SUSTAINABLE DISTANCE EDUCATION: A LITERATURE REVIEW OF THE LAST DECADES AND A CORRESPONDING BIBLIOMETRIC ANALYSIS

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Abstract
Today's colleges and universities face a wide range of challenges, including disengaged students, high dropout rates, and the ineffectiveness of a traditional "one-size-fits-all" approach to education. Furthermore, the current COVID pandemic has highlighted the need for an innovation in training and education that will make sustainable and robust in the face of uncertainty and force majeure situations. The proposed approach must be sustainable and flexible to accommodate the needs and timetable of the students and educators without compromises to its quality and at the same time take into account unforeseen situations. At the same time the method should include the ability to reach remote areas without extreme costs for new infrastructure, exploit the advantages of the digital realm and provide immersive learning experiences. It is critical to take into account the preferences of students and educators so that education can move from its traditional style and be rendered to one of personalized learning. The starting point is distance learning which has gained a lot of momentum in the current years and is able to respond to the challenges that have arisen. The current paper provides an extensive literature review focusing on distance learning, initiating from 2000.

Furthermore, a bibliometric analysis has taken place, through the use of VOS-viewer, and identified fundamentals concepts that are associated with the development and evolution of distance learning.

Keywords: Distance Learning, Internet, Sustainable, Education, VOS-viewer

JEL classification: M53

Introduction

Today's colleges and universities face a wide range of challenges, including disengaged students, high dropout rates, ineffectiveness of a traditional "one-size-fits-all" approach to education. COVID pandemic has highlighted the need for an innovation in training and education. In this context, distance education will provide sustainable and robust approach in the face of uncertainty. It is critical that distance education must be sustainable and flexible to accommodate the needs and timetable of the students and educators without compromises to its quality and at the same time taking into account unforeseen situations.

Furthermore, distance education should include the ability to reach remote areas without extreme costs for new infrastructure, exploit the advantages of the digital realm and provide immersive learning experiences. In a distance education class, electronic communication systems serve as the delivery method which replaces the face-to-face classroom. Distance education offers the potential to build better interactive classrooms which foster learning communities. The goal is to achieve a personalized interaction with students that can be successful in a transparent and efficient manner based on the Web.

The digital environments (for video conferencing, shared writing, chat, forums and more), which characterized Distance Teaching (DAD) during the pandemic have been widely used, due to the fact that they have been established tools for several years. Immersive environments exploit the ability of media to make us feel present and with agency in a place different from the one where you are physically.

Distance education, also called distance learning, e-learning, and online learning, is the form of education in which the main elements include physical separation of teachers and students during instruction and the use of various technologies to facilitate student-teacher and student-student communication.

The attributes of distance learning include the following:

- The limits and potentialities linked to the design of online classes in addition to or in substitution to traditional ones are mainly detectable in the ability to favour the participation of students.
- It is critical to take into account the preferences of students and educators so that education can move from its traditional style and be rendered to one of personalized learning.
- Distance learning has gained a lot of momentum in the current years and is able to respond to the challenges that have arisen.

Distance education objectives include assistance of students in achieving their academic goals, and instructors able to adapt their lectures to maximize the knowledge they wish to convey. The aim and scope of the current study is to present a bibliometric analysis, through the combined use of Mendeley and VOS-viewer and identify fundamentals concepts that are associated with the development and evolution of distance learning.

The following sections include a brief literature review on distance education, and then the methodological approach is presented. Analysis of the papers based on the Vos Viewer is highlighted and the paper presents the conclusion along with limitations and further research.

Distance Education

Distance Education has gained an increase demand within the last years. In this context, publications associated with Distance Education has significantly increased. In a distance education class, electronic communication systems serve as the delivery method which replaces the face-to-face classroom. Distance education offers the potential to build better interactive classrooms which foster learning communities (Flugrad et al., 2000).

Boticario and Gaudioso (2000) initiative has presented that personalized interaction with users/students can be successful in a transparent and efficient manner through the Web. This can be accomplished without the use of specific software but based on dynamically constructed HTML.

Furthermore, personalization capacity of the system relies on the effectiveness of the design of the learning tasks. Distance education is moving to offer education to international students. Therefore, successful means of distance learning within a national environment, with positive outcomes for distance education may lead to a negative effect when implemented to international students. It is significant to note that cultural exchange is difficult for both the teacher and the student. Developers of distance education are required to be as informed as possible when presenting their education to different cultures. Supervisors, content developers and students need to be aware of ramifications, misunderstandings and higher levels of dedication that are required (McPhee & Christian, 1999).

Brower and Klay (2018) defined that student socialization was critical. New electronic technologies lead to a new examination of the processes through which future generations of public servants socialize. In essence distance technologies are forcing to examine how to convey the values of public service more effectively.

The balance among traditional and distance education is the aim of the current study. The paper identifies both the advantages and disadvantages of the implementation of distance education to various aspects with emphasis on the access to education (Rockenbach & Almagno, 2013). The role of instructor changes. Therefore, in a distance education system the instructor could be considered as “information navigator” according to Raymond (2000).

As the means and technologies transform and alter, the greatest challenges faced by academicians would be that of reinventing their roles in terms of a new pedagogical philosophy. Within the application of these tools in order to facilitate distance education, the instructor is no longer the promoter of knowledge to students as in the traditional classroom setting. Within this new context, the role of the teacher includes acting as a facilitator (Raymond, 2000).

The role of libraries in the system of distance education is also discussed. Aiming at autonomy, the services of distance education libraries are imperative to focus on inducting students into the information system. Core processes are the ones involved in searching. These activities of identifying and locating resources are included in specific fields of study and need to be taught in conjunction with substantive content (George & Love, 1955).

The next paper uses the Informing Science Framework to present the institutional system established at METU (Middle East Technical University) in Turkey, which has initiated Internet-based learning through its METU-Online project. In METU-Online, the planning, funding, development and delivery of courses are centralized at the Informatics Institute, thus avoiding duplication of effort and enabling the consolidation of scarce resources (Onay, 1999).

Gregor and Cuskelly (1994) describes experiences with computer mediated communication (CMC) in a postgraduate information systems module over two successive years. CMC was introduced to enhance the learning experiences of students, but a further aim was to carry out an exploratory investigation into factors affecting its successful adoption and the benefits to students.

Brigham (1992) is one of the pioneers in setting the context of the success parameters for distance education. The aim of this exploratory study is to investigate the course development process within a specific distance education context. The study seeks to identify factors and relationships among factors facilitating and impeding the development of distance education courses at Syracuse University, a large, private university in Central New York State.

In the following paper, Shale and Garrison's model of distance education developed in the late 1980s is updated and critiqued for the late 1990s, through the addition of Internet-based distance education tools, such as electronic mail, newsgroups, chat lines and the World Wide Web.
The suggested model of combining distance education with the Internet-based tools, aims to offer to professionals of human resource development (HRD) effective and efficient training solutions for the workforce (Anderson, 1999).

Kovacich, Arndt and Clark (1998) provide a brief overview of the types of new distance learning technologies and their uses in rural areas by several federally funded projects. Special reference is made to the Maine “Electronic Classroom”, a distance education modality introduced to provide health care professions students with relevant rural practice skills, practical knowledge, and to accommodate specific academic schedules and needs.

Trentin and Scimeca (1999) focus on the roles and the process that characterize the design of online education courses, and also to draw some simple guidelines for designers of such courses. The elements considered in the study as most important for designing an online education course were: finding a suitable form of internal organization within the design staff, strict definition of the structure of interaction among the design staff, close relationship between designing and managing the course and finally appropriate composition of the tutoring staff.

Dringus and Terrell (1999) offer a definition for Online learning environments (OLEs) in higher education institutions. The main objective of the paper is the presentation of a framework to support a "directed" approach to OLEs that provides a basis for planning, designing, implementing and evaluating OLEs, as well as for online courses. Starr (1998) reviews some

basic tenets for educational practice, considering current trends in distance education and possible future directions for higher education. The example of the Western Governor's University, a platform conceived in 1995 as a consortium of private and state supported institutions, is examined.

Lauzon (2000) with his study supports understanding distance education as a community of practice that has to acknowledge and accommodate diversity in the context of increasing economic globalization. The next paper analyzed the educational context influence on six fields: 1) student appreciation of the course's progress, 2) student motivation, 3) student/student and student/professor interaction, 4) student autonomy, 5) student support and collaboration, and 6) student satisfaction. The development of supportive and collaborative behaviour among remote site students needs to be further studied as it appears to be a significant factor (Fillion et al., 1999).

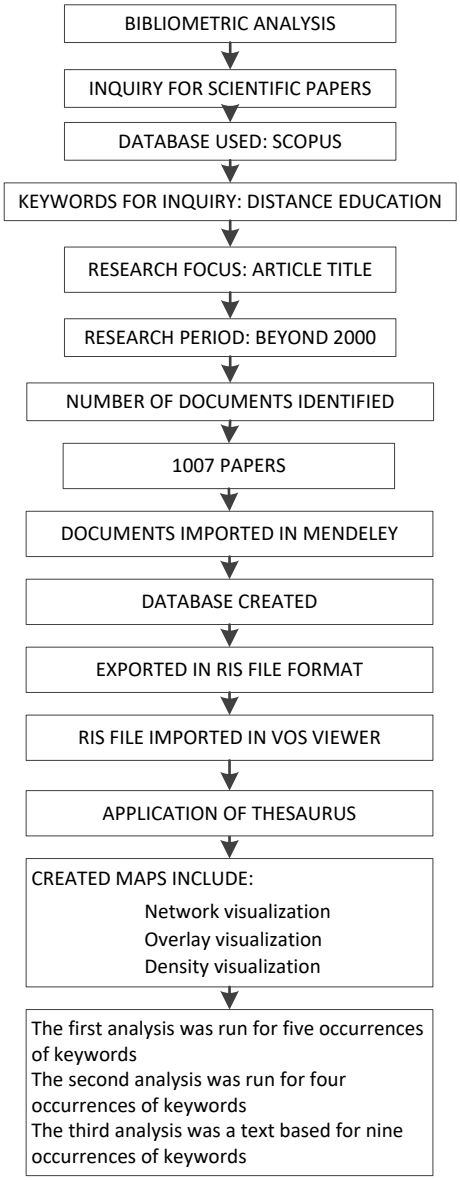
Methodological Approach

The methodological approach followed within the current study includes a number of steps which are as follows:

- Inquiry for scientific papers
- The database used was Scopus
- Keywords used: “Distance Education”
- The inquiry was focused on “Article Title”
- Research Period: beyond 2000
- Documents that were identified and examined equal to: 1007
- Documents were imported in the reference manager: Mendeley
- A database for analysis regarding “Distance Education” was created
- The citations were exported in a “RIS” file
- Vos Viewer was used to create the bibliometric maps
- The “RIS” database was imported in Vos Viewer Application
- Three types of maps were created which included:
    - ✓ Network visualization
    - ✓ Overlay visualization
    - ✓ Density visualization
    - ✓

The complete methodological approach is presented in the following figure 1:

Figure 1. Methodological Flowchart



Vos Viewer is the critical tool for the required analysis. In this context, the bibliometric analysis took place with the aid of Vos Viewer. The options for Vos Viewer regarding the analysis were focused in the three following basic pillars:

- The first analysis was run for five occurrences of keywords
- The second analysis was run for four occurrences of keywords
- The third analysis was a text based for nine occurrences of keywords

Analysis produced three "maps" for each pillar, namely: Network, Overlay and Density.

Bibliometric Analysis and Findings

The bibliometric analysis was based on a thesaurus developed for the two samples. The thesaurus is presented in the following Table 1:

Table 1. Thesaurus for Bibliometric Analysis

LABEL	REPLACE BY
Adult Learners	Adult Learner
Construction Industry	Construction
Dropout	Drop-Out
Early Dropout	Drop-Out
Educational	Education
Information and Communication Technologies in Education	Information Communications Technology
Learning Management System (LMS)	Learning Management System
Learning Management Systems	Learning Management System
Open and Distance Learning	Open and Distance Education
Open and Distance Learning (ODL)	Open and Distance Education
Open Universities	Open University
Structural Equation Modelling	Structured Equation Modelling
Student Support Services	Student Support
User Satisfactions	User Satisfaction

Analysis based on the Database of 1007 papers

Figures 2 to 10 present the various maps created based on the sample of 1007 papers, according to the methodological approach. For each of the three pillars, three different maps were produced:

Figure 2. Network Map Designed for Five Occurrences of Keywords

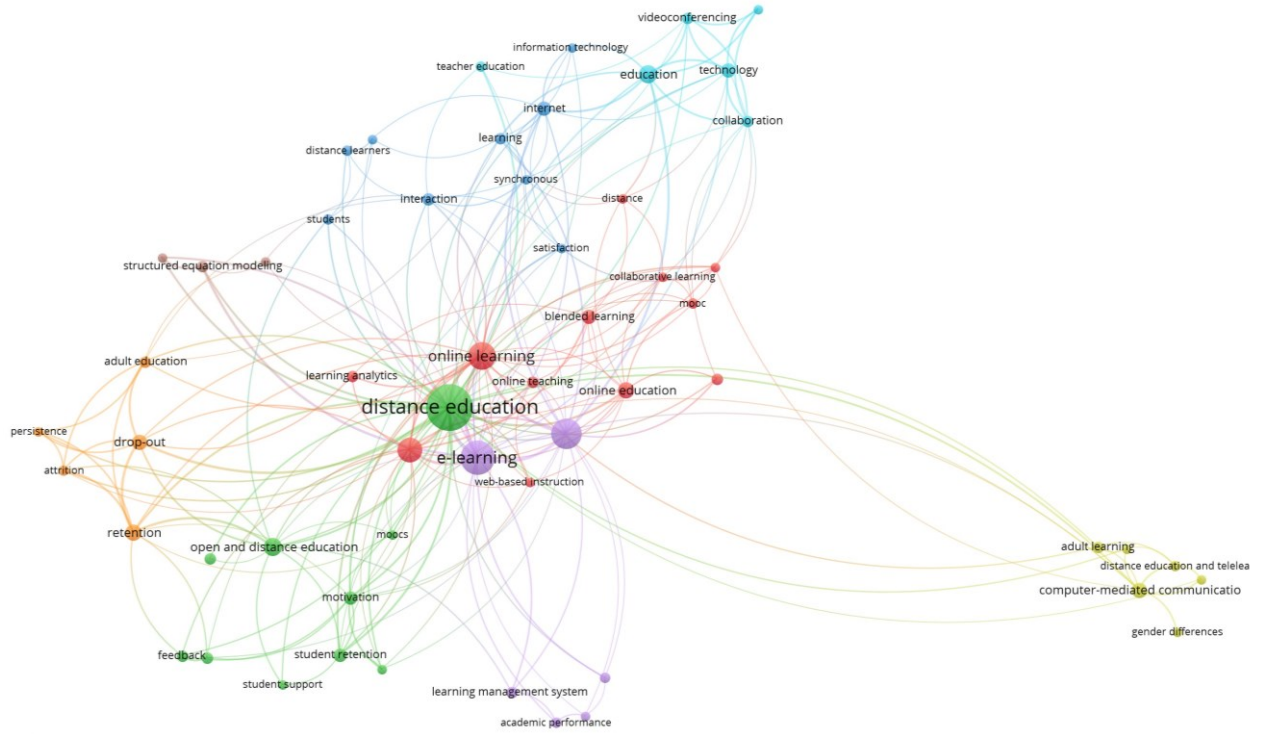


Figure 3. Visualization Map Designed for Five Occurrences of Keywords

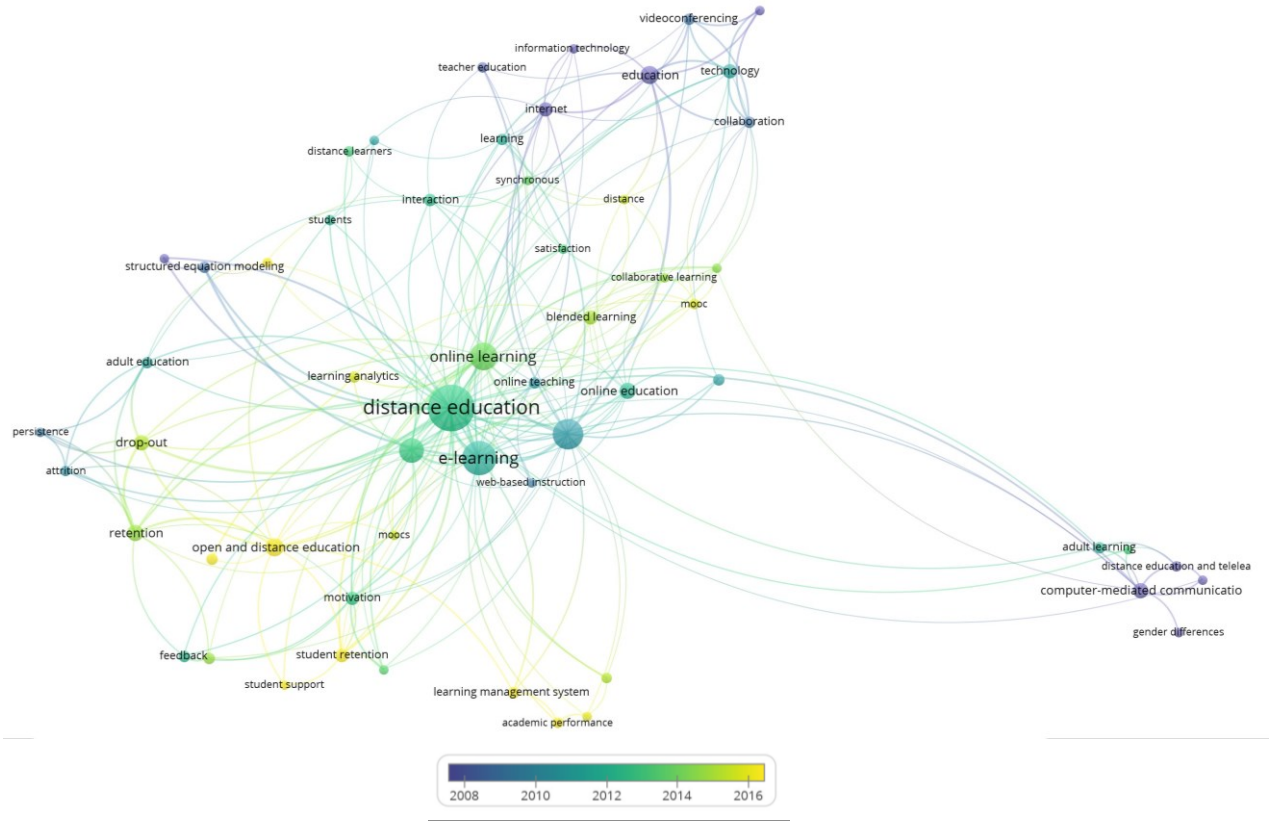


Figure 4. Density Map Designed for Five Occurrences of Keywords

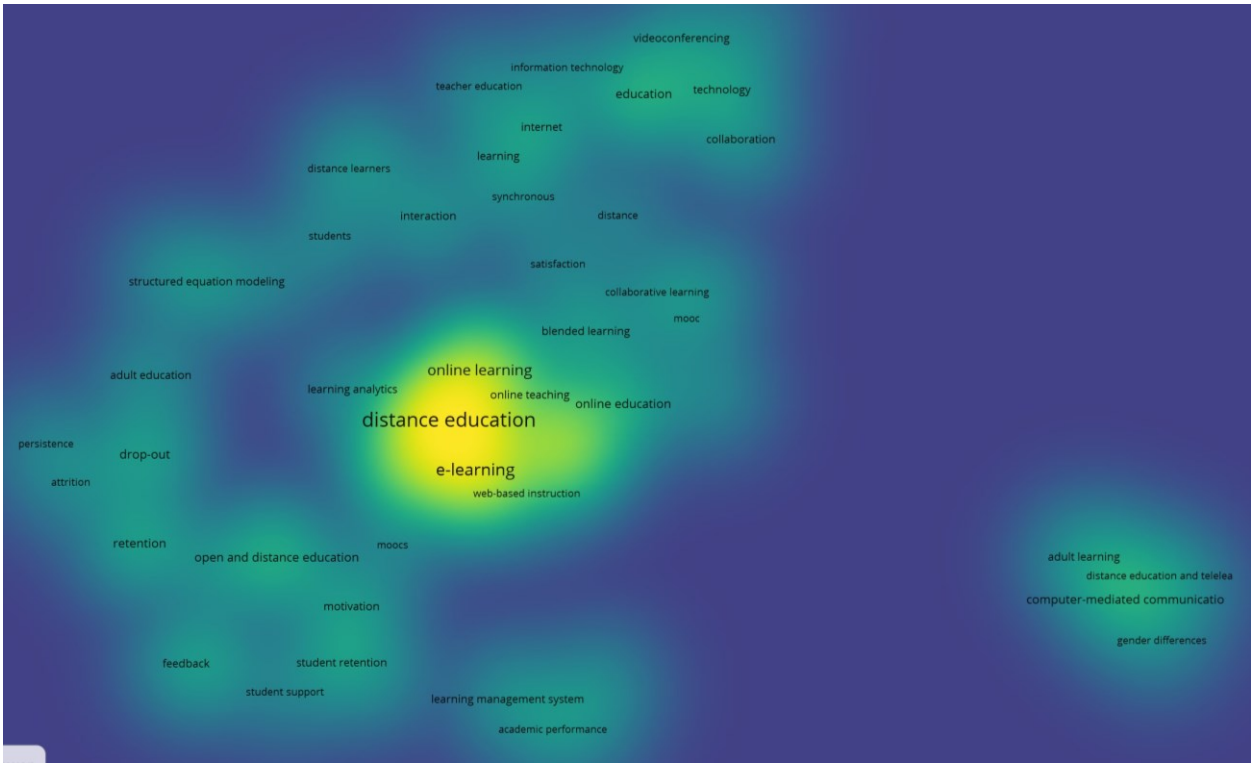


Figure 5. Network Map Designed for Four Occurrences of Keywords

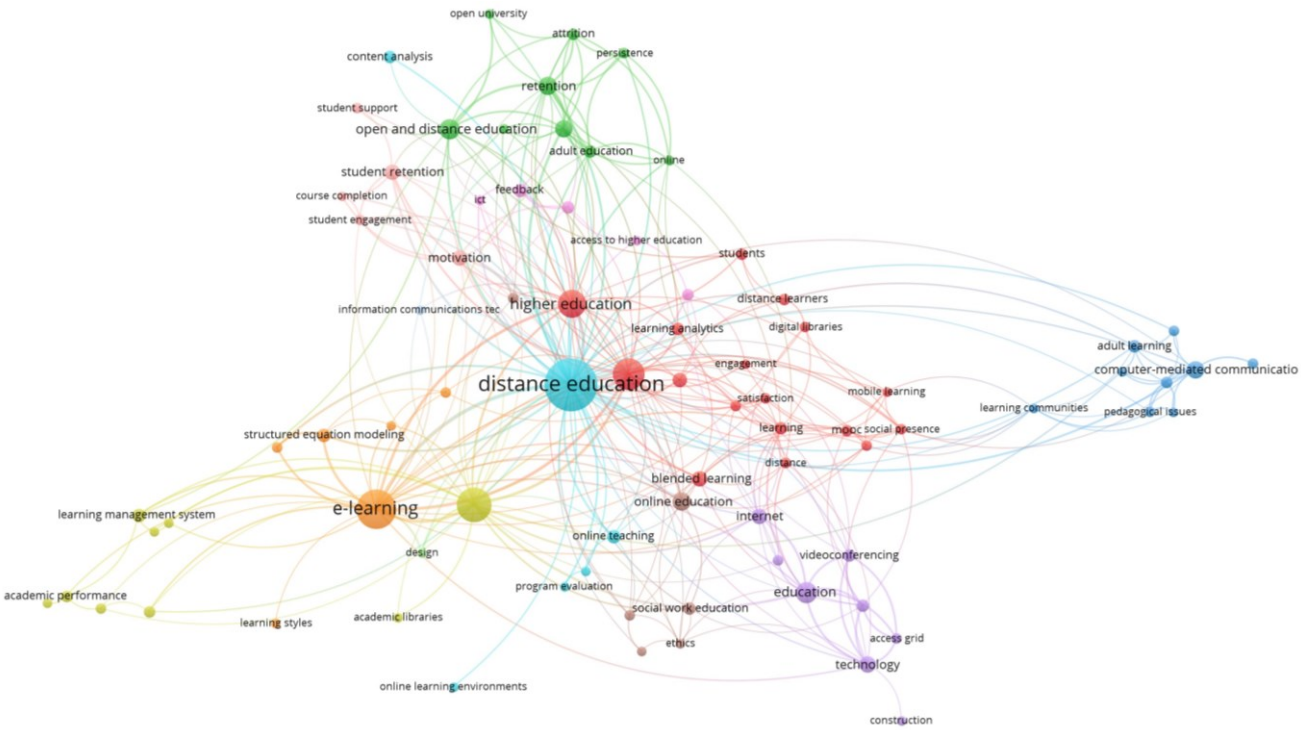


Figure 6. Overlay Map Designed for Four Occurrences of Keywords

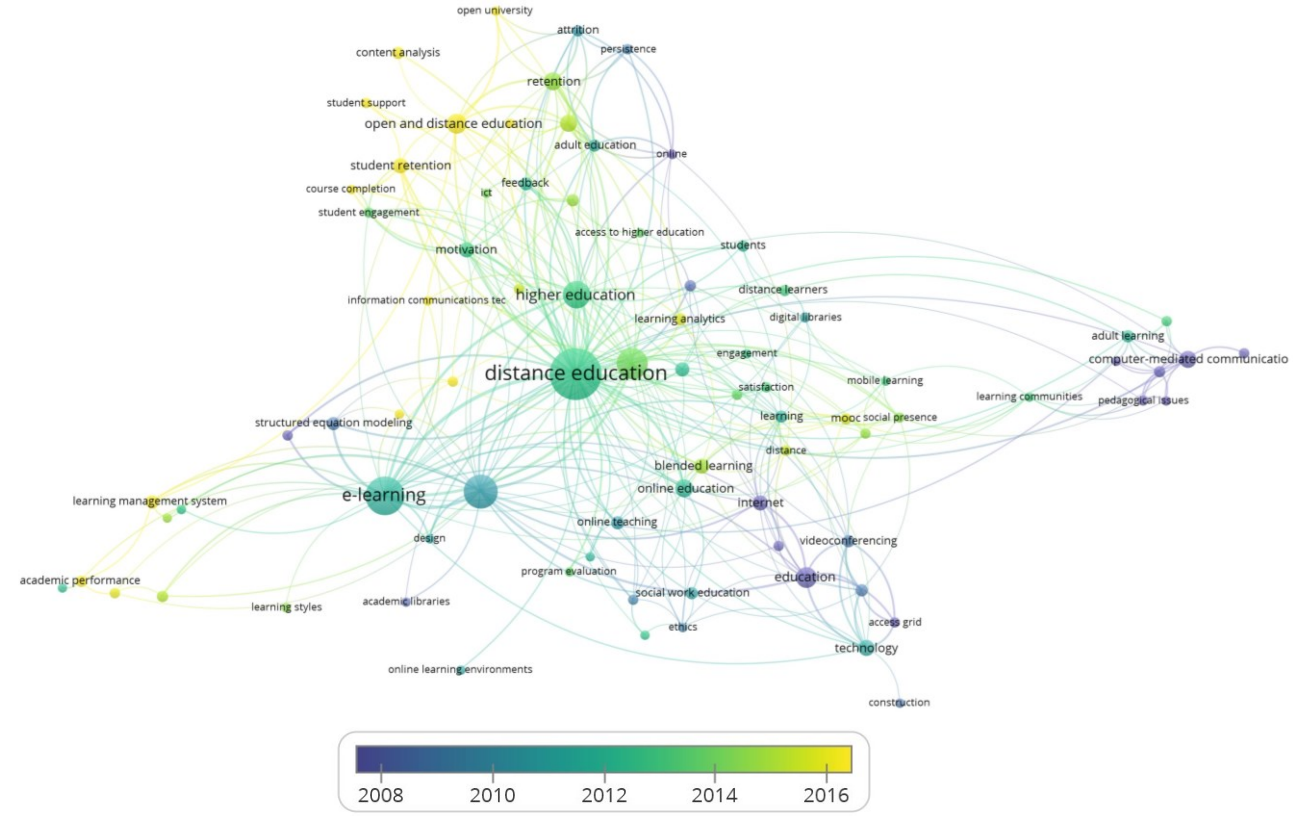


Figure 7. Density Map Designed for Four Occurrences of Keywords

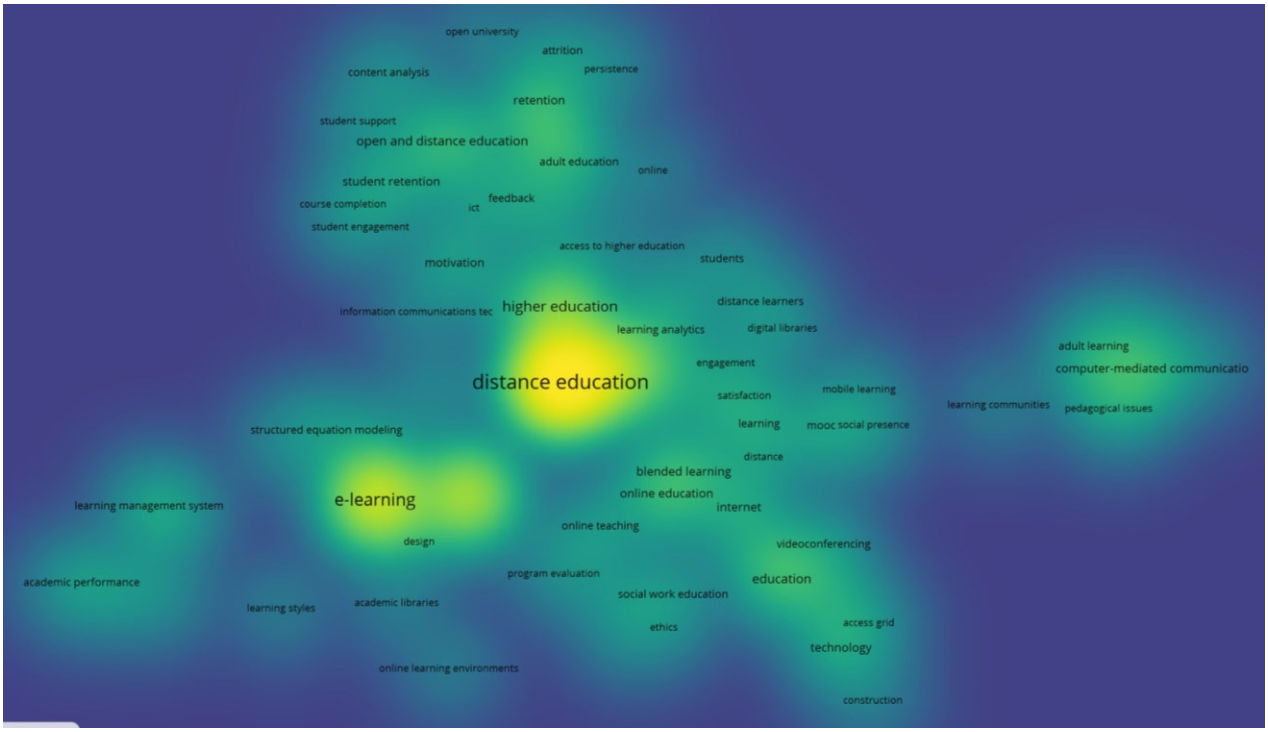


Figure 8. Network Map Text Based

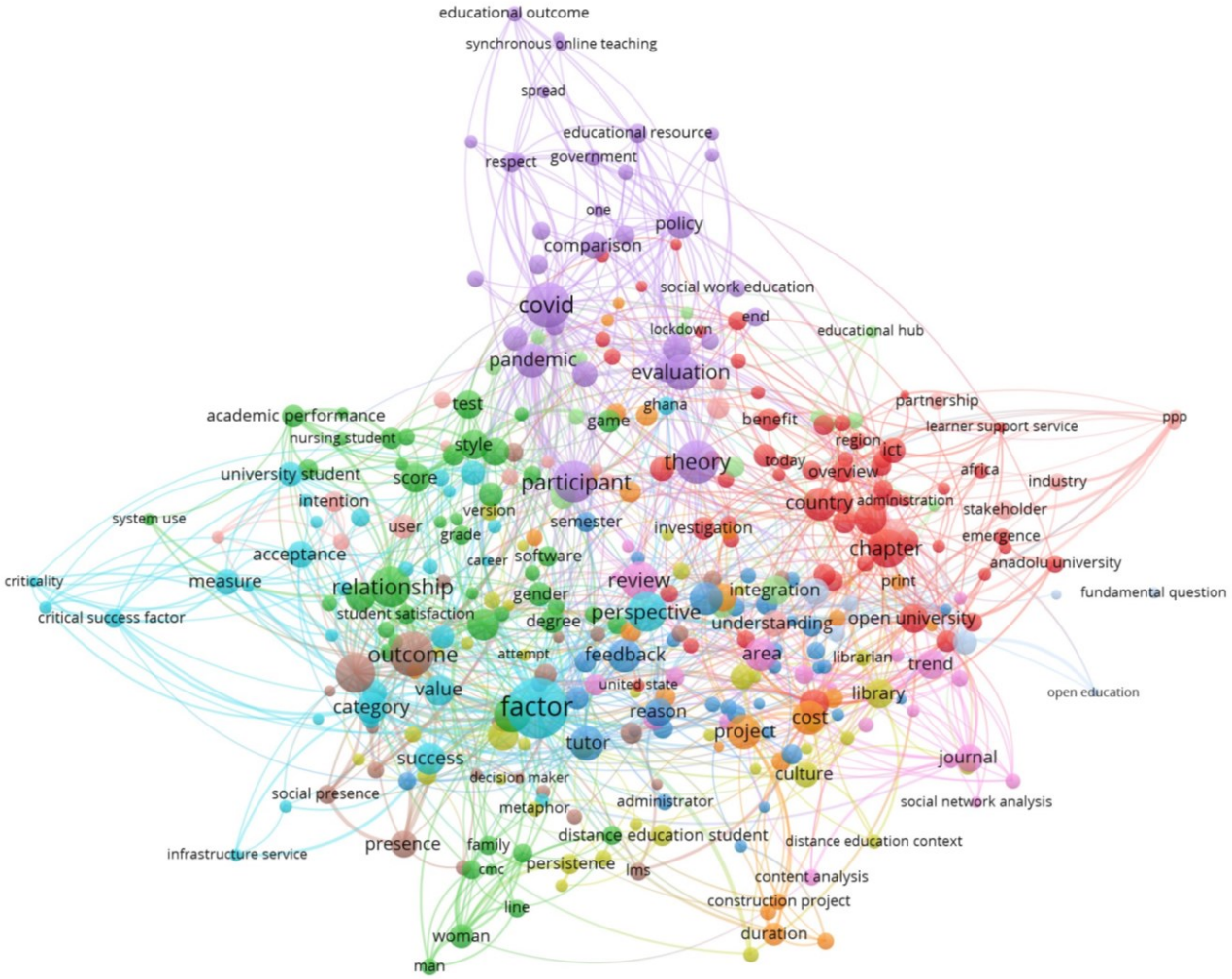


Figure 9. Overlay Map Text Based

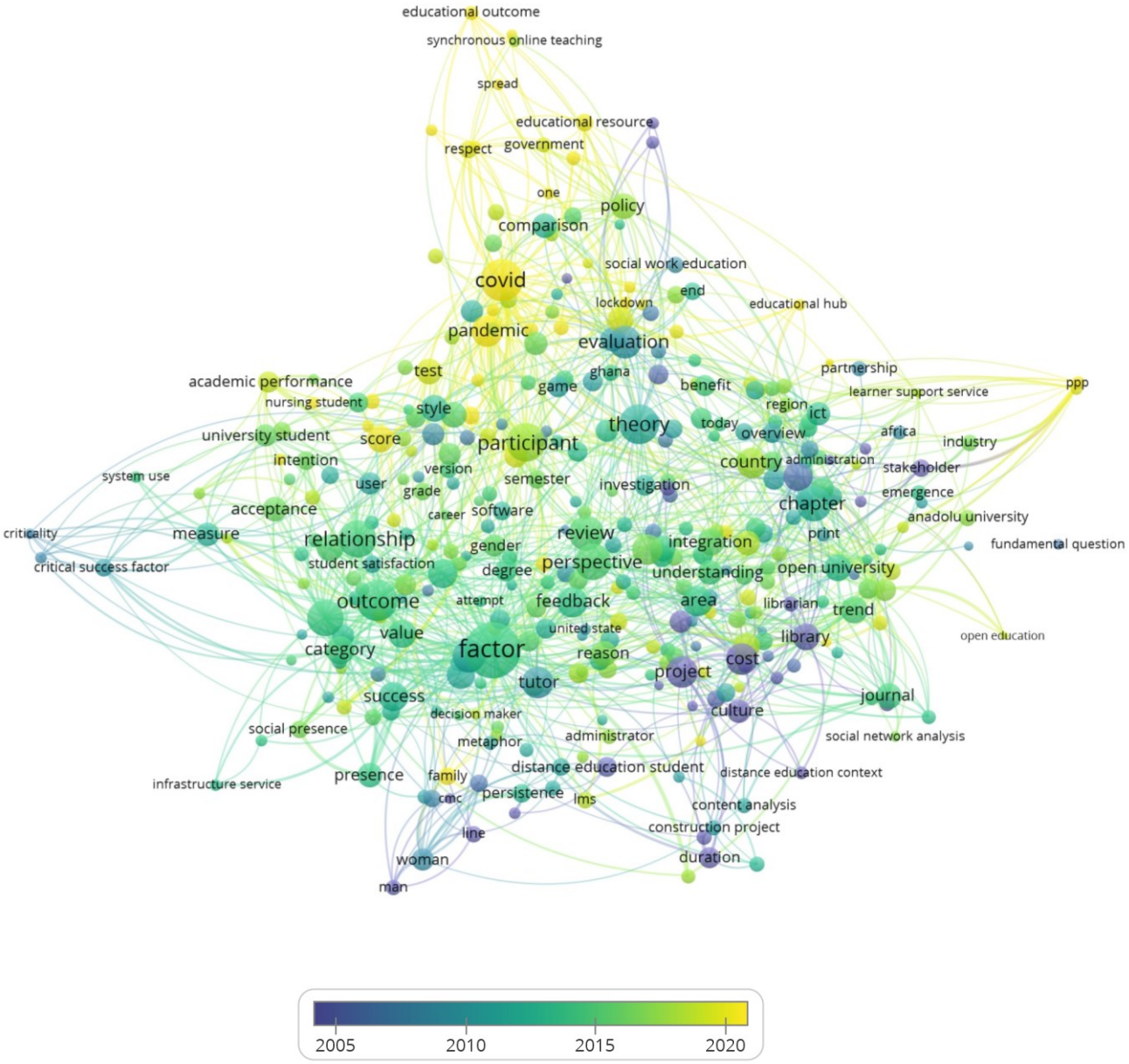
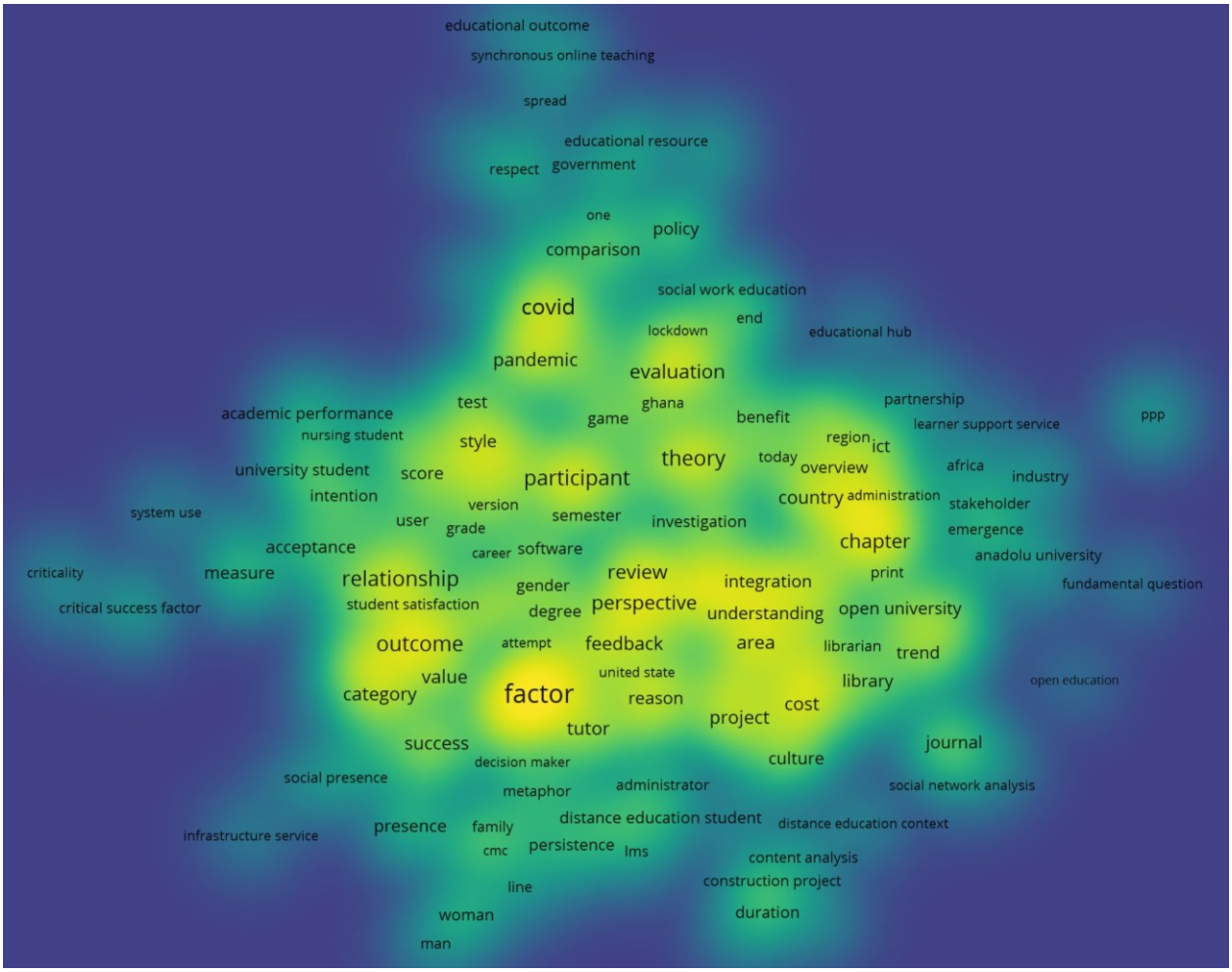


Figure 10. Density Map Text Based



Conclusions

The analysis of both the papers identified along with the consideration of the bibliometric analysis led to a number of the general comments and highlights along with the conclusions established by the current research that in turn could be summarized in the following statements: Through the analysis it became obvious that Distance Education especially during COVID 19 is a significant tool, more specifically a critical tool, that had the ability to transform the educational process and it managed to do so, in a quick pace, during the years that followed COVID 19.

Looking at the people who are involved in the implementation of distance education programs, the analysis highlighted the fact, that all these partners originate from a wide variety of scientific fields. People with expertise in the subject being taught along with psychologists, website designers, application / software programmers, experts in the field of communication technology, managed to build teams that facilitated this new teaching and learning environment.

Examining the publication trends, it is impressive the magnitude of increase in the numbers of research papers, in recent years, dealing with the “Distance Education” subject and the impact of this new approach to people lives and education. The interesting fact is that these changes

took place almost simultaneously across all countries and for all levels of education due to the COVID pandemic. It is fair to say that such an event has transformed the current educational system and provided tools and methods that effectively reengineered the educational system.

During these significant changes the driver is usually the associated technology. Therefore, a great portion of the research, investigation and publications are associated with the bilateral effect of technology and distance education. It is interesting that studies revealed the way existing and available technology has transformed education and at the same time, highlighted the ways in which the needs of a distance education system forwarded investments and discoveries in the associated and supporting technology.

It became apparent that hundreds of published papers and corresponding research has also focused on the association of COVID 19 and distance education. As mentioned above the pandemic was a pivotal event for the transitions in current education and life in general. It produced a new educational and working environment and the changes established have obtained a continuous dynamic and application throughout the everyday life. It was certain that research would embrace these facts and present them through published research.

Every educational research project or activity in general is focusing on main participants which are namely: the instructors and students. Therefore, a great deal or research and relevant publications have focused on them. The aspects that were studied were many and a great deal of work focused on the interaction among instructors and students, and among students, within the distance education environment. The research agenda focused greatly on the human factor and in this context personality and cognitive abilities are being considered and evaluated within this new educational reality. In order to achieve the optimum educational results, it was necessary to study the human attributes that could make this “distributed” and “distance” educational scheme achieve its goals.

As it clearly becomes important another critical parameter emerged and that was pedagogy. In this context, teaching and learning styles are receiving a lot of attention, both in the traditional education but also in the distance education. These terms “teaching and learning styles” needed to be redefined due to the drastic changes in the educational environment.

As mentioned earlier the enablers of distance education were the corresponding technologies. Therefore, it is worth mentioning that technological innovations and availability combined with affordable procurement cost have also increased the demand for distance education. Cost is a crucial parameter within every activity, and as the cost of the supporting technology decreased, the demand for distance learning increased. It is also critical to mention that this demand is also strengthened due to the time and location constraints of the educators and students. Therefore, based on these changes, education has become more inclusive in the recent years.

The current paper has also produced a number of bibliometric analyses based on various options with the aid of Vos Viewer. The analysis for **four** occurrences of keywords based on the Network map identified the following clusters: Distance Education, E-Learning, Higher Education, Open and Distance Education, Retention, Computer Mediated Communication.

Furthermore, based on the Map of Density, the concepts that seem to be dominant for **four** occurrences of keywords, include the following: Distance Education, E-learning, Open and Distance Education, Retention, Computer Mediated Communication.

The analysis was repeated and this time the findings are based on **five** occurrences of keywords, which were visualized by a **Network map,** which in turn identified the following key parameters within the published papers: Distance Education, E- learning, Online Learning, Computer Mediated Communication, Education, Dropout, Retention.

The same analysis for **five** occurrences of keywords, but this time based on the **Density map** identified the following parameters as being critical within the sample of publications: Distance Education, E- learning, Online Learning, Computer Mediated Communication.

Then, a Network Text based analysis was run with the aid of Vos Viewer, which identified certain core concepts as follows: COVID, Participant, Theory, Evaluation, Relationship, Country, Outcome.

Finally, a Density map Text based analysis identified certain core concepts that included the following: COVID, Participant, Theory, Evaluation, Relationship, Country, Outcome, Review Perspective.

The limitations of the current study, firstly concern the fact that the analysis focused on 1007 unique papers. During the papers' identification the keywords used was "Distance Education". In the current study the database was created based on Mendeley and the bibliometric analysis was based on Vos Viewer. Regarding the Vos Viewer the analysis was mainly based on four and five occurrences and text-based analysis.

As part of the future research, it is proposed that the Mendeley database should be further expanded to include more relevant papers. At the same time, additional keywords could be examined (apart from Distance Education) and various options regarding the Vos Viewer analysis could also be implemented. A more focused and detailed thesaurus could be applied in order for the analysis to be more reliable. The database needs to be screened for repetition and relevant terms. Finally, the analysis could take place based on each consecutive decade and compare the findings.

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