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Journey Higher education developments in context to tools and technology spectrum from four-wall instructional strategies to E-learning Platforms

Dr.RenuVij [a]

[a] Associate Professor College of Business Studies VidyaJyoti Institute of Higher Education Chandigarh .Email id: renuvij@gmail.com

Abstract: In recent years, educational technology has advanced. Educational technology has been used in a variety of subjects with development in education tools. This paper unveils a bibliometric analysis and the historiography of the published research on education technology between 1994 and 2021. In the field of education, the representation of e-learning tools, technologies and systems also examined. Journals and affiliations, citations, keyword distribution, many cited publications, and the most significant authors and journals are among the different extracted metadata. This report examines the state of educational technology development and trends.

Keywords: Education technology, Education, Instructional strategies, E-learning, Higher Education

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1. Introduction

The pandemic disaster has however shaken higher education, and this apprehension is prospective to reverberate around the globe. Such an outbreak compelled and impacted the educational system over the world (Rieley,2020). Educational institutions are scrambling to adapt to this scary scenario. These challenges accentuate the need of scenario planning for academic institutions (Liquori,2020).Traditional academic skills and rote learning are valued less in the twenty-first century than talents like critical thinking and adaptability (Favale et al,2020). Institutional measures can indeed aid us in combating this pandemic (Liguori ; Eric,2020).

The adoption of a new culture, a novel instruction– erudition environment known as Electronic learning has been made possible by the digital transformation of education institutions at all levels. The transformation to blended teaching has occurred to web based learning in today's society, where the digital transformation is advancing as a result of the epidemic. During the previous two decades, enormous progress in the realm of artificial intelligence exploded in the Pedagogical area (Albirini,2006). In the pandemic-era each walk of life includes business, culture, administration and education all moved online (Sułkowski, 2020). ICT used to solve concerns about higher education access and quality. Digital literacy gaps in class among the participants and academics between instructors and students also harm e-learning since digital abilities do not match every day the digital skills needed in an online academic environment (knutsson,2012). An era marked by fast technology innovation and digitization, not least in educational settings (e.g., Selwyn 2012; McFarlane 2019). Learning environments based on information technology should boost teaching and learning.

Technological tools (Stambough et al, 2020) for e-learning instructional design, as well as their impact on effective teaching, have also been recognized (Seale, J.; Cooper, 2010).

ICTs are a conglomeration of technology tools that are accustomed to collect, disseminate facts to automate and communicate for exploration, learning and business. Increase in technological advancement ensures the way to transform education execution and administer process, as well as how students acquire, transfer, and utilise across the globe (Haung, 2014).

E –learning (Korucu & Alkan, 2011; Liu & huwang, 2010, Chokrabati, 2016). Electronic learning involves use of digital media for learning (TibanaHerrara,2018). As learning resource wide range of e-applications in the classroom, internet application make student teacher interaction effective, teaching interesting with clarity with particular prominence on web-based learning , TV , Video-tape, (Duderstad et al,2002;Varalakshmi,2019, Stambough et al,2020)

The innovation online learning forms is considered as high-tech or mechanical ensures potential users perceive to be novel (Fischer, 2013). Internet, a modern technology, is not limited anymore to the four walls classroom, now encompasses to virtual class fully technically supported for interactive teaching environment (Behera,2013). The Internet is one of the very pertinent method for sharing and collecting information among students and professors. It is being used for producing learning materials, for teaching and for regulating university courses (Arkorful & Abaidoo, 2015). The advancement of ICTs and digital media has a notable impact on education and education. Educational transformation now make teaching learning with integration technology devices and resources as well as didactic changes make E-Learning possible.

Rethinking teaching techniques to allow for the restructuring of instructional processes and online learning immersion possibilities (Stein, 2011; Wilson, 2012; smith, 2012).Specific requirements connected to exclusive environment and topics are being met through e-learning, which should be existing when indispensable and most handy, viable, operational and feasible (Stein, 2011; Wilson, 2012; smith, 2012). In instructional technology, online learning systems have become valuable (Yuwen,2018). Through the learner centric and teacher centric network paradigm, virtual Learning liberates interactions between students and mentors, or learners group, from time ,location constraints (Katz, 2000; Trentin , 1997). The quality of online learning should be broadly in line to or better than of traditional classrooms (Ball & Levy, 2008; Schmidt, 2002).

In Higher educational Institutions E-learning is in great demand (Benta,2014; Sife 2009;Madhumathi,2013;Abe,2020). E-Learning environment, includes vital facets identified learner, instructor, curriculum, module, know-how, technique design, and conservational dimension (Zahra.2014;Webster, 1997;Jiang,1998;Haq,2018). Learning is being accelerated by the use of digital technologies and content that would be interactive in some manner, such as digital platforms between the learner and their teacher or peer (Sangra, 2012). Computerized based Learning systems take online technologies and a wide array of learning materials to provide a tailored learner-centric approach for students to impart open, engaging, collaborative value of acquiring to fostering , enriches the mechanisms of learning (Schindler,2017).

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Rapid technological advancements are transforming the way education is planned and implemented, as well as how the students develop, communicate, and interact socially across the world (Huang, 2014).

However, traditional or teacher/curriculum-centered learning approaches still predominate in higher education (Esteve,2008) which provides limited room for other Practices of education (kostoulas,2020). Using electronic technology modes to teach traditional learning models to teach traditional curricula (Law,2000). In general, digitization ensures the assist, organize and disposition of knowledge to learners (llomaki,2018). With all that information accessible virtual, finding evidence pertaining to the erudition aims can still exist daunting for students that lack the ability to search and comprehend it (Rahimi,2014).

The design and implementation of E-content were unlikely to alter and respond to learners' expectations and preferences (Benhamdi et al. 2017) as certain students have access to the same learning materials (Halawa et al. 2015).Content delivery in structured data, governance of the learning experience, learners' network community, and content developers and specialists are indeed e-learning components (Papanis, 2005). Most of the distinct mechanisms widely accustomed with conventional teaching, such as novice presentations, debates, discussions and diverse modes of communicating information collecting knowledge, are also included in e-learning (Bencheva, 2010). Techniques, applications, procedures, and academic disciplines for learning (Hubalovskya, Hubalovskab & Musileka, 2019). Trends in education has altered scholastic tactics, and scholastic institutions are working to adapt approaches to incorporate e- instructional tools to attain tutorial objectives (Fasso, Wendy; Knight, Cecily; Knight, Bruce Allen,2014;Hubalovskya, Hubalovskab & Musileka, 2018).

World wide web supports innovation and sustains such systems running (Babu; Sridevi,2018). High-tech tools (Stambough et al,2020) identify design the subject matter, users/learners / participants and e-learning systems which all are the components of e-learning (Cohen, Nycz, 2006). These are taken in the form of online courses, learning effectiveness, evaluation results, and evaluation methods to make teaching learning pedagogy effective. E-learning includes specific elements that facilitate and nourish the learning-teaching model by integrating a wide range of options for exchanging information and uploading content information in innumerous ways and sizes as in electronic system web-based approach, no supplementary tools have been designed, and once the content is published, users can access it at any time (Raheem; Khan,2020). In this sense, the wide range of technological tools at an elevated level has enabled the development of a wide range of electronic education programmes. With its advent, there's been a trend toward a more student-centered approach to education (Gallie,2004).

Practical lessons are essential for quality education programs, and for particular fields of expertise, these hands-on experiences are critical in preparing students to tackle real-world difficulties in the future. For example, all Engineering programs subject their students to long hours of hands-on training, such as Practice sessions & internships (Cake, 2016). E-learning for teaching and learning has been incorporated rapidly. The pace of cognitive support for the implementation of e-learning courses in universities has influenced the whole development (Paechter & Maier, 2010). (Times New Roman 10)

1.1. **Education Technology**

In higher education techno skill for teaching , administration is implemented. Education technology, teacher know-how training, assistive expertise, classroom equipment, classroom technology, technological efficiency. Using educational technology to assist with daily routine social or learning activities.

Evolving application of digital expertise in didactic settings is evolving of Mentoring and coaching, allowing learning in both real ,virtual environments (ZhenAli,2016). Virtual and augmented reality, teacher technology training, assistive technology, classroom equipment, technology in teaching, classroom technology efficacy, techniques in special education with educational technology (Zilz,2019).

To enhance the learning process, educational technology (Ed Tech) is used (Ghavifekr,2015; S Ahmad, M Nisa,2020) incorporating the use of videos and game-based learning (Liu,2020; Greenhow,2009). To combat the growing demand for higher education, a myriad of educational initiatives academic interventions are undertaken (Idrissi et.al. ,2018,2020,2021) with integration of new technical breakthroughs that assist informative course of action are being implemented in existing classroom interactive management styles (Zaitri,2019,2020;Machwate,2020; Berrada,2021;Ahmad.et.al,2020). It can be imperative to connect proper technology into teaching and learning (Beng,2021).

Educational Technology gaining popularity in education (Dfe,2019). While administrations have been promoting the learning technology in educational institutions, though no conclusive proof of using digitalization improves basic competencies (Falloon, 2020; Borthwick, 2017).

The growing usage of digital technology in education widens the teaching and learning environment to allow learning to happen in physical as well as virtual areas (Li,2006).

Originators of virtual environments involve creating, executing a customized knowledge sharing condition, concentrating on the group's distinct needs and milieu. An instructional process is a series of tasks whereby instructors endeavor and structure their involvement to construct a model and transfer of knowledge (Ismail 2018). The challenge of e Learning Environment designers, practitioners and organizations, is to adopt factors of the e-learning efficiency system and succeed with the learners acceptability (Haq,2018). So focus on creating electronic teaching models that are free of potential pitfalls (Cloete, 2001).

Several factors to consider in order to meet the course's learning objectives (Cloete, 2001).Understanding of human technological relationships ensures to support meaningful electronic course learning, the components of the e-learning courses should be consistent and well structured.

Learner-centered techniques also indicate a balance amid group adaptation to tailored learning sustenance in such contexts. Learning provision, a crucial factor to be considered in technological learning policies of quality assurance (Sinclair et al. 2017).

The learning, adaptation and erecting cycle by expressing and pondering practice inspired the instructional method (Rajabalee et al.,2020).Simulated testing facilities evolved a valued possibility in

hands on, practical labs as a result of the potential afforded relevant data but also technological developments in academic arena. Furthermore, the likelihood of computer-generated research laboratory offers up latest avenues aimed at the long-term viability .The four stages of is instructional design paradigm that organizes in steps of Analysis, Design, Development, Implementation, and Evaluation to make learning effective(karki,2020).Emergence of online learning systems that provide learning opportunities, features of virtual learning platforms that pose as educational institutions while eschewing traditional educational institutions' normative and regulatory limitations MOOCs and suppliers of virtual education must go above and beyond(Zeide,2018).

Viable processes of teaching with markedly better consistency and performance (Yuwen,2018). Assess an augmented mixed learning approach for education, which increases the need to comprehend determinants student satisfaction and the effect on post-graduate learning outcomes of engaged learning. The perception of students could enhance if the instructor delivers knowledge milieus often in a conventional teaching space, however in a student centric system. (Alajab,2018).Education technology is interrelated with the e-learning system and student teacher learning. Technology uses underlying modifications, and can be integral to substantial productivity improvements (Yusuf, 2020;Hodge, 2020).Innovation is used to support both education and knowledge or even encompasses instructional media, such as computers and hands-on devices; broadens the courses, perspectives and learning materials; supports 24 hours a day, 7 days a week; builds skills of the 21st century; amplifies interaction in the classroom; and accelerates learning. Automation is indeed able to transform teaching by incorporating a connected teaching model (Ferri,2020).

This paper unveils a bibliometric analysis and the historiography of the published research on education technology between 1994 and 2021. In the field of education, the representation of e-learning tools, technologies and systems also examined.

2. **Materials and methods**

2.1. Data extraction and approach

In this study, Data analysis is the interdisciplinary science of the quantitative analysis by mathematical tools of all knowledge carriers (Merigo,2016).The bibliometric (Berger,2014) method can evaluate emerging trends in evolution or investigation using the keywords, title of the author (Chen, 2016). Bibliometrics have hitherto been extensively used to analyse co-authorship, co-citation analysis, and development of all fields (Merigo,2016).

Author collected bibliometric data from one of the most commonly used repositories of research. Scopus is an overview directory of peers-reviewed literature and an element of Elsevier's SciVerse as highlighted in the segment until and indeed focused on the same database as ScienceDirect (http://www.scopus.com/home.url) (Tober,2011). Bibliometric analysis a foremost contribution using one of the most widely used databases, Scopus. In terms of context, a bibliometric analysis reveals trends of publication, writings in journals, the inclusion in exploration studies, authors, institutions and spatial distributions. Its other focus is to visualize the prior learning and insights by envisioning the citation network using HistCite™. Latter two findings would support establishing collections of the top-quality impacts that might also abet in assessment by historiography interlinked research trends.

This helps to trace the Ed-tech evolution with e-learning concept, tool environment, technique education, mobile technology.

The analysis database was developed from the Clarivate Analytics core collection and quotation index which include the SSCI, the Emerging Sources City Index (ESCI), and the Science Citation Index Expanded (SCI-Expanded), supported by the Science web (WoS). SCI and SSCI are the favourite databases for systematic review and most meta - analysis software tools are supported. The explored terminology e learning environment, e-learning, education technology, e-Learning effectiveness, blended learning, artificial intelligence, higher education were used in association with the preferred syntax languages for the retrieval of the relevant papers. The inclusion criteria Literature based solely on English-language articles and opinion pieces. . Besides that, only in the ground literature of education, computer science, engineering, medical, IT, human behavior consisted to optimize the relevance in research. Retrieved studies have been monitored and reviewed for redundancies and the final. The content was already cleaned for validity according to the aim of study.

2.2 Data Analysis

HistCite™ (Waltman 2009, 2010) a software used for the bibliometric investigation of literature, the analysis and visualisation of direct quotation links between science papers e was used. Its entries (with mentioned references) are bibliographic files obtained from the WoS (Garfeild et al,2006). It unfolds key articles and reveals how articles, authors and countries link to each other (Zhou,2019).

Pritchard coined the terminology "bibliometric" in 1969 and replaced the former term "statistical bibliography," which outlined the use of math and statistical methods in books (Pritchard,1969). HistCiteTM is a free, bibliometric analysis software tool which derives from the developers' original purpose, to study quote-based history and citation-based historiography (Garfeild,2003). In the identification of quotes from publications and the most major ones by calculating citations this software has sturdy benefits (Garfield, 2003). Numerous bibliometric tools and indicators are being developed to detect patterns for publications, assess the quotation network, and illustrate trends topics in certain disciplines (Chen, 2006;Silva,2008)

HistCiteTM also includes key index information of TLCS, TGCS, Global, local citation score. With the exception of outlining the links among authors, publications, quotations and journals, historiographical imagery is also the origin of the relation between authors over a timeframe. It denotes chronological association among historical record and paper influence. The analysis results are presented in tables, ordered by publication years, authors, languages, countries, or citation frequency. Further for data analysis Bib-excel applied to measure the publication times of citations and most cited papers. With help of SPSS v.21 software, Co-citation matrix normalized and generated clusters of most cited publications to analyze, Articles with a minimum of Five citations were selected, thereby resulting in a total of 101 publications. This cluster has the advantage of identifying the relevant clusters and assisting in exploring the evolution of research domains and future directions of research through gap identification in education e-learning tools and education technology.

3. Results and Analysis

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Dataset

Table 1 shows the main information found by Scopus , from period of 1994:2021 including the number of entries, the search time zone, the related key words, the author-specific features, and the type of material found on the keywords of educational technology and e-learning.

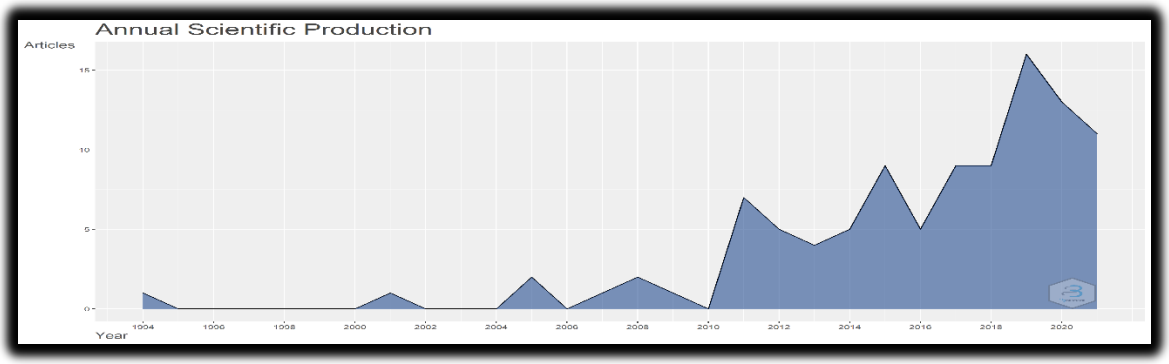
Table:1

Description	**Results**
MAIN INFORMATION ABOUT DATA	
Timespan	1994:2021
Sources (Journals, Books, etc)	79
Documents	101
Average years from publication	4.95
Average citations per documents	11.94
Average citations per year per doc	1.962
References	1
DOCUMENT TYPES	
article	101
DOCUMENT CONTENTS	
Keywords Plus (ID)	392
Author's Keywords (DE)	360
AUTHORS	
Authors	302
Author Appearances	312
Authors of single-authored documents	22
Authors of multi-authored documents	280
AUTHORS COLLABORATION	
Single-authored documents	23
Documents per Author	0.334
Authors per Document	2.99
Co-Authors per Documents	3.09
Collaboration Index	3.59

3.1 Annual Science Production

The production shows the contents of articles, books, and various researches conducted in the years from 1994 to 2021. It shows the trend of the occurrence of the keywords and we can observe that educational technology, e-learning and information systems have appeared mostly in 2019.

Table:2



3.2. Highly cited Papers

Various information related to the corresponding author's country, source dynamics and the production of annual science. Here, we briefly describe the content and the publishers with the highest citation given in Table shown below. Where the top 101 creators with the highest citation are listed. According to the results, Holden (2011) have highest rate of citation , In study, the TAM model shows how users accept the technology, use of educational technology by teachers extended to include usability and self-effectiveness measures. The study surveyed K-12 teachers in two rural school districts in Virginia. Author analyzed reliability statistics and overall linear modelling techniques for the responses. The results showed that integrating perceived usability into the tam explains more variance and is more influential than its lack of tam elements. It has been observed that teachers technology self-efficiency more beneficial than computer.

The second study which is highest cited is A study of educational simulations part 1 - engagement and learning (Adam,AK,2008) The interactive computer simulations with complex displays and sophisticated graphics are relatively new classroom complements, and research is limited in this field. describe our designing process. The design features used for creating an intuitive simulation for students.

3.3.Keyword analysis

The selection and implementation of keywords demonstrated the main trends and the nature of the study in a specific field. The trend and domination of the key words reveal the framework and basis of the studies. The top 10 keywords applied in the field of Education Technology tools and other variables.

The top-cited keywords in these aspects were education technology, e-learning, education, mobile learning, higher education, online learning ,distance education, distance learning, educational technology. These keywords has been researched dominantly implementation of technology in education ,to explore the tools used , trends in field of education in higher education to make teaching learning interesting, effective and collaborative.

Table -3

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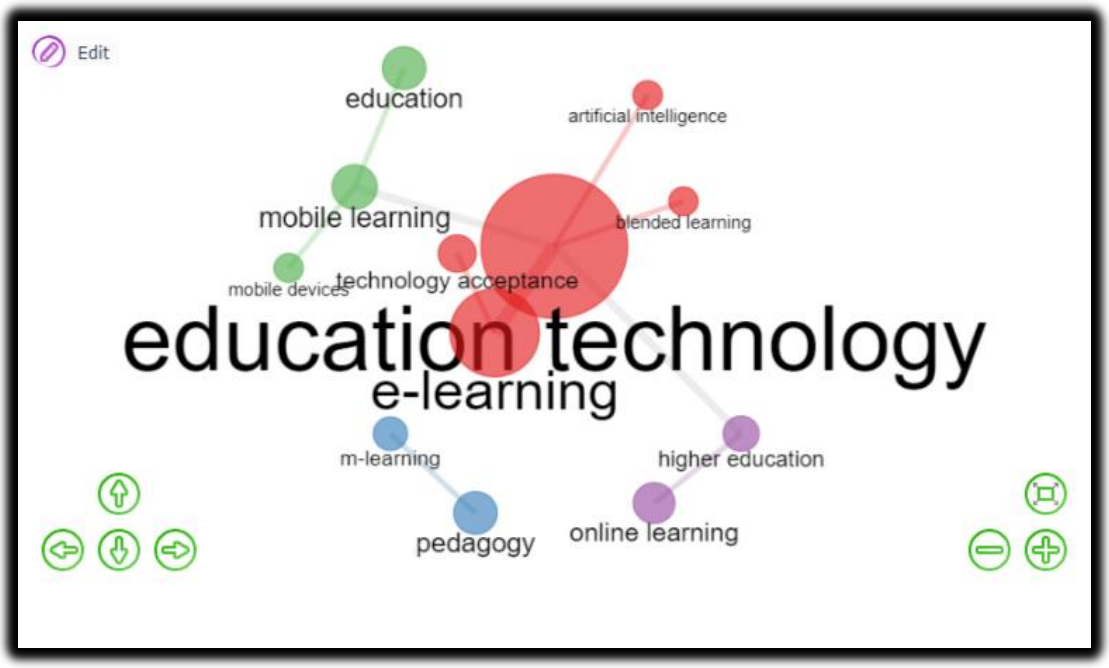
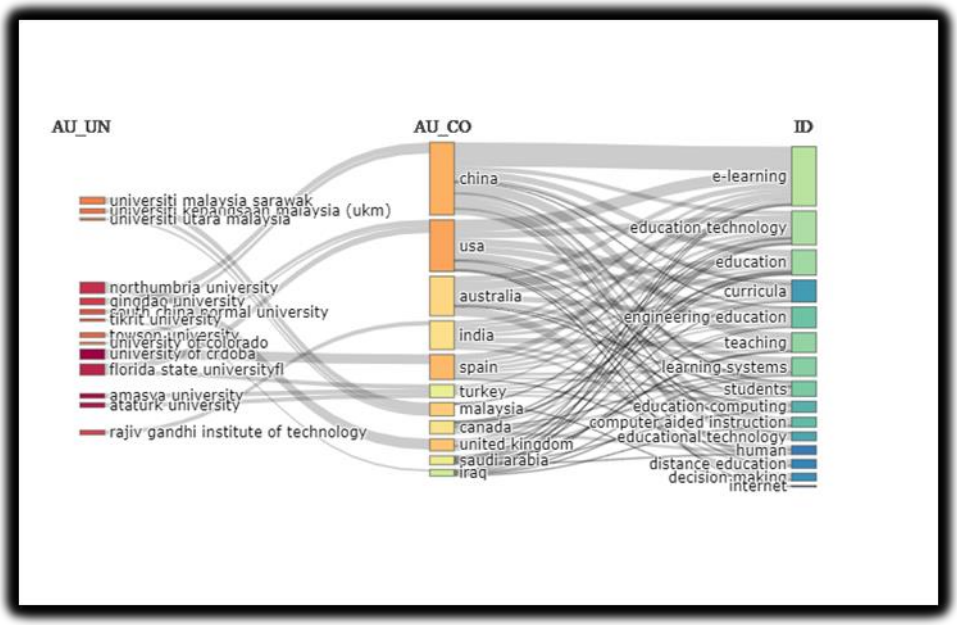


Thematic map Analyses indicates that in cluster label 1, named educational technology 28 occurrence of educational technology, 13 e-learning, 3 blended eLearning and rest for assessment, gamification and technology acceptance level. Whereas in Cluster 2 named E-learning indicates only 2 occurrence of e-learning , In Cluster 3 named interactive learning environment virtual reality occurrence observed in cluster 4, 5 and 6 very few occurrence in cluster of higher education , affective computing and ICT no other words occurrence reflected .

Table-4



ree-field Plot of

A three-field Plot (Sankey diagram) of Country, Keyword, and Year of publication

of the cited references was created to depict the proportion of research topics for each

country and the recency of the papers that they cited

A three-field study, Country, Keyword/theme for the references mentioned has been developed to describe the proportion of research topics in each country and the actualization of the papers they quoted. The dominant topic of research is e-learning.

It revealed that journals and authors of china worked more on e-learning , where describes principles of the interactive techniques in the techcode, with key words e-learning; education technology; proposes a framework for primary e-learning environment to present the mathematical operations in the central processing unit of computer system. Most of the papers discussed published by china, USA, Spain, Malaysia. Whereas, universities of USA, Australia, India, Malaysia emphasis study on education technology.

Thematic Map

3.4 Thematic Map

Thematic Analysis analyzes enable us to identify and scrutinise the progression of the thematic fields of a science discipline. In the next step, further consideration would be required in future research to identify scientific gaps and predict future trends for the development of the science sector. Two common ways to build strategic and subject maps of a domain are citation and lexical analyses. These two methods be used simultaneously in comparing citations and lexical patterns, and we can create a new perspective on scientific research by compensating the deficiencies of both methods.

Thematic or thematic maps Table -5 of the science map deriving from key words clusters are used for lexical analyses. These clusters are regarded as subjects. The two meanings (density and the centre) of each cluster are used to categorize each research theme into 4 sections by two parameters (density and centre).The network chart called the tetamic network is a theme with a keyword and internal communication. One of the most relevant and significant keywords associated with the same subject is named for each tributary network. It is a resilient visual design and we can analyze the themes by which quadrant they are located.

Top right Quadrant: Engine/Motor Themes - Good Themes – Pedagogy, technology acceptance, learning analytics by Finding and Important for the Research Structure.

The top left quadrant: Emerging and emerging themes and poorly developed, marginal.

Left quadrant: Very special and special themes, important for the subject of research, but not developed.

The bottom right quadrant: The Basic main themes - The themes are well developed with in-house relationships, but with trivial external relations (just a margin for the topic). Online learning. Distance education, e-learning, Artificial intelligence. As we find from the figure that e-learning, online learning, blended learning are important for the structure of all research, and they were used in all periods of time. The word “e-learning” is an important and emerging theme associated with other keywords. The word “technology, mobile e-learning, education” is a very popular word used in time stats along with other key-words. The words “interactive learning environment” and “virtual reality” are the words that

can be focused more on the current time and are one of the important issues for research in the present and future.

Table-5

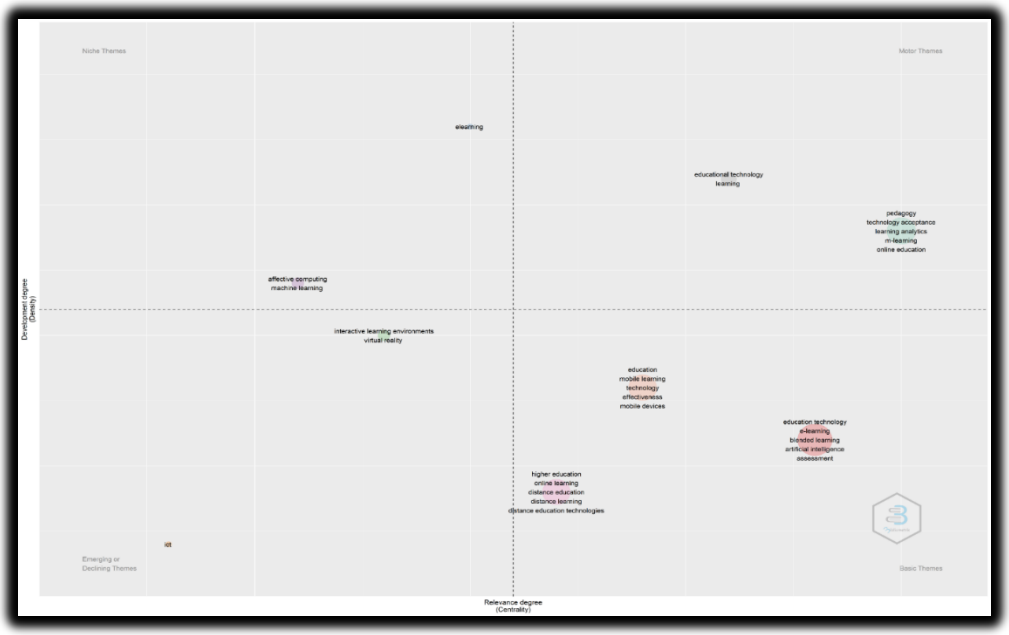
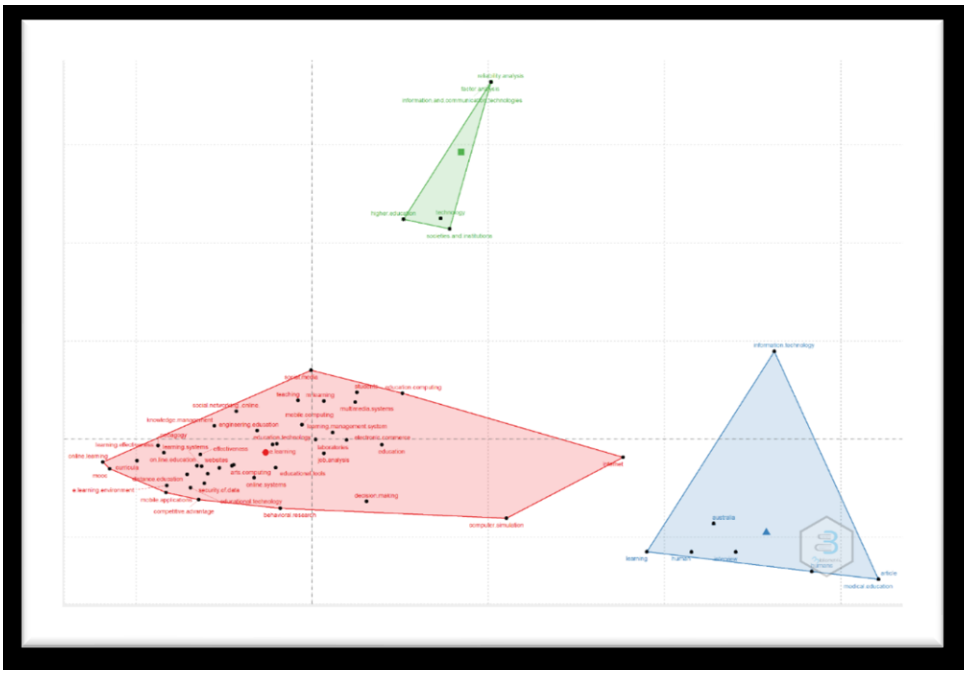


Table-6



Factorial Analysis

3.5.Factorial Analysis

Co-Word Analysis: The purpose of the Co-Word Analysis is to map the framework concept structure in a bibliographical collection using the words co-occurrences. Dimensionality reducing techniques such

as Multidimensional Scaling (MSS), CA, or Multiple Correspondence Analysis can be used in the analysis (MCA). We present an example with the conceptual structure which carries out the CA function to design a field conceptual structure to identify document clusters which express common concepts. On a two-dimensional map results are shown.

4. Conclusion

The review draw the conclusion that in contrast to the specialists, the majority of the articles are published by the academics. The highest number of research conducted on e-tools in countries China , US which indicates that emerging technology impact on education day by day . Also, in the continuous span of time review showed that researchers are aware about the technology intervention in teaching learning, how gradually tools improved the education system from classroom to feedback review of learner.

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