Hybrid Online Virtual Classroom during the COVID-19 Pandemic

The pandemic has had a profound effect on education at all levels, especially in the early stages of the pandemic. In the early stages of the pandemic, schools worldwide were forced to take various measures, including social distancing measures, in order to reduce the spread of the virus and to ensure student health and safety. The use of the in-person traditional classroom approach always outperforms the online virtual classroom and distance-learning instruction when it comes to attracting and keeping student interest. However, in the spring of 2020, Chinese higher education institutions were abruptly forced to move from in-person classrooms to online virtual classrooms because of the COVID-19 pandemic, despite the fact that the conventional classroom is preferred by both teachers and students for efficient communication and learning outcomes.

1. Introduction

Over two years has passed since the novel coronavirus-infected pneumonia was first identified in Wuhan City, China, in 2019 [1]. According to the World Health Organization, as of 30 March 2022, over 6 million people across the globe have died from the COVID-19 pandemic, and the number of confirmed cases is still on the rise. The world is now feeling the impact of the pandemic with a new surge of infections of the SARS-CoV-2 Omicron variant in many countries. The eradication of SARS-CoV-2 is not a simple prospect, as the world is a global village, and no individual country can move forward without working with other countries. Pandemic eradication takes the 'weakest-link' perspective, in which the active participants are the individual countries investing in epidemic eradication. From this point of view, a chain is as strong as its weakest link, and the overall effort concerning pandemic eradication is equal to the lowest amount of effort across different countries [2].

The pandemic has had a profound effect on education at all levels, especially in the early stages of the pandemic. In the early stages of the pandemic, schools worldwide were forced to take various measures, including social distancing measures, in order to reduce the spread of the virus and to ensure student health and safety. The use of the in-person traditional classroom approach always outperforms the online virtual classroom and distance-learning instruction when it comes to attracting and keeping student interest [3]. However, in the spring of 2020, Chinese higher education institutions were abruptly forced to move from in-person classrooms to online virtual classrooms because of the COVID-19 pandemic, despite the fact that the conventional classroom is preferred by both teachers and students for efficient communication and learning outcomes. Thus, a significant shift toward online learning was prompted by the COVID-19 pandemic, and the virtual classroom automatically became the best option to continue teaching and learning. Hence, the first research question is how a change in the learning environment affects educational activities, especially with the students' new virtual learning experiences.

2. Hybrid Online Virtual Classroom during the COVID-19 Pandemic

The virtual classroom has received much attention in academia. Researchers have conducted a great many studies focused on the student experience and the learning effects associated with synchronous virtual classrooms. However, various mixed conclusions have been reached. Some studies have found that the virtual classroom environment leads to desirable learning effects. For example, Hiltz [4] reviewed and compared various features of both the traditional classroom and virtual classroom. The findings revealed that the virtual classroom can stimulate and enhance collaborative student learning. Moreover, both teachers and students reported high levels of satisfaction as a result of productive shared contributions. Cao et al. [5] stated that the virtual classroom effectively raises student satisfaction. Lietzau and Mann [6]

found that students can learn more and achieve higher marks as long as they engage in synchronous virtual classrooms. Parker and Martin [7] compared the perceptions of undergraduate students using a virtual classroom in a fully online and a blended education course and found that online students rated their perceptions of the characteristics of the virtual classroom higher than students on the blended course.

A number of studies have shown that the virtual classroom is effective in terms of enhancing student learning and achievement [8][9][10][11]. Fidalgo et al. [12] found that most students were interested in taking distance-education courses, though they were somewhat apprehensive. Even during the COVID-19 pandemic, online learning tools, such as Tencent Meeting and Smart Classroom, had a significant impact on student learning performance [13][14]. In another study, Yu [15] revealed that gender, education level, and personality traits might affect student online learning outcomes in the context of the COVID-19 pandemic. In particular, postgraduate students outperformed undergraduate students in terms of online learning outcomes. Because the pandemic has not been fully eradicated worldwide, virtual classroom and distance-learning tools remain of importance in certain critical circumstances, such as during the blockade of a city, while learning or working from home. In such cases, it is vital that teachers highlight students' perceptions of playfulness or enjoyment during online classes in order to enhance their intention to repeat the virtual learning experience [16].

In addition, course design and structure are important to students' satisfaction and their learning-outcomes [17][18][19][20][21][22]. Betty et al. [17] found that effectiveness in an online environment is contributive to the development of relationships and the overall success of coursework. Meanwhile, the online learning environment, if it is devoid of personal communication, is inundated with approaches that help students feel a sense of partnership while meeting their learning needs. Van Wart [18] emphasizes the importance of course structure and pre-planning, organization, and consistency, and argues that students prefer virtual class organizations that are modular and repetitive. Kauffman [19] argues that course instructional design to be of great importance. Eom, Wen, and Ashill [20] surveyed 397 university students and found instructor feedback in online courses to be statistically significant; and course structure was found to be the most significant determinant of student satisfaction. Jung [21] argues that online courses are more challenging to organize; students tend to be very critical of what they perceive as any confusion or unclear structure in the distance-learning setting. McMurtry [22] states that good online teachers keep students focused by creating a structured environment that is logically organized, delivered in small chunks, and sufficiently repetitive.

Meanwhile, other scholars have insisted that the virtual classroom has certain disadvantages, such as equipment requirements, the textual and technical skills required, the motivation and regular participation required, and the potential "information overload". In practice, a semi-virtual classroom may be a good alternative for the distance-education environment [4]. In addition to these factors, interaction difficulty may be negatively associated with student satisfaction during internet-based course learning [16]. Learning from a virtual classroom alone may lead to significantly lower grades compared with learning outcomes from a traditional classroom [23].

In the context of the COVID-19 pandemic, Rizun and Strzelecki [24] revealed that the impact of COVID-19 in terms of shifting higher education to virtual learning in Poland was seen in a positive light and was effective. Sprenger and Schwaninger [25] compared e-lectures, the classroom response system, classroom chat, and mobile virtual reality in terms of technology acceptance and found that the classroom response system had the highest level of acceptance, while mobile virtual reality saw a substantial drop in behavioral intention after 3 months of usage. Various practical problems have been commonly encountered in distance-learning during the COVID-19 pandemic. For instance, Sharma and Bumb [26] listed 25 challenges faced in online classes, including a lack of interaction with peers, interruptions in the online classroom, and mental stress resulting from the pandemic. In addition, even though students reported a moderate feeling that virtual learning tools enhanced their effectiveness and productivity, they still preferred to return to a traditional classroom [14][24].

There are a large number of studies focusing on the comparison between online virtual and traditional teaching [27][28][29][30], with mixed results. For instance, Ali Alghazo [27] used students' final grade to examine the effectiveness of both online and traditional teaching, and concluded that there existed no significant differences in the effectiveness of online education and traditional face-to-face education. Sondoozi [28] showed that the online learning outcomes of students were similar to the performance of those using the traditional approach, while the satisfaction and attitudes of online learners were positive. Feng et al. [29] compared the effects of online teaching during COVID-19 with the pre-pandemic traditional teaching in compulsory education. They found that student's performance before the pandemic was better than after the pandemic, with many previously high-scoring students now scoring closer to the mean. Zhao et al. [30] compared teaching efficiency between virtual reality and traditional education in medical education. Their results indicated students in the virtual reality group performed better than those in the traditional teaching group, concluding that virtual reality teaching may enhance learning-comes for medical students.

In general, the virtual classroom has gained considerable popularity since 1994. However, despite both teachers and students covering the material set forth in the textbooks and workbooks [31], and later moving from instructor-centered to student-centered curriculum [32], the traditional face-to-face approach remains key in modern education practice. Since both modes have pros and cons, it is best to synthesize the merits of the two modes in higher education. Although the hybrid virtual classroom/traditional classroom mode offers a promising channel for both teaching and learning in various contexts, little effort has been focused on the blended mode and the relationships between learning patterns and performance during the COVID-19 pandemic.

At present, people are more adaptive to the ongoing pandemic environment in terms of reduced fear and anxiety, as well as more protective ways to address this health crisis. More teachers are adapting to blended virtual classrooms in colleges and universities and some are returning to conventional classrooms. However, compared with the currently numerous research regarding the nexus between learning performance and the various learning patterns, studies focusing on the subject in the initial phase of the COVID-19 pandemic are relatively scarce. China was the first country to be shocked by the pandemic, and few empirical studies in the field of higher education were conducted. This research has practical significance in terms of exploring the undergraduate learning performance associated with the initial virtual online teaching and learning experience, as well as the blended learning approach in higher education.

The results of the available literature depend on the models and data used in the studies, and the impacts of the COVID-19 pandemic on higher education in China and beyond remain unclear with mixed conclusions. Additionally, there is no one-size-fits-all model to adopt for examining the effects of online teaching and learning environment on undergraduates' learning performance. The most relevant models are regression analysis tools [8][13][33]. Chowdhury [8] using binary logistic regression to explore whether virtual classroom can improve students' learning performance, found most participants have positive opinions about the use of virtual classroom for learning purposes, but it does not include the impact of COVID-19 disruption in the model analysis explicitly. In another study, Quadir and Zhou [13] used regression and showed that determinants of technology acceptance models had a positive effect on student learning outcomes in the context of the pandemic. Guse et al. [34] performed the binary logistic regression model on the association of gender, distress, and depression with serious worries in medical students during the pandemic. They investigated mental health outcomes among medical students during the initial phase of the COVID-19 pandemic, and perceptions of the students on how the learning environment had changed in a larger sample of undergraduates. They found that medical students experienced much distress and mental burden during the pandemic.

References

1. Li, Q.; Guan, X.; Wu, P.; Wang, X.; Zhou, L.; Tong, Y.; Ren, R.; Leung, K.S.M.; Lau, E.H.Y.; Wong, J.Y.; et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. N. Engl. J. Med. 2020, 382, 1199–1207.

2. Charles, D.; Kolstad. Market Failure: Public Goods, Public Bads, and Externalities. In Environmental Economics, 2nd ed.; Oxford University Press: New York, NY, USA, 2007; pp. 100–109.

3. Garson, G.D. Evaluating implementation of web-based teaching in political science. PS Polit. Sci. Pol. 1998, 31, 585–590.

4. Hiltz, S.R. The Virtual Classroom: Learning without Limits via Computer Networks; Ablex Publishing Corp: New Jersey, NJ, USA, 1994.

5. Cao, Q.; Griffin, T.E.; Bai, X. The importance of synchronous interaction for student satisfaction with course web sites. J. Inf. System. Educ. 2009, 20, 331–338.

6. Lietzau, J.A.; Mann, B.J. Breaking out of the asynchronous box: Using web conferencing in distance learning. J. Libr. Inf. Serv. Dist. Learn. 2009, 3, 108–119.

7. Parker, M.A.; Martin, F. Using virtual classrooms: Student perceptions of features and characteristics in an online and a blended course. MERLOT J. Online Learn. Teach. 2010, 6, 135–147.

8. Chowdhury, F. Virtual classroom: To create a digital education system in Bangladesh. Int. J. High. Educ. 2020, 9, 129–138.

9. Miltiadou, M.; Savenye, W.C. Applying social cognitive constructs of motivation to enhance student success in online distance education. Educ. Technol. Rev. 2003, 11, 78–95.

10. Riel, M.; Harasin, L. Research perspectives on network learning. Mach. Med. Learn. 1994, 4, 91–113.

11. Vrasidas, C.; McIsaac, M.S. Factors influencing interaction in an online course. Am. J. Dist. Educ. 1999, 13, 22–36.

12. Fidalgo, P.; Thormann, J.; Kulyk, O.; Lencastre, J.A. Students' perceptions on distance education: A multinational study. Int. J. Educ. Technol. High. Educ. 2020, 17, 18.

13. Quadir, B.; Zhou, M. Student's perceptions, system characteristics and online learning during the COVID-19 epidemic school disruption. Int. J. Dist. Educ. Technol. 2021, 19, 15–33.

14. Petchamé, J.; Iriondo, I.; Villegas, E.; Riu, D.; Fonseca, D. Comparing Face-to-Face, Emergency Remote Teaching and Smart Classroom: A Qualitative Exploratory Research Based on Students' Experience during the COVID-19 Pandemic. Sustainability 2021, 13, 6625.

15. Yu, Z. The effects of gender, educational level, and personality on online learning outcomes during the COVID-19 pandemic. Int. J. Educ. Technol. High. Educ. 2021, 18, 14.

16. Virto, N.R.; López, M.F.B. Lessons from lockdown: Are students willing to repeat the experience of using interactive smartboards? Int. J. Emerg. Technol. Learn 2020, 15, 225.

17. Barr, B.A.; Miller, S.F. Higher Education: The Online Teaching and Learning Experience. Available online: https://files.eric.ed.gov/fulltext/ED543912.pdf (accessed on 11 April 2022).

18. Van Wart, M.; Ni, A.; Rose, L.; McWeeney, T.; Worrell, R. A Literature Review and Model of Online Teaching Effectiveness Integrating Concerns for Learning Achievement, Student Satisfaction, Faculty Satisfaction, and Institutional Results. Pan-Pac. J. Bus. Res. 2019, 1, 1–22.

19. Hauffman, H. A Review of Predictive Factors of Student Success in and Satisfaction with Online Learning. Res. Learn. Technol. 2015, 23, 2.

20. Eom, S.; Wen, H.; Ashill, N. The Determinants of Students' Perceive Learning Outcomes and Satisfaction in University Online Education: An Empirical Investigation. Decis. Sci. J. Innov. Educ. 2006, 2, 215–235.

21. Jung, I. The Dimensions of e-Learning Quality: From the Learner's Perspective. Educ. Technol. Res. Develop. 2011, 4, 445–464.

22. McMurtry, K. Effective Teaching Practices in Online Higher Education. Ph.D. Thesis, Nova Southeastern University, Fort Lauderdale, FL, USA, 2016.

23. Hung, J.L.; Hsu, Y.C.; Kerry, R. Integrating data mining in program evaluation of K-12 online education. J. Educ. Technol. Soc. 2012, 15, 27–41.

24. Rizun, M.; Strzelecki, A. Students' Acceptance of the COVID-19 Impact on Shifting Higher Education to Distance Learning in Poland. Int. J. Environ. Res. Public Health 2020, 17, 6468.

25. Sprenger, D.A.; Schwaninger, A. Technology acceptance of four digital learning technologies (classroom response system, classroom chat, e-lectures, and mobile virtual reality) after three months' usage. Int. J. Educ. Technol. High. Educ. 2021, 18, 8.

26. Sharma, S.; Bumb, A. The Challenges Faced in Technology-Driven Classes During COVID-19. Int. J. Distance Educ. Technol. 2021, 19, 66–88.

27. Ali, A. Comparing Effectiveness of Online and Traditional Teaching Using Students' Final Grade. Available online: https://core.ac.uk/download/pdf/60530022.pdf (accessed on 10 April 2022).

28. Sondoozi, T. A Comparison of the Effectiveness of On-Line Teaching versus Traditional Teaching Methods in Higher Education: A Critical Review. 2000. Available online: https://www.learntechlib.org/p/126982 (accessed on 10 April 2022).

29. Feng, X.; Ioan, N.; Li, Y. Comparison of the effect of online teaching during COVID-19 and pre-pandemic traditional teaching in compulsory education. J. Educ. Res. 2021, 114, 307–316.

30. Zhao, G.; Fan, M.; Yuan, Y.; Zhao, F.; Huang, H. The comparison of teaching efficiency between virtual reality and traditional education in medical education: A systematic review and meta-analysis. Ann. Transl. Med. 2021, 9, 252.

31. Goodlad, J. A Place Called School; McGraw-Hill Book Company: New York, NY, USA, 1984; pp. 13–14.

32. Cuban, L. How Teachers Taught: Constancy and Change in American Classrooms, 1890–1990, 2nd ed.; Teachers College Press: New York, NY, USA, 1993.

33. Cameron, A.C.; Trivedi, P.K. Microeconometrics Using Stata; Stata Corp LP: College Station, TX, USA, 2010; pp. 130–131.

34. Guse, J.; Heinen, I.; Mohr, S.; Bergelt, C. Understanding mental burden and factors associated with study worries among undergraduate medical students during the COVID-19 pandemic. Front. Psychol. 2021, 12, 734264.