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Editorial

Unleashing the Potentials of Flexible Education with Pedagogical and Technological Innovations

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The COVID-19 global pandemic had a profound impact on the education sector, forcing many educational institutions worldwide to adapt to new modes of teaching and learning rapidly. As a result, the pandemic has stimulated a significant shift towards more flexible education, with many institutions embracing online and hybrid learning models. This transformation was first driven by the need to accommodate social distancing measures and reduce the risk of transmission while simultaneously providing learning opportunities to students. As the approaches were practised, the potential benefits of flexible education were gradually highlighted and appraised by both scholars and practitioners; these benefits include, but are not limited to, increasing accessibility to education, enhancing personalized learning, introducing convenience to learners by catering for one's own learning pace and schedule, better meeting the needs of learners in an increasingly digitized world, and bringing new thinking towards more sustainable approaches of education [1].

While the potential benefits of flexible education are becoming increasingly apparent and evident, there are still several research gaps in this area, including:

1. Technological affordances of flexible education: The wide adoption of online and blended learning mediated by educational technologies, including social media, virtual classrooms, open online courses, virtual environments, etc., brings new research questions regarding the technological affordances of flexible education. For example, it is mainly unexplored how different technologies can afford various teaching and learning activities in flexible education, such as collaborative projects [2]. Also, how different technologies can be used to support various types of learners, such as those with learning difficulties or those with low self-motivations, needs to be addressed [3,4]. Learner engagement and motivation: Flexible education can be challenging for some learners who may struggle with self-directed learning or lack the motivation to engage with online resources [4]. More research is needed to explore strategies for promoting student engagement and motivation in various flexible education settings.
2. Social interaction and learning community building: One of the potential drawbacks of flexible education is the need for more social interactions and learning community building that can occur in conventional face-to-face settings [5]. More research is needed to explore how to create learning communities in asynchronous teaching and learning and how to promote more social interactions during flexible education.
3. Evidence of effectiveness: While some research suggests that online and blended learning can be as effective as conventional face-to-face instruction, more studies

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are needed to evaluate flexible education regarding the intended learning outcomes, particularly in different subject areas and for different types of learners.

4. Accessibility, equity, and support: Although flexible education can increase access to education for learners who might not otherwise be able to attend in-person classes, there are still concerns around issues of accessibility and equity. More research is needed to explore how to ensure that flexible education is accessible to all students, regardless of their background or circumstances [6]. Moreover, what types of support are needed for learners and practitioners should be further studied and discussed.

To address the research gaps listed above regarding flexible education, we proposed this Special Issue "Sustainable Inspiration of Flexible Education" in MDPI *Sustainability*. Through a rigorous peer-review process, we selected 11 high-quality articles that addressed some of the most pressing research gaps in this area.

Regarding the first research gap, the enabling technologies of flexible education, Contribution 1 reviewed current concepts and applications in the subject area of Maritime Education and Training (MET); the fuzzy analytic hierarchy process was used to group them, supplemented with a survey. The results showed that online methods, specifically "XR within the metaverse", had the highest priority, highlighting the need for attention on online education platforms via metaverse-based "expansion" and "connection". Contribution 2 examined undergraduate students' perceptions of the appropriateness and acceptance of social media for flexible learning. The longitudinal research, which involved a literature review and questionnaire, tracked the awareness, use, satisfaction, communication, testing, and revision of different social media platforms. The findings suggested that student' satisfaction with social media for academic purposes had decreased in some platforms and there was a significant decrease in social media use for studying, with Wikipedia, Facebook, and video calls experiencing the most significant declines. Meanwhile, digital games also have great potential as a technology for flexible education. They offer an engaging and interactive learning experience that can be tailored to individual learner needs and preferences. Digital games can also provide real-time feedback, allowing learners to track their progress and adjust their learning strategies accordingly. Furthermore, they can be accessed anywhere and anytime, making them a convenient tool for flexible education. There are studies on the use of digital games for flexible education from various perspectives. Specifically, Contribution 4 reported the work of designing and implementing a digital game-based course, aiming to address the issue of Internet addiction among middle school students in China from the perspective of digital citizenship. The results suggested that the approach not only led to the better cyber wellness of the participating students but also enhanced their motivations and emotional engagement. Contribution 7 reviews prior publications on gamified project-based learning. The review highlights the various aspects of the current status of research in gamified project-based learning and offered several recommendations for the future development of it, including the need for constructing a systematic framework for guiding the design of gamified project-based learning, enhancing practitioners' competency, strengthening the theoretical underpinning of gamified project-based learning, and redesigning evaluations to benefit from the game-based approaches. Contribution 11 also conducted a review on game-based learning that highlighted digital games' potential in assessments, especially in formative assessments, and identified some research gaps and future research directions.

Regarding the second research gap, Contribution 9 investigated an important factor that could potentially contribute to learner engagement and motivation during flexible education—the quality of the learning environment. The presented study used regression models to explore the relationship between students' perception of learning environments and their engagement during school closures due to the global pandemic. The results showed that teaching and social interaction in the learning environment had positive effects on learners' cognitive and emotional engagement. The ease of technology use had a positive effect on emotional engagement, and family learning presence had a positive effect on behavioural engagement. Emotional and cognitive engagement also indirectly

affected behavioural engagement. Valuable guidelines are provided for teachers and parents to design effective flexible education to enhance K-12 students' learning engagement. Furthermore, Contribution 2 and Contribution 6 also provided some suggestions regarding how to enhance learner engagement and motivation from both technological and pedagogical perspectives.

Thirdly, social interaction and learning community building in flexible education could be challenging. Social media has the potential to enhance social interactions and build a sense of community in flexible education. By providing a platform for communication and collaboration, social media can enable learners to connect with each other and engage in meaningful discussions, thus fostering a sense of community and enhancing social interactions. Additionally, social media facilitates sharing resources, ideas, and feedback, further enhancing learning outcomes. Contribution 2 brought some interesting insights regarding the potential of using social media for flexible education from the learners' perspectives. Furthermore, enhancing social interaction and learning community building can also be carried out offline. In this new normal era, many institutions have been transitioning back to blended learning to make flexible education more sustainable. Learners' feedback regarding this transition and the authors' experience of adapting to such a transition are shared with valuable suggestions to practitioners (Contribution 5; Contribution 7).

Fourthly, there is strong evidence of effectiveness regarding the practice of flexible education, which has been reported in the articles of this Special Issue. Among these articles, Contribution 3 presented a study evaluating flexible education by academics in the higher education setting, which was a new perspective that had often been overlooked. A mixed research method involving a questionnaire survey and focus group interview was used to collect feedback on delivering synchronous hybrid instructions to both in-person and remote learners. The results showed that academics felt technically prepared but reported lower levels of interaction, engagement, and motivation from learners, especially remote learners. The suggestions for improvement ranged from technological support to professional development for enhancing interaction, communication, and learner engagement. Contribution 6 also provided some important insights regarding how flexible education could be designed and evaluated for different types of learners with various learning styles. We agree with the authors that learners' learning styles should be better discussed and considered in the future research on flexible education.

Lastly, the accessibility, equity, and support of learners and practitioners in flexible education cover numerous important topics, which need further exploration. Contribution 10 summarised the roles of practitioners and the support they need when using the technologies for flexible education by analysing 84 relevant publications on hybrid and flexible learning published between 2013 and 2022. The impact of institutional support on the effective implementation of flexible education is highlighted. We encourage future studies to explore other aspects under this umbrella of topics.

As the field of flexible education continues to evolve, it is obvious that there are numerous research gaps and opportunities for further exploration. While the articles included in this Special Issue contribute significantly to our understanding of this topic, it is necessary to recognise that they cannot fully address all the research gaps in this area. However, the approaches and methods used in these studies, as well as the findings and discussions presented, can serve as a valuable starting point for future research. By building on the insights gained from this Special Issue, researchers can continue to identify new and innovative approaches to make flexible education more accessible, engaging, effective, and sustainable.

List of Contributions.

1. Kim, J.; Lee, C.; Jeong, M.; Cho, E.; Lee, Y. Identifying Optimal Approaches for Sustainable Maritime Education and Training: Addressing Technological, Environmental, and Epidemiological Challenges.
2. Černá, M.; Borkovcová, A. Acceptance of Social Media for Study Purposes—A Longitudinal Case Study.

3. Li, K.C.; Wong, B.T.M.; Kwan, R.; Chan, H.T.; Wu, M.M.F.; Cheung, S.K.S. Evaluation of Hybrid Learning and Teaching Practices: The Perspective of Academics.
4. Wang, K.; Liu, P.; Zhang, J.; Zhong, J.; Luo, X.; Huang, J.; Zheng, Y. Effects of Digital Game-Based Learning on Students' Cyber Wellness Literacy, Learning Motivations, and Engagement.
5. Simonova, I.; Faltynkova, L.; Kostolanyova, K. New Blended Learning Enriched after the COVID-19 Experience? Students' Opinions.
6. Wang, H.; Huang, T.; Zhao, Y.; Hu, S. The Impact of Dashboard Feedback Type on Learning Effectiveness, Focusing on Learner Differences.
7. Kostolanyova, K.; Cirus, L.; Javorcik, T.; Simonova, I. A New Concept of the Informatics Curriculum in the Czech Republic: Teacher Reflection on the First Year of the Transition Period.
8. Huang, W.; Li, X.; Shang, J. Gamified Project-Based Learning: A Systematic Review of the Research Landscape.
9. Ma, Y.; Zuo, M.; Yan, Y.; Wang, K.; Luo, H. How Do K–12 Students' Perceptions of Online Learning Environments Affect Their Online Learning Engagement? Evidence from China's COVID-19 School Closure Period.
10. Wong, B.T.M.; Li, K.C.; Chan, H.T.; Cheung, S.K.S. HyFlex Learning Research and Practice: A Longitudinal Analysis.
11. Zhu, S.; Guo, Q.; Yang, H.H. Beyond the Traditional: A Systematic Review of Digital Game-Based Assessment for Students' Knowledge, Skills, and Affections.

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