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Editorial

Post-COVID-19 Education for a Sustainable Future: Challenges, Emerging Technologies and Trends

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The COVID-19 pandemic, which has been destabilizing the world since the end of 2019, has significant repercussions on not only health but also the economy, finances, society, politics, the environments, culture and education. In the academic environment, which is the case for universities, all pre-pandemic modes of operation have been called into question and all actors—students; teachers; researchers; engineers; librarians; and administrative, technical, social and health personnel—have been mobilized to address issues such as the adequacy, viability and sustainability of university educational practices during the health crisis. Significant work has been carried out to reassess and adapt university teaching strategies, and this work must continue after the pandemic. While the COVID-19 pandemic turned the world upside down, it was time for higher education to be innovative and proactive and to adapt to a post-COVID-19 world by rethinking its future and taking the necessary steps.

This Special Issue, entitled “Post-COVID-19 Education for a Sustainable Future: Challenges, Emerging Technologies and Trends”, aims to provide concrete answers and solutions to today’s key challenges in order to accelerate and integrate the changes to post-COVID-19 higher education for a sustainable future. The first challenge we have identified is the training of education professionals in digital literacy. The “teacher factor” appears to be one of the most important factors for the success of students, who must be able to adapt throughout their lives to a constantly changing environment. The second challenge is the success of all learners, regardless of their social background. The third challenge is digital inclusion, which is expressed in terms of hardware (i.e., access to equipment and, especially, to networks), usage (i.e., use of tools and acquisition of good practices) and understanding (i.e., proper use of the systems used and familiarization with artificial intelligence), which is necessary for mastering the usage of equipment and the need for their upgrades.

This Special Issue is therefore an opportunity to support active and engaged education and to build upon the world of education after the COVID-19 pandemic.

The authors of [1] investigated the factors that influence users’ intention to continue using payment platforms, as well as their knowledge and manners of promoting sustainability of these platforms. This study reached three main conclusions: The first is that perceived usefulness, user satisfaction and spokesperson identity have direct positive impacts on users’ willingness to continue using a platform, while perceived cost has a direct negative impact on users’ willingness to continue using a platform. The second strength of the study is that perceived ease of use, content quality and system quality of knowledge payment platforms have direct impacts on user satisfaction and indirect impacts on users’ willingness to continue using them. Finally, the last highlight of this study is that users’ perceived enjoyment, membership experience, auditory experience and other factors have direct impacts on user satisfaction and indirect impacts on users’ willingness to continue using them.



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Another interesting area was examined in [2], where teachers' technological, pedagogical and content knowledge (TPACK) contextualized the research in English as a foreign language (EFL) teaching in China. Barriers to the use of interactive whiteboards in English language teaching include lack of effectiveness, traditional pedagogical beliefs, insufficient technical support and training, shortcomings of interactive whiteboards for English language teaching and time constraints. This study proposed measures to reduce teachers' non-instructional tasks to ensure the sustainable adoption of technology in EFL teaching.

The authors of [3] examined the factors that influence the choice of online learning by parents of students. This case study was conducted in elementary schools, and the results can definitely be extended to the academic domain. In this article, the mechanism of these factors on choice intention was also explored. The results show that continuity of online learning and the risk of developing a learning attitude are two new variables that influence parents' knowledge of online learning. Perceived ease of use, performance evaluation and perceived cost affected parents' assessments of their children's satisfaction with online learning during the pandemic. Therefore, parents' satisfaction with online learning positively affects their intention to choose online learning.

A machine learning model for learning performance prediction was implemented by the authors of [4]. Additional pre-training and fine-tuning phases were applied, and a personalized feedback generation method was designed to enhance the effect of online learning. A quasi-experiment involving 62 participants (33 in the experimental group and 29 in the control group) assessed the validity of the prediction model and personalized feedback generation, as well as the impact of personalized feedback on learning performance and cognitive load. The results show that the proposed model achieves a much more satisfactory level of accuracy than the reference models. In addition, students who learned with personalized feedback achieved much better results in terms of learning performance and showed lower cognitive load.

In [5], a reliable self-assessment framework of practicing teachers' digital skills when teaching online was conducted using data from 1342 teachers with online teaching experience. The used data analysis methods included exploratory factor analysis (EFA), confirmatory factor analysis (CFA) and item analysis. The results demonstrate that the constructed evaluation framework is consistent with the data collected and that the framework is an effective instrument to support the evaluation of practicing teachers for their online teaching.

The authors of [6] addressed the prediction of student performance in hybrid learning environments in the early post-pandemic period. Specifically, the main factors affecting student performance (case study conducted in mechanical engineering) were identified and quantified in order to build a generalized linear autoregressive (GLAR) model. This model, which is characterized by its simplicity and ease of implementation, is intended to predict students' grades in online learning situations in hybrid environments. Special attention was also given to students whose grade predictions were underestimated and to those who failed. The methodology presented is applicable to all aspects of the academic process, including students, instructors and decision makers.

In [7], information and communication technologies (ICT) were explored to provide out-of-school art education during the COVID-19 pandemic. Using mobile positioning technology and information platforms, students were able to complete 32 art appreciation activities in their hometowns during this period. Mobile positioning information submitted by students, feedback questionnaires, post-viewing data and other data were used to identify learning outcomes. This paper confirms that satisfaction with the art appreciation task has a direct effect on students' interest in art and promotes the sustainable development of aesthetics education in school.

The authors of [8] examined the knowledge domain of blended learning during the COVID-19 pandemic, using educational games to facilitate self-directed learning. A curriculum for teaching the principles of consensus mechanisms, private blockchain and public blockchain was designed. Feedback from educational experts was analyzed using technical

statistics and latent Dirichlet allocation (LDA)-based modeling to evaluate and modify the curriculum. The approach to curriculum design incorporating gamification elements was found to be effective but needs to be expanded to include level-based instructional elements.

Education as a fundamental pillar of competitiveness was studied in [9]. The authors analyzed a large survey conducted in Romania with two samples of respondents, one composed of 173 university professors and the other composed of 732 students. The results presented in this article indicate a high level of adaptation to the new teaching methods, both among professors (84.4%) and students (58.7%), with a large number of professors (51.4%) considering that online education can become an important factor in the development of the society and in improving economic competitiveness (60.7%).

A personalized diagnostic assessment of a learner's cognitive load in an e-learning system using Bayesian network as a learning analytics method was studied in [10]. The results of this study demonstrate that diagnostic information about cognitive load helps learners improve their academic performance by managing and controlling their cognitive loads in the online learning environment. In addition, instructional designers are able to propose more appropriate teaching methods by considering learners' cognitive loads in the online learning environment.

The issue of student learning experience using Microsoft (MS) Teams versus social networking sites (SNSs) was studied in [11]. Students' learning experiences and reactions to courses incorporating SNSs and MS Teams were studied as a unique distance learning platform during the COVID-19 pandemic. The results show that the use of SNSs and MS Teams not only helps students access information and learning resources but also has a positive impact on knowledge construction and critical thinking, and the learning experience is beneficial overall.

Finally, the authors of [12] proposed an econometric analysis with a quantitative approach and a sample survey, aiming to explore students' perception and challenges of online courses during the COVID-19 pandemic. The results of the logistic regression show that Internet quality, prior knowledge of ICT, family income, mother's education and number of rooms have positive impacts on online courses. The results of the study reveal that, on average, students had a positive perception of online courses during the pandemic in maintaining their academic level. Policy makers and educational institutions should be encouraged to adopt the latest online course techniques and to continuously train teachers and students to make the teaching and learning process more enjoyable and effective during the pandemic.

In conclusion, this Special Issue offers a comprehensive range of topics related to post-COVID-19 education for a sustainable future, presenting the challenges, emerging technologies and trends. In order to understand future trends and issues, we have endeavored to bring together several researchers working on related topics. We thank each of the authors for their significant contributions to this Special Issue. We also express our gratitude to all the reviewers for their thorough and timely reviews, which helped this Special Issue achieve a high level of quality.

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References

1. Xu, H.; Zhang, M.; Zeng, J.; Hao, H.; Lin, H.-C.K.; Xiao, M. Use of Latent Dirichlet Allocation and Structural Equation Modeling in Determining the Factors for Continuance Intention of Knowledge Payment Platform. *Sustainability* **2022**, *14*, 8992. [\[CrossRef\]](#)
2. Huang, F.; Qi, J.; Xie, A. Sustaining Teaching with Technology after the Quarantine: Evidence from Chinese EFL Teachers' Technological, Pedagogical and Content Knowledge. *Sustainability* **2022**, *14*, 8774. [\[CrossRef\]](#)
3. Han, C.; Liu, L.; Chen, S. Factors Influencing Parents' Intention on Primary School Students' Choices of Online Learning during and after the COVID-19 Pandemic in China. *Sustainability* **2022**, *14*, 8269. [\[CrossRef\]](#)

4. Wang, X.; Zhang, L.; He, T. Learning Performance Prediction-Based Personalized Feedback in Online Learning via Machine Learning. *Sustainability* **2022**, *14*, 7654. [[CrossRef](#)]
5. Tang, L.; Gu, J.; Xu, J. Constructing a Digital Competence Evaluation Framework for In-Service Teachers' Online Teaching. *Sustainability* **2022**, *14*, 5268. [[CrossRef](#)]
6. Kanetaki, Z.; Stergiou, C.; Bekas, G.; Jacques, S.; Troussas, C.; Sgouropoulou, C.; Ouahabi, A. Grade Prediction Modeling in Hybrid Learning Environments for Sustainable Engineering Education. *Sustainability* **2022**, *14*, 5205. [[CrossRef](#)]
7. Song, B.; He, B.; Wang, Z.; Lin, R.; Yang, J.; Zhou, R.; Cai, Y. Research on Open Practice Teaching of Off-Campus Art Appreciation Based on ICT. *Sustainability* **2022**, *14*, 4274. [[CrossRef](#)]
8. Choi, E.; Choi, Y.; Park, N. Development of Blockchain Learning Game-Themed Education Program Targeting Elementary Students Based on ASSURE Model. *Sustainability* **2022**, *14*, 3771. [[CrossRef](#)]
9. Tănase, F.-D.; Demyen, S.; Manciu, V.-C.; Tănase, A.-C. Online Education in the COVID-19 Pandemic—Premise for Economic Competitiveness Growth? *Sustainability* **2022**, *14*, 3503. [[CrossRef](#)]
10. Choi, Y.; Kim, J. Learning Analytics for Diagnosing Cognitive Load in E-Learning Using Bayesian Network Analysis. *Sustainability* **2021**, *13*, 10149. [[CrossRef](#)]
11. Sobaih, A.E.E.; Salem, A.E.; Hasanein, A.M.; Elnasr, A.E.A. Responses to COVID-19 in Higher Education: Students' Learning Experience Using Microsoft Teams versus Social Network Sites. *Sustainability* **2021**, *13*, 10036. [[CrossRef](#)]
12. Khan, M.A.; Kamal, T.; Illiyan, A.; Asif, M. School Students' Perception and Challenges towards Online Classes during COVID-19 Pandemic in India: An Econometric Analysis. *Sustainability* **2021**, *13*, 4786. [[CrossRef](#)]

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