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Macro-trends Analysis of Technologies and Practices Affecting the Higher Education Teaching and Learning in the Future

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Abstract

In order to propel the transformation and sustainable development of higher education, EDUCAUSE published the report of 2020 EDUCAUSE Horizon ReportTM (Teaching and Learning Edition) in March 2020. A section of the report describes current and future trends affecting global higher education teaching and learning from a technological perspective; it also provides a detailed introduction to emerging technologies and practices that will significantly impact the future of higher education through Artificial Intelligence/Machine Learning. Based on the interpretation of the core contents of the report, the study would provide some hints and suggestions for reform and development of higher education, especially in the area of web-based teaching and learning practice and effective utilization of technologies in the pandemic situation of novel coronavirus pneumonia (NCP) prevention and control.

Keywords

Horizon Report; Higher Education; Technology Adoption; Artificial Intelligence Education.

1. Introduction of 2020 EDUCAUSE Horizon Report™

2020 EDUCAUSE Horizon Report™ (Teaching and Learning Edition) was released on the EDUCAUSE website on March 2, 2020 [1], which uses a new Delphi and Foresight approach to summarize the key trends [2], emerging technologies, and practices most likely to influence global higher education teaching and learning, forecast the future direction and scenarios of higher education teaching and learning, and invite nine experts to comment on the report's key The findings have been reflected upon.

The report will inform higher education decision makers and help learners, faculty, and leaders to think deeply about the current state of technology used in higher education and the future path of change. This paper will analyze and reflect on the two parts of the report, namely "Trends Affecting Global Higher Education Teaching and Learning" and "Emerging Technologies and Practices Affecting the Future Development of Higher Education".

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2. Technology Trends Affecting the Development of Higher Education Teaching and Learning

2.1. Three Major Trends in Instructional Technology for Higher Education Learning

The first part of the report describes fifteen current and future trends affecting higher education teaching and learning worldwide from five perspectives: social, technological, economic, higher education itself, and political. Among these, the technological trends include the applications of artificial intelligence technology, next-generation digital learning environments, and analytics and privacy issues. In response to this trend, **Table 1** summarises the three major trends in technology from the expected impact and evidence.

Table 1. Three major trends in instructional technology in higher education

Trend	Expected Impact	Evidence
Applications of Artificial Intelligence Technology	Artificial intelligence is being used in educational services and curriculum design, with an increasing number of human instructors using it to provide feedback on student work and improve their own productivity through "virtual teaching assistants". Artificial intelligence can also be used to refine language translation and facilitate learning for students with visual or hearing impairments.	Amazon has released the Alexa Education Skills API, which enables Alexa to respond to questions such as "How well did Alexa, XX perform on the math test?" and so on to respond to queries.
Next-generation digital learning environments	Next-generation digital learning environments are transforming the way institutions build learning ecosystems for students and faculty, and educational technology applications increasingly require open standards to provide more synchronous or asynchronous and flexible learning experiences for students, prompting teachers and students to break free from the rules and rethink and optimize their approach to education.	A growing number of colleges and universities are now using learning tool interoperability specifications developed by the Global IMS. The University of Wisconsin has associated the Blackboard platform with its open-source online learning management system, resulting in a systematic learning system.
Analysis and privacy issues	Higher education institutions will continue to invest billions of dollars in enhancing their analytics capabilities, but it also raises several issues, such as the invasion of student privacy. As a result, universities need to be more proactive in protecting faculty and student data and be more cautious about exchanging data with other organizations, vendors, governments, etc.	The European Union implemented the General Data Protection Regulation (GDPR) in 2018, China is also starting a system called "social credit", and Google estimates that the number of users of its Google Apps for Education will reach 110 million by 2020.

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2.2. Emerging Technologies and Practices Affecting the Future of Higher Education

The second part of the report details six emerging technologies and practices that will significantly impact the future of higher education. This paper focuses on the analysis of the second one: Artificial Intelligence/Machine Learning.

- **Artificial Intelligence/Machine Learning**

Machine Learning (ML) refers to teaching machines to learn something without programming, and the basic idea is that machines learn through a repetitive process [3]. Artificial Intelligence (AI) attempts to create machines that can do things that previously could only be done through human cognition [4]. Artificial intelligence is thus machine learning in a generic sense, i.e., machines performing tasks intelligently. Currently, the higher education sector has begun to use AI to improve educational efficiency, for example, Learning Management Systems (LMS), Student Information Systems (SIS) etc.

The educational application of artificial intelligence helps to realize intelligent management. Artificial intelligence chatbots currently serve many universities, making life easier for students and faculty by "extending" the system's working hours. The University of Oklahoma Libraries developed *Bizzy* (a smart chatbot) in 2018 to support students and faculty in conducting research [5], and Alexa Skill, an intelligent application developed by the University, can answer common library questions from students and faculty during non-working hours. In addition, the Online Computer Library Center (OCLC), in collaboration with 70 librarians and experts from various organizations, designed and developed a product called "Responsible Operations". The product is visually presented and designed to track people's engagement with library services through machine learning and artificial intelligence.

It is important to note that although AI and machine learning are costly, it has a high practical value. As an example, the AI chatbots mentioned in the above case study, although their development process requires a large investment of human, material and financial resources, practice shows that these chatbots can indeed bring great convenience to university students and faculty, meeting their needs all the time (24 hours / seven days / 365 days) [5].

- **Assessment of the impact of emerging technologies and practices**

This section aims to explore the impact of emerging technologies and practices on institutions of different sizes and types around the world. Panellists were invited to evaluate each technology or practice on five dimensions: cost, faculty acceptance, riskiness, positive impact on learning, and level of support for equity and inclusion. The specific results are shown in **Figure 1**. From the figure, it is not hard to summarize that (a) AI/ML is more expensive; (b) Teachers are less receptive to AI/ML; (c) AI/ML is riskier; (d) AI/ML has a relatively small positive impact on learning; (e) AI/ML is less supportive of equality and inclusion; etc.

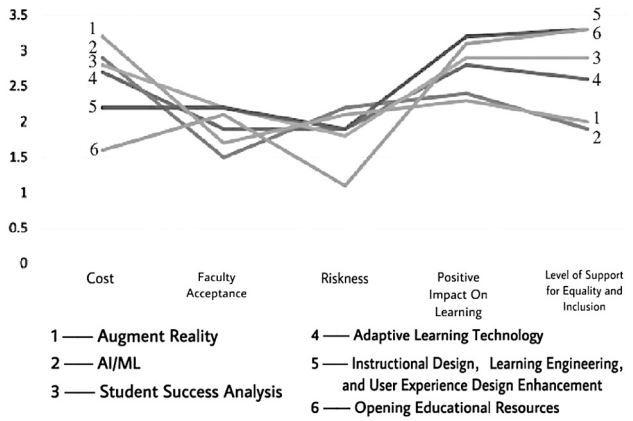

Figure 1. Results of the six emerging technologies and practice impact assessments [5]

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3. Reflections and Implications of the Epidemic

The COVID-19 epidemic since the beginning of 2020 has instantly changed the deeply rooted traditional pedagogical model of Chinese higher education, significantly boosted the pace of online teaching and learning practices in China and accelerated the trend of change in higher education in China and around the world. In this particular context, the release of the *2020 EDUCAUSE Horizon Report (Teaching and Learning Edition)* can give us a clearer picture of the new trend of global higher education change, and many questions are worth considering and responding to.

- Promoting changes in higher education teaching through online education.
- Rational use of artificial intelligence to improve the accuracy of higher education teaching and learning.
- Providing multiple safeguards to promote the sustainable development of open educational resources.

The future era is a time of change in which emerging technologies and teaching and learning are deeply integrated and innovative, especially in the face of the epidemic, higher education in all countries are facing enormous challenges and pressure for change. EDUCAUSE released the *2020 Horizon Report: Teaching and Learning Edition*, which points out some important trends and directions for the future development of global higher education, and the global spread of the new coronary pneumonia epidemic since 2020, perhaps will accelerate the arrival of these future trends [6]. Therefore, higher education researchers and practitioners should recognize the situation and face it positively. It is hoped that the interpretations and reflections in this paper can provide some reference for the reform and practice of higher education teaching.

3.1. The Epidemic has Given Rise to New Century MicroClass

MicroClass 1.0 is more of a classroom resource of about 25 minutes, edited and compressed from classroom teaching video resources. It was first born in 2003 during the SARS outbreak when most of China was shut down for about three months. The Chinese government launched the Air Classroom in an emergency, editing and processing the rich video resources accumulated over the past decade or so, and using TV channels to broadcast them for the whole country to help students and assist them in their home learning [7].

MicroClass 2.0, which emphasises professionals and speakers to explain in layman's terms, vividly and concisely around a specific knowledge content, is similar to Khan Academy's microlearning. For example, we are impressed by TED Talks, which can be very inspiring and are such a micro-lesson. It emphasises explaining a specific topic of knowledge in a clear and concise language in a short period [8]. When the epidemic came, society stopped, and schools closed. However, it is not student growth that we say has hit the pause button, it is the institutionalised, neat, and perhaps even rather dogmatic form of education that has been pushed. The innate growth and development of students does not stop there. Students grow back into their families, back into nature, back into society.

The children are directly confronted with the complexities of everyday life, and they learn through practice, through communication with their families, through hands-on experience and through the media how society as a whole is dealing with the epidemic. In the process, they gained a richer learning experience [8-9].

3.2. Students Will Move from Reactive to Autonomous Planning in the Post-epidemic Era

For students, the most important thing that online education in the context of the epidemic has proved, I'm afraid, is that students can learn through the Internet.

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Until today, although students have long been the main force in embracing the Internet, the Internet natives of the information age are at the same time a particularly guarded group for teachers and parents [9]. Even in the minds of many teachers and parents, the Internet is a flooding beast for students. Society as a whole has become accustomed to describing the Internet as the culprit, leading us to rely on it in our lives while avoiding it in our education. It's an absurd phenomenon, but it is a real reality in our education [10-11]. The epidemic is forcing us to start online education, and society as a whole is beginning to look at the pros and cons of online education.

3.3. How the Country has Moved from Local Adaptation to Equitable Individuality

In terms of online education in the context of the epidemic, on the one hand we can comfortably say that China has come to the forefront of the world in terms of online infrastructure. Although we still find from various sources that there are still many shortcomings in online education even in remote areas, rural areas and so on, in terms of overall work, our online education work, especially in terms of our online infrastructure, has been at the forefront.

But on the other hand, in terms of the actual needs of people, the educational resources provided by the government are still not enough [12-14]. Although we have a primary and secondary education network, including a cloud platform for primary and secondary education, it is still difficult for many schools to find the right resources. Therefore, the government needs to continue to strengthen the assistance for the weak groups in terms of resources, from the perspective of new infrastructure, and from the system, including subsidies for network costs, etc. Only with a holistic planning of Internet online education, the three-dimensional development can be improved rapidly and strongly in a short period of time.

For many years, most of people have stressed that reading is the simplest and most effective tool for advancing educational equity. If reading promotes educational equity by nurturing one's ability to learn from the inside out, then online education is actually about building an environment that promotes educational equity by helping people access more resources from the outside in [14]. In this way, the internet and reading, one from the inside and one from the outside, complement each other and promote each other to promote educational equity in the shortest possible time.Internet.

3.4. How Parents can Build a Good Parent-child Relationship

Families under the epidemic, precisely because of the increased time parents and children spend with each other, have instead led to many family tensions [15-16]. Data surveys show that the percentage of students who die by drowning or jumping to their death is much higher under homeschooling than before the epidemic.

This sad fact reflects a problem that we have to face: a large number of parents do not know how to communicate and express themselves properly with their children, nor do they know how to build a good Parent-child relationship with their children, nor do they know how to conduct effective family education [17]. In the Post-epidemic era, working from home may become a normal part of life for a significant proportion of parents. It can well-predicted that in the near future, and it won't even take long for more employees who are parents to enter such a state of life, these parents will have more time to spend with their children. So how to relate to children and how to grow up together with them is an important element for parents to learn in the Post-epidemic era.

To address this issue, whether in terms of the science of education, parents' own educational needs, or to start with the laws of student growth, parents first need a basic renewal and improvement of their philosophy of home education [18]. Keep in mind the saying that happiness is more important than success, and that adulthood is more important than success.

ISSN: 2688-8653

The goal of home education is to cultivate good habits in children, stimulate more interests in them, and assist them in building up their aspirations and exploring their potential [19]. So as parents, they should of course nurture our children's sense of competition and ability, but more importantly, we should show them that there is no one in the world, and that true success is not about overcoming others, but about overcoming oneself and having a greater ability to help others.

4. Summary

In the face of the global spread of the new pandemic, educators need to adapt and scale up educational solutions more quickly. In addition, educators are challenged to think about "how we can move beyond the impact of the new pandemic and build an education system that is responsive, adaptive, contributory, community connected and future-focused", which is the guiding question posed by the Future Learning Network. There is no doubt that online education is bound to be the future trend of education development. We have reason to believe that online education will effectively bridge the gap caused by the uneven distribution of educational resources and allow more people to enjoy quality educational resources.

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