Review of Factors Affecting Efficiency of Online Education

B. Fathima Josepin Prasanna[1*], Dr. T. Balaji[2] & Dr. M. Sumathi[3]

[1]*Department of Computer Science, The American College, Madurai, Tamil Nadu, India.*

[2]*Department of Computer Science, Government Arts College, Melur, Tamil Nadu, India.*

[3]*PG Research Department of Computer Science, Sri Meenakshi Government Arts College for Women,*

Madurai, Tamil Nadu, India.

Corresponding Author Email: *bfathima0202@gmail.com**

Abstract

The emergent of the contiguous disease COVID-19 (Corona Virus Disease–2019), emerged in Wuhan, China forced the countries to announce lockdown in order to control the spread of the disease. The nationwide or localised closure of the educational organisations influences the lives of millions of learners. As a response, the institutions stimulated digital learning to facilitate continuity of education for the learners. Though the virtual classroom is the only alternate, both the teachers and students face numerous problems related to network, learning atmosphere and mainly in health conditions. This paper analyses research papers and identified the factors affecting efficacy of online education. The factors are classified under ten categories. Identifying factors having high impact in the outcome of online education can be analysed for enhancement.

Keywords: Digital Learning; Covid-19; Virtual Classroom; Factors related to online education; Teachers; Learners; Challenges.

1. Introduction

The role of education is of prominent as it gives better citizens to society. Education methods in India have undergone different versions, from Gurukulam to modern classroom system. Recently, the practice of new mode of learning through internet has been started. It does not require the physical presence of teachers and learners in the same place. Developed countries already adapted to the new method of learning process. The Corona Virus Disease (COVID-19), which spread vigorously all over world compelled the governments to take measures to control the pandemic situation. As a first step, all educational organisations were closed temporarily to end the spread of the disease. However, having a break in learning process would affect the students' knowledge level; the institutions were in a position to pursuit for optimum alternative. The institutions started offering virtual teaching learning process for the benefit of the students. With the sudden change, the teachers and learners faced lot of difficulties and challenges. To avoid the problems and to improve the efficiency of online learning, researchers focused to analyse the factors that have impact on the results of online learning.

2. Online Education
2.1. Online Education before COVID-19
The ubiquity of computer in every field changed almost all aspects of human life. With the existence of E-commerce, E-mail and E-government, E-education is also added in the succession [1]. The model of distance learning, implemented using postal system, radio and television has evolved into online

7338

Eur. Chem. Bull. 2023,12(Special Issue 7), 7338-7345

education in developed countries [2]. Universities implemented the mode of virtual learning for the degree program [3]. It provides education for the learners who are not interested/able to attend face-to-face classes. Innovative methods with upgraded technology can improve the online experience of both learners and instructors [4]. Before the existence of COVID- 19, the status and learning methods in online education is different in the various regions of the world [5]. In India, online education was expected to grow with the government's support. The main factors preventing the expansion of online education in Middle Eastern nations were the absence of educational repositories in Arabic. When compared to conventional face-to-face classroom instruction, they also identified the drawbacks of virtual learning.

2.2. Rise of Online Education during COVID - 19

As world health organisation (WHO) announced the corona virus (COVID-19) as a global pandemic on 11th march, 2020, governments of all countries were in apposition to control the spread of the contiguous disease. All educational institutions were forced to shut down their campuses [6]. Without knowing the end of pandemic, the institutions had to change the educational system in order to support the students to continue their learning process. They started to use the already existing technical platforms to continue the teaching learning process in virtual mode [7]. Crawford et al.[8] analysed the measures taken by Higher Educational Institutions in 20 countries to continue the teaching process for their student during the pandemic period. They reported that some countries have started to redesign the syllabus in order to overcome the break of study. While some other countries didn't take any actions for that. Litao Sun et al., reported that covid-19 changes the education to online in china and suggested that content should be modified according to online learning and teachers should adopt new innovative methods to engage the students and make them as active participants [9]. Wei Bao [10] did a case study in Peking University, China and listed the principles as effective delivery, relevance, sufficient support participation of students and plan preparation to improve the effectiveness of virtual learning. Mansureh Kebritchi et al. [11] classified the factors affecting online learning into three main categories, problems related to trainer, learner and content. But the major problems were faced by students as they didn't have enough time and practice to adapt to the new method [12]. Higher education institutions' use of online learning would not have the desired impact in underdeveloped nations like Pakistan [13]. Due to network availability and financial concerns, access to the Internet is restricted. The countries like Zambia, need to use virtual learning due to COVID-19, though they are not familiar with latest technologies and system [14]. Paudel P. analysed benefits and challenges of online education from learners and teachers' perception in Nepal [15]. It was revealed that students considered online education as beneficial due to global connectivity and making them self-disciplined. ICT oriented curriculum and courses will increase the effectiveness of virtual learning. Blended learning of both virtual and face-to-face is needed in the context of Nepal, due to the reliability of internet connection and the lack of technical knowledge. Switching to the virtual mode in education is not a beginning. Everyone should understand that digital transformation of teaching learning process in higher education is inevitable in future [16]. Government must initiate to help for the change in educational system by ensuring quality in communication tools and infrastructure.

2.3. Efficiency of Online Education

Though virtual mode of learning was considered as an alternate for traditional classroom learning, it has the potential to be expanded by providing educational opportunities for increased student population and introducing innovative pedagogical methods [17]. Contrast to the traditional class room teaching-learning, online education has to focus on various significant components as virtual classroom, individual activities required by both instructor and students, assessment for evaluation and collaborative group work. Though online education is considered to be lacking in interaction, online

7339

Eur. Chem. Bull. 2023,12(Special Issue 7), 7338-7345

teaching platforms have the facility to encourage teacher-student interaction as well as collaboration among students [18]. The effectiveness of online education can be analysed from the perspective of the stakeholders, teachers and students. Analysing their perception, satisfaction, problems they faced, level of understating and evaluation methods will progress the efficacy of online education.

2.4. Students' Perception

Online classes will be helpful to bridge the gap for the students during the pandemic period. As students are the key stakeholders, they should realise the importance of learning and should have all effort to gain knowledge [19]. Tinggui Chen made a study to collect learners' experience data in online education in China during Pandemic. Online user reviews were analysed using emotion data analysis to classify the efficacy of platform. Data from questionnaire were also examined to form an equation relating the different factors. Despite of personal factors, platform availability had the highest influence on learners' satisfaction. And system quality, interaction quality and service quality were also to be considered in user satisfaction in online education [20]. A study was conducted to analyse the perception of undergraduate students in a university in India towards online learning in pandemic period. It was found that students felt online classroom could be a feasible alternate for situation like pandemic [21]. A survey was conducted among agricultural students to understand their perception towards online learning. It identified the students' willingness towards virtual learning during pandemic and at the same time they reported that students prefer recorded lectures, as it makes convenient to learn in the available time [22]. As agriculture is based on practical sessions, a hybrid mode will be suitable. As the major source for online learning being a mobile phone, the platform, which is to be designed for virtual learning, should be well matched with mobile phones. In a survey conducted with agricultural students for analysing online classes, it was found that they preferred the duration of online classes to be 45 minutes with a minimum of 15 minutes break between subsequent classes. Compared to face-to-face classes, virtual learning has the drawback of addressing the queries. It is not convenient for both the students as well as faculties for doubt clarification. Regarding this, some students prefer online chat, others choose to contact the faculties through mail or WhatsApp.

2.5. Teachers' role in online education

In order to cope up with the goal of education, quality of technology as well as curriculum should get importance. Most importantly, teacher self-efficacy should be improved to help the students to reach their goals [23]. In traditional classroom, success of education system is strongly related with self-efficacy of teachers. Teaching in virtual classroom is different from traditional face-to-face classroom. The abrupt switch from in-person instruction to digital learning also requires a teaching staff with a variety of levels of preparation to employ various pedagogies and specialised talents. The teacher has to guide students from different groups. They should take effort to guide the students to understand the key concepts of the subjects than teaching the lessons only. They need to motivate the students to be engaged in learning process. The role of teacher is to assist discussion and giving feedback to students in addition to teaching. Students have to be motivated by the instructor to have active participation. The competency of the teachers in digitization can be explored in various forms as ICT literacy, computer knowledge and digital competence. Digital competency requires the ability to access and use the digital resources [24].

Pettersson states that all the factors teachers' individual decision, learning technologies and the organisational context have to be integrated for the successful implementation of online learning [25]. Professors use various online educational platform to teach their students. Using these platforms and tools, they can teach via video conferencing and post the notes and course material in the same

7340

Eur. Chem. Bull. 2023,12(Special Issue 7), 7338-7345

platform like Google Class Room. Students can also submit their assignments and attend tests. Science courses need to provide laboratory sessions for its students to practice what they learn. In this case, virtual laboratory system (simulation system) helps the teachers to experience the same in online education.

2.6. Challenges to Online Education

Although technology has made life easier and more effective in many ways, there are still significant difficulties associated with offering and receiving education electronically in developing and underdeveloped nations [26]. The availability of cutting-edge communication technologies varies considerably around the world. To make the learning process engaging and effective, the teacher and the students must both be proficient with a range of applications, assessment tools, and aids related to digital education. The main issue in online education that needs to be resolved is technical barriers. Access to internet, availability of devices, signal problems, installation issues, issues in downloading the material, and audio/video problems may cause disturbance in virtual classroom [27]. Paudel P. analysed benefits and challenges of online education from learners' and teachers' perception in Nepal. It was revealed that students considered online education as beneficial due to global connectivity and making them self-disciplined. ICT oriented curriculum and courses will increase the effectiveness of virtual learning. Blended learning of both virtual and face-to-face is needed in the context of Nepal, due to the reliability of internet connection and the lack of technical knowledge [15]. Challenges pertaining to online education are apparent to students. The problems of online education from student's point of view are communication gap between faculty and students, technical barriers, economic conditions, pandemic related to anxiety and depression, time management and health problems [28]. Teachers had to possess computer knowledge to handle online classes and undergo training to use the new technologies, platforms and learning tools. They should be practiced to solve the problem that arise during the online classes [29]. These challenges can be overcome with the help of government, parents and educational institutions.

3. Discussion

3.1. Factors related to Online Education

The collected papers focused on various features of online learning. Among them, prominent are challenges, opportunities, tools and techniques, problems, efficiency and student satisfaction. The different aspects of online learning for research from the research papers are mentioned in the figure 1.
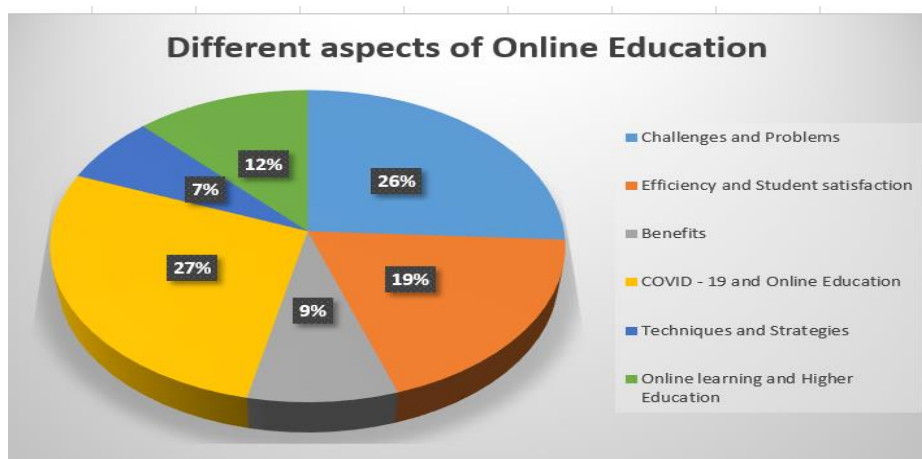

Figure 1. Aspects of Online Education

7341

Eur. Chem. Bull. 2023,12(Special Issue 7), 7338-7345

Out of 46 selected papers, 16 papers discussed the impact of COVID – 19 on online education. The contagious disease forced the education system to a new mode. Educational institutions in all countries shifted the process of teaching learning to online mode. Among the features, challenges confronted during online learning is the prominent one. Efficiency of virtual classroom in the perspective of learners' satisfaction is also to be considered. The challenges have to be addressed to improve the effectiveness. An analysis framework for analysing not only students' standpoint, other stakeholder' view could be useful to improve the value of online learning.

Education is the act of both imparting knowledge and receiving it. As it is a two-way communication, the channel used for communication is vital. When compared to traditional classroom method, online teaching has challenges. Learners' awareness and knowledge they gained through online learning are the key factors when considering the fruitfulness of virtual teaching. Students' satisfaction can be identified using questionnaire and web crawler to gather information from the comment an emotion from internet and education platform. While using the questionnaire to retrieve the detail from learners, it is very much important that questions have to be framed in way to extract the needed information from the students. Questions that were used to collect feedback from the learners that were used from research papers are listed in the table 1.

Table 1. Questions used by researchers

S.No.	Questions Category	Details of the Questions
1.	Basic Information	Previous experience in online learning, age, gender, place of residence.
2.	Technical Requirements	Preferred device, mode of communication about class updates, mode of internet.
3.	Nature of online class	Live online class or recorded video, study material.
4.	Duration of online classes	Preferred duration for each class, frequency of classes, break time between classes.
5.	Clarifying doubts	Mode for clarification (During the class, online chat, E-mail, Discussion forum).
6.	Digital approaches in online teaching	PowerPoint presentation, Whiteboard and pen, animation. Digital board and pen.
7.	Interaction	Chat during the lecture, both the professor and students keep video on.
8.	Health issues	Excessive screen time makes stress, problems with eye, headache.
9.	Challenges	Internet connection, experience in online platform, distraction, lack of monitoring, availability of device.
10.	Benefits	Flexibility, Convenient time, accessibility to learn from anywhere in the world.

The researchers frame the questionnaires with the attention of these listed conceptions. Questions were classified according to learner' experience in attending online classes, challenges and problems that have to solved and advantages of online learning with the intention to make it better. These questions help to get the feedback from learners about their understanding, difficulties and preferences to improve the virtual learning.

7342

Eur. Chem. Bull. 2023,12(Special Issue 7), 7338-7345

3.2. Techniques used to analyze online education

Generally, the effectiveness and problems of online education is determined with the help of questionnaires prepared to be answered by learners as well as teachers. Researchers used statistical methods and data analytical techniques to analyse the usefulness of virtual learning over traditional classroom learning. Paudel, P. conducted a survey and identified the participant's qualities, preferences and challenges in online education.

Designed the questionnaire with the questions classified under general issues, content delivery, interaction, health issues and assessment. He then related all these factors with social issues with correlation and covariance. He constructed a model and evaluated it using partial least squares structural equation modelling (PLS-SEM). He estimated the latent variables composite reliability and average variance extracted (AVE). Discriminant validity was measured to make sure that the constructs are independent of each other. The researcher performed chi square test and normal fit index (NFI) and concluded that 42.7 % of the variation in social issue was related to the considered factors general issues, interaction, content delivery, assessment and health issues.

Tinggui Chen et al., collected the information using a questionnaire as well as web crawler to gather the online comments in order to have a macro analysis. For quantitative investigation of the relationships between the components affecting online learning, a structural equation model was created. They concluded that platform availability had the greatest impact on learner satisfaction while user personal aspects had no direct impact. Furthermore, in order to determine user experience with the online education system, a BP Neural Network Model was applied. Paudel, P used the chi square test and normal fit index (NFI) to arrive at the conclusion that the factors general issues, interaction, content delivery, assessment, and health issues were connected to variation in social issues.

4. Conclusion

Compared to traditional classroom teaching, the online mode has less interactive methods. Input teaching is the core system in online learning. This has to be changed by modifying the online platform to be more interactive with stimulating interactive methods. Games and case studies related the subject make the students to get more involved in classes. The teachers should find effective ways to have interaction with the students. Practice of online education, emerged as a consequence of pandemic will be helpful to understand the future aspect of education system.

5. References

1. Shailendra C. Jain Palvia. E-evolution or E-revolution: E-mail, E-commerce, E-government, E-education. Journal of Information Technology Case and Application Research. 2013; Editorial Preface Article, 15(4), 4–12. https://doi.org/10.1080/15228053.2013.10845725
2. Anderson T, & Dron J. (2011). Three Generations of Distance Education Pedagogy. International Review of Research in Open and Distributed Learning, 12(3), 80–97. https://doi.org/10.19173/irrodl.v12i3.890
3. Wallace RM. Online learning in higher education: A review of research on interactions among teachers and students. Education, Communication & Information. 2003 Jul 1;3(2):241-80. https://doi.org/10.1080/14636310303143
4. Bell, Bradford S, and Jessica E. Federman. E-Learning in Postsecondary Education. *The Future of Children*. 2013: 23(1): 165–185. *JSTOR*, http://www.jstor.org/stable/23409493.

7343

Eur. Chem. Bull. 2023,12(Special Issue 7), 7338-7345

5.   Palvia S, Aeron P, Gupta P, Mahapatra D, Parida R, Rosner R, Sindhi S. Online education: Worldwide status, challenges, trends, and implications. Journal of Global Information Technology Management. 2018;21(4):233-41. https://doi.org/10.1080/1097198X.2018.1542262

6.   Toquero CM. Challenges and opportunities for higher education amid the COVID-19 pandemic: The Philippine context. Pedagogical Research. 2020;5(4).

7.   Kaur G. Digital Life: Boon or bane in teaching sector on COVID-19. CLIO an Annual Interdisciplinary Journal of History. 2020;6(6):416-27.

8.   Crawford J, Butler-Henderson K, Rudolph J, Malkawi B, Glowatz M, Burton R, Magni P, Lam S. COVID-19: 20 countries' higher education intra-period digital pedagogy responses. Journal of Applied Learning & Teaching. 2020;3(1):1-20. https://doi.org/10.37074/jalt.2020.3.1.7.

9.   Sun L, Tang Y, Zuo W. Coronavirus pushes education online. Nature materials. 2020 Jun;19(6):687. https://doi.org/10.1038/s41563-020-0678-8

10.   Bao W. COVID-19 and online teaching in higher education: A case study of Peking University. Human behavior and emerging technologies. 2020 Apr;2(2):113-5. https://doi.org/10.1002/hbe2.191

11.   Kebritchi M, Lipschuetz A, Santiague L. Issues and challenges for teaching successful online courses in higher education: A literature review. Journal of Educational Technology Systems. 2017 Sep;46(1):4-29. https://doi.org/10.1177/0047239516661713

12.   Bettinger E, Loeb S. Promises and pitfalls of online education. Evidence Speaks Reports. 2017 Jun 9;2(15):1-4.

13.   Adnan M, Anwar K. Online Learning amid the COVID-19 Pandemic: Students' Perspectives. Online Submission. 2020;2(1):45-51.

14.   Mulenga EM, Marbán JM. Is COVID-19 the gateway for digital learning in mathematics education?. Contemporary Educational Technology. 2020 Apr 18;12(2):ep269. https://doi.org/10.30935/cedtech/7949

15.   Paudel P. Online education: Benefits, challenges and strategies during and after COVID-19 in higher education. International Journal on Studies in Education. 2021 Sep 27;3(2):70-85.

16.   Mishra L, Gupta T, Shree A. Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. International Journal of Educational Research Open. 2020 Jan 1;1:100012. https://doi.org/10.1016/j.ijedro.2020.100012

17.   Platt CA, Amber NW, Yu N. Virtually the same?: Student perceptions of the equivalence of online classes to face-to-face classes. Journal of Online Learning and Teaching. 2014 Sep 1;10(3):489.

18.   Alqurashi E. Technology tools for teaching and learning in real time. In Educational technology and resources for synchronous learning in higher education 2019 (pp. 255-278). IGI global.

19.   Alam A. Challenges and possibilities of online education during Covid-19. Preprints.org 2020, 2020060013. https://doi.org/10.20944/preprints202006.0013.v1.

20.   Chen T, Peng L, Yin X, Rong J, Yang J, Cong G. Analysis of user satisfaction with online education platforms in China during the COVID-19 pandemic. In Healthcare 2020 Jul 7 (Vol. 8, No. 3, p. 200). MDPI. https://doi.org/10.3390/healthcare8030200.

21.   Chakraborty P, Mittal P, Gupta MS, Yadav S, Arora A. Opinion of students on online education during the COVID-19 pandemic. Human Behavior and Emerging Technologies. 2021 Jul;3(3):357-65. https://doi.org/10.1002/hbe2.240

22.   Muthuprasad T, Aiswarya S, Aditya KS, Jha GK. Students' perception and preference for online education in India during COVID-19 pandemic. Social sciences & humanities open. 2021 Jan 1;3(1):100101. https://doi.org/10.1016/j.ssaho.2020.100101

23.   Corry M, Stella J. Teacher self-efficacy in online education: A review of the literature. Research in Learning Technology. 2018; 26. https://doi.org/10.25304/rlt.v26.2047

24.   Calvani A, Fini A, Ranieri M, Picci P. Are young generations in secondary school digitally competent? A study on Italian teenagers. Computers & Education. 2012 Feb 1;58(2):797-807. https://doi.org/10.1016/j.compedu.2011.10.004

7344

Eur. Chem. Bull. 2023,12(Special Issue 7), 7338-7345

25. Pettersson F. On the issues of digital competence in educational contexts–a review of literature. Education and information technologies. 2018 May;23(3):1005-21.

26. Rajab MH, Gazal AM, Alkattan K. Challenges to online medical education during the COVID-19 pandemic. Cureus. 2020 Jul 2;12(7). e8966. doi:10.7759/cureus.8966

27. Dhawan S. Online learning: A panacea in the time of COVID-19 crisis. Journal of educational technology systems. 2020 Sep;49(1):5-22.

28. Suri CS. Challenges to online education: A review. Journal of Contemporary Issues in Business and Government Vol. 2021;27(1).

29. García-Morales VJ, Garrido-Moreno A, Martín-Rojas R. The transformation of higher education after the COVID disruption: Emerging challenges in an online learning scenario. Frontiers in psychology. 2021 Feb 11;12:616059. https://doi.org/10.3389/fpsyg.2021.616059

7345

Eur. Chem. Bull. 2023,12(Special Issue 7), 7338-7345