The Rise and Challenges of Postpandemic Online Education

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Abstract—*The pandemic is forcing educational institutions around the world to rapidly transition from face-to-face instruction to e-learning. However, e-learning has some multifaceted problems that are waiting to be solved and optimized. Therefore, this article aims to discuss how we can optimize online learning systems to benefit traditional education systems in the long run. Based on the findings, this article suggests policy makers, educators, and system developers not only develop continuous training for teachers and learners on e-learning to improve their skills and acceptance of online education systems but also create a more comprehensive technical environment to accelerate adoption and increase the intention to continue using e-learning systems. In addition, high-quality online education designs that include interaction mechanisms and adaptations to students' perceptions and attitudes toward online education are needed, and the design of online education systems should be varied according to the different characteristics of educational subjects. The proposed insights in this article are applicable to a wide set of projects for online education. Moreover, this article calls on scholars from around the world to further explore the critical factors for adapting online education and optimizing online education environments to propose better solutions for future crises similar to the COVID-19 pandemic.*

Key words: Continuance intention, online education

I. IMPACT OF COVID-19 ON EDUCATION

IT became quite different and challenging in 2020 with the outbreak of COVID-19. As a new type of coronavirus, COVID-19 has led to a large number of deaths and infected people worldwide. Because this new type of coronavirus spreads most commonly through droplets and contact ([Bahl *et al.,* 2020]; [Sabino-Silva *et al.,* 2020]), and population density and social interaction are the main risks for exposure to this new type of coronavirus [Coccia, 2020], many countries have become conventional to social distancing in everyday life and governments are working to contain the disease through various means, including public health education and contact tracing [Ting *et al.,* 2020]. These circumstances lead to widespread behavioral changes in people. Many activities that were originally performed physically are now performed virtually, and people are beginning to work and learn from home to avoid contagion.

Researchers and practitioners from various disciplines face the challenge of looking at the influences and problems caused by COVID-19 from different perspectives. Among these influences, education systems and professional development of corporations have been greatly affected worldwide ([Bondar *et al.,* 2021]; [Corazza and Saluto, 2021]; [Karasan and Erdogan, 2021]; [Khan *et al.,* 2021]; [Sorour *et al.,* 2021]). Due to the risk of contagion, quarantines were imposed during the pandemic, which greatly affected faculty-student interactions [Khan *et al.,* 2021]. The pandemic also

forced the closure of educational institutions, resulting in school closures in 188 countries and serious challenges to the global higher education sector ([Crawford *et al.,* 2020]; [Khan *et al.,* 2021]; [Sorour *et al.,* 2021]). With the demise of traditional classroom and face-to-face teaching, educational institutions must adapt to this new crisis without compromising student learning performance. For this reason, most higher education sectors, such as universities, are sticking to their school calendars by offering distance learning solutions [OECD, 2020]. Accordingly, e-learning has become an approach to maintain the continuity of education during the pandemic ([Ibrahim *et al.,* 2021]; [Karasan and Erdogan, 2021]).

II. RISE AND CHALLENGES OF ONLINE EDUCATION

As stated above, the COVID-19 pandemic is forcing professionals and educational institutions around the world to rapidly shift from face-to-face instruction to e-learning. However, as an effective means that combines content delivery with educational services, e-learning has some multifaceted problems that still need to be solved and optimized [Karasan and Erdogan, 2021]. First, the rapid shift to all online instruction has brought about major changes in instructional practices. Therefore, it is important to understand how teachers assess their readiness for e-learning [Scherer *et al.,* 2021]. Second, providing effective e-learning content has become more important than ever. Therefore, it is crucial to take measures to improve the quality of e-learning so that students can have better learning experiences during and after the COVID-19 pandemic ([Khan *et al.,* 2021]; [Nariman, 2020]; [Zhang *et al.,* 2021]). Third, there is a need to investigate students' perceptions of e-learning used by

educational institutions during the pandemic to better meet students' needs [Khan *et al.,* 2021].

Given this sudden change in the shape of education, some wonder if the adoption of online education will continue postpandemic [Li and Lalani, 2020] and how we can optimize online education systems to benefit traditional teaching systems in the long run. This article believes it is an opportune time to broaden the search scope and to promote the formation of solutions to the educational problems caused by COVID-19 for which little knowledge about it exists in the current literature.

To date, the pandemic continues to spread in most parts of the world. By July 2021, about 130 000 new cases are reported daily in Europe and more than 90 000 new cases in the United States. Taiwan, considered one of the countries that have responded most effectively to COVID-19, has experienced ups and downs during the pandemic. Taiwan recorded its 200th consecutive day without a locally transmitted case of COVID-19 on October 30, 2020 [Berlinger, 2020], then reported 667 domestic COVID-19 cases on May 27, 2021, an all-time high, and was able to contain the spread of the pandemic again by reporting 12 new cases with zero deaths for the fourth consecutive day on July 31, 2021 [Taiwan Centers for Disease Control, 2021]. During the pandemic, the Taiwanese government has announced that all public and private schools will be closed and classes will be held through online learning platforms in an effort to contain the spread of COVID-19. This article considers this circumstance as a great opportunity to investigate users' intentions in using online education systems during the pandemic, and the author believes that it is valuable to share the observations as many countries

have also been repeatedly affected by the pandemic.

In order to practically understand users' intentions toward online education, a questionnaire survey is conducted in this article to collect data. The constructs of the questionnaire include the following.

1) The degree of confirmation of expectations of the online education system before use.
2) The degree of usefulness of the online education system.
3) The degree of interaction during online courses.
4) Learning preferences.
5) Technology experience and skills.
6) Infrastructure and environment during the use of online education systems.
7) Demographic information, including age, gender, field of study, and education level.
8) Intention to continue using online education systems after the pandemic.

University students in Taiwan were selected as the target population for the survey. After passing the pilot test, a total of 285 valid questionnaires were obtained for analysis.

III. IMPORTANT FACTORS OF ONLINE EDUCATION

In this article, a questionnaire survey was conducted and the results indicate that 1) when students have a higher level of confirmation of their expectations of the online education system before using it, or a higher level of interaction during the online courses, they will find the system to be more useful and further increase their intention to continue using it; and 2) when students feel that they learn better by participating and contributing than by sitting still and absorbing during the online course, their intention to continue using the online education system will immediately decrease.

In addition, students' intention to continue using online education systems is strengthened when 1) teachers encourage interaction during online courses and motivate students to use online education systems, 2) the user interfaces of online education systems are friendly and access to the system is available at any time, 3) students are not unfamiliar with the software applications and the devices on which the software runs, and 4) the infrastructure and network speed of using online education systems are reliable and adequate.

IV. LEARNING PREFERENCES, IN-CLASS INTERACTIONS, AND STUDY SUBJECTS

Several practical insights emerge from the above findings. First, online education systems with interactive features should be designed to
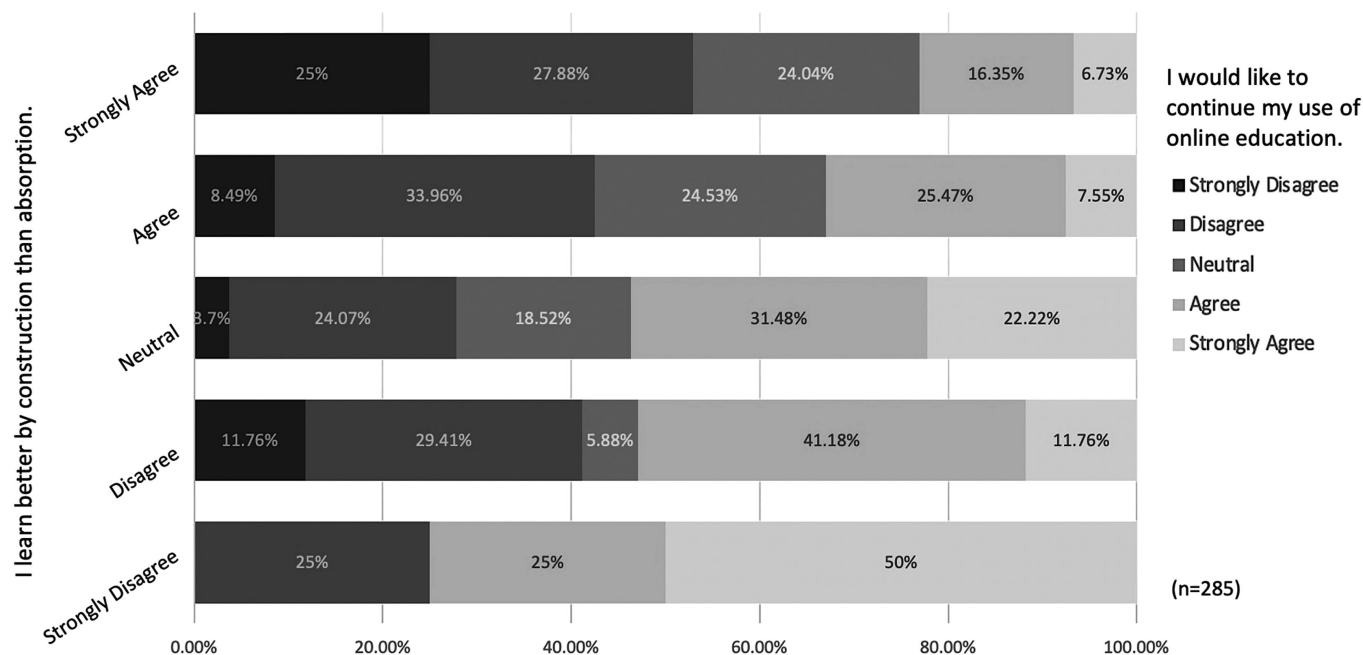

Figure 1.   Cross-analysis of learning preferences and intention to continue using online education systems.
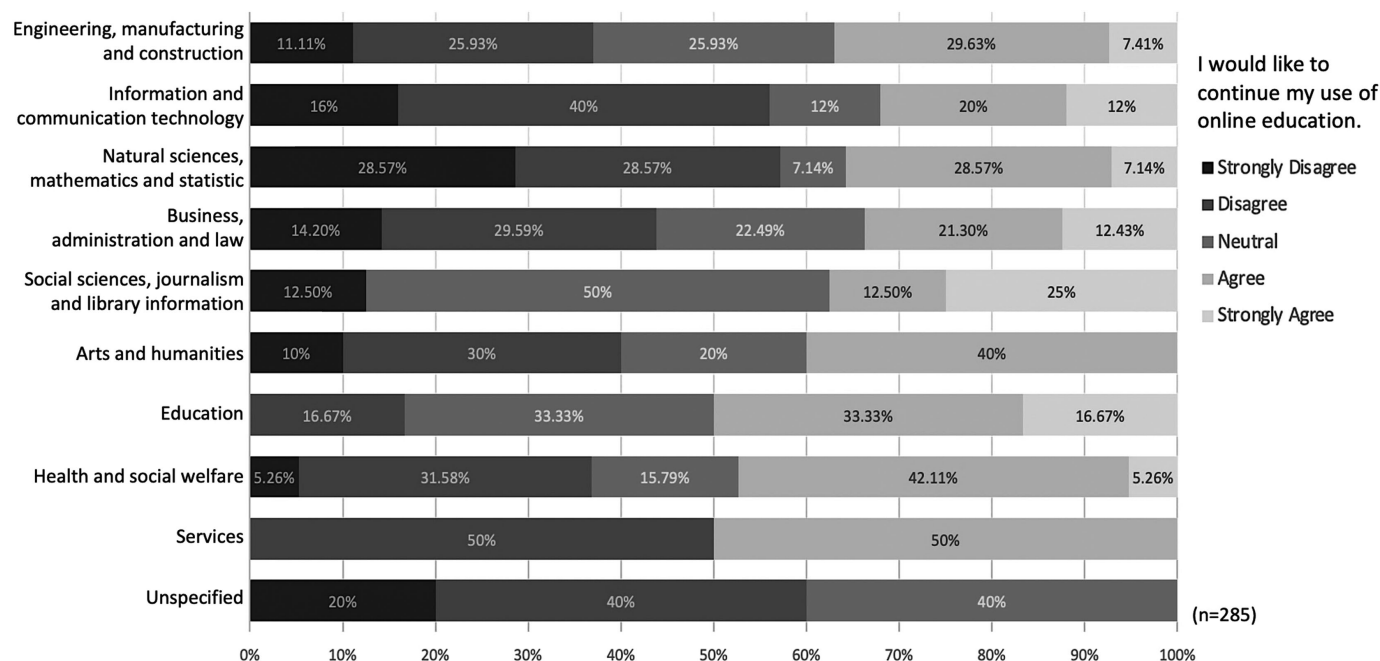

Figure 2.   Cross-analysis of study subjects and intention to continue using online education systems.

preserve students' intention to continue using them after the pandemic outbreak. The findings indicate that interactions between individual students and between students and teachers during an online course may lead students to find the online education system as useful and therefore be willing to continue using it. Second, to increase students' willingness to continue using online education systems, the elements and user interface of the systems should be designed to be user-friendly and available at all times. In addition, online education systems should be developed considering the technical environment to ensure comfortable screen design, stable computer networks, and high browsing speed. Furthermore, teachers can encourage participation and interaction in online courses. Teachers can also motivate students to use online education systems. The results show that the above actions taken by teachers can help to strengthen students' willingness to continue using online education systems.

Moreover, we need to be aware that students' intention to continue using online education systems is not simply determined by the characteristics of the system or the teachers. The findings in this article suggest that students' learning preferences for absorption (sitting still and absorbing) and construction (participating and contributing), their expectations of the system prior to using, and their skills in using software applications and the devices on which the software runs must also be considered in the development of online education in the long run.

From the cross-analysis of students' learning preferences and their intention to continue using online education systems, it appears that students who learn better through construction (participating and contributing) than absorption (sitting still and absorbing) are less willing to continue using online education systems (see Figure 1). This could be due to the fact that online education systems do not currently have comprehensive interaction mechanisms and are therefore not attractive to those who learn better through participation and involvement in the classroom. From the cross-analysis of students' majors and their intention to continue using online education systems, it appears that students majoring in social sciences, journalism, and library information are more willing to continue using online education systems than students in services (see Figure 2). This finding suggests that the design of online education systems should be varied according to the different characteristics of educational subjects.

V. Conclusion

This article suggests that students are more likely to perceive online education as useful if they have higher levels of confirmation of expectation about the e-learning system before using it, higher degrees of interactive collaboration during the e-learning, and feel that they learn better by participating and contributing than by sitting still and absorbing during the course; students' perceived usefulness of the online education system increases their satisfaction with the system and their intention to continue using it; students' technical competency, students' perceived effectiveness of the content, instructor characteristics, and technical environment reinforce the relationship between students' perceived usefulness and their intention to continue using the system.

Based on the findings, this article suggests that policy makers, educators, and system developers should not only develop continuous training for teachers and students on online education to improve their skills and adoption of online education systems, but also create a more comprehensive technical environment to accelerate adoption and increase intention to continue using online education systems. Also, quality online education designs that incorporate interaction mechanisms and adaptations to students' perceptions and attitudes toward online education are required.

In addition, this article calls for researchers around the world to further explore the critical factors for adapting online education and optimizing online education environments to propose better solutions to address crises such as the COVID-19 pandemic in the future.

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