

DIGITAL LEARNING RESEARCH DURING COVID-19 PANDEMIC: CONTRIBUTED TO ACTUALIZATION OF VISIONARY POLICYMAKERS OF SENIOR HIGH SCHOOL

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ABSTRACT

This research will analyzed on obtaining a visualization and profile of Digital Learning (DL) during the COVID-19 pandemic. This research employed a purpose with bibliometric analysis of publications, which we think will be useful for future research. In general, this research findings indicate that the COVID-19 pandemic has a favorable influence on the acceleration of digitalization in poor nations. Scopus by Elsevier meta-database, is the world's largest academic meta-database, was used by the researchers. Another conclusion is that there is a movement in the face-to-face learning paradigm approach to digital technology-based learning, which has been shown to be successful in enhancing student learning outcomes. Fundamental research implications: educational transformation can happen in online education, changes to distance learning, changes in roles, also ways both now and after the COVID-19 pandemic. In today's educational policy, technology will play a significant role. In addition, to open opportunities for the actualization of visionary policymakers in senior high schools.

Keywords: *DL, COVID-19 Pandemic, Trend Research, Learning*

1. INTRODUCTION

COVID-19 has become a major problem in the past year. According to recent research, COVID-19 is harmful and can continue to evolve [1]-[5]. There have been 152,783,230 worldwide cases of COVID-19. A total of 130,720,961 have recovered, while 3,205,682 others have died. There were 18,856,587 worldwide active cases. With a total of 33,145,463 occurrences, the United States is the country with the most cases. India, which is in the spotlight due to the surge in coronavirus infections per day, has reported more than 19.5 million cases [6].

The COVID-19 outbreak has also had an influence on school-based learning. To control the spread of COVID-19, schools have deployed Digital Learning (DL). DL has become an alternative solution during the COVID-19 pandemic. DL provides solutions to support learning to continue during the COVID-19 pandemic. It is also confirmed by previous latest research that show the success of DL varieties during the COVID-19 pandemic [7]-[18]. In general, the COVID-19 pandemic outbreak does not only have negative effects, but also has good effects, especially the acceleration of DL.

In underdeveloped nations, it is extremely difficult to implement DL on a large scale. This is due to limited resources and financial support. However, the COVID-19 pandemic brings a positive side, namely the acceleration of DL implementation in developing countries. With the existence of New Normal and Social Distancing during the COVID-19 pandemic, which indirectly forced educators and the government to make learning innovations. Recent research results have shown that variations of DL can contribute positively to student learning outcomes and education sustainability in a country affected by the pandemic of COVID-19 [19]-[22]. In addition, the actualization of visionary leadership is said to be more effective in directing and guiding teachers in the field of study in order to improve teaching materials. Through direction and guidance, it is hoped that maximum and optimal learning will be carried out. The direction and guidance of the principal above include, 1) implementing learning, 2) making lesson plans, 3) managing classes in supporting the achievement of learning objectives, 4) assessing student learning processes and outcomes, and 5) being able to motivate and encourage students to learn.

Through such visionary activities, it is hoped that the quality of learning and the achievement of learning objectives will be more effective and efficient. However, in reality it motivates and creates the power of innovation, some teachers complain. The administrative burden of preparing tomorrow's teaching materials, learning media and evaluation of learning is doubled. Learning technology that has been used does not necessarily provide the opportunity, space and time to innovate. In fact, it becomes a trap for the administrative regime and a burden in itself. Teachers should be good partners for students are also overlooked. This problem is compounded by education policy makers at the Regency / City and Provincial levels who are still hesitant to translate the call for Freedom of Learning (i.e. Merdeka Belajar) from the Minister of Education, Culture, Research and Technology, Indonesia. Many of the above incidents are experienced by teachers in big cities such as the city of Surabaya, Indonesia. Educators at the public high school education level show low quality in terms of content creation, learning methodologies used and utilization of information technology (IT) media. The ability to manage learning innovation needs to be improved. Many students are less active in participating in learning due to the limitations of teachers mastering computer software and not using it optimally as a learning medium for students. The limited ability of teachers' innovation skills in managing fun learning is now being questioned. Teachers' skills in managing learning innovations are considered important and should receive great attention from school principals. Work motivation and encouragement to change teaching habits to teachers. Generating the spirit of teaching with meaningful things. This kind of encouragement and motivation is a form of organizational leader who is responsible for the survival of the school going forward. Hadiyanto [23] formulates the duties and roles of school principals including managing, fostering through administrative activities and leading their subordinates. For this reason, school principals must be able to manage all school activities effectively, including encouraging the creation of skills for teachers to always innovate in every lesson.

With the rapid development of information technology and the internet, educational institutions have come to do so, Implementation of several important policies and tasks for education reform and management Learning through social networks known as online learning [24]. Technology-based or online learning emerged as an option to carry out the teaching and learning process in the new normal

era [25]. One of them is by applying Digital learning materials can be defined as learning materials that are digitized and interconnected [26]. The use of digital learning materials comes from their perspective that digital learning materials can overcome the weaknesses of printed textbooks [27]. The media and learning methods must be in accordance with the circumstances and learning materials have a major influence on student learning outcomes [28]. Therefore, this study will analyze to obtain a visualization and DL profile during the COVID-19 pandemic. Thus, readers can obtain information related to the condition of DL research trends that can support the development of research related to DL in the future. In addition, the implications of this research are expected to be empirical evidence of the advantages of DL from the progress and benefits of technological developments in various parts of the world. Also, as an opportunity in innovation to contribute to the actualization of visionary policy makers in secondary schools. In addition, this research has a novelty in discussing DL and its contribution to the actualization of visionary policy makers in SMA which has never been done before by other researchers, so that this research can produce an overview for conducting sustainable research in the DL environment. Research objectives such as:

- To know the document sources, publication output, and also language sources of trends on DL research during COVID-19 Pandemic.
- To get the publication distribution of top authors and countries of trends on DL research during COVID-19 Pandemic.
- To know the publication patterns: source titles of trends on DL research during COVID-19 Pandemic.
- To get the visualization of trends on DL research during COVID-19 Pandemic based on mapping visualization VOSViewer.
- To get the profile of top 10 cite article in DL research during COVID-19 Pandemic based on literature review.
- To analyze student's response to DL during COVID-19 Pandemic.
- To analyze the actualization of visionary policymakers of senior high school.

2. METHODOLOGY OF RESEARCH

This research employed a purpose with bibliometric analysis of publications, which we think will be useful for future research [29]-[30]. Scopus by Elsevier meta-database, is the world's largest academic meta-database, was used by the

researchers. In scientific research, it is critical to gain a larger view on existing research concerning a relevant material, as well as a bibliometric analysis profile on the research trajectory and dynamics of research activities throughout the world. To search abstracts, titles, and also keywords from all years, the filter "DL During COVID-19 Pandemic" was used. The general research procedures are as follows:

- determine topic "DL During COVID-19 Pandemic";
- optimised Elsevier's Scopus database;
- download RIS and CSV;
- analyse data RIS using VOSViewer software [27-30];
- analyse data CSV using Microsoft Excel;
- interpretation;
- literature review (ten articles of top citation);
- get profile Trends of DL Research During COVID-19 Pandemic.

It was 921 documents of whole years (database Scopus). The investigation was performed to examine research trends such as characteristics of document sources, publication outputs, distribution of institutions and countries, language sources, distribution of outputs in specifically subject categories, keywords, top authors, publication trends and top citations over a long period of time. VOSViewer software [31]-[33] was utilized to analyze the research trend on DL During COVID-19 Pandemic. In this research also conduct a survey to students to analyze their response of Digital Learning during the COVID-19 Pandemic. The survey was conduct via *Google Form*. There are 1.593 respondents which is all grades Senior High School Students.

3. RESULT AND DISCUSSION

3.1 Document Sources, Publication Output, and Language Sources

Data collected were 921 publications related with DL during the pandemic of COVID-19 outbreak publications in the Scopus meta-database. 921 papers have been distributed in two years, especially in 2021 (394) and 2020 (527). Document sources of DL during COVID-19 pandemic research including 10 document sources (see Table 1).

Table 1. Document sources of DL during COVID-19 pandemic research

Document Sources	Total	Document Sources	Total
Article	574	Editorial	14
Conference Paper	202	Note	9
Review	64	Letter	6
Conference Review	34	Data Paper	2
Book Chapter	14	Book	1

Furthermore, out of a of 921 papers amount, the majority of articles were written in English (829 documents or 90%). The remaining documents were written in German, Spanish, French (3%), and Russian (8%). While they were few in number, the documents utilized Chinese, Slovenian, French, Portuguese, Turkish, and Croatian with a ratio of less than 1%. (see Table 2).

Table 2. Mount of documents based on language

Language	Total	Language	Total
English	829	Slovenian	3
German	27	French	2
Spanish	26	Portuguese	2
Russian	8	Turkish	2
Chinese	3	Croatian	1

3.2 Distribution of Publication Countries and Top Authors

Based on the Table 2, The United States' domination was undeniable with 162 publications. The countries such as UK, India, Spain, Germany and Indonesia contributed to this topic with 78, 69, 63, 58, 49 publications. Whereas, with about the same mount, Russian Federation, Australia, Italy, and Canada contributed documents between 35-41.

Table 3. DL during COVID-19 pandemic research based on countries

Country	Total	Country	Total
United Stated	162	Indonesia	49
United Kingdom	78	Russian Federation	41
India	69	Australia	38
Spain	63	Italy	36
Germany	58	Canada	35

Table 4. Top Authors in DL during COVID-19 pandemic research

Author	Total	Author	Total
Balcombe, L.	3	Ittamalla, R.	3
García-Peñalvo, F.J.	3	Limone, P.	3

Author	Total	Author	Total
Huber, J.	3	Mpungose, C.B.	3

Table 4 shows the Top Authors in DL during COVID-19 pandemic research in terms of productivity. Balcombe, García-Peñalvo, Huber, Ittamalla, Limone, and Mpungose, were the most productive authors in the DL publications. The rest, many researchers have researched the topic of DL during the COVID-19 pandemic.

3.3 Publication Patterns: Source Titles

From Figure 1 presents the most often cited journal or proceeding on the DL during the COVID-19 pandemic research. ACM International Conference Proceeding Series and Journal of Physics Conference and ACM was the most well conference series that included 31 and 24 publications about DL during COVID-19 pandemic research. The remaining journals were Educational Technology Research and Development, Sustainability Switzerland, and Gms Journal for Medical Education.

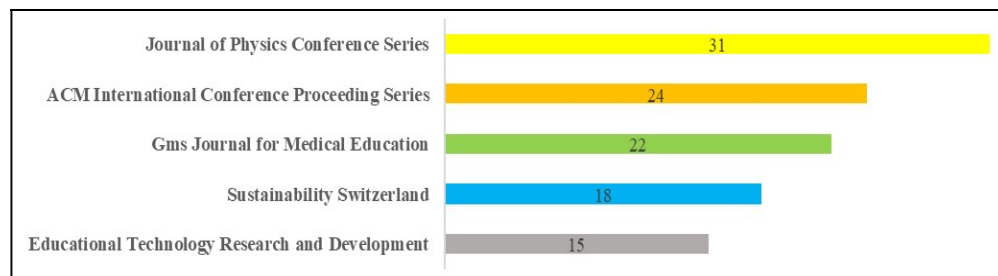


Figure 1: Number of documents in DL during COVID-19 pandemic research across source titles Scopus.

3.4 Visualisation of Research Trends on DL during COVID-19 Pandemic based on Mapping Visualization VOSViewer

The researchers used VOSViewer software to visualize the research patterns on this issue among the 921 publications linked to DL during the pandemic of COVID-19 outbreak research (see Figure 2). This attempt is beneficial in determining the novelty of research in this subject.

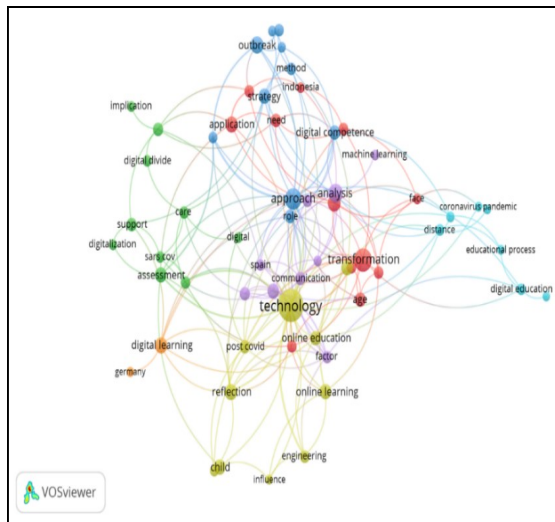


Figure 2a: The whole picture (network visualization) of research on DL

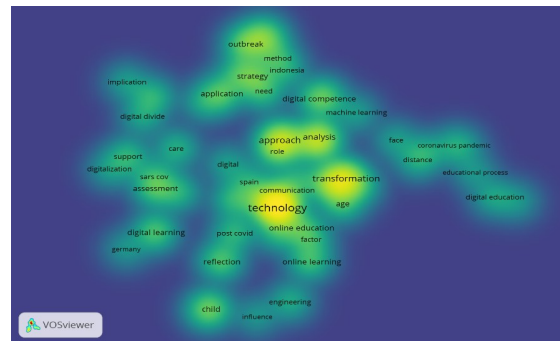


Figure 2b: Density visualization of publication on DL .

Figure 2 depicts the entire publications on DL during the pandemic of COVID-19. Six clusters were created by researchers all across the world. Four of seven clusters were the significant clusters (indicated with red, green, yellow, blue, dark blue, purple, and orange). The first cluster (in red) was DL during the COVID-19 pandemic as a result of an online change, age, face, application, need, digital competence. The second cluster (yellow) was DL during COVID-19 pandemic focus on technology in relating to post covid, online education, reflection, child, influence, engineering, online learning, and online education. The third cluster (green) was DL during COVID-19 pandemic in connecting with assessment,

digitalization, sars cov, digital, implication, digital device and digitalization. The fourth cluster (blue) indicated DL during COVID-19 pandemic in relating to coronavirus pandemic, educational process, digital education, and distance. The five cluster (dark blue) was DL during COVID-19 pandemic focus on approach in connecting with

rule, strategy, method, outbreak, and application. The six cluster (orange) focus on DL. The seven cluster (purple) as an analysis related to Communication, factor, and machine learning.

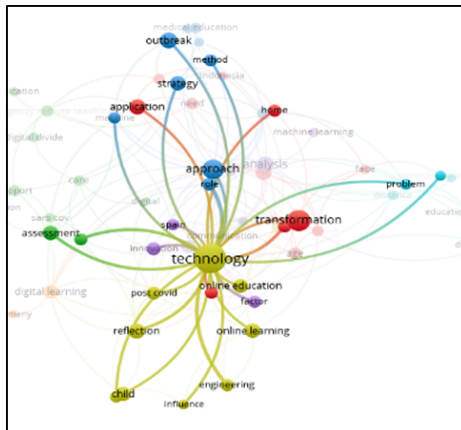


Figure 3a: Technology

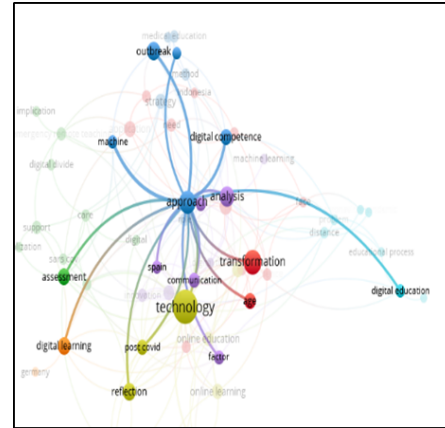


Figure 3b: Approach

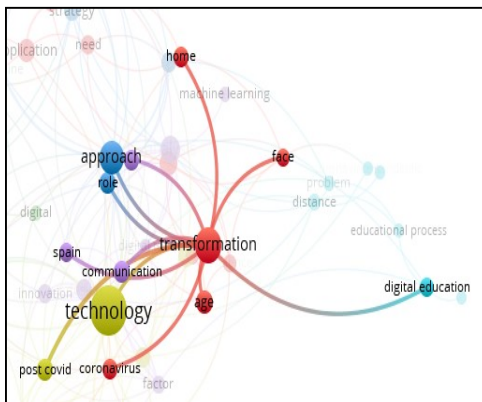


Figure 3c: Transformation

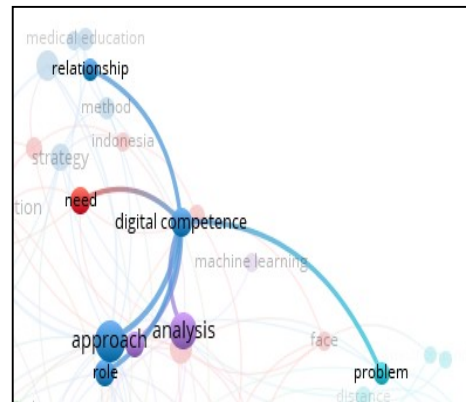


Figure 3d: Digital Competence

Figure 3: Novelty and trends of publications on DL

Based on Figure 3 denote the findings, which show that various characteristics or interrelationships between variables were employed to capture the trend and uniqueness of DL study. Throughout the COVID-19 Pandemic, such as investigating on DL During COVID-19 Pandemic and technology, the approach to researching on DL During COVID-19 Pandemic, the transformation on DL During COVID-19 Pandemic, and digital competence on DL during the outbreak of COVID-19.

Research trends in form of May 05, 2021 related to technology topics (3,384,857), COVID-19 (135,618), Coronavirus (121,980), DL (69,663), DL during the COVID-19 in 2020 (527), DL during COVID-19 pandemic in 2021 (394). Other findings highlight the top keywords trends as of May 05, 2021 (Scopus Database) connecting to DL during the outbreak of COVID-19 such as: COVID-19 (356), E-learning (215), pandemic (165), human (154), humans (124), students (118), education

(111), pandemics (97), online learning (89), and teaching (86) in Scopus meta-database.

3.5 The Profile of Top 10 Cite Article in DL Research During COVID-19 Pandemic Based on Literature Review

Based on the results of the literature review, the subsequent research recommendations are provided. Recent research supports conclusion as follows. These findings will serve an empirical

foundation for future study, particularly in DL during the COVID-19 pandemic [19]-[22]. Digital Competence still can be a research trend in latest publications research, specifically in the field of technology education. It is supported by the Scopus document in All years, there are 5,602 documents with some recent research related to digital competence [34]-[39]. The literature review of articles on DL during the covid-19 pandemic is presented in Table 5.

Table 5. Top 10 Cite Article in DL Research During COVID-19 Pandemic

Authors	Citations	Findings
H. Blake, F. Bermingham, G. Johnson, and A. Tabner [40]	547	Develop and evaluate digital learning packages using Agile methodologies that include evidence-based guidance, support and direction related to psychological well-being. With results showing high user satisfaction with content, low cost usability.
E.M. Mulenga, and J.M. Marbán [41]	282	Digital learning can be done by students at home as long as they have the necessary digital devices, access to the internet, internet fees. It is evident that the result has a pedagogical shift of learning to teaching methods that are entertaining and engaging. The adoption of digital learning in response to COVID-19 will stimulate the growth of digital learning more rapidly.
P. Zis, A. Artemiadis, P. Bargiotas, A. Nteveros, G.M Hadjigeorgiou [42]	102	During the COVID-19 pandemic, the use of digital learning primarily by medical students showed a significant level of risk where they experienced emotional exhaustion, mainly experienced by final year students due to lack of clinical experience.
D. Scully, P. Lehane, and P. Scully [43]	64	Digital learning shows a positive trend. Students also have a good response to technological developments.
S. Shehzadi, Q.A. Nisar, M.S. Hussain, W.U. Hameed, and N.I. Chaudhry [44]	51	Creating a university brand image to support learning in times of emergency such as covid-19. With the development of the digital learning platform, it can provide guidelines for educational institutions to implement an effective learning management system.
D.S. Aditya [45]	41	The COVID-19 pandemic has forced students to start digital learning to ensure continuity of learning. The study found that teachers felt they were psychologically, technologically, and pedagogically prepared to undertake digital teaching and learning. This study also found that the problem of digital learning is due to differences in the level of student affordability to technology.
L.A. Hassell, J. Peterson, and L. Pantanowitz [46]	16	With the increasing use of digital learning for learning and supporting facilities in schools, this must be balanced with an increase in teacher competence and quality.
J. Liu, Q. Chen, and J. Dang [47]	12	The COVID-19 pandemic has led to digital device engagement, which has significantly increased digital device use, psychosocial stress, and myopia symptoms
A. Sawangchai, H. Prasarnkarn, J. Kasuma, A.G. Polyakova, S, Qasim [48]	11	Digital learning has proven to be able to overcome the challenges of COVID-19 for students by making learning more comfortable and more modern.

Authors	Citations	Findings
H. Galindo-Domínguez, and M.J. Bezanilla [49]	10	With digital learning, students are more adept at recognizing and using more tools and techniques to address academic problems and support perceived stress reduction.

3.6 Students Response to DL During COVID-19 Pandemic Based on Survey to Students

The results of the survey on students in DL during the COVID-19 Pandemic is presented in Table 5. Based on Table 5, most students consider that DL can help learning during the pandemic. This is in line with Scully et al., 2021 [50]. However, in the second statement, 48.4% of students chose to disagree that DL is one of the fun learnings during the COVID-19 pandemic. This might because of students feel saturated when they have to constantly face the screen and cannot interact with friends or teachers. 71% students are indicated increased stress and anxiety due to the COVID-19 outbreak, one of the causes is distance learning [51].

In this regard, in the third statement, students prefer the option of disagreeing that DL can improve learning outcomes during the COVID-19 pandemic. Furthermore, students also feel that DL cannot increase knowledge during the COVID-19 pandemic. It is also in line with the fourth statement that 48.1% of students chose the option of disagreeing that DL can improve skills.

Then, as many as 47.0% of students chose to disagree that DL can improve attitudes during the COVID-19 pandemic. However, in the next statement, 55.7% of students chose the option of agreeing to the statement that DL can be one of the good solutions at a time when the condition of COVID-19 victims is greatly improved. In the next statement, 42.1% of students chose the option of disagreeing on the statement of learning outcomes better when using DL during the COVID-19 pandemic than face-to-face learning.

Then, in closing, students choose to agree that DL statements must be set to be more interesting, so that students are more enthusiastic and motivated on remote learning. Based on the analysis, it can be known that the survey response to DL during the pandemic among high school students still has negative results. One of the causes could be because the DL activities they do are less innovative and less interesting, so that students' motivation in following learning is still low. So, this can be used as a study of educational innovation in DL. Also, this discovery signifies that students are not ready to move from face-to-face learning to distance learning [52].

Table 6. Students in DL during COVID-19 pandemic

Statement	Answers			
	Very Disagree	Disagree	Agree	Very Agree
DL helps during the Covid-19 Pandemic.	102 (6.4%)	458 (28.8%)	842 (52.9%)	191 (12.0%)
DL are fun during the Covid-19 Pandemic.	211 (13.2%)	771 (48.4%)	521 (32.7%)	90 (5.6%)
DL can improve learning outcomes during the Covid-19 Pandemic.	228 (14.3)	870 (54.6%)	442 (27.7%)	53 (3.3%)
DL can increase knowledge during the Covid-19 Pandemic.	172 (10.8%)	830 (52.1%)	528 (33.1%)	63 (4.0%)
DL can improve skills during the Covid-19 Pandemic.	156 (9.8%)	766 (48.1%)	585 (36.7%)	86 (5.4%)
DL can improve attitudes during the Covid-19 Pandemic.	147 (9.2%)	749 (47.0%)	615 (38.6%)	82 (5.1%)
DL is considered to be a good solution when there is an increase in casualties during the Covid-19 Pandemic.	65 (4.1%)	148 (9.3%)	887 (55.7%)	148 (9.3%)
Learning outcomes are better when using DL during the Covid-19 Pandemic than face-to-face.	235 (14.8%)	671 (42.1%)	545 (34.2%)	235 (14.8%)
DL needs to be set more interesting so that students are more enthusiastic and motivated in distance learning.	40 (2.5%)	68 (4.3%)	620 (38.9%)	865 (54.3%)

The use of DL should be one of the visionary policymaker actualizations that can make it more effective in directing and guiding teachers in the field of study in order to improve teaching materials / materials. Visionary actualization is being able to see challenges and opportunities while positioning the organization to achieve the school's vision. By looking at the trends of DL and student response, DL should be one of the visionary actualizations as an effort to increase educational innovation, especially to achieve the vision of the school's mission in the COVID-19 pandemic. Based on the findings, visualization and discussion related to DL have similarities with research [53] that the trend of DL research is increasing and has an important role in education. The principal as a leader in the implementation of education has a central and strategic position, especially in making the goal of national education as a top priority that must be reached optimally. A visionary leader is a good communicator, this means that the principal must have the ability to communicate so it is hoped that with good communication the principal is able to express the vision and goals to the team or in this case are educators and education staff. In addition, the role of leaders in an organization is as central in achieving common goals, so that in achieving effective leadership, a leader in this case is the principal must know the function and role in an organization. Siagian, [54] states that one of the functions of a visionary leader is as a good communicator, where what is meant is in establishing relationships both from within and outside the organization a leader must go through a good communication process, with communication will produce harmonious operational activities. between leaders and subordinates, fellow officials, and implementing officers. So based on some of the statements above, in developing teacher learning innovations to achieve common goals, it is necessary to have good communication by the principal as a leader in the education unit. As for the role of the principal as a leader who is a communicator, it can be seen in how the principal is able to actualize visionary leadership in socializing, transforming, and implementing.

The actualization of school principals in senior high schools in the socialization role has been carried out. Principals in high schools have a very important socialization role in organizational activities, this is because with good communication the leader, namely the principal, can establish good relationships with teachers, so that they are able to easily transfer a message, namely a shared vision of creating innovative learning. Good communication

with leaders is able to have a good impact on understanding the vision of members, from this case it is the principal to teachers so that they are able to increase understanding of vision and increase responsibility, one of which is learning innovation. The ability to transform is one of the four strategic steps that must be taken by a visionary leader, while the four steps are creating a vision, formulating a vision, transforming a vision, and implementing a vision. In actualizing visionary leadership, principals from both schools are able to become leaders as good communicators, principals should be able to transform the vision to all members. Transformation efforts are reflected in the coordination meeting activities that aim to build trust through intensive and effective communication so that a shared commitment arises in achieving the predetermined vision [55].

Vision transformation is able to diffuse the vision into all members and generate commitment from all members, namely the work culture, including commitment to developing learning innovations [56]. In addition, implementation skills in communication are also needed in visionary leadership. This is because everything that has been socialized and transformed must be implemented. The ability to implement the vision of the visionary principal is the principal's ability to describe and translate the vision into action, and in fact the vision must be realized in the leadership work of the principal. Based on the explanation above, the principal can be said to be a communicator leader. This is because the two principals have made efforts to actualize visionary leadership including the ability to socialize, transform and implement the vision that has been determined, and of course have an effect on the development of teacher learning innovations in schools.

4. CONCLUSION

From this research, several results from the research objectives can be found, including: (1) Document sources in the form of articles which are mostly written in English; (2) Countries that dominate research related to DL are the United States; (3) Journal of Physics Conference Series is the most frequently featured source titles related to DL during the covid-19 pandemic; (4) Various characteristics or interrelationships between variables were employed to capture the trend and uniqueness of DL study ; (5) The majority of the literature review shows that Digital Competence can still be a research trend in the latest publications research, specifically in the field of

technology education; (6) Based on the results of student responses to DL during the covid-19 pandemic, most students consider that DL can help learning during the pandemic. According to the findings of the study, the COVID-19 outbreak has a beneficial influence on the acceleration of digitalization in poor nations. According to the findings, there is a movement in the face-to-face learning and teaching paradigm approach to digital technology-based learning, which has been shown to be beneficial in increasing student learning outcomes. Educational change now and after the outbreak of COVID-19 can occur in transformation to learning from home, in role, approaches and online education. Technology will be important aspect in current educational policy in senior high school. Current research trend of DL during COVID-19 pandemic such as researching on technology, approach, transformation, and digital competence. Based on the survey through the high school students, it can be known that the survey response to DL during the pandemic among high school students still has negative results. this discovery signifies those students are not ready to move from face-to-face learning to distance learning. Visionary actualization of policymaker in senior high school is being able to see challenges and opportunities while positioning the organization to achieve the school's vision. By looking at the trends of DL and student response, DL should be one of the visionary actualizations as an effort to increase educational innovation, especially to achieve the vision of the school's mission in the COVID-19 pandemic.

5. ACKNOWLEDGEMENTS

Thank you to the state university of Surabaya, Indonesia for supporting postgraduate doctoral research. The editors and reviewers who have improved the quality of this article so that it can be published.

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