract**—Among the tools used in teaching and learning, computers are very important. Determining what kind of computer-related studies are carried out in the learning and teaching processes for university students will contribute to future research. In this context, the aim of the study is to examine university students' documents related to computers in teaching and learning, scanned in the Web of Science database, thematically and methodologically. The study was designed by adopting the case study method from the qualitative research models. A sample was not determined for the articles to be included in the study but it was aimed to reach the whole population. In this context, all documents in the Web of Science database have been accessed through the library system of the university. In the document search, the keywords 'learning and teaching' and 'computer' were searched in all areas, and the studies were found by searching the keyword 'university student' within the title. All the studies were analysed by year, document type, Web of Science category, country and language of publication. The findings obtained from the research are explained in detail by content analysis method. A total of 305 documents were reached in the research findings. The findings obtained as a result of the research carried out are given in detail in the findings and results section.

**Keywords**—computer, teaching, learning, university, Web of Science, student

### 1 Introduction

Science tries to understand and change the world in which human beings are in the process of establishing a new world. Man's effort to understand and change the world has not only accelerated scientific development, but also improved the technology he uses. Humanity has not only developed and used existing technology to make life easier

and increase the production of products necessary for its life, but also researched what it should or should not do to reduce or eliminate undesirable consequences of technology when it occurs. Technology is a component of production relationships as well as social and political relationships. For this reason, technology is a result of this change as well as a cause of social change [9] [32]. It is necessary to keep up with scientific developments. Technology is part of science.

In the 2000s, with the development in digital communication technologies, especially the proliferation of mobile devices and the internet becoming an indispensable element of daily life with mobile technologies, these tools have led to changes in the scope of open and distance education, which has taken on a more functional structure. In the age we live in, the rapid technological developments, the phenomenon of globalisation and the increase in knowledge have led to the need for communication by leading people towards more research. Thanks to technological developments, communication has become easier and information transfer has accelerated [31]. The level of development of countries is measured through science and technology. It is a part of digitalisation in technological developments. All kinds of activities that can be accessed with digital communication technologies can become informal learning particles; on the other hand, any content created without fulfilling the requirements can be presented as a distance learning activity in the digital world. It has become a necessity to use data, which are constantly encountered throughout life, in order to adapt to the developing world, in both professional (business and educational) life and real (social) life. In this context, individuals benefit from lifelong learning environments. As a matter of fact, it is an accepted fact of life in the 2000s that open and distance education, data and information can be delivered to individuals who want to continue their learning, whenever and wherever they want [26]. With the rapid development in digital communication technologies, open and distance learning, like everything else, has changed in every aspect. Distance education and communication technologies, whose historical developments are constantly evolving and changing depending on each other, combined with digitalisation, have created a different interconnected field by developing its scope.

Understanding the powerful effect of education on the lifestyles and value judgments of individuals and societies and realising the impact of rapidly advancing technology on education has led to the beginning of a new education movement by combining education and technology in most nations [15]. Thanks to the above-mentioned action, education that embraces progress and differentiation has begun to create new knowledge and has gained a productive environment with the help of developments in the field of technology. Today, the place of information technologies, which is an indispensable element, in social life is increasing [2].

In today's conditions, where using technology has become a necessity rather than a privilege, people need to acquire knowledge, skills, attitudes and habits in order to adapt to the ever-changing and developing technology, to understand technology and to benefit from the benefits it offers. Technology is expressed as innovations that have emerge with the use of knowledge and methods obtained as a result of scientific research and studies aimed at improving people's skills and meeting their needs and wishes at a sat-

isfactory level [8]. Although technological products are not in a structure that can eliminate all educational problems, the use of these products in teaching activities has become a necessity today [11].

Computers, phone/smartphone, tablet, internet and other virtual combination tools, their visible area, digital activities created by digital technologies and inter-network relationships have changed our daily life and school environment by deeply penetrating them. In this context, digital learning is encouraged in schools and many policies are developed and implemented in order to eliminate domestic and international differences.

Although there are different opinions about the use of computers in education, it is possible to combine them under certain headings when an integration study is carried out by looking carefully at the relevant resources [13]. It has been observed that teaching with the help of computers and technology increases the success of students and contributes to their high-level cognitive thinking abilities to reach the analysis, synthesis and evaluation dimension [21]. In computer education management, it is used by school administrators in the planning of teachers, classrooms, laboratories, books and other educational equipment to provide the best results. In the same way, trainers use the computer in training, planning and development. In order to determine the knowledge level and performance of the students in a healthy way, the computer-managed instruction method can be used and the necessary precautions can be taken more quickly.

Computers are used as both a purpose and a tool in the field of education. With the developing technology, computers, which are indispensable in our daily life, have a very important place in the field of education. The first period of communication was with written documents (letters, newspapers etc.), the next period was with audio-visual tools (radio, television etc.), the third period of the industrial system approach was supported by face-to-face lectures and videos, the fourth period was when computer support and teleconferences were used and increased interactions with Internet/web applications constituted the fifth period [18] [22]. The role of computer use in education and its effects on education are investigated, on the one hand, with studies conducted in this field; on the other hand, efforts are made to expand the use of technology in education and to improve the opportunities it provides to individuals (Sevinc, 1996). With the help of computers that appeal to the eye, students and teachers can make presentations. Since the programmes prepared in computer environments are differentiated by taking into account various student types, they also provide privileges and conveniences for students with different intelligence levels and types. In addition, attempts are made to improve the vocabulary by using very different words, thanks to carefully prepared programmes [7].

Some of the areas wherein we use informatics in our lives are as follows: in daily life (listening to music, playing games on tablets, phones, etc., watching movies and so on), in the field of education (using computers / smart boards in lessons, using e-learning tools, certificate / diploma programmes with the departments opened with distance education, online lessons, fun lecture videos etc.), health sector (computed tomography and microsurgery methods in the definition of disease and treatment of patients), trans-

portation (navigation apps), security (security cameras and systems), banking and shopping (Internet banking and online shopping sites) and communication (video conferences, seminars, speaking and messaging). Apart from these areas, the use of information technologies is increasing in communication, business and logistics; in short, in all areas [12] [1] [23] [14] [16]. Knowledge of the teachers about online lessons was revealed. In-service trainings and their competencies can be increased in technology-supported trainings [3] [20] [6].

Advances in technology also affect the concept of science. Developments in science and technology require some changes in educational practices. The use of technology-learning environments is increasing. Educational technology is related to the teaching process and helps to achieve the goals set. However, there is a difference between the concept of educational technology and the concept of instructional technology. 'Instructional technology' is a technology-related term that is regulated depending on the sub-concept of 'teaching' and taking into account the specific aspects of certain teaching disciplines, for example, 'science teaching technology'. 'Educational technology', on the other hand, develops, applies and evaluates appropriate designs by employing relevant elements (human power, knowledge, method, technique, equipment etc.) to systematically analyse the problems involving all aspects of the phenomenon of 'human learning' and to develop solutions for them. It is a complex process. The term 'educational technology' emphasises a discipline related to learning and teaching processes. On the other hand, the term 'instructional technology' expresses the effectiveness of guiding learning in teaching a subject [25] [24].

With the innovations brought about by technology, developments in every field are increasing. Mobile-supported applications have taken their place in many areas, such as commerce, business and education industry [4]. With the use of computer technology in schools, lessons in schools that can reach this technology have started to be taught from computers and smart boards. It is stated that with the use of computers, tablets and smart boards in the lessons, more permanent and rich learning environments are provided to the students. For this reason, various projects are being developed to promote the use of materials such as computers, tablets and smart boards in schools in many countries of the world [10] [5]. Educators need to have pedagogical competence and knowledge about instructional technologies in order to choose and use appropriate technology. The qualifications that educators should have have been determined as international standards by the national educational technology standards project for teachers carried out by the International Society for Technologies in Education [19].

We live in an age where technology is used in every sector and technological developments are advancing rapidly. The most widely used technological tool in research is computers. Computer use levels are important in the learning and teaching processes of university students, who are the generations of the future. For this reason, it is important to determine which studies are carried out on the use of computers by university students and which countries are involved in these studies.

### 1.1 Purpose and importance of research

In the document search in the Web of Science database, the keywords 'learning and teaching' and 'computer' were searched in all areas, and the studies were found by searching the keyword 'university student' within the title. All articles placed in the Web of Science database were examined. All the studies were analysed by year, document type, Web of Science category, country and language of publication. The findings obtained from the research are explained in detail in the content analysis method. A total of 305 documents were reached in the research findings.

### 1.2 Limitations

- This research is limited to documents selected and reviewed in the Web of Science database.
- Content analysis of documents is limited to the five themes mentioned earlier

## 2 Method

In this study, the qualitative research methodology is carried out using document analysis and related content analysis. The basic process in content analysis is to compile similar data within the framework of the determined concepts and themes and to interpret the institutions in a way that the readers can understand. Basically, content analysis is a scientific framework that enables the systematic analysis of written, oral and other sources. Content analysis is a scientific framework that provides systematic analysis of oral, written and other research sources [17].

### 2.1 Data collection and analysis

Within the scope of researches related to the use of computers by university students in the learning and teaching process, 'learning and teaching' and 'computer' were searched for in all areas, and the studies were found by searching, primarily, the Web of Science database between 1994 and 2021, using the keyword 'university student'. As a result of the search, a total of 305 documents were reached. It is shown in Figure 1. Documents accessed from the Web of Science database were analysed and integrated with each other. In addition, the data were analysed through content analysis.

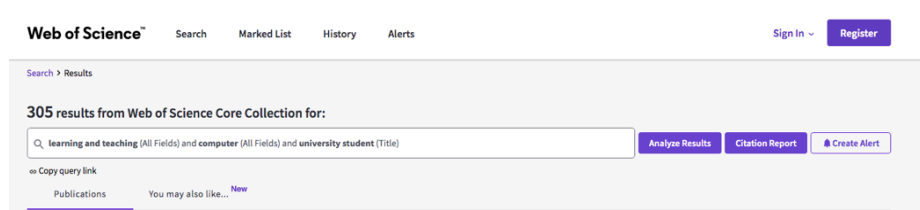


Fig. 1. Documents accessed using the keywords 'learning and teaching', 'computer' and 'university students' in the Web of Science database

### 3 Findings

#### 3.1 Findings of the documents by year

In the research, 305 studies were reached by browsing the Web of Science database to find studies on ‘learning and teaching’, ‘computer’ and ‘university students’. The distribution of data of the 305 studies by year is given in Table 1.

**Table 1.** Distribution of the documents by year

Years	Frequency
2021	25
2020	29
2019	25
2018	36
2017	26
2016	33
2015	32
2014	16
2013	12
2012	12
2011	18
2010	9
2009	6
2008	6
2007	5
2006	3
2004	3
2003	3
2002	1
1998	2
1995	2
1994	1

When the findings of the studies on university students in the period of computer learning and teaching were examined, it was determined that the studies were mostly carried out in 2018 and 2017. The first study was carried out in 1994. It was revealed that there was no study carried out in 2005, 2000, 2001, 1999, 1996 and 1997.

#### 3.2 Findings of the documents by document type

When the studies conducted in the fields of university students in the period of computer learning and teaching were examined in the Web of Science database, it was seen

that there were articles (154), proceeding papers (153), early access (7), book chapter (4), data papers (1) and meeting abstracts (1).

**Table 2.** Distribution of the documents by document type

<b>Document type</b>	<i>f</i>
Article	154
Proceedings paper	153
Early access	7
Book chapter	4
Data papers	1
Meeting abstracts	1

### 3.3 Findings of the documents by Web of Science categories

**Table 3.** Distribution of the documents by Web of Science categories

<b>Web of Science categories</b>	<i>f</i>
Education educational research	172
Computer science interdisciplinary applications	47
Education scientific disciplines	35
Computer science information systems	30
Computer science theory methods	29
Engineering electrical electronic	15
Computer science artificial intelligence	13
Social sciences interdisciplinary	13
Engineering multidisciplinary	10
Language linguistics	9
Management	8
Information science library science	7
Psychology multidisciplinary	7
Telecommunications	6
Chemistry multidisciplinary	5
Environmental sciences	5
Linguistics	5
Multidisciplinary sciences	5
Business	4
Economics	4
Environmental studies	4
Green sustainable science technology	4
Healthcare sciences services	4
Operations research management science	4
Educational psychology	3

When we look at the distribution of the studies with regard to the place of computer in learning and teaching, which is among the studies in the Web of Science database categories, we can see that the most field of study is education and training research (172). Again, according to the fields of study, we concluded that studies were conducted in the fields of Computer science interdisciplinary applications (47), Education scientific disciplines (35), Computer science information systems (30) and Computer science theory methods (29). Among these fields, it is seen that Educational psychology (3) is the least field of study.

### 3.4 Findings of the documents by research area

**Table 4.** Documents by research area

Research area	<i>f</i>
Education educational research	193
Computer science	82
Engineering	27
Social sciences and other topics	13
Business economics	12
Linguistics	12
Psychology	12
Science technology and other topics	9
Information science library science	7
Environmental sciences ecology	6
Telecommunications	6
Chemistry	5
Healthcare sciences services	4
Operations research management science	4
Physics	4
Communication	4
Energy fuels	2
Mathematics	2
Anatomy morphology	1
Area studies	1
Arts humanities and other topics	1

When the research areas of the studies published in the Web of Science database were examined, it was found that equal research was carried out in the fields of Education educational research (193) and Computer science (82). It was also found that the least research areas were in the fields of Anatomy morphology (1), Area studies (1), Arts, humanities and other topics (1), Biochemistry molecular biology (1), Cell biology (1), Cultural studies (1), Dentistry oral surgery medicine (1), Development studies (1), General internal medicine (1), Genetics heredity (1), Geography (1), Instruments in-



strumentation (1), Materials science (1), Medical Informatics (1), Neurosciences Neurology (1), Public environmental occupational health (1), Robotics (1), Social Issues (1), Sport sciences (1) and Urban studies (1).

### 3.5 Findings of the documents by countries

Considering the distribution of studies on the themes searched in the Web of Science database by country, it was found that the country with the most studies was Spain (12), followed by the People's Republic of China (25) and Australia (19).

**Table 5.** Documents by countries

Countries/regions	<i>f</i>
Spain	37
People's Republic of China	25
South Africa	19
Australia	16
Russia	16
Malaysia	14
USA	14
England	13
Taiwan	13
Saudi Arabia	9
Turkey	9
Mexico	8
Germany	7
Iran	7
Ukraine	7
Czech Republic	6
Canada	5
Indonesia	5
Romania	5
Belgium	4
India	4
Japan	4
Nigeria	4
Poland	4
Thailand	4

### 3.6 Findings of the documents by languages

When the written languages of the studies scanned in the Web of Science database are examined, it is seen that almost all of the studies were written in English (291). It was observed that seven documents were written in Spanish language, three documents

in Russian, two documents in Chinese and one each in Afrikaans and French were found.

**Table 6.** Documents by languages

<b>Languages</b>	<b><i>f</i></b>
English	291
Spanish	7
Russian	3
Chinese	2
Afrikaans	1
French	1

#### **4 Conclusion, discussion and suggestions**

Within the scope of this research, when the distribution of studies on the concept of computer related to university students in the learning and teaching process in the Web of Science database was examined, it was concluded that the most studies were conducted in 2018 and 2017. The first study was carried out in 1994. Considering the technological developments, it is pleasing that working in computer fields with university students and learning strategic management has increased in recent years. When the distributions by year were examined, it was seen that the studies carried out has increased in direct proportion. The fact that studies have not been carried out in some years makes us unable to follow the current developments in this field.

When we examined the studies on the place of the computer in the learning–teaching process on university students and scanned the Web of Science database, we reached the conclusion that the most studies were published as articles (154) and 153 studies were published as papers. It is seen that there are studies in the types of early access (7), book chapters (4), data papers (1) and meeting abstracts (1). This result is very pleasing as studies in many types of documents have been published.

Considering the distribution of the studies conducted with university students in the Web of Science database in the learning and teaching process according to the Web of Science category, it was concluded that the most studies were carried out in the field of ‘Education educational research (172)’. It was also concluded that there are very few studies in the field of Educational psychology (3) in the Web of Science categories database. This is the result of the distribution of the Web of Science database according to its fields. In this case, we can say that studies in different fields are incomplete and few in number.

When we examined the research areas of the studies published in the Web of Science database, which is another finding of ours, it was seen that the majority of research was carried out in the fields of ‘Education educational research (193)’ and Computer science (82). While it was concluded that the Web of Science database had the highest number of studies in its field research, it was also concluded that education and training

researches were the most. When the research areas of the studies were examined, it was concluded that the same field had the most studies. The least researched areas are Anatomy morphology (1), Area studies (1), Arts, humanities and other topics (1), Biochemistry molecular biology (1), Cell biology (1), Cultural studies (1), Dentistry oral surgery medicine (1), Development studies (1), General internal medicine (1), Genetics heredity (1), Geography (1), Instruments instrumentation (1), Materials science (1), Medical informatics (1), Neurosciences Neurology (1), Public environmental occupational health (1), Robotics (1), Social issues (1), Sport sciences (1) and Urban studies (1). Important research focuses on the importance of teamwork in education [26] [28] [29] [30]. For this reason, it can be said that the studies in this field are high.

When the distribution of studies on the themes researched in the Web of Science database is analysed by country, the country with the most research was Spain (37). Looking at the countries of the authors conducting the studies, People's Republic of China (25) ranked second. South Africa (19) and Australia (16) ranked third. The number of countries without education is quite high. This may be related to the situation of developed countries in terms of globalisation. USA is a developed country among the countries of the world. But, it is surprising that most of the studies were carried out in Spain.

When the written languages of the studies scanned in the Web of Science database were examined, it was concluded that almost all of the studies were in English (291). It was seen that only one study was written in Afrikaans and French. This situation is thought to be related to the acceptance of English as a universal language. However, considering the distribution by country, it can be said that studies in different languages should be increased.

As a result of this research, suggestions for future researchers are as follows:

This study was carried out in the Web of Science database. Studies in other databases can be examined and compared. The theses about the computer tool in the learning and teaching processes of university students should be examined and further studies should be carried out. In countries where there are few studies on the use of computers in the learning-teaching processes of university students, the number of studies can be increased.

## 5 Acknowledgement

This paper has been supported by the Kazan Federal University and RUDN University Strategic Academic Leadership Programme.

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Article submitted 2021-08-05. Resubmitted 2021-09-13. Final acceptance 2021-09-16. Final version published as submitted by the authors.