

JOURNAL MAPPING AND RESEARCH OPPORTUNITIES ON DIGITAL LEARNING THEMES

Bibliometric Analysis in Scopus Indexed Journals in 2018-2021

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Abstract

This research is a bibliometric analysis on digital learning themes indexed by Scopus in 2018-2021. This study is aimed at determining the classification of articles whose themes are digital learning, to figure out which researches are conducted and discussed the most. In addition, it is also targeted to uncover trends and research opportunities on digital learning themes. This research is a qualitative literature research with bibliometric method. The data in this study are obtained from Scopus metadata attained with Publish or Perish. According to data analysis, it can be concluded that the metadata collected from Publish or Perish must be reduced and corrected. The results of data analysis using VOSviewer revealed that from a total of 215 inputted datasets, there were 178 keywords divided into nine clusters. (1) The most discussed research topics in the first order are storytelling topics that are in cluster 1. The second order is the topic of age which is in cluster 3. The third order is the assessment of topics in cluster 8. (2) Trends and research opportunities with Digital learning themes indexed by Scopus from 2018-2021 appeared to be increasing. The research spike occurred between 2019 and 2021. (3) Topics that became trends and opportunities in research with digital learning themes apart from storytelling, age, and assessment were educators, digital language learning, digital platforms, vocabulary mastery, English language learning, lecturer, instrument, teaching material, online learning, digital competence, process, theory, language pedagogy, 12 learning, SLA, case, feedback, critical thinking, internet, student, ADDIE model, pre service teacher training, gender, participation, and the author.

Keywords: Bibliometric Analysis; Digital Learning

INTRODUCTION

Technology has advanced dramatically in the past few years. On the other side, people are “forced” to adapt to Covid-19 Pandemic effects. All sectors, including education, have to adjust to the so-called “new normal”, as people are required to keep safe distance to combat the spread of this virus. Those who are involved in education need to adapt by digitalizing the learning system. However, most educational institutions, in addition to students, parents, as well as government are not yet ready to do so as they struggle in administering and participating in online learning.

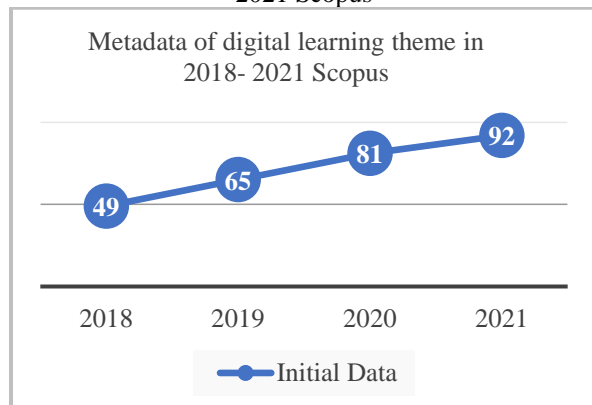
Adjusting to new regulations is undeniably confusing at the beginning as it takes time to adapt and comprehend. Adjustment process

may lead to innovative methods in digital learning. Various approaches, strategies,

models and techniques are discovered by education practitioners all around the world through researchers and experiments.

Researches and experiments on digital learning have escalated in recent years, which is confirmed by research maps on digital learning in Scopus Indexed Journals during the 2018 - 2021 period.

Figure 1. Metadata of digital learning theme in 2018-2021 Scopus



Note: Data are obtained from Publish or Perish without any additional treatment.

Referring to the data visualization in Figure 1, researchers on the digital learning theme are considered paramount for further exploration and discussion. Therefore, it is necessary to conduct extensive researches on digital learning themes, especially on researches opportunities in addition to research mapping. Researches opportunities in addition to research mapping can be accomplished through the application of bibliometric analysis.

Bibliometrics have become an essential tool for assessing and analyzing the productivity and impact of academics and technology (Moral-Muñoz et al., 2020, p. 3). Bibliometrics is defined as the application of mathematical and statistical methods to books and other media of communication, Pritchard (Derviş, 2019, p. 157).

Many studies on bibliometrics have been carried out, including (Baas et al., 2020) who discuss Scopus as the main data source for bibliometric studies. In addition, (Giraldo et al., 2019) apply this method as they study worldwide research trends on wheat and barley.

It is important to conduct a bibliometrics study to establish the basis to determine which

topics need to be studied further and which topics have been researched repeatedly that they reached saturation point. Therefore, researchers have proper data for avoiding particular topics. Several studies on bibliometrics have been carried out by several researchers.

(Donthu et al., 2020) study the bibliometric analysis as they analyze the impact of one of the journals, i.e Journal of Business Research (JBR). They also study the prominent topics of this journal, and its most productive authors. (Gaviria-Marin et al., 2018) applying the bibliometric analysis as they carry out performance analysis and a science mapping analysis of the *Journal of Knowledge Management* (JKM). Additionally, (Tang et al., 2018) perform the similar research on *Sustainability* (SUS) journal. This research will apply a similar bibliometric analysis procedure as mentioned in the above. The analysis will cover the journal mapping and research opportunities in Scopus Indexed Journals during 2018-2021.

Prior to further discussion about digital learning, we would need to define this phrase thoroughly. According to (*Cambridge Advanced Learned Dictionary*, 2008), digital is defined as “describes information (music, an image, etc). that is recorded or broadcast using computer technology”. Another definition of digital is provided by Moeljadi et al., 2020 as they define the term digital as everything relates to numbers / numbering processes in certain calculation systems that can be converted and changed continuously (such as lines in pictures or sound signals) that are presented in computer technology. Thus, it can be concluded that the definition of digital is a computer technology which stores and presents binary numbers into a certain form (text, images, audio, video, and others) that can be converted and changed continuously. The second phrase that we need to discuss is learning itself. Learning according to Roth and Anderson is a difficult and complex

process of conceptual change, not a process of acquiring and memorizing facts (Johnson & Gallagher, 2021, p. 343). According to Lachman, learning is a change in behavior caused by experience (De Houwer et al., 2013, p.631). Sarason describes learning as a process, a way, a personal reaction to something outside one's self (De Houwer et al., 2013, pp. 508–509).

Other experts shared similar definitions of learning. From some of these opinions it can be concluded that that learning is a complex process that changes a concept, that it is reflected on behavior and ways of reacting to something outside oneself which is obtained from experiences.

Through the definition of digital and learning, then we can conceptualize what digital learning is. Digital learning is a complex business that changes a concept and behavior through computer technology so that it is reflected in the behavior and the way people react.

The term ‘digital learning’ according to Renton School District (Basak et al., 2018, p. 195) refers to any instructional practice that effectively employs technology to strengthen a student’s learning experience and implies a wide spectrum of tools and practices:

- Interactive learning resource, digital learning content (which may include openly licensed content), software, or simulations, that engage students in academic content;
- Access to online databases and other primary source documents;
- The use of data and information to personalize learning and provide targeted supplementary instruction;
- Online and computer-based assessments;
- Learning environments that allow for rich collaboration and communication, which may include student collaboration with content experts and peers;
- Hybrid or blended learning, which occurs under direct instructor supervision at a

school or other location away from home and, at least in part, through online delivery of instruction with some element of student control over time, place, path, or pace.

Below are several digital learning platforms and tools which can be employed in the teaching and learning process (Bujang et al., 2020, p. 3).

Table 1. Digital Learning Platforms and Tools

Digital Learning	Features	Activity	Type
Edmodo	To create online collaborative groups, administer and provide educational materials, measure student performance, and communicate with parents, among other functions.	Polls Quizzes Assignment Notes Blogs Award Badges Online	Tool
Socratic	To allows lecturers to create exercises or educational games	Quizzes Quick Question Class Count	System
Project	To create a real-time dynamic presentation platform	Dashboard Slide Powerpoint	Platform
Thinglink	To save and share notes and observations about real-world spaces, situations, and artifacts.	Customized visual material	Tool
TED-Ed	To allows democratizing access to information, both for lecturers and students.	TED-style talks Discussion Sharing ideas	Platform
ClassDojo	To improve student behavior with instant feedback	Share photo, video, and	Tool

		announcement on class story Private message	
eduCipper	To share and explore references and educational material	Virtual class Digital record	Platform
Animoto	To create a high-quality video in a short time	Audiovisual content	Tool
Kahoot!	To promotes game-based learning	Questionnaires Discussion Survey Education by gaming	Platform

Research on the digital learning theme is a vast field of study. Although there have been many studies which focus on this theme, some issues might still need to be explored and studied intensively, while others might need to be dissipated since they have been researched repeatedly. Thus, there is a need for analysis related to mapping and research opportunities on digital learning themes. There are several issues that need to be addressed, i.e. how are articles on digital learning themes classified? What research topics are most widely discussed? What are the trends and research opportunities on digital learning themes?

RESEARCH METHOD

This research refers to qualitative literature which employs the bibliometric method. Bibliometric methods are applied to assess the productivity of scientific outputs quantitatively. The Bibliometric approach is aimed at capturing a variety of article information, which is then connected in a quantitative way to assess the evolution, main journals and authors, and the impact and

diffusion of the research studies within a broader research field (Beuckels et al., 2021, p. 2). This approach requires some tools to be functioned properly, which are shown in the following table.

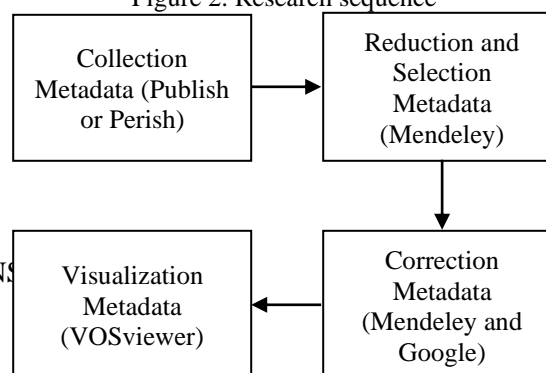
Table 2. Tools and Platforms in Bibliometrics analysis

No.	Name	Function
1	Publish or Perish	Gather the metadata
2	Mendeley	Complementing the metadata
3	Google	Complementing the metadata and download the article
4	VOSviewer	visualizing the complete metadata

The data in this study were obtained from Scopus metadata during 2018- 2021 which were taken with Publish or Perish. There are four data sets in this study. Each data set represents one year of data. The data for 2022 was not taken due to the lack of metadata. When writing, the researcher only found two research titles that discussed digital learning with the keyword language.

The data obtained from Publish or Perish were reduced and selected to exclude the data that were not related to the theme. The reduction and selection process was carried out by exporting it in BibTex format, then importing it to Mendeley. The imported data were then completed and selected. Data which were not related to the digital learning theme in the education and language categories were reduced with the Mendeley application. The metadata from Mendeley were then exported in RIS Format to be imported into VOSviewer so that they can be visualized. The following is the flow of the research process.

Figure 2. Research sequence



The data were analyzed by applying the VOSviewer program. The data which were completed and fixed by applying Mendeley and Google were then imported to VOSviewer by exporting them to RIS format before. The four sets of data were imported simultaneously to VOSviewer. The data visualization was set by initially. (1) create; (2) read data from reference manager file; (3) import four data set (2018-2021); (4) title and abstract field-Binary counting; (5) minimum number of occurrences of term (two occurrences); (6) number of terms to be selected (186 terms); (7) Uncheck terms from Spanish (eight terms); (8) finish.

FINDINGS AND DISCUSSION

The data obtained by Publish or Perish were not employed entirely for some reasons. The main reason was that some of those data had no correlation with education and language themes. In addition, the data were written in English so that it was difficult to identify. Furthermore, some researches were written by the same researchers.

The research categories that often appear with digital learning keywords are programming technology, game development for health. Other categories include the influence of digital media on social life, economic analysis of financial markets, geography, architecture, electronics, manufacturing,

The complication of this research was that there was no DOI address in the metadata collected, so the researchers had to search manually the research titles on the Google search engine. When the authors were not so sure about the relevance of the title to the research theme, the authors examined the name of the journals. If the researcher's journal being examined did not provide sufficient information, the researchers then read the abstract either from Mendeley,

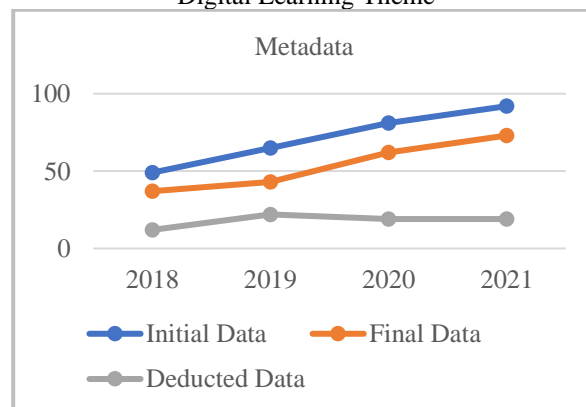
Google, or from a downloaded PDF. Some metadata, even though they have DOI, were still incomplete, for example, not all the researchers names are written properly, or they only use initial letters. There were even some metadata with DOI errors that can't be automated. The Metadata Reduction is shown in the following table.

Table 3. Scopus 2018-2021 Metadata Reduction on Digital Learning theme

No.	Year	Initial Data	Final Data	Data Deducted
1	2018	49	37	12
2	2019	65	43	22
3	2020	81	62	19
4	2021	92	73	19
Total		287	215	72

The data reveals that, (1) There was an increase in the number of studies from 2018 to 2021. (2) The lowest research metadata was in 2018, while the highest was in 2021. (3) The highest research spike occurred from 2019 to 2020. (4) There was a high data reduction in 2019, while the lowest data reduction occurred in 2018 metadata. (5) Even though the metadata has been reduced, the results remain the same, namely an increase in the number of researches on digital learning themes from 2018-2021. The following is a visualization graph of the data reduction.

Figure 3. 2018-2021 Scopus Metadata Reduction on Digital Learning Theme



1. Article classification on digital learning theme in 2018-2021

The results of data analysis using VOSviewer found that there were 178 keywords which were divided into nine clusters from a total of 215 inputted datasets. The detailed numbers for each cluster is cluster 1 (29 items), cluster 2 (27 items), cluster 3 (22 items), cluster 4 (21 items), cluster 5 (20 items), cluster 6 (19 items), cluster 7 (15 items), cluster 8 (13 items), and cluster 9 (12 items). The following is a breakdown of the items/keywords in each cluster.

Table 4. 2018-2021 Scopus Detailed Cluster on Digital Learning theme

Cluster	Items	Total
1	Autonomy, case study, child, creation, digital media, digital world, experiment, experimental group, improvement, intervention, learning English, literacy learning, mathematics, pre, pre test, pupil, reading, recent year, relation, Russian, school, significant difference, story, storytelling, tablet, tesol, text, writing, and young child.	29
2	Addie model, college student, computational, thinking, creativity, digital competence, expert, feasibility test, form, home, instructor, instrumental, internet, language teaching, lecturer, opinion pre service teacher training, process, R&D, response, SPSS, study show, subject, suitability, sup, teaching material, validity, and work.	27
3	Advantage, age, attitude, call, communication technology, computer assisted language, condition, digital language, digital platform, digital resource, digitalization, disadvantage, English learning, English teaching, ICT, idea,	22

	instance, pedagogy, pre service teacher similarity, software, and word.	
4	Better design, complexity, culture, design principle, digital learning, English language learning, Europe, focus, higher education, inclusion, indigenous person, initiative, lack, module, qualitative study, relevance, resource, space, suggestion, topic, and type.	21
5	Case, digital medium, eric, feedback, gamification, good criterium, majority, medium, meta analysis, point, retention, significant role, stage, testing, theme, validation, vocabulary, vocabulary acquisition, vocabulary English, and web.	20
6	Communication, consideration, educator, EFL, exploratory study, idle, idle activity, informal digital learning, international language, mediator, multicultural environment, pedagogical implication, perception, quantitative data, relationship, significant predictor, total, university student, and variety.	19
7	Behavior, digital badge, digital era, digital language learning, DLL, forum, importance, innovation, insight, 12 learning, language pedagogy, second language, second language acquisition, SLA, and theory.	15
8	Assessment, author, example, foreign languages, gender, mean, online environment, outcome, participation, quality, quantity, region, and training.	13
9	Arabic, community, comparison, control group, critical thinking, digital, end, keywords, online learning,	12

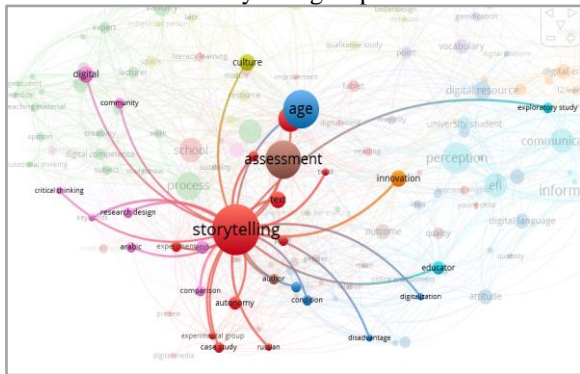
research design, scale, and self.

Cluster classifications were grouped according to the most employed to the least employed keywords in research journals.

2. The most widely discussed research topics on digital learning theme in 2018-2021

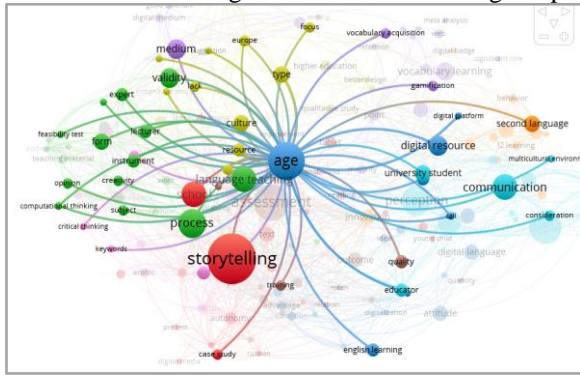
The most widely discussed research topic was storytelling which was in cluster 1. This topic has 57 links, total link strength 68, and occurrences 16.

Picture 1. Networking Visualization on the Storytelling Topic



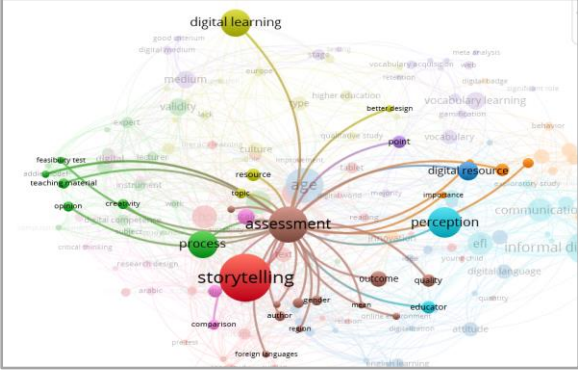
In the second position was the age topic which was in cluster 3. It has 51 links, total link strength 55, and occurrences 12.

Picture 2. Networking Visualization on the Age Topic



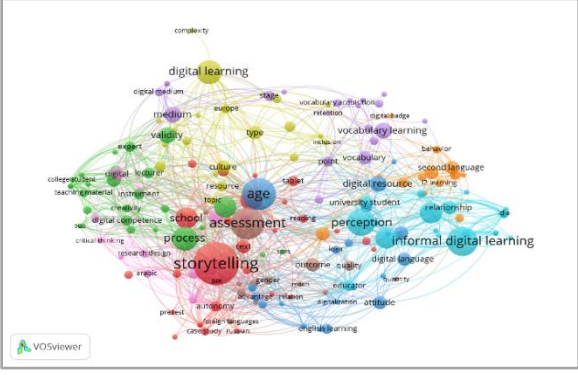
The third most widely discussed research topic was the assessment topic in cluster 8 which has 35 total links, total link strength 36, and occurrences 12.

Picture 3. Networking Visualization on the Assessment Topic



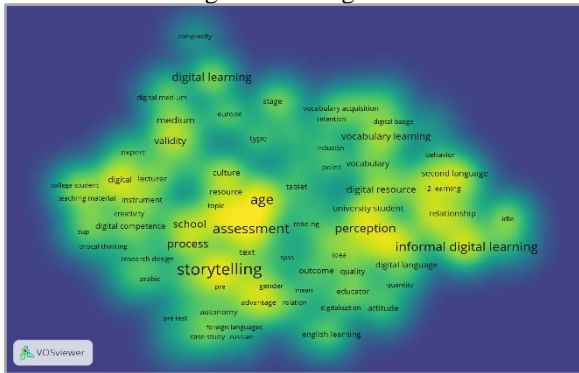
Picture 4 below shows the networking graphic which emphasized the statement saying that there are three most discussed topics. The large circles indicated the popularity of the topics among others. It can be seen that the storytelling topic had the largest size. It was then followed by two other topics, namely age and assessment.

Picture 4. 2018-2021 Scopus Networking Visualization on Digital Learning Theme



The above statement was also confirmed by the density of the topics/ themes in which the yellow the color, the more often the topic was discussed as shown in the picture below.

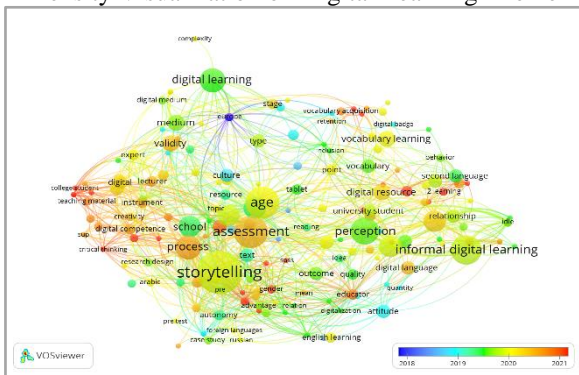
Picture 5. 2018-2021 Scopus Density Visualization on Digital Learning Theme



3. Trends and research opportunities on 2018-2022 digital learning theme

Trends and research opportunities digital learning theme indexed by Scopus from 2018-2021 appeared to be increasing. The research spike occurred between 2019 and 2021. The following is a picture of the VOSviewer analysis results of trends and research opportunities on the 2018-2021 digital learning theme.

Picture 6. 2018-2021 Scopus Density Visualization on Digital Learning Theme



The color in the image represented a different year. The blue color represented 2019, light blue 2018, yellow 2020, and red 2021. Trends and research opportunities on the digital learning theme are the most in 2019 since yellow dominated research trends and opportunities. As explained earlier, the keywords are storytelling (yellow), assessment (orange), and age (yellow).

Topics that become trends and research opportunities on digital learning theme in addition to the three topics already mentioned, namely digital learning theme with the topic of educator, digital language learning, digital platform, vocabulary acquisition, English language learning, lecturer, instrument, teaching material, online learning, digital competence, and process (in orange). This trend lasts from 2019 to 2020 and could be an opportunity for further research.

The trends and research opportunities that occurred in 2020 (in red) include theory, language pedagogy, 12 learning, SLA, case, feedback, critical thinking, internet, college students, ADDIE model, pre-service teacher training, gender, participation, and authors. Research opportunities on digital learning themes can actually be seen from topics that only have two occurrences. Two point occurrence is the minimum number set by the researchers. It suggests that not many researchers have studied the topic or that there has not been much interaction on this topic. However, if this method is applied, it can lead to two possibilities, firstly, the topic does have an opportunity and is interesting to study. Second, the topic is not interesting or important to research. Research opportunities can be seen from the few occurrences and the redder color or the color on the right side.

CONCLUSIONS

According to the data analysis, it can be concluded that metadata collected from Publish or Perish must be reduced and corrected because not all the data matches the inputted keywords. The collected metadata cannot be corrected properly on Mendeley because it does not have DOI or DOI shows error notifications when they were retrieved. The results of data analysis in which VOSviewer was applied revealed that there were 178 keywords divided into nine clusters from a total of 215 inputted datasets.

The most discussed research topic in the first order is the topic of storytelling which is in cluster 1. The second order is the topic of age which is in cluster 3. Then the third order is the topic of assessment in cluster 8.

Trends and research opportunities on digital learning themes indexed by Scopus from 2018-2021 seem to be increasing. The research spike occurred between 2019 and 2021. Topics that became trends and shows bigger research opportunities on digital learning theme apart from storytelling, age, and assessment were educators, digital language learning, digital platforms, vocabulary acquisition, English language learning, lecturers, instrument, teaching material, online learning, digital competence, process, theory, language pedagogy, 12 learning, SLA, case, feedback, critical thinking, internet, college student, ADDIE model, pre service teacher training, gender, participation, and author.

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