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Research Report on
Digital Transformation of Higher Education Teaching and Learning

International Center for Higher Education Innovation under the auspices of UNESCO
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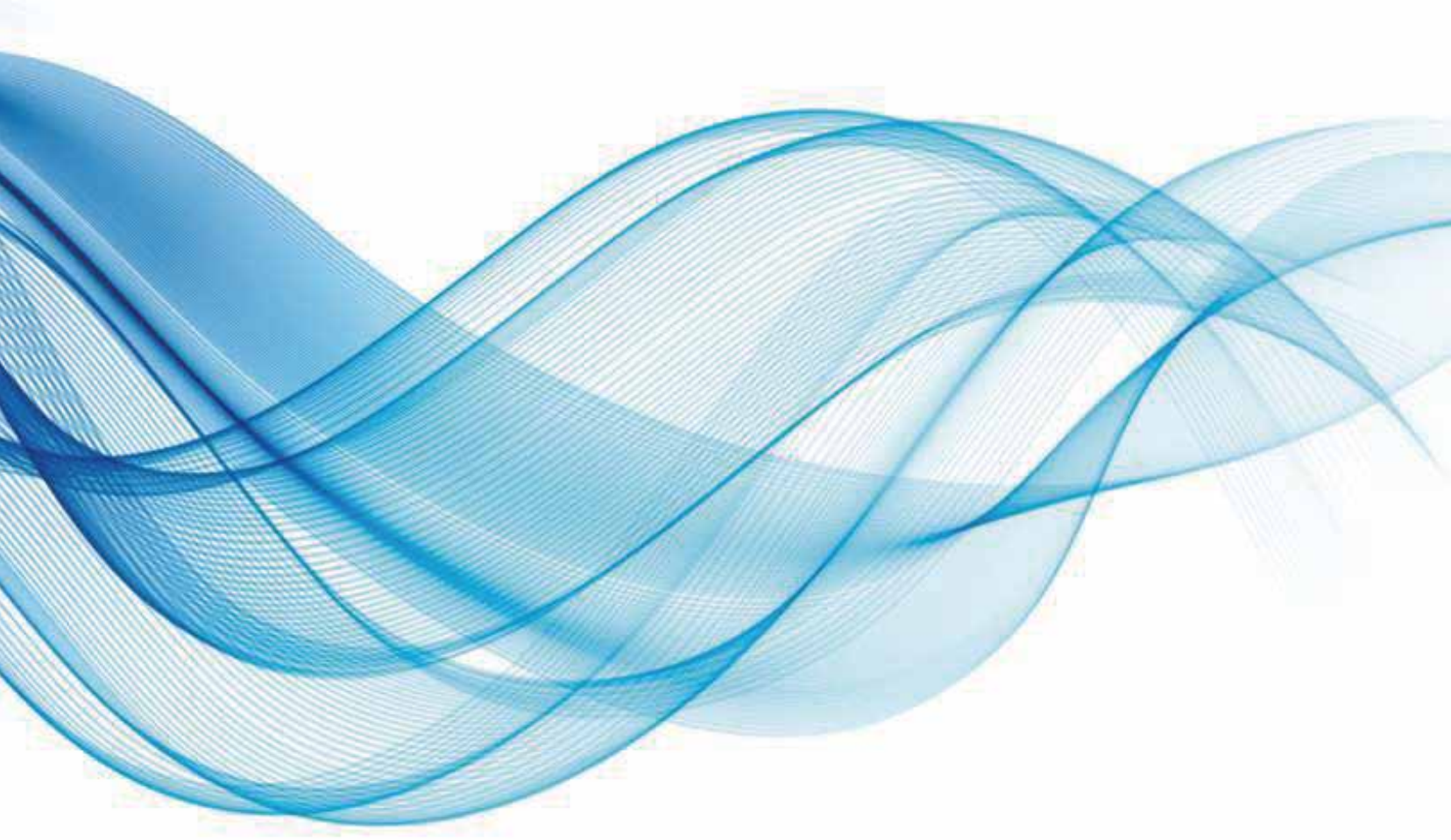
Executive Summary of Research Report on Digital Transformation of Higher Education Teaching and Learning



The increasing innovations of digital technologies have been transforming production, lifestyle and learning in an unprecedented way. Digital transformation has spread across global higher education under the impact of diverse factors. Policy makers, education practitioners, learners, researchers and other stakeholders have been actively responding to the trend of digital transformation of higher education teaching and learning. There is tremendous transformative potential in digital technologies, but countries still face huge challenges in promoting the digital transformation of higher education teaching and learning. The International Center for Higher Education Innovation under the auspices of UNESCO (UNESCO-ICHEI) and the Institute of Education (IOE) of Tsinghua University jointly prepared the report *Digital Transformation of Higher Education Teaching and Learning,* trying to introduce relevant concepts, ideas, methods, challenges, and possible solutions for international organizations, governments, HEIs, enterprises and other stakeholders to promote digital transformation of education.

Digital transformation of higher education teaching and learning: contents and framework

The digital transformation of higher education teaching and learning not only requires the application of digital technologies to education, but also advocates the deep integration of digital technologies and education, and the aim is to improve the operations, strategic directions and values of HEIs and develop new education systems adaptive to the digital age. The digital transformation of higher education involves changes in institution's space, operations, strategic directions, and values, as the digital age takes on different characteristic in this regard from the industrial age. In the process, students will have greater autonomy in their learning, course selection, ability acquisition and academic certification, and HEIs will develop a stronger social resource call via the Internet, which will ultimately revolutionize the traditional teaching models of higher education and create new models.

The report proposes a two-dimensional framework to describe the system structure and progression in the digital transformation of higher education teaching and learning, and elaborates on the future developments. A HEI is a complicated system that is formed by many elements including institutional policies, strategies and support, academic program approaches, curriculum development and delivery, teachers' professional competencies, learners and their learning, and teaching quality assurance systems. While these elements interact with each other, they are also subject to external factors such as society, politics, economy and technologies. The digital transformation of education is a gradual process where digital teaching and learning in educational institutions evolves from applying digital technologies to education to full digital transformation. Based on readiness in applying digital technologies to education, the digital transformation of education comprises three stages: integration of digital technologies and teaching, early transformation, and advanced transformation. **In the stage of integration of digital technologies and teaching,** where curriculum development and delivery will not be limited by time or space, the core elements such as teaching objectives, contents, activities, assessments, and environment will be reshaped and reorganized by the integration of physical and virtual spaces. At this stage, students will enjoy more flexible learning by blending online and offline methods and HEIs will expand Internet-based teaching to promote educational reform towards blended teaching. **In the stage of early transformation,** HEIs will gain access to external resources for curriculum development, such as those from other HEIs, relevant enterprises and social organizations. At this stage, HEIs will develop individualized curriculum designs with a flexible combination of course modules from different schools and academic programs to meet diverse needs of students. **In the stage of advanced transformation,** digital technologies will completely break boundaries between HEIs, enabling connectivity between HEIs, between HEIs and society, between HEIs and enterprises, and between HEIs and other stakeholders. By that time, the sharing of academic programs, curriculum, teachers, facilities, and services will become possible, and educational resources of the whole society will be fully utilized. The traditional ivory tower of HEIs will become history, and everyone will have access to appropriate educational resources in line with their individual needs, making education equity and sustainable development possible.

Analysis of essential components for the digital transformation of higher education teaching and learning

Higher education institutions: HEIs are the initiators and guarantors of the digital transformation of teaching and learning. It is necessary for HEI leaders, administrators, teachers, technicians, off-campus supportive parties to play an active role in the digital transformation, and systematically promote the digital transformation of essential components such as objectives and plans, organizational structure, policies and norms, supportive services, technical environment, personnel's digital competencies, and cultural atmosphere.

Academic Program Approaches: The objectives of the digital transformation of academic programs are to provide suitable talents for society and support more personalized development of students. The digital transformation of academic programs in HEIs are characterized as follows: training objective turns from specialists to interdisciplinary talents; academic programs move from isolation to integration; HEIs pursue collaborative development rather than independent growth; and programmatic and specialized accreditation turns from rigidity to flexibility. The digital transformation of academic programs needs to be promoted in terms of professional talent training schemes, teaching resources, environment and platform for academic program development, and experimental and practical teaching bases.

Curriculum development and delivery: The core of the digital transformation of higher education teaching and learning lies in curriculum development and delivery. The integration of digital technologies into curriculum development and delivery will greatly expand the connotation of curriculum

objectives, students, curriculum contents, instruction activities, learning evaluation and feedback, teachers and instruction environment, and their relationships will also be expanded in all dimensions. The whole process of gearing curriculum development towards the social demand for talents will be restructured. The instruction system becomes more open, complex, and dynamic, instruction contents, that is, knowledge generation and dissemination, more dynamic and mass-oriented, instruction scenes, greatly expanded in time and space, and instruction forms, more diversified and blended.

Teachers: As teachers play an essential role in teaching activities, they are the key to the digital transformation of higher education teaching and learning. In the digital era, new demands on teachers' professional competencies are reflected in four aspects: the awareness, literacy, competency of integrating digital technologies into teaching, and related research. The development of teachers' digital competencies requires the guidance of government departments, collaboration among social organizations, faculty training and development in HEIs, and self-empowering learning of teachers.

Learners: The ultimate objective of the digital transformation of higher education teaching and learning is to realize better learning and development of students in the digital age. As the development of various emerging technologies reconstruct students' learning and cognition, the digital transformation of industry highlights the importance of digital literacy in students' development objectives. It is necessary to create digital and adaptive learning context, provide diversified, intelligent and open educational resources, build open and socialized learning communities, and provide personalized and precise learning supportive services to meet the learning needs of students in the digital age.

Teaching quality assurance: Teaching quality is vital to the survival and development of higher education. In the digital age, the HEI teaching quality assurance system shifts its objectives from singleness to diversity, its function from rating to early warning, its contents from decentralization to integration, its coverage of evaluation standards from phased and one-sided to whole-process and all-rounded, its method from regular sample-based to normal and full-scale, and its process from closed loop to open one.

This report contains 11 cases from nine countries, including Malaysia, Egypt, Indonesia, Kazakhstan, Morocco, Peru, the Philippines, Serbia, and China. The cases show the efforts and achievements these countries have made in actively promoting the digital transformation of HEI teaching in terms of institutional policies, academic programs, curriculum development and delivery, teachers' professional competencies, students and their learning, demonstrating the arduous and long-term nature of the transformation.

Challenges and strategies in the digital transformation of higher education teaching and learning

In the future, promoting the digital transformation of higher education teaching and learning will be a long-term and gradual process. It is bound to face many challenges, such as the digital divide brought about by technological changes, the constraints imposed by existing HEI instruction system, intuition-based thus flawed instruction management and decision-making, narrow professional fields and lack of flexible credit and degree accreditation system, differentiated teaching limited by traditional class mode and curriculum system , teachers' lack of the practical competency to deliver innovative instruction with digital methods, students deficient in self-management competency for digital learning, confusion and choice dilemma brought by fragmented learning, and the difficulty of using existing educational theories to guide complex teaching practice in the digital age.

In face with the above challenges, it is necessary for the stakeholders of higher education teaching and learning to make concerted efforts and advance the digital shift systematically.

Strategies to deal with the digital divide brought by technologies: International organizations, governments, HEIs and enterprises need to make joint efforts to continuously build the infrastructure needed to digitally transform teaching, so as to ensure that higher education can provide every learner with equal technical resources and access to information and educational opportunities. It is also important to accommodate the differences in the popularity and usage habits of educational technologies and culture differences among different regions. Digital literacy should be regarded as one of the core skills in the 21st century. Special attentions should be paid to cultivate students' rationality, empathy, creativity, and critical thinking, so as to help them resist the risks in the digital society. The digital transformation should strive to ensure that the digital technologies, tools and platforms applied in the field of education develop in the direction of supporting human rights, improving human capabilities and promoting human dignity and humanistic spirit, so as to maintain the peaceful, just, and sustainable development of the digital society.

Strategies to deal with the limitations of current HEI instruction system. Higher education policy makers, relevant administrators of educational institutions, researchers, and practitioners need to remove the limitations of thought that "technologies in an industrial society empower education and teaching" and that "the digital transformation of education is only applied to the field of education". They should deeply understand the nature of the digitally transformed higher education system, as well as the relationships between higher education and other systems such as society, economy, politics, and technology. They should also jointly formulate the vision and path of such transformation that reflects the concerns of all parties, integrate resources and services in other fields of society in cyberspace, and promote the systematic transformation of higher education.

Remedies for intuition-based instruction management and decision-making: When promoting the digital transformation of teaching and learning, higher education policy makers and HEIs should consider multiple evidence sources and polish their competencies of evidence collection and analysis. The application of big data to instruction can not only help obtain teaching information in time but also facilitate the monitoring and

dynamic adjustment of the instruction process. Digitalization of instruction management is not merely a technical upgrade of management tools and means. Its key feature lies in that digital technologies are integrated into instruction management system to establish a continuous action system including information collection, analysis and conclusion-making, consultation and argumentation, planning and decision-making, implementation monitoring, feedback and adjustment.

Strategies to address narrow professional fields and lack of flexible credit and degree accreditation system: Government departments and HEIs need to work together to formulate policies and standards to reform the credit and degree accreditation system, and adopt technologies like blockchain to promote the adoption of micro-credentialing and micro-certificate across HEIs and disciplines, so as to establish a flexible credit and degree accreditation system. Learners can go beyond the limitations of the traditional degree system, and choose and create "their own disciplines" instead of being confined to a certain HEI or discipline. International organizations should work with governments and vigorously advocate an international credit and degree accreditation system.

Strategies to address differentiated teaching limited by traditional class mode and curriculum system: Teachers and instructional designers need to improve their data literacy and cultivate their competency in applying technologies to intelligent instruction environment. They should fully integrate big data, AI teaching assistants, and other technologies into the curriculum development and delivery process, expand instruction time and space, and realize accurate whole-process analysis of learners, accurate prediction of instruction results, and accurate regulation of instruction process, with a view to meeting personalized learning needs.

Strategies to address teachers' lack of competency to deliver innovative instruction with digital methods: The government should formulate standards over teachers' digital competencies and policies to promote such competencies. To that end, HEIs should build complete systems while social organizations can provide teachers with various resources. It is also beneficial to implement various digital competency development programs and carry out related certification. International organizations should advocate international and regional cooperation to develop online digital competency training programs (micro-credential, micro-degree, etc.), and work together to promote the continuous improvement of teachers' digital competency. Facing the impact of digital technologies, teachers should continue to innovate instruction ideas and improve digital competencies, and turn challenges into opportunities to reform traditional instruction and innovate future instruction.

Strategies to deal with students' deficiency in self-management competency for digital learning: HEI administrators should actively use digital technologies to provide support for students' independent development, such as using AI to establish prediction models that can identify employment and skills development trends, and thus helping them plan their future learning and development paths. The role of teachers should be transformed from imparting knowledge to offering academic guidance and career planning. Students should be fully self-motivated to avoid dependence on teachers and technologies.

Strategies to deal with confusion and choice dilemma brought by fragmented learning: HEI administrators, instructional designers and researchers should work together to sort out the disciplinary knowledge in higher education build an adaptive visual learning engine with function like disciplinary knowledge verification, integration and mapping navigation, solve the problem of knowledge fragmentation on the Internet, and thus support the transformation from fragmented learning to meaningful reconstruction of knowledge system.

Strategies to tackle the difficulty of using existing educational theories to guide complex teaching practice in the digital age: HEIs and researchers should change their "single-discipline and isolated" way of organizing scientific research. Instead, they should draw strength from multiple disciplines and regions and explore an effective online scientific research collaboration mechanism so as to jointly face and solve the new problems brought about by the digital transformation of teaching and learning. At the same time, attention should be paid to the data-driven evidence-based research paradigm, in order to produce new ideas, new theories and new methods that lead the digital instruction practice.