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Opportunities of innovator technologies in the educational process

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Abstract

Digital generation and digital native concepts have become today's terms. Along with technological developments, it is important to look at the changes with technological tools in the education process. Identifying innovator technologies used in the education process will contribute to future research. In this context, the aim of this study is to examine the documents related to the opportunities of innovator technologies in education scanned in the Web of Science database thematically and methodologically. In order to achieve this aim, a case study, one of the qualitative research methods, was adopted. In the selection of the articles included in the study, the sample was not determined and it was aimed to reach the whole universe. In this context, the documents in the Web of Science database were accessed through the library system of the university. While scanning the documents, the keywords 'education' and 'technology' were searched in all fields, and the keyword 'innovator' was searched within the title and all studies were found. The findings obtained from the research are explained in detail with the content analysis method. The research findings reached 505 documents. As a result of this research, it was concluded that the most work was carried out in 2016. It was concluded that the first study was carried out in 2004. With regard to the document type of the published studies, the most were proceedings papers (138). In the field of visual arts, the field in which the teachers' work related to technology was mostly carried out was Education and Educational Research (119). The language most used was English (162).

Keywords: Innovative approach, technology, education, educational opportunity;

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1. Introduction

Since the new century, we are in the age of technology. We are in an age where robotic coding, artificial intelligence and technological tools are becoming more and more diversified day by day. With the rapid development in technology, technology has taken its place in every aspect of our lives. Technology is among the methods used in education and training fields. With the development in technology in all areas of daily life, art, which is fed by individual and social perceptions, is changing. Technology has also taken its place in art. In the field of digital culture and digital art, not only materials, tools or techniques but also change in perception is emphasised (Çalıkoğlu, 2005; Mendez, Mendez, & Anguita, 2020). Among the advantages of technology, all kinds of information can be accessed with a single click and in a very short time. In the 21st century, when the information and technologies we live with dominate, the developments in computer and communication technology affect education in a positive way and in many different dimensions. The structuring of the information age we live in has also led to the development of new professions and different interdisciplinary fields of expertise. Parallel to these developments, the education curriculum has also changed, and this dizzying development, which continues at full speed, has also led to the emergence of many new professions and areas of expertise. Of course, naturally, educational technologies have also started to change constantly (Bakhmat, Liubarets, Bilynska, Ridei, & Anhelina, 2020; Dolunay & Karamustafaoğlu, 2021).

Accelerating and maintaining a teaching–learning approach is both useful and technical. In recent years, the ideas of the Internet and technology have been working well in education and in every field. We are in the digital age and the power of digital tools at the speed of learning and teaching in education is increasing day by day (Tonbuloğlu & Tonbuloğlu, 2021).

Şahin (2009) explained the concept of 'Students of the digital technological generation' in his study and examined the characteristics of today's students. Students who learn by exploring and experimenting with new millennium digital tools with perception types are those who keep their focus small, are impatient in communication and relationships, expect instant feedback, are game-oriented learners, have developed imaginations and develop digitally. He stated that students who prefer digital tools instead of paper-based tools have high expectations from education (Pedro, 2006, as cited in Şahin, 2009).

The 21st century is the age of digital natives with social and institutional structures of radical and rapid technological development in the information age. Its impact is felt in almost every sector, including the education sector (Uşun, 2000). Therefore, technology-oriented innovations in social, cultural, political and economic fields also affect the education sector and create systemic changes, which are stable today. Technological devices have gradually expanded their usage areas and have started to get rid of static (Çakır, 2011; Heinecke, Milman, Washington, & Blasi, 2002; Kozma & Anderson, 2002; Wang & Hannafin, 2005; Watson, 2001). People can access information on the go, regardless of time or location. This is becoming more and more important. As a result, people can work with different devices in different locations and can achieve performance. Studies carried out in this regard include data access, data transfer, data sharing and data processing. Processes are quick and easy, regardless of time and place.

Kılıçer (2011) pointed out that nowadays, with the increase in the amount of information, the reaction times to technological innovations are shortened and that it is imperative to be an innovator. According to Kılıçer (2011), innovation was used to make the individual different. Today, it is a feature that does not make a difference on its own, but is a prerequisite for making a difference. This has become a problem. Elçi (2011) stated that innovation is the driving force of economic development. The basis of innovation is many, i.e., employment and welfare, can only

increase through innovation and multiple ideas, and different alternatives and available knowledge (from the known) indicated that divergence has taken place. Innovation capacity is directly related to the nature of scientific research institutions. Elçi (2011), in his study 'Restructuring the Education System', pointed out that the culture of innovation, entrepreneurship and creativity should be brought to individuals at an early age and should be emphasised throughout the education process. For this reason, it is of great importance that the education system is structured in a way that will ensure the training of innovator individuals, that the innovation dimension of curriculum evaluation studies is valued and that the designed curriculum is based on improving innovation.

In another study, it is seen that the examples given by the primary schoolteacher candidates regarding the concept of innovation before the process of designing innovator teaching materials were explained in the categories of system change and technology use. In this context, it has been concluded that pre-service teachers associate innovation with changes in the education system, changes in the measurement and evaluation system and technological applications. He also stated that the pre-service teachers who designed innovator teaching materials explained the examples they gave for the concept of innovation in the categories of using technology and renewing the existing one. It is seen that technology is an integral part of innovation in the innovator-ness perception of teacher candidates and stated that it is any product, service, information or application (Yokuş & Yelken, 2016).

1.1. Purpose and importance of the research

With the digital generation, innovations used in education are also changing. Along with technological developments, it is important to look at the changes in technological tools in the education process. It is important to determine the effects of innovator technological developments included in education. Identifying innovator technologies used in the education process will contribute to future research. In this context, the aim of this study is to examine the documents related to the educational opportunities of innovator technologies scanned in the Web of Science database thematically and methodologically. In order to achieve this aim, a case study, one of the qualitative research methods, was adopted. In the selection of the articles included in the research, it was aimed to reach the entire universe without a sample. In this context, the documents in the Web of Science database were accessed through the library system of the university. While scanning the document, the keywords 'education' and 'technology' were searched in all fields, and the keyword 'innovator' was searched in the title and all studies were found. The findings obtained from the research were explained in detail with the content analysis method. As a result of the findings obtained from this research, the place of innovator technological developments in the education process will be determined.

1.2. Limitations of the research

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

2. Method

In this research, a detailed examination of the studies on innovator technological opportunities in the education process was made in order to determine the opportunities of innovator technologies in the education process. For this purpose, 'education' and 'technology' keywords were searched in all fields in the Web of Science database, and the keyword 'innovator' was used to search the titles of the studies. All articles in the Web of Science database were included and analysed in this study. All studies were analysed by year, document type, Web of Science category, country and publication language. The findings obtained from the research are explained in detail with the content analysis method. A total of 505 documents were reached in the research findings.

2.1. Data collection and analysis

Research on the theoretical and methodological foundations of innovator technology approaches in the education process was examined. In this context, 'education' and 'technology' were scanned in all fields in the Web of Science database document scanning for the distribution of the studies. In the title of the research, the term 'innovator' was searched. As a result of the search, 505 documents were found, as 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.

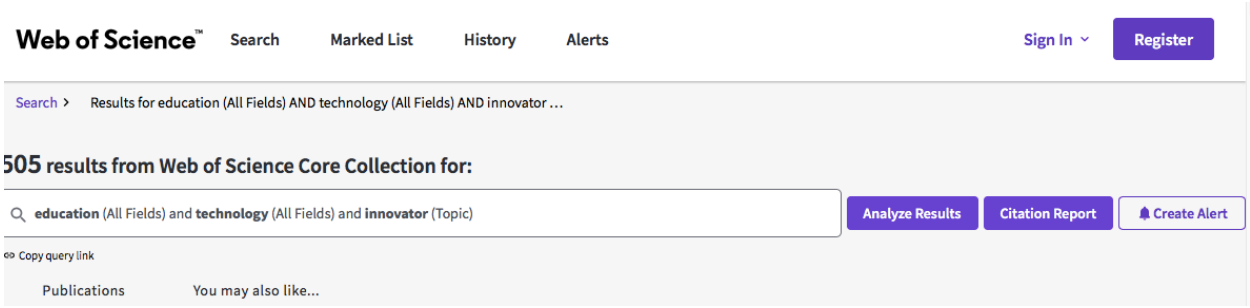

Figure 1. Documents accessed using the keywords 'education', 'technology' and 'innovator' in the Web of Science database

3. Findings

3.1. Findings of the documents by year

In the research, 505 studies were accessed by browsing the Web of Science database to find studies on 'education' and 'technology', which were scanned in all fields in the Web of Science database document scanning for the distribution of the studies. In the title of the research, the term 'innovator' was searched. The distribution of data, of the 505 studies, by year is presented in Table 1.

Table 1. Distribution of the documents by year

Years	Frequency
2022	13
2021	35
2020	45
2019	47
2018	62
2017	49
2016	44
2015	27
2014	34
2013	29
2012	21
2011	20
2010	17
2009	12
2008	7
2007	12
2006	7
2005	6

2004	2
2003	5
2002	2
2000	1
1999	3
1998	1
1997	1
1994	2
1993	1

When the findings of the studies on innovator technologies in the education process are examined by year, it can be seen that the most studies were carried out in 2018. In the same way, it was determined that the most studied years were 2018, 2017 and 2020. The first study was carried out in 1993.

3.2. Findings of the documents by document type

Table 2. Distribution of the documents by document type

Document type	*f*
Articles	304
Proceedings papers	169
Review articles	17
Editorial materials	16
Book chapters	11
Early access	4
Biographical items	1
Book reviews	1
Reprints	1

When the studies on the innovator technologies in the education process are examined, it can be seen that there are articles (304), papers (169), review articles (17), editorials (16), book chapters (11), early access (4), biographical items (1), book reviews (1) and reprints (1) in the Web of Science database.

3.3. Findings of the documents by Web of Science categories

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

Web of Science categories	*f*
Education and educational research	154
Education and scientific disciplines	59
Management	45
Economics	41
Business	38
Computer science information systems	31
Engineering multidisciplinary	31
Computer science interdisciplinary applications	25
Computer science theory methods	19
Engineering electrical electronic	18
Multidisciplinary sciences	18
Engineering industrial	17
Computer science artificial intelligence	14
Social sciences interdisciplinary	13
Environmental sciences	12
Environmental studies	12

Operations research management science	12
Business finance	11
Engineering manufacturing	9
Green sustainable science technology	9
Information science library science	9
Medical informatics	8
Healthcare sciences services	7
Regional urban planning	7
Telecommunications	7
Agriculture multidisciplinary	6
Communication	6
Surgery	6
Pharmacology pharmacy	6
Psychology multidisciplinary	5
Area studies	4

When the distribution of studies on the innovator technologies in the education process is examined, which are among the studies included in the Web of Science index, we can see that the most studied field is Education and educational research (154), followed by the fields of Educational and scientific disciplines (59), Management (45), Economy (41), Business (38) and Computer science information systems (31).

3.4. Findings of the documents by research area

Table 4. Documents by research area

Research area	*f*
Education and educational research	188
Business economics	102
Engineering	81
Computer science	55
Science technology other topics	27
Environmental sciences ecology	19
Social sciences other topics	18
Operations research management science	12
Agriculture	9
Information science library science	9
Psychology	9
Healthcare sciences services	8
Medical informatics	8
Public administration	8
Chemistry	7
Mathematics	7
Telecommunications	7
Communication	6
Materials science	6
Surgery	6
Pharmacology pharmacy	5
Robotics	5
Area studies	4
Automation control systems	4
Energy fuels	4
Food science technology	4
International relations	4
Optics	4
Physics	4

Research experimental medicine	4
Arts humanities other topics	3
Cardiovascular system cardiology	3
Construction building technology	3
Development studies	3
Geography	3
History philosophy of science	3
Instruments and instrumentation	3

The research areas of the Web of Science database includes Education and educational research (188), Business economics (102), Engineering (81), Computer Science (55), Science technology other topics (27), Environmental sciences ecology (19), Social sciences other topics (18), Operations research management science (12), Agriculture (9), Information science library science (9) and Psychology (9).

3.5. Findings of the documents by country

Table 5. Documents by country

Countries/regions	*f*
USA	144
Japan	47
Peoples R China	44
England	34
Australia	26
Russia	20
Germany	19
Canada	16
Spain	16
Netherlands	15
India	11
South Africa	10
Sweden	10
Italy	9
Romania	9
Austria	8
France	8
Poland	8
Turkey	8
Colombia	7
Czech Republic	7
Finland	7
Ireland	7
Mexico	7
Slovakia	7
South Korea	7
Malaysia	6
Taiwan	6
Indonesia	5
Belgium	4
Brazil	4
New Zealand	4
Portugal	4
Switzerland	4
Thailand	4
Ukraine	4

Estonia	3
Norway	3
Singapore	3
Argentina	2
Croatia	2
Denmark	2
Ecuador	2
Greece	2
Iran	2

Considering the distribution of studies on the themes scanned in the Web of Science database by country, it can be seen that the country with the most studies is USA (144), followed by Japan (47), Peoples R China (44), England (34), Australia (26), Russia (20), Germany (19) and Canada (16). Countries with lesser studies include Botswana (1), Bulgaria (1), Chile (1), Cuba (1), Cyprus (1), Egypt (1), Eswatini (1), Guatemala (1), Honduras (1), Hungary (1), Iceland (1), Jordan (1), Lebanon (1), Liechtenstein (1), Luxembourg (1), Macedonia (1), Mauritius (1), Morocco (1), Nigeria (1), Pakistan (1), Qatar (1), Sri Lanka (1), Tanzania (1), Trinidad and Tobago (1), UAE (1) and Zambia (1).

3.6. Findings of the documents by language

Table 6. Documents by language

Languages	*f*
English	482
Spanish	12
Russian	5
German	2
Hungarian	1
Korean	1
Portuguese	1
Slovak	1

When the written languages of the studies in the Web of Science database are examined, it can be seen that almost all of the studies were written in English (482). It can be observed that 12 documents were written in Spanish, 5 in Russian, 2 in German, 1 in Hungarian, 1 in Korean, 1 in Portuguese and 1 in Slovak.

4. Conclusion and discussion

In this study, it was aimed to evaluate the researches on the use of rapidly changing and developing technologies in education. For a detailed examination of the applicability of innovative technological approaches in education, all published studies in the Web of Science database were examined.

When the findings of the studies on innovator technologies in the education process are examined by year, it can be seen that the most studies were carried out in 2018. In the same way, it was determined that the most studied years were 2018, 2017 and 2020. The first study was carried out in 1993. It can be said that the reason for the increase in the number of carried out in 2020 is the transition of education to distance education due to the pandemic. Technology-supported trainings used in distance education have varied and many educational institutions have continued their education by using different distance education techniques. Distance education is one of the innovative technologies.

When the studies on the innovator technologies in the education process are examined, it can be seen that there are articles (304), papers (169), review articles (17), editorial materials (16), book chapters (11), early access (4), biographical items (1), book reviews (1) and reprints (1) in the Web of Science database. Considering this finding, it can be said that the studies conducted vary. Studies have been carried out in many formats. This is pleasing.

Considering the distribution of studies on the innovator technologies in the education process is examined, which are among the studies included in the Web of Science index, we can see that the most studied field is Education and educational research (154), followed by the fields of Educational and scientific disciplines (59), Management (45), Economy (41), Business (38) and Computer science information systems (31). Studies on the concept of education are generally published in education-themed fields. It is also seen that work has been carried out in many areas.

The research areas of the Web of Science database includes Education and educational research (188), Business economics (102), Engineering (81), Computer Science (55), Science technology other topics (27), Environmental sciences ecology (19), Social sciences other topics (18), Operations research management science (12), Agriculture (9), Information science library science (9) and Psychology (9). When we look at the research field, it is pleasing to see that studies are carried out in many fields in the same way. It is positive to try to determine the effects of innovative technologies in every field.

When the distribution of studies on the themes scanned in the Web of Science database by country, it can be seen that the country with the most studies is USA (144), followed by Japan (47), Peoples R China (44), England (34), Australia (26), Russia (20), Germany (19) and Canada (16). Countries with lesser studies include Botswana (1), Bulgaria (1), Chile (1), Cuba (1), Cyprus (1), Egypt (1), Eswatini (1), Guatemala (1), Honduras (1), Hungary (1), Iceland (1), Jordan (1), Lebanon (1), Liechtenstein (1), Luxembourg (1), Macedonia (1), Mauritius (1), Morocco (1), Nigeria (1), Pakistan (1), Qatar (1), Sri Lanka (1), Tanzania (1), Trinidad and Tobago (1), UAE (1) and Zambia (1).

When the written languages of the studies in the Web of Science database are examined, it can be seen that almost all of the studies were written in English (482). It can be observed that 12 documents were written in Spanish, 5 in Russian, 2 in German, 1 in Hungarian, 1 in Korean, 1 in Portuguese and 1 in Slovak. When the publication fields and publication languages are compared, publications have been made in different languages, although studies have been carried out in many countries. The number of countries and the language of publication differ. By increasing the number of studies in different languages, it can be ensured that the findings would reach more people.

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