

## Investigating Research Trends on Digital Storytelling: A Bibliometric and Visualized Analysis

Perihan Gülce Özkaya<sup>i</sup>  
Muğla Sıtkı Koçman University

### Abstract

Digital storytelling is a method often preferred in the education process in terms of its appeal to different senses by creating a multimedia environment, and it may also be used in the development of language skills as it often includes both textual and audio elements. The current study investigates the research trends of digital storytelling, which is one of the methods recently preferred for education and for Turkish language skills development, through an examination of the Web of Science (WoS) database. The study was designed as a descriptive study. Data obtained from 545 academic works published within the context of the study were subjected to bibliometric analysis according to six categories; number of articles and citations, most-cited articles, most-used keywords, most influential countries, most influential institutions, and most influential journals. The study also presents bibliometric network maps of the most-cited articles, most-used keywords, as well as the most influential countries, institutions, and journals. The bibliometric analyses and network maps were performed using the VOSviewer\_1.6.16 program. The results of the study show that digital storytelling is a method currently preferred in education. It is thought that examining the global trends of studies undertaken on digital storytelling in education will help to guide researchers looking to work on this subject in Turkish language education or in other fields of education.

**Keywords:** Digital Storytelling; Education; Turkish Language Education; Turkish Language Skills; Bibliometric Analysis

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<sup>i</sup> Perihan Gülce Özkaya, Research Assist Dr., Faculty of Education, Muğla Sıtkı Koçman University, ORCID: 0000-0001-9630-9739

**Email:** ozkayagulce@gmail.com

## INTRODUCTION

“Digital stories,” which can be defined as presenting stories in an interactive environment by enriching them with sound, music, rhythm, and visuals, has become a preferred learning tool in today’s education due to features such as its appeal to different senses and increased levels of interaction. Digital stories prepared by teachers can be used as a learning tool in the classroom, as well as a method in which the learning process is structured on the basis of students preparing digital stories themselves, either individually or collaboratively, in order to achieve gains under the guidance of their teacher. This method is known as “digital storytelling.”

Digital storytelling is considered to be an effective technological application designed to take advantage of user-generated content and also to remove obstacles to the efficient use of technology within educational environments (Robin, 2008). Digital storytelling can be employed to facilitate meaningful learning for students in harmony with the use of technology (Sadik, 2008).

In education, digital storytelling is a method that can be preferred in terms of its ability to appeal to different senses through a multimedia environment; as such, it can be used in the development of language skills as it includes both text-based and audio-based elements. It may be said that students skills can be activated through digital storytelling, such as through engaging the writing skills of students during the creation of a story’s text, which is the first stage of digital storytelling, reading aloud skills during the storytelling stage, listening skills during the story-sharing stage, and oration skills during interpretation of the shared story. In this context, digital storytelling can be said to be a multidimensional approach that can appeal to students’ comprehension (listening, reading) and expression (speaking, writing) skills.

In related studies, it has been stated that digital storytelling is an effective method in the development of Turkish language skills, that it is suitable for Turkish language teaching in terms of facilitating learning through the creating of multimedia environments, and that it can address all types of comprehension and expression skills (Duran & Ertan-Özen, 2017; Özkaya, 2020). According to this connection, digital storytelling can also be considered an effective tool in the development of competence in “communicating using the mother tongue,” which is one of the eight basic competences that should be possessed by individuals according to the Turkish Framework of Competences (Milli Eğitim Bakanlığı [Turkish Ministry of National Education], 2019) which was developed based on the European Framework of Competences in order to develop “digital competence” in K-12 students.

When the literature in this area is reviewed, it can be seen that studies have investigated the effect of digital stories on participants’ critical thinking skills (Chen & Chuang, 2021), digital literacy skills (Çetin, 2021; La Rose & Detlor, 2021), their academic achievement, learning motivation and attitudes (Kim & Li, 2021; Saritepeci, 2021), and language skills (Güvey-Aktay, 2020; Tabieh et al., 2021; Yang et al., 2020). In addition, meta-analyses have shown that digital stories can positively affect students’ academic achievement (Akgün & Akgün, 2020; Şahin & Çoban, 2020) and literacy skills (Takacs et al., 2015). In the meta-analytic and meta-thematic study conducted by Talan (2021), it was reported that the digital storytelling method can significantly affect students’ learning achievement, that it is effective in imparting 21st century skills such as critical thinking, effective communication and inquiry skills, and that it facilitates learning and increases retention. Moreover, in the meta-analysis study published by Özkaya (2020), digital stories were found to be highly influential on the development of Turkish language skills.

All of these various research results have led researchers to conduct studies on the use of digital storytelling and digital stories in education. When Turkey’s Council of Higher Education (YÖK) thesis database was examined, which is considered an important and reliable resource for data about graduate studies undertaken in Turkey, a total of 16 graduate theses were found to have investigated the effects of storytelling and digital stories on Turkish language skills. The fact that these studies were completed during the period from 2014 to 2020 shows how digital storytelling has become one of the methods more recently preferred for the development of Turkish language skills.

It is therefore considered that examining the global trend of studies published on digital storytelling in education will provide a valuable guide for researchers looking to work on this subject in Turkish language education as a research area, or in any other field of education. Accordingly, it is suggested to be important to examine a database that is predominantly accepted by the scientific world and is considered a rich source of data for researchers in terms of both quantity and quality. The Web of Science (WoS) is considered to be just such a database, accepted by the scientific world at large and includes leading citation indexes such as Science Citation Index-Expanded (SCI-Expanded), Social Science Citation Index (SSCI), Arts and Humanities Citation Index (A&HCI), Conference Proceedings Citation Index-Science (CPCI-S), Conference Proceedings Citation Index-Social Science & Humanities (CPCI-SSH), Book Citation Index-Science (BKCI-S), Book Citation Index-Social Sciences & Humanities (BKCI-SSH), and the Emerging Sources Citation Index (ESCI). As such, WoS is considered to be a large and important data source for academic researchers, and therefore researchers are encouraged to publish their research studies in journals that are indexed by WoS.

When the literature is examined, it can be seen that no study has yet been published that determines the research trends of digital storytelling. Therefore, the author decided to search the WoS database in the current study so as to investigate and determine the trends of digital storytelling research. To this end, answers to the following research questions were sought:

What is the distribution of studies on the use of digital storytelling in education, and citations to these studies by years?

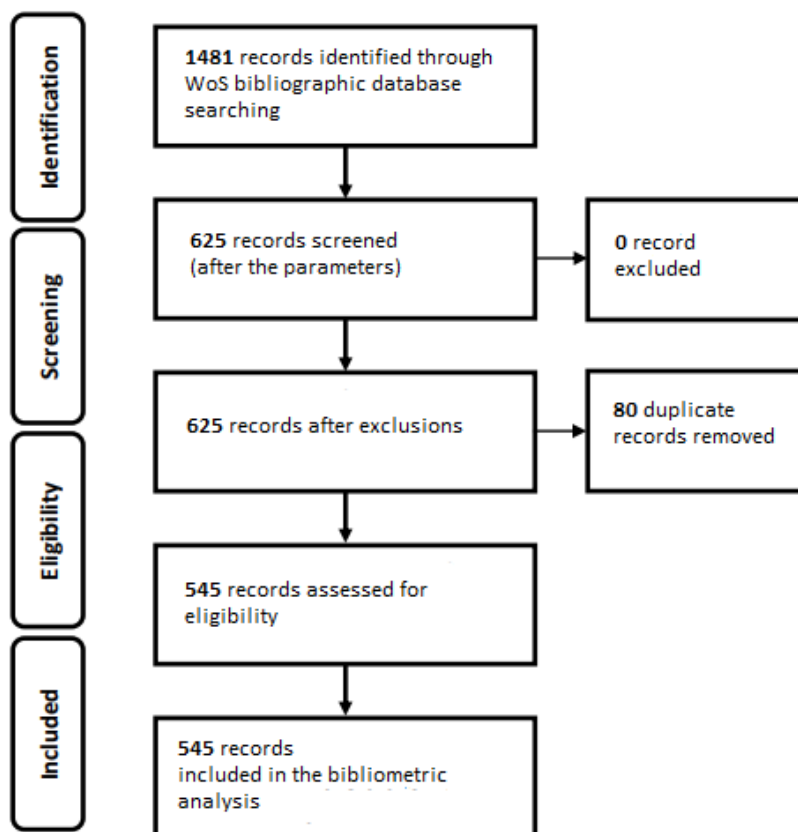
What are the most-cited articles, and how are they connected on a network map?

What are the most-used keywords, and how are they connected on a network map?

What countries, institutions, and journals made the greatest contribution to the field of digital storytelling, and how are they connected on a network map?

## **METHOD**

The current study was designed as a descriptive research. Descriptive research can be defined as the description and revelation of what already exists (Sönmez & Alacapınar, 2014). In the current study, the related works determined to examine the trend of digital storytelling in the WoS database, were analyzed through bibliometric techniques and the obtained findings then reported. The review was reported according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Moher et al., 2009). The PRISMA flow diagram of the search to identify and screen the analytical resources is presented in Figure 1.



**Figure 1. PRISMA flow diagram**

### **Data collection procedure**

Data of the study were obtained through a WoS database search performed on December 17, 2020. The search criteria determined for the current study consisted of: use of the term “digital storytelling” OR “digital story” OR “digital stories” in the subject area, the inclusion of studies in the “Education and Educational Research” category, and with the search being performed on the “WoS Core Collection.” These criteria also constitute the limitations of the current study. Limitations were not placed on the year or type of publication.

From the database search performed, bibliographic data on a total of 545 academic works published in the category of education and educational research from 2004 to 2020 were retrieved and a dataset for the study subsequently created. Of these works, 340 were journal articles, 178 were conference presentations, 62 were book sections or chapters, 17 were articles opened to early access (i.e., preprint or advance online publications), 13 were educational materials, 10 were academic reviews, three were book reviews, and two were books. Overall, 526 of the retrieved academic works were written in the English language, plus 10 in Spanish, four in Portuguese, two in Russian, two in Turkish, and one in Malay Language.

### **Data analysis**

The collected data were subjected to bibliometric analysis, which refers to the cross-disciplinary science of quantitative analysis by means of statistical and science-mapping methods (Merigó et al., 2016). Through bibliometric study, the most prominent contributors of a given field can be revealed, as too can the most influential articles and journals, and more importantly, the gradual progression of a field can be understood and visualized (Saha et al., 2020). Bibliometric analyses can be either descriptive or evaluative. While analyses aiming to determine the numbers of articles written

in a specific year are generally considered to be descriptive, those conducted to reveal how articles affected subsequent research are considered to be evaluative (Zan, 2019).

In the current study, a bibliometric analysis was conducted according to six categories; (1) numbers of articles and citations, (2) most-cited articles, (3) most-used keywords, (4) most influential countries, (5) most influential institutions, and (6) most influential journals. The data placed within each of the related categories was then presented in tabular format as well as using bibliometric network maps for the most-cited articles, most-used keywords, and the most influential countries, institutions, and journals. The bibliometric analysis and accompanying network maps were performed using the VOSviewer\_1.6.16 program, which is software used especially to retrieve bibliometric data and to create visualized network maps to reveal connections between the data and for examination of the data interactively (Van Eck & Waltman, 2010). The fact that bibliometric research goes beyond definition to becomes descriptive also plays a role in the evaluation of scientific publications, and thereby contributes to the more efficient use of resources (Al et al., 2012). In this direction, descriptive data were presented in tabular format and then examined in detail through network mapping in order that the connections between the data could be described.

## RESULTS

### Results related to distribution of studies and citations by years

Distribution of the 545 studies retrieved from the WoS database based on the use of digital storytelling, along with a total of 3,326 subsequent citations to these studies, are presented in Figure 2 and Figure 3 for each year of the examined period.

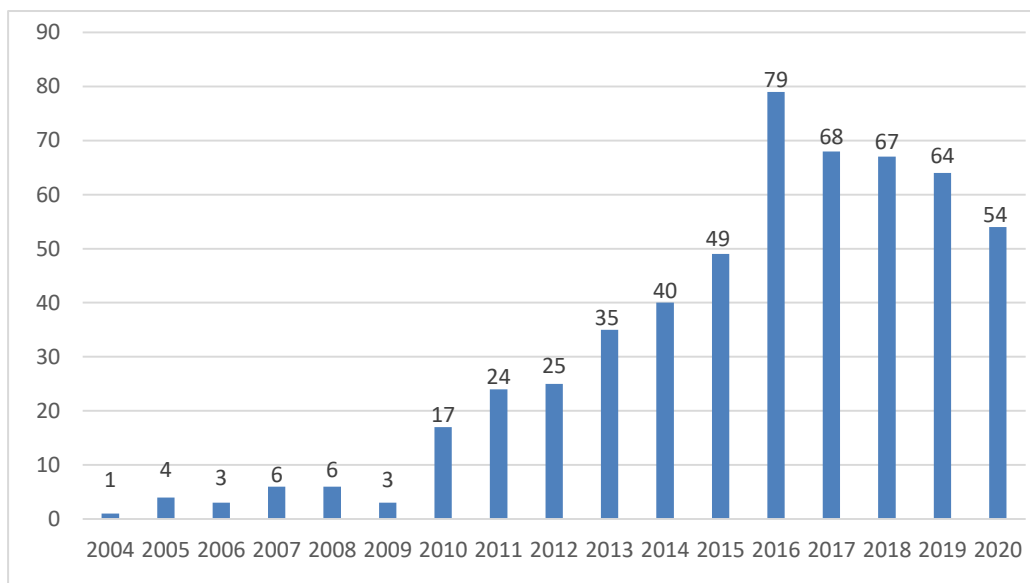
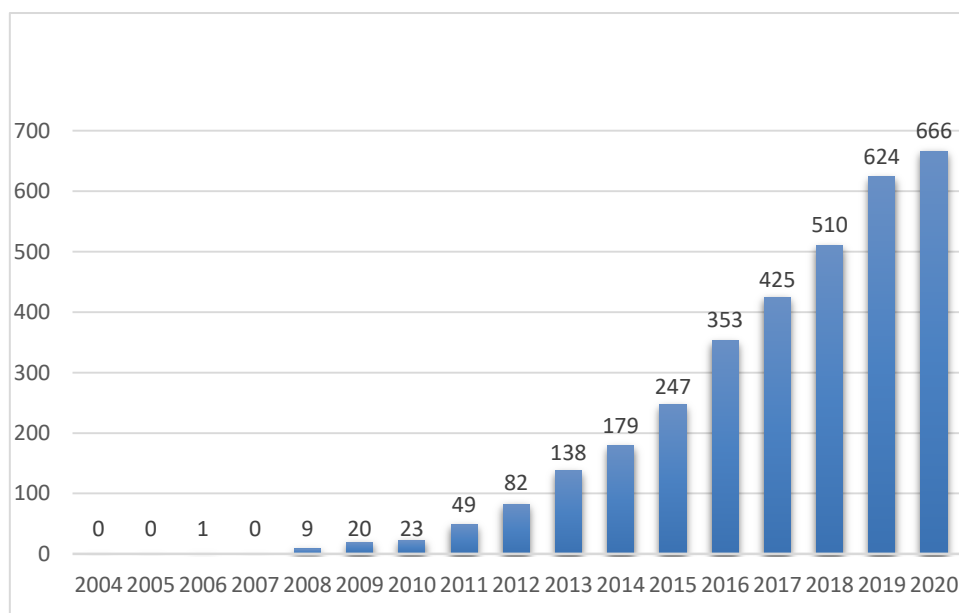


Figure 2. Distribution of studies by year (2004-2020)



**Figure 3. Distribution of citations by year (2004-2020)**

As can be seen in Figure 2, the first study on digital storytelling was published in 2004. The highest number of studies conducted on digital storytelling was in 2016 (n = 79), and although this number decreased in 2020 (n = 54), it can still be considered high. When the distribution of citations to the published articles (see Figure 3) is examined, it can be seen that the first citation was registered in 2006. The number of citations for studies on digital storytelling has shown an increasing trend over the years, with the highest being 666 in 2020.

### Results related to most-cited articles

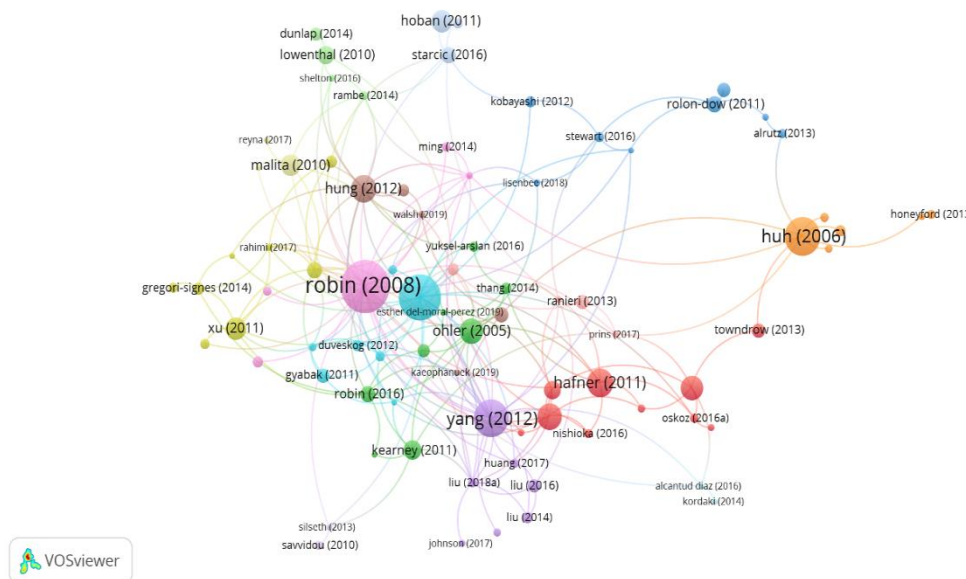
As a result of the examination of the use of digital storytelling in educational research (citation-documents), the 10 most-cited articles of the 123 that met the threshold of having attracted at least “5 citations” are presented in Table 1; whilst the corresponding network map is presented in Figure 4.

**Table 1. Ten most-cited articles**

No	Author/s	Year	Article title	Journal name	*WoS citations
1	Robin	2008	Digital storytelling: A powerful technology tool for the 21st century classroom	Theory into Practice	302
2	Sadik	2008	Digital storytelling: A meaningful technology-integrated approach for engaged student learning	Educational Technology Research and Development	226
3	Hull & Katz	2006	Crafting an agentive self: Case studies of digital storytelling	Research in the Teaching of English	164
4	Yang & Wu	2012	Digital storytelling for enhancing student academic achievement, critical thinking, and learning motivation: A year-long experimental study.	Computers & Education	155
5	Hafner & Miller	2011	Fostering learner autonomy in English for science: A collaborative digital video project in a technological learning environment	Language Learning & Technology	91
6	Hung et al.	2012	A project-based digital storytelling approach for improving students’ learning motivation, problem-solving competence and learning achievement	Educational Technology & Society	87
7	Verdugo & Belmonte	2007	Using digital stories to improve listening comprehension with Spanish young learners of English	Language Learning & Technology	78

No	Author/s	Year	Article title	Journal name	*WoS citations
8	Ohler	2005	The world of digital storytelling	Educational Leadership	75
9	Nelson	2006	Mode, meaning, and synaesthesia in multimedia L2 writing	Language Learning & Technology	66
10	Jernigan et al.	2012	Addressing food insecurity in a Native American reservation using community-based participatory research	Health Education Research	59

\* Number of WoS citations determined according to citations in other publications also listed in the WoS citation index (as at December 17, 2020).



**Figure 4. Network map of 10 most-cited articles**

In Table 1 and Figure 4, the most-cited articles on the subject of digital storytelling are presented. The most-cited article attracted 302 citations in WoS-indexed publications and was authored by Robin (2008) under the title, “Digital storytelling: A powerful technology tool for the 21st century classroom” and published in the Theory into Practice journal. This article is deemed one of the seminal works on the use of digital storytelling in education.

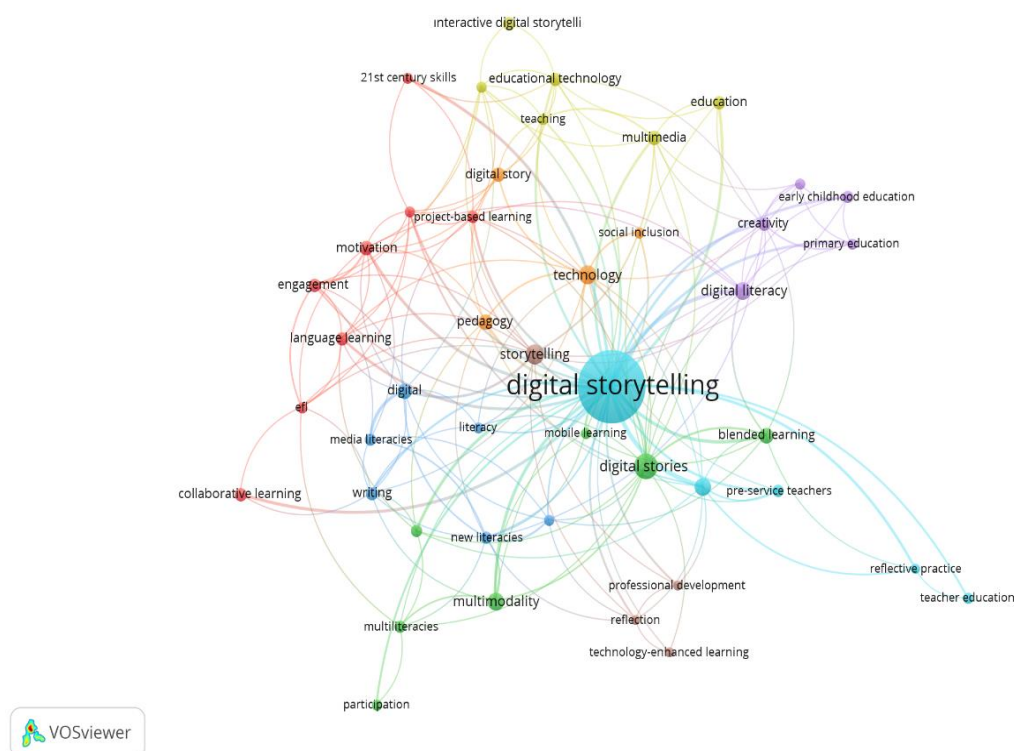
Of these 10 most-cited articles, three (Hafner & Miller, 2011; Hull & Katz, 2006; Nelson, 2006) relate to language teaching, indicating that the number of studies on the use of digital storytelling in language teaching and developing language skills can be considered fairly high. This is a significant finding, since it indicates that digital storytelling is a method preferred for the development of language skills.

### Results related to most-used keywords

From the analysis conducted to determine the most-used keywords in the selected studies on digital storytelling (co-occurrence-author keywords), 45 keywords were identified that met the threshold of having been used a minimum “5” times, out of total of 1,349 keywords used overall. The results for the 10 most-used keywords are presented in Table 2 and a network map of the 45 keywords is illustrated Figure 5.

**Table 2. Ten most-used keywords**

No	Keyword	Connections	Total Connection Power
1	Digital storytelling	238	163
2	Digital stories	29	22
3	Storytelling	18	19
4	Technology	17	18
5	Higher education	15	26
6	Multimodality	15	16
7	Digital literacy	14	22
8	Digital	11	21
9	Blended learning	11	17
10	Pedagogy	11	12



**Figure 5. Network map of most used keywords**

As can be seen in Table 2, the most-used keyword was revealed to be “digital storytelling” (TCP = 163; Connections = 238), followed by “digital stories” (TCP = 22; Connections = 29), “storytelling” (TCP = 19; Connections = 18), and “technology” (TCP = 18; Connections = 17). In Figure 5, it can be seen that the 45 keywords are subsumed under eight clusters (combined TCP = 339). The clusters are listed as follows: Cluster 1 is the red cluster (8 nodes), Cluster 2 is the green cluster (7 nodes), Cluster 3 is the navy-blue cluster (6 nodes), Cluster 4 is the yellow cluster (6 nodes), Cluster 5 is the purple cluster (5 nodes), Cluster 6 is the blue cluster (5 nodes), Cluster 7 is the orange cluster (4 nodes), and Cluster 8 is the brown cluster (4 nodes).

The keyword that comes to the fore in the red cluster is “motivation” (TCP = 19; Connections = 10). The other keywords in this cluster are “21st century skills,” “collaborative learning,” “language learning,” “Project-based learning,” “engagement,” “efl,” and “web 2.0.” The concepts that constitute this cluster seem related to the educational dimension of digital storytelling. Based on the clustering of the keyword “motivation,” this may be due to digital storytelling being considered to include a motivational characteristic.



The keyword that comes to the fore in the green cluster is “digital stories” (TCP = 22; Connections = 29). The other keywords in this cluster are “multimodality,” “multiliteracies,” “mobile learning,” “blended learning,” “participation,” and “student engagement.” The common characteristic of the keywords making up this cluster seem related to the suitability of digital stories for use in multimedia environments.

The keyword that comes to the fore in the navy-blue cluster is “digital” (TCP = 21; Connections = 11). The other keywords in this cluster are “media literacies,” “new literacies,” “writing,” “literacy,” and “case study.” The keywords that constitute this cluster seem to be gathered around the concept of “literacy.” The fact that the concept of “digital” comes to the fore here indicates an emphasis of “digital literacy” in this cluster.

The keyword that comes to the fore in the yellow cluster is “multimedia” (TCP = 16; Connections = 10). The other keywords in this cluster are “educational technology,” “education,” “interactive digital storytelling,” “teaching,” and “learning.” The concepts in this cluster appear to meet within the framework of the contributions that storytelling makes to multimedia and increased interaction.

The keyword that comes to the fore in the purple cluster is “digital literacy” (TCP = 22; Connections = 14). The other keywords in this cluster are “creativity,” “digital storytelling,” “primary education,” and “early childhood.” What brings these concepts together may be how studies have shown that digital literacy, as a dimension of digital storytelling, improves creativity in early age groups.

The keyword that comes to the fore in the blue cluster is “digital storytelling” (TCP = 163; Connections = 238). The other keywords in this cluster having the highest connection power are “higher education,” “teacher education,” “pre-service teacher,” and “reflective practice.” The common point of the concepts in this cluster is that they relate to the use of digital storytelling in higher education, particularly in pre-service teacher education. The high connection power found for the concept “digital storytelling” might be due to this method being widely used in teacher education, hence the number of studies in this field is seen as high.

The keyword that comes to the fore in the orange cluster is “technology” (TCP = 18; Connections = 17). The other keywords in this cluster are “digital story,” “pedagogy,” and “social inclusion.” These concepts are believed to be together due to the connection between storytelling with technology, education, and social inclusion.

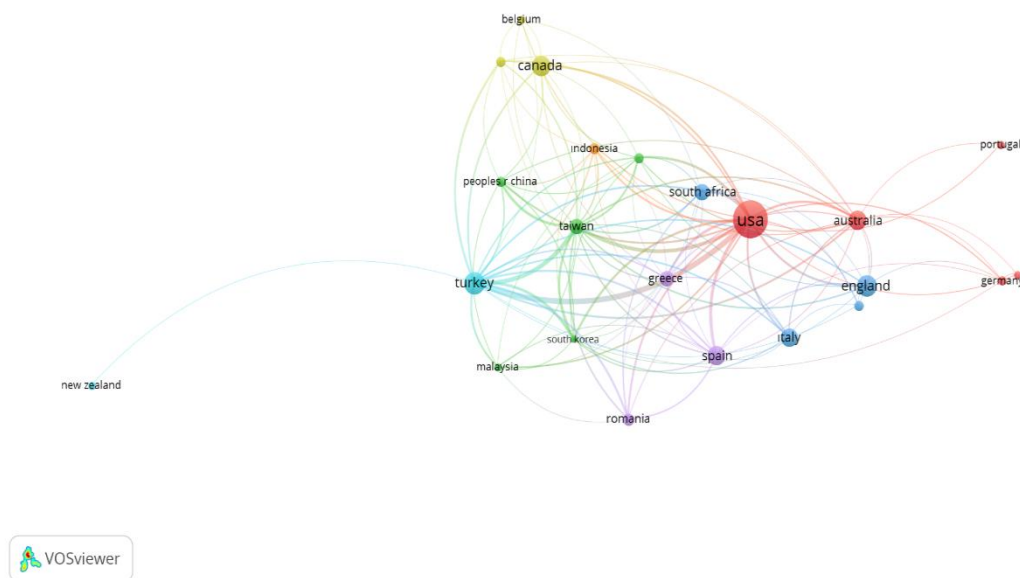
The keyword that comes to the fore in the brown cluster is “storytelling” (TCP = 19; Connections = 18). The other keywords in the cluster are “reflection,” “professional development,” and “technology-enhanced learning.” The concepts here emphasize that the use of digital storytelling is closely associated with both professional development and reflection.

### **Results related to most influential countries**

As a result of the analysis conducted to determine the most influential countries in terms of having contributed to the field of digital storytelling (citation-countries), 23 out of 63 countries were found to have met the threshold value of having at least “5” works published, with at least “1” subsequent citation in a WoS-indexed journal, on digital storytelling. The data of the 10 most influential countries in the field of digital storytelling are presented in Table 3 and the corresponding network map is shown in Figure 6.

**Table 3. Ten most influential countries**

No	Country	Citations in WoS	Articles	Total Connection Power
1	United States	1,314	120	310
2	Taiwan	327	21	168
3	Australia	191	34	58
4	Canada	157	35	27
5	United Kingdom	154	42	35
6	Spain	151	33	66
7	Turkey	128	43	245
8	China	128	10	46
9	South Korea	119	5	63
10	Romania	116	14	42



**Figure 6. Network map of most influential countries**

Data regarding the most influential countries in the field of digital storytelling are presented in Table 3 and a network map of their connections illustrated in Figure 6. As can be seen, the United States is clearly the most influential country in the field (articles = 120; citations = 1,314; TCP = 310). Turkey ranks second in terms of the number of academic works published and seventh in the number of citations. Thus, it can be argued that Turkey has made an important contribution to the field (articles = 43; citations = 128; TCP = 245). When the data are examined in terms of cooperation between countries, it can be seen that Turkey works in cooperation with countries such as the United States and New Zealand.

When the contribution of Turkey to the trend in WoS is examined, it is seen that from among Turkey’s 43 articles, the highest number of citations ( $n = 29$ ) was to the article entitled “The effect of digital storytelling on visual memory and writing skills,” which was authored by Cıralı-Sarıca and Koçak-Usluel (2016) and published in the *Computers & Education* journal. This is followed by an article titled “A phenomenological study: Teachers’ experiences of using digital storytelling in early childhood education,” which was written by Yüksel-Arslan et al. (2016) and published in the *Educational Studies* journal, and with six subsequent citations in WoS-indexed journals. The other articles related to Turkish language skills that were also indexed in WoS are Cigerci and Gultekin’s (2017) “Use of digital stories to develop listening comprehension skills,” which was published in *Issues in Educational Research* (citations = 6), Girmen and Kaya’s (2019) “Using the flipped classroom model in the development of basic language skills and enriching activities: Digital stories and games,” which was published in the *International Journal of Instruction* (citations = 4), Korkmaz

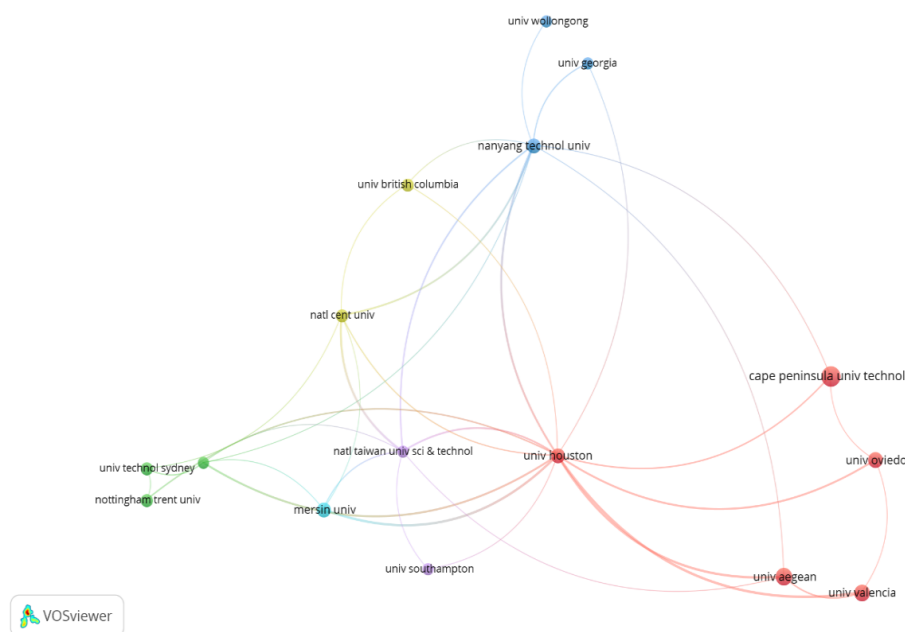
and Güneyli’s (2017) “Impact of technology-assisted context-based teaching on the listening skills of teacher candidates,” which was published in the *Eurasia Journal of Mathematics, Science and Technology Education* (citations = 3), Dayan and Girmen’s (2018) “Turkish education writing process: Digital storytelling” which was published in the *Journal of Qualitative Research in Education* (citations = 0), and Tanrikulu’s (2020) “Students’ perceptions about the effects of collaborative digital storytelling on writing skills,” which was published in *Computer Assisted Language Learning* (citations = 0). When the general citation data of the 43 Turkish articles on digital storytelling in WoS are examined, it can be seen that 26 articles have at least one subsequent citation, but that 17 articles have yet to be cited in WoS-indexed journals.

### Results related to most influential institutions

As a result of the analysis conducted to determine the most influential institutions contributing to the field of digital storytelling (citation-organization), 17 out of the 552 institutions having published academic works on digital storytelling were determined as having met the threshold of at least “5” articles published that subsequently attracted at least “1” citation in a WoS-indexed journal. Data for the most influential institutions in the field of digital storytelling are presented in Table 4 and their network map is shown in Figure 7.

**Table 4. Ten most influential institutions**

No	Institution	Citations in WoS	Articles	Total Connection Power
1	University of Houston	406	7	52
2	National Central University	54	6	15
3	University of Technology Sydney	49	6	4
4	Cape Peninsula University of Technology	39	14	5
5	Nanyang Technological University	33	7	19
6	Nottingham Trent University	29	6	4
7	University of the Aegean	26	10	12
8	University of Valencia	25	9	12
9	University of British Columbia	24	6	3
10	University of Oviedo	19	8	7



**Figure 7. Network map of most influential institutions**

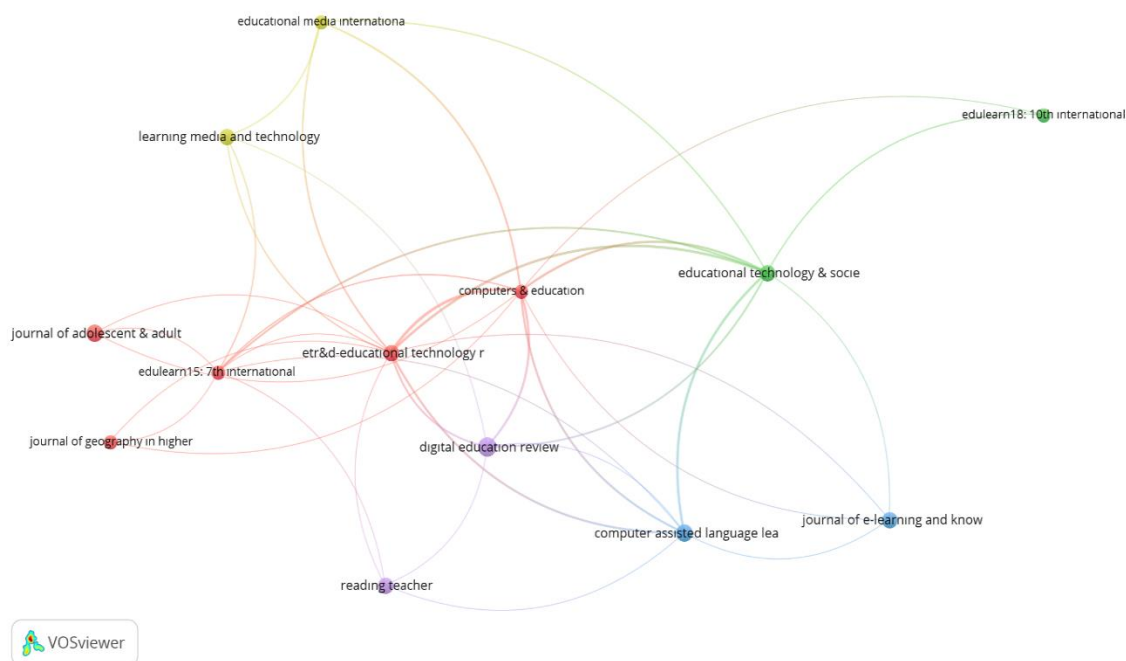
As can be seen from both Table 4 and Figure 6, the institution that made the most significant contribution to the field in terms of the number of articles published was the “Cape Peninsula University of Technology” (articles = 14; citations = 39; TCP = 5), while the institution that made the greatest contribution in terms of the number of citations in WoS-indexed journals that their articles subsequently amassed and total connection power was “University of Houston” (articles = 7; citations = 406; TCP = 52). Additionally, the “University of Houston” also seems to be one of the prominent institutions in the field of digital storytelling. The researcher having the highest number of citations in the field, Dr. Bernard Robin works at this institution and was responsible for opening the Centre of Educational Uses of Digital Storytelling in 2004. Moreover, since 2008, the Digital Storytelling Contests have been organized under the leadership of Dr. Bulent Dogan also from the “University of Houston.” These achievements perhaps go a long way to explaining how the University of Houston has made such a significant contribution to the field in terms of the number of citations and total connection power.

### Results related to most influential journals

From the analysis conducted to determine the most influential journals in the field of digital storytelling (citation-source), 13 out of the 323 journals having articles published on digital storytelling were found to meet the threshold of at least “5” articles having been published which had subsequently cited been at least “1” time in a WoS-indexed journal. Data showing the most influential journals in the field of digital storytelling are presented in Table 5 and the corresponding network map is illustrated in Figure 8.

**Table 5. Most influential journals**

No	Journal name	Citations in WoS	Articles	Total Connection Power
1	Computers & Education	269	5	36
2	Educational Technology Research & Development [ETR&D]	253	6	35
3	Educational Technology & Society	182	6	33
4	Learning Media and Technology	76	6	7
5	Journal of Geography in Higher Education	59	5	3
6	Journal of Adolescent & Adult Literacy	45	7	3
7	Digital Education Review	42	9	17
8	Reading Teacher	41	6	4
9	Computer Assisted Language Learning	31	7	21
10	Journal of E-Learning and Knowledge Society	13	6	4
11	Educational Media International	3	5	11
12	Edulearn15 Proceedings	2	5	13
13	Edulearn18 Proceeding	1	5	3



**Figure 8. Network map of most influential journals**

As can be seen in Table 5, the journal that attracted the highest number of citations in other WoS-indexed journal publications and total connection power was “Computers & Education” (number of articles = 5; number of citations = 269; TCP = 36). Figure 8 depicts that the 13 most influential journals are in fact clustered around just five (combined TCP = 95). The clusters are presented as follows: Cluster 1 is the red cluster (5 nodes), Cluster 2 is the green cluster (2 nodes), Cluster 3 is the navy-blue cluster (2 nodes), Cluster 4 is the yellow cluster (2 nodes), and Cluster 5 is the purple cluster (2 nodes). The journals that come to the fore within each of the clusters are determined according to their total combined connection power.

The journal that comes to the fore in the red cluster is “Computers & Education” (TCP = 36; Connections = 10). This is a journal that features both theoretical and practical works on the use of digital technology in education. The impact factor of the journal is 5.296.

The journal that comes to the fore in the green cluster is “Educational Technology & Society” (TCP = 33; Connections = 8). It is a journal that maintains its focus on how learning, teaching, and evaluation are affected by long-term technology applications. The journal’s impact factor is 2.086.

The journal that comes to the fore in the navy-blue cluster is “Computer Assisted Language Learning” (TCP = 21; Connections = 7). This journal is an interdisciplinary journal publishing both theoretical and practical studies on computer-assisted applications. Its impact factor is 2.642, and is a journal often preferred for the publishing of studies investigating language teaching through technological applications.

The journal that comes to the fore in the yellow cluster is “Educational Media International” (TCP = 11; Connections = 4). This is a scientific journal that publishes studies that aim to address the problems and difficulties encountered in the development, application, and evaluation of media in education. The impact factor of the journal is 0.77.

Finally, the journal that comes to the fore in the purple cluster is “Digital Education Review” (TCP = 17; Connections = 6). This journal includes studies that are designed to investigate the effect

of communication technologies on education, as well as innovative teaching and learning methods in digital environments. Its impact factor as a journal is 0.80.

## DISCUSSION, CONCLUSION AND SUGGESTION

The current study aimed to examine the trends of digital storytelling in the Web of Science (WoS) database. As such, the bibliographic data of 545 academic works published in the category of educational research from 2004 to 2020 were retrieved and the obtained data then subjected to bibliographic analysis within six categories.

According to the results of the bibliographic analysis, there were a total of 3,326 citations made to the 545 studies in WoS-indexed journals. The number of the studies published on digital storytelling and the citations subsequently made to these studies was found to have an increasing trend over the examining period. This shows that digital storytelling is a method preferred in the education field. In addition to the many individual studies that have investigated the use of digital storytelling in education (Kim & Li, 2021; Saritepeci, 2021), there have been meta-analyses conducted that have shown that digital storytelling can positively affect students' academic achievement (Akgün & Akgün, 2020; Şahin & Çoban, 2020) as well as their literacy skills (Takacs et al., 2015). Meta-analysis and meta-thematic studies have shown that digital storytelling is effective in imparting 21st century skills to learners such as creative thinking, effective communication, and research skills (Talan, 2021). The high effect sizes obtained from these studies point to why digital storytelling has become preferred in the field of education.

The most-cited article was "Digital storytelling: A powerful technology tool for the 21st century classroom," which was published in the *Theory in Practice* journal by Robin in 2008. This appears to be a seminal work in the field of digital storytelling. Determination of the most-cited article may help to guide future researchers who are planning to conduct research on the use of digital storytelling in education. Three of the 10 most-cited articles were found to be in the field of language teaching (Hafner & Miller, 2011; Hull & Katz, 2006; Nelson, 2006), indicating the importance attached to digital storytelling in language teaching. Other studies have shown that digital storytelling can improve the language skills of study participants (Güvey-Aktay, 2020; Tabieh et al., 2021; Yang et al., 2020). This finding was also supported in the meta-analysis conducted by Özkaya (2020), which concluded that digital stories can highly affect the development of Turkish language skills. Also, when Turkey's Council of Higher Education (YÖK) thesis database was examined, which is considered an important and reliable resource for data about graduate studies undertaken in Turkey, a total of 16 graduate theses were found to have investigated the effects of storytelling and digital stories on Turkish language skills. The fact that these studies were completed during the period from 2014 to 2020 shows how digital storytelling has become one of the methods more recently preferred for the development of Turkish language skills. This is similar to the fact that the studies on digital storytelling in education in the WoS database and the citations to these studies show an increasing trend in 2014 and later. In this context, it can be said that digital storytelling has been a preferred method in the development of Turkish language skills in recent years.

The most-used keyword was found to be "digital storytelling," whilst the United States was found to be the country that made the greatest contribution to the field of digital storytelling. Turkey was shown to rank second in terms of contribution to the field in terms of the number of articles and seventh in terms of the number of citations. When the contribution of Turkey to the trend in WoS is examined, it can be seen that from among Turkey's 43 articles, the highest number of citations ( $n = 29$ ) was for the article entitled "The effect of digital storytelling on visual memory and writing skills," which was authored by Cıralı-Sarıca and Koçak-Usluel (2016). When the general citation data of the 43 Turkish articles on digital storytelling in WoS were examined, it was seen that 26 articles had at least one citation, but that 17 articles had not yet been cited. Also 6 articles on Turkish language skills (Ciğerci and Gültekin, 2017; Çıralı-Sarıca and Koçak-Usluel, 2016; Dayan and Girmen, 2018; Girmen and Kaya, 2019; Korkmaz and Güneşli, 2017; Tanrikulu, 2020) were found in WoS, and it was determined that 4 of these articles (Ciğerci and Gültekin, 2017; Çıralı-Sarıca and Koçak-Usluel,

2016; Girmen and Kaya, 2019; Korkmaz and Güneyli, 2017) were cited. In this context by increasing the number of references made to articles sourced from academicians affiliated with Turkish institutions, it is likely that Turkey's power in the field would increase.

The institution that made the greatest contribution to the field of digital storytelling in terms of the number of articles published was the "Cape Peninsula University of Technology," whilst the institution whose works drew the greatest number of citations and total connection power was the "University of Houston." In future, researchers looking to conduct research in the area of digital storytelling may wish to follow studies published by academicians working at these institutions.

The most influential journal in the field of digital storytelling was found to be "Computers & Education." Determination of the most influential journals in the field of digital storytelling can aid researchers to find the right journal in which to publish their studies, and also for the purposes of following the current research in the area. Additionally, researchers looking to follow the latest research on the use of digital storytelling for the purposes of developing language skills, and/or to publish their own research on this subject, may wish to consider the "Computer Assisted Language Learning" journal.

Based on the results of the current research, it may be stated that digital storytelling is a preferred method of teaching in education. In light of these findings, further research could be conducted on the use of digital storytelling in the Turkish language teaching context and in the development of Turkish language skills, as in all areas of education, and that researchers should be encouraged to publish studies in journals listed within databases recognized by the scientific world as well-founded and authoritative resources of academic literature. Also, it is considered that examining the global trend of studies published on digital storytelling in education will provide a valuable guide for researchers looking to work on this subject in Turkish language education as a research area, or in any other field of education. Therefore, the number of studies examining these trends can be increased.

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