ICOIE 2021

International Conference on
Open and Innovative Education

PROGRAMME & ABSTRACTS OF PAPERS

5–7 July, 2021

Organizer:

香港公開大學
THE OPEN UNIVERSITY OF HONG KONG

政府創辦·多元創新
Government established · Diversified and innovative

開放及創新教育研究所
Institute for Research in
Open and Innovative Education

Contents

The organizer reserves the right to amend the programme as and when necessary.

Message from the President, The Open University of Hong Kong

Prof. Paul Lam Kwan Sing
President
The Open University of Hong Kong

I am delighted to welcome you to the 2021 International Conference on Open and Innovative Education (ICOIE), organised by The Open University of Hong Kong (OUHK). This year's conference is the eighth in the series. With its success in previous years, ICOIE has provided a platform for the exchange of quality research, effective practices and well-formulated views on open and innovative education; facilitated networking and collaboration among researchers and educators in the fields of educational innovation and openness; and promoted open and innovative education to enhance educational quality and achievement. I am certain that this conference will continue to be a fruitful event for every participant.

The goals of ICOIE are in line with the mission of The OUHK. With more than 30 years of experience in offering open and flexible education, the University has evolved into a dynamic, modern institution which provides a broad range of programmes in face-to-face, distance, and blended learning modes for learners with diverse interests and needs. Our mission is to advance the delivery of education and offer students a satisfying learning experience through innovative teaching and educational technology in order to meet society's needs. As a key event of The OUHK, this conference demonstrates our endeavour to keep abreast of, and respond in a timely manner to, the latest educational developments.

As in the past, ICOIE 2021 covers a wide array of areas related to open and innovative education. In particular, the conference's keynote addresses focus on learning analytics and STEAM education, which have undergone substantial development and had a strong impact. Learning analytics have been playing an increasingly significant role in education at all levels, in terms of facilitating the utilisation of student learning data to summarise trends, make predictions, conduct interventions and inform policy formulation. STEAM education – the disciplinary integration of science, technology, engineering, arts, and mathematics – has also become a prominent global trend in education and has been recognised as conducive to developing learners' 21st century skills. In addition, this conference features a forum on the challenges and future development of open and online learning. With the increasing adoption of online channels for teaching and learning, particularly during the COVID-19 pandemic, we as education providers are obligated to seek ways to help students learn more efficiently and effectively through these channels. I am sure you will gain fruitful insights and have valuable academic exchanges in these important areas through participating in these conference activities.

I would like to express my gratitude to the Hong Kong Pei Hua Education Foundation and the Wu Jieh Yee Charitable Foundation for their generous sponsorships for this conference and its delegates, as in previous years. I hope that this valuable support will continue in future, and that more grants will be received from other funding bodies for our delegates.

Finally, I would also like to thank the ICOIE 2021 Organising Committee for its efforts to make this conference a great success. I thank you for participating and wish you a rewarding and enjoyable experience in the conference.

Message from the Chair, Conference Organizing Committee

Dr Kam Cheong Li
Chair
Conference Organizing Committee

COVID-19 has highlighted the importance of using technology and innovative teaching to deal with the challenges in education. Even after the pandemic subsides, it is envisaged that many good practices devised and implemented during it will continue and become an integral part of our delivery of education. In this regard, ICOIE 2021 serves as an ideal venue for sharing research and practices which help to advance our teaching and learning.

Although ICOIE 2021 has a virtual format in respond to the pandemic, we have received a comparable number of submissions to previous years, and about 90 papers by authors from 20 countries or regions have been accepted after a rigorous review process. This year, the topics cover a range of important aspects of open and innovative education, such as academic/learning analytics, artificial intelligence in education, open educational resources, and the impact of COVID-19 on teaching and learning. To recognise outstanding contributions, this conference will continue as in previous years to present the Best and Excellent Paper Awards as well as the Student Paper Awards.

In this conference, we are honoured to have distinguished scholars to deliver keynote speeches on learning analytics and STEAM education. They include Professor Dirk Ifenthaler from the University of Mannheim and Curtin University; Professor Bart Rienties from the Open University, UK; Professor Sanna Järvelä from the University of Oulu; Professor Yeping Li from the Texas A&M University; and Professor Gwo-Jen Hwang from Taiwan University of Science and Technology. I am sure we will gain many insights from their thoughts.

This conference also features a discussion forum on open and online learning. Three international experts – Professor Alan Tait from the Open University, UK; Professor Melinda dela Peña Bandalaria from the University of the Philippines Open University; and Professor Kandarpa Das from the Krishna Kanta Handiqui State Open University – will take part and address the challenges and ways forward for open and online learning. Their academic exchanges in the forum will certainly be highly illuminating and enlightening.

Although we cannot get together physically this year, to facilitate networking and academic exchanges, some of the breaks between conference sessions have been extended and in them theme-based discussion chatrooms will be provided. You are most welcome to participate in them.

I take this opportunity to give sincere gratitude to the President and Provost of The OUHK for their support and encouragement. Their leadership has always been a great asset for the success of this conference. My thanks also go to the Organising Committee, Programme Committee, and colleagues in the Research Office and Educational Technology and Development Unit for the time and effort they have devoted to this conference. I hope that you find this conference stimulating and fruitful.

Committees

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Programme Committee

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	Billy T M WONG	The Open University of Hong Kong
	Tsuneo YAMADA	The Open University of Japan

About the Conference

Openness and innovation are major trends in contemporary education, influencing the whole spectrum of education institutions across the globe. Technological advancement and breakthroughs are bringing about a paradigm shift in contemporary education. Modes of learning and teaching are becoming more open and innovative in terms of time, space, curriculum contents, organization, pedagogical methods, infrastructure and requirements. These changes take place in all institutions offering conventional, online and/or open courses. With this background, The OUHK organizes this annual conference series with the following aims to:

- provide a platform for sharing quality research, effective practices and well-formulated views relevant to open and innovative education;

- facilitate networking and cross-institutional collaboration among researchers and educators in fields of educational innovation and/or openness; and

- promote studies and advancements open and innovative education.

Themes of conference papers include the following:
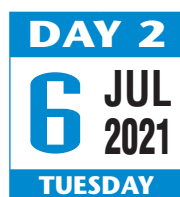
1. Academic/learning analytics;

2. Artificial intelligence in education;

3. Engaging students and learning design;

4. Impacts of pandemic on online learning

5. Innovations in curriculum development;

6. Innovations in educational technology;

7. Mobile and ubiquitous learning;

8. Open education;

9. Open educational resources and MOOCs;

10. Pedagogical innovations;

11. Social media and technology-mediated learning communities;

12. STEAM education;

13. Technology-enabled student advising;

14. Virtual reality/augmented reality in education; and

15. Other topics relevant to the conference.

Programme
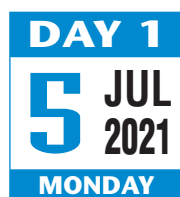
14:00–14:15 Opening Ceremony

Welcoming Remarks
Prof. Paul Lam
President
The Open University of Hong Kong

Opening Address
Dr Kam Cheong Li
Chair
Organizing Committee

14:15–15:15 Keynote Session I
Drivers for Successful Adoption of Learning Analytics

Speaker
Prof. Dirk Ifenthaler
Professor and Chair of Learning, Design and Technology
University of Mannheim
UNESCO Deputy Chair of Data Science in Higher Education Learning and Teaching
Curtin University
Please refer to p.14 for details.

15:15–15:45 Networking (15:20–15:40)

15:45–16:45 Parallel Paper Presentation Session I
Please refer to p.9 for details.

16:45–17:45 Keynote Session II
Implementing Learning Analytics and Learning design@scale. What have we Learned a Decade of Research and Practice of Big and Small Data at OU UK?

Speaker
Prof. Bart Rienties
Professor in Learning Analytics
Institute of Educational Technology
Open University UK
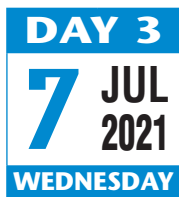*Please refer to p.15 for details.*

Programme

DAY 2 **6 JUL 2021** **TUESDAY**	09:30–10:30	Parallel Paper Presentation Session II *Please refer to p.10 for details.*
	10:30–11:20	Networking (10:35–11:15)
	11:20–12:20	Keynote Session III **Global Trends and Hot Topics in STEM Education** Speaker **Prof. Yeping Li** Professor Department of Teaching, Learning, and Culture Texas A&M University *Please refer to p.16 for details.*
	12:20–13:20	Break
	13:20–14:20	Parallel Paper Presentation Session III *Please refer to p.11 for details.*
	14:20–14:25	Break
	14:25–15:55	Forum **Flexibility in Open and Online Learning: Challenges and Ways Forward** Forum Facilitator **Dr Kam Cheong Li** Chair Organizing Committee Speakers **Prof. Alan Tait** Emeritus Professor of Distance Education and Development Open University UK **Prof. Melinda dela Peña Bandalaria** Chancellor and Professor University of the Philippines Open University; President, Asian Association of Open Universities (2017–2019) **Prof. Kandarpa Das** Vice Chancellor Krishna Kanta Handiqui State Open University *Please refer to p.19 for details.*
	15:55–16:00	Break
	16:00–17:00	Parallel Paper Presentation Session IV *Please refer to p.12 for details.*
	17:00–18:00	Keynote Session IV **Approaches to Conducting STEM Research in the Mobile Era** Speaker **Prof. Gwo-Jen Hwang** Chair Professor Graduate Institute of Digital Learning and Education Taiwan University of Science and Technology *Please refer to p.17 for details.*

Symposium on STEAM Education

▨   *Highlighted sessions are also part of Symposium on STEAM Education.*

Programme

DAY 3
7 JUL 2021
WEDNESDAY

09:30–10:30	Parallel Paper Presentation Session V *Please refer to p.13 for details.*
10:30–11:00	Networking (10:35–10:55)
11:00–12:00	Keynote Session V **Implementing Multimodal Data and Learning Process Analytics to Optimize Collaborative Learning** Speaker **Prof. Sanna Järvelä** Professor Learning and Educational Technology Research Unit Department of Educational Sciences University of Oulu *Please refer to p.18 for details.*
12:00–12:30	Closing Ceremony Announcement of Paper Award Results **Dr Kam Cheong Li** Chair Organizing Committee Closing Remarks **Prof. Reggie Kwan** Provost The Open University of Hong Kong Closing Address **Dr Eva Tsang** Vice-chair Organizing Committee

Parallel Paper Presentation Session I

Room 1	Room 2	Room 3 (Student Paper Presentation Session)
Virtual reality/augmented reality in education	**Engaging students and learning design**	**Academic/Learning analytics**
OXREF: Open Extended Reality for Education Framework **Ishan Sudeera Abeywarde** University of Waterloo p.59	**Design for Blended Learning in Distance Education via the Moodle Platform** **Yuehui Zhong, Huiping Fu, Zhicheng Gan and Quan Zhou** The Open University of China p.28	**Research on Personalized Learning Intervention Based on a Collaborative Filtering Algorithm and Knowledge Map** **Yingge Zhou , Ruofan Wang, Yirong Yao, Xindong Ye and Changlei Gao** Wenzhou University p.23
Design and Realization of Virtual Simulation Experiments in Engineering Distance Education **Zhixiang Li** The Open University of China **Yu Fu** Inner Mongolia Open University p.60	**Can Rubrics Actualize Assessment for Learning? Perspectives from Students and Educators** **Doris Yin Kei Chong** The Open University of Hong Kong p.29	**Innovations in educational technology**
		A Comparison of Experienced K-12 Administrators' and Teachers' Attitude and Perception Towards One-to-one Digital Learning **Xiaoqing Zhou and Jianli Jiao** South China Normal University **Chunqing Zhan** Guangdong Academy of Education p.46
Innovations in curriculum development	**Promoting Student Engagement Through Publication for the Community** **Ji Lian Yap** Singapore University of Social Sciences p.31	**Virtual reality/augmented reality in education**
The Business Digitalization Track: An Industry-in-Curriculum Approach **Henry Koh Chee Eng, Shee Chee Lim, Nikki Ng Yen Cheng and Heng Kiong Yap** Ngee Ann Polytechnic p.42		**Influence of Virtual Reality Fidelity on Oral English Learners' Learning in Different Cognitive Styles** **Ruofan Wang, Yingge Zhou, Yirong Yao and Xindong Ye** Wenzhou University p.59
Blended Learning as an Innovative Modality for Communication Theology: Assessing Achievement and Motivation **Irudayaselvam Stanislaus** University of the Philippines p.43	**Artificial intelligence in education**	
	Application of Data-Stream Processing in Smart Education **Yidan Wang, Wei Yuan and Xin Wang** The Open University of China p.27	

Parallel Paper Presentation Session II

Room 1	Room 2	Room 3	Room 4 (Student Paper Presentation Session)
Academic/ Learning analytics	Impacts of pandemic on online learning	Impacts of pandemic on online learning	Engaging students and learning design
How to Integrate ICT into a Class: Video Analysis of 229 Excellent School Classes from Beijing **Jiyou Jia** Peking University p.24	**Evaluation of Hybrid Teaching Effectiveness: Feedback from Academics** **Billy Tak Ming Wong, Reggie Kwan, Kam Cheong Li and Manfred Man Fat Wu** The Open University of Hong Kong p.41	**Education in the New Normal: University of the Philippines Los Baños Students' Readiness for Remote Learning** **Beverly R. Pabro and Maria Ana T. Quimbo** University of the Philippines Los Baños p.38	**Research on Social Presence in Chinese Language MOOCs from the Perspective of Facilitators** **Wang Chenxin** Shanghai International Studies University p.28
Learner Support Services in Online Learning: Strategy Design Based on Learner Personas **Jun Xiao** Shanghai Open University **Xuejiao Li** East China University of Science and Technology **Zhujun Jiang** Shanghai Normal University p.25	**Gamification and Effectiveness of Different Digital Teaching and Learning Tools used in Online Tertiary Education Classrooms during the Pandemic** **Sumie Chan** The Hong Kong University of Science and Technology **Noble Lo** The Hong Kong Polytechnic University p.38	**Online Exams in Online Distance Education: Current Practices, Challenges and Solutions** **Recep Okur, Hasan Ucar and Erdem Erdogdu** Anadolu University p.36	**Transferring the Physical into Digital to Extend the Reach of Museum Access** **Ruobin He, Elicia Lanham and Guy Wood-Bradley** Deakin University p.29
A Novel Online Autonomous Learning Path Analysis by Eye-tracking: An Empirical Study **Su Mu and Meng Cui** South China Normal University **Xiaodi Huang** Charles Strut University p.26	**E-learning Practices in the Pre-pandemic Phase: Impacts on the Teaching Practices in Higher Education in the Macau SAR** **Ana Sofia Nogueira** Macao Polytechnic Institute & University of Science and Technology of Macao **Lina Morgado** Universidade Aberta p.39	**Should I Complete My Degree Online? Perspectives of International Students During the COVID-19 Pandemic** **Luis M. Dos Santos** Woosong University **Ching Ting Tany Kwee** The University of New South Wales p.37	**Pedagogical innovations** **The Effect of the Engineering Integrated Science Curricula on Elementary Students' Learning Performance** **Qi Si and Jing Leng** East China Normal University **Feng-Kuang Chiang** Shanghai Normal University p.56
Using Random Forest to Examine the Relationship between Student Reading Competencies and ICT-related Factors **Wenting Weng and Seoyeon Park** Texas A&M University p.22	**Open Education** **Study on How Change in Carbon Footprint of Online Education in China under COVID-19 Epidemic Conditions Impacts Sustainable Development** **Tingting Zhao and Rongrong Fan** The Open University of China **Peng Yue** Zhangjiakou Radio and Television University **Shuai Li** Open University of Sichuan p.53	**Calm Amidst the Storm: Reflections and Predictions for Higher Education** **Dave Towey** University of Nottingham Ningbo China p.37	

Parallel Paper Presentation Session III

Room 1	Room 2	Room 3	Room 4
Engaging students and learning design	**Engaging students and learning design**	**Academic/ Learning analytics**	**Academic/ Learning analytics**
Evaluating Expectations and Engagement with Emergency Remote Teaching: A Cross-faculty Case Study of a Sino-British University **Derek Irwin, Amarpreet Gill, Lauren Knowles, David Krygier, Chiew-Foong Kwong, Matthew Pike, Dave Towey and James Walker** University of Nottingham Ningbo China p.32	Creativity During the Coronvirus Pandemic: Inspiring Language Learning at University During Lockdown **Peter Carter** Kyushu Sangyo University p.30	Multilevel Structural Equation Modelling for the Relationships Among ICT-related Factors, Country Economic Indices, and Student Academic Achievement **Seoyeon Park and Wenting Weng** Texas A&M University p.22	Research on a Personalized Recommendation of MOOC Resources Based on Ontology **Yuanmin Li, Zehui Zhan, and Xitian Yi** South China Normal University **Dexin Chen** Hubei University p.25
Student Mentorship Programmes: Students as the Real Teachers? **Dave Towey and Matthew Pike** University of Nottingham Ningbo China **Zhiye Chen** Fu Jen Catholic University p.33	Enhancing Architecture Students' Engagement Through Gamification **Maycon Sedrez, Amarpreet Gill, Xinwei Wang, Xuan Sun, Kexin Hu, Sihui Shen, Ao Cheng, Yichen Xia, Zhihaun Liu and Xiaohao Zhang** University of Nottingham Ningbo China p.30	Preparing SQA Professionals: Metamorphic Relation Patterns, Exploration, and Testing for Big Data **Zhihao Ying, Dave Towey, and Anthony Bellotti** University of Nottingham Ningbo China **Zhi Quan Zhou** University of Wollongong **Tsong Yueh Chen** Swinburne University of Technology p.23	**Engaging students and learning design** Multilevel Challenges in Learning Design: An Investigation of Novice Learning Designer Teams **Daisy Chen, Leming Liang and Nancy Law** The University of Hong Kong p.35
Transformation of Design Education: Adaptation to Hybrid Classrooms During the Pandemic **Chung Yin Yu, Ah Pun Chan, Ki Lam, and Mei King Yang** Technological and Higher Education Institute, p.33	Peer Observation of Hybrid Teaching in a University **Chi Wai Patirck Lee** The Open University of Hong Kong p.34	An Investigation of Students' Engagement in Different Blended Learning Models **Zhang Rui, Zhai Miao, Qiu Hong, and Chen Jie** TongJi University p.24	**STEAM education** The Integration of WSQ Knowledge Constructing Approach for Supporting Students' STEM Science Learning **Shu-Hao Wu and Chin-Chung Tsai** Taiwan Normal University p.57
Language Learning by Synchronous CMC: A Study in Japan **Yoko Hirata and Yoshihiro Hirata** Hokkai-Gakuen University p.32		**STEAM education** Confidence in Implementing Project-based Learning in STEM Education: Perspectives of Hong Kong In-service Teachers **Wing Shui Ng** The Open University of Hong Kong p.57	**Impacts of pandemic on online learning** Hidden under the Fog of Remote Teaching with Zoom: At-risk Student Detection in a Pandemic-impacted Course **Andrew Kwok Fai Lui and Sin Chun Ng** The Open University of Hong Kong p.40

DAY 2: 6 July 2021 (Tuesday), 16:00-17:00

Parallel Paper Presentation Session IV

Room 1	Room 2	Room 3	Room 4 (Student Paper Presentation Session)
Innovations in educational technology	Mobile and ubiquitous learning	Open education	Artificial intelligence in education
The Robots Will Rule: Improving Coursework Marking and Feedback Through an Automated System **Matthew Pike, Boon Giin Lee, and Dave Towey** University of Nottingham Ningbo China p.44	**Employees' Attitudes Towards Ubiquitous Library-supported Professional Learning: An Empirical Investigation in the Beauty Spa Industry** **Chun-Kuei Chen and Neng-Tang Norman Huang** Taiwan Normal University **Gwo-Jen Hwang** Taiwan University of Science and Technology p.47	**Bilibili Interactive Teaching Video — A Supplement to the Undergraduate Course on Operational Research** **Yuyang Zhou, Shuyan Zheng, Tongfei Li, Songpo Yang, and Jia He** Beijing University of Technology p.51	**Design and Implementation of an Intelligent Tutoring System in the View of Learner Autonomy** **Huixiao Le and Jiyou Jia** Peking Univeristy p.27
Understanding the Cybersickness Effects of Using Virtual Reality-based Classrooms for Undergraduate Students: A Preliminary Study **Sannia Mareta, Xin Mou, Holly Nelson, May Tan-Mullins, Joseph Manuel Thenara, and Rafael Rivero** University of Nottingham Ningbo China p.44	**A Case Study to Sustain Student Interest in Science General Education Subjects** **Kim Hung Lam, Po Yee Chung, Chau Ming Hin, Alex Wong, Chunghin Chui, Kai Pan Mark** The Hong Kong Polytechnic University p.47	**The Dilemmas of the Teaching Staff Construction of the Open University of China, Based on the Visualization Analysis of the Literature Indexed in CNKI** **Shu Qi** The Open University of China p.51	**Impacts of pandemic on online learning** **A Blended Physics Experiment Teaching Environment: What Do We Expect?** **Yuying Li, Chen Ni and Kai Fang** Tongji University p.36
A Pilot Study Investigating Students' Perception of a Virtual Classroom Environment in Higher Education **Sannia Mareta, Xin Mou, Amarpreet Gill, Gabrielle Saputra Hadian, Yilin Li, and Dave Towey** University of Nottingham Ningbo China p.45	**Podcasts as Metacognitive Prompts: A Case Study of Graduate Students' Metacognition Regarding Citations** **Gregory P. Thomas, Debbie Feisst and Virginia Pow** The University of Alberta p.48	**The Quality Evaluation Model of Learning Support Service for Open University, Based on Connectivism Theory** **Xu Ling** Jiangsu Open University p.53	
Technology-enabled Automation Process Improvement Framework (TEAPIF): A Case of Optimization and Efficiency at the University of Waterloo's Centre for Extended Learning **Jason Greatrex and Daspina Fefekos** University of Waterloo p.46		**Sendai Youth Leadership Program: A Community-initiated Open Education Program in Areas Affected by the 2011 East Japan Earthquake and Tsunami** **Chia-Huei Tseng** Tohoku University p.52	

Parallel Paper Presentation Session V

Room 1	Room 2	Room 3	Room 4 (Student Paper Presentation Session [Putonghua Session])
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Does Technology Matters? The Success of Accelerated Learning Tai Ming Wut, Ka Lok Wong and Artie Ng The Hong Kong Polytechnic University p.54	**Will I Continue Teaching Sustainable Development Online? An International Study of Teachers' Experiences During the COVID-19 Pandemic** Ching Ting Tany Kwee The University of New South Wales Luis M. Dos Santos Woosong University p.49	**How Online Learning Can Disrupt the Development of Students' Key Relationships in Higher Education** Isabel Hopwood University of Bristol p.34	**The Effects of Virtual Reality Fidelity and Social Anxiety on Oral English Learning** Yao Yirong, Yingge Zhou, Ruofan Wang, and Xiaozhi Li Wenzhou University, p.60
Research on College English Teaching from the Perspective of Ecological Linguistics Xueyu Sun Jiangsu Open University p.54	**The Exploration of Teaching Behaviours in a Mobile Learning Context** Ching-Leng Liu and Chiu-Lin Lai Taipei University of Education p.50	**Promoting EFL Students' Metacognition and Self-efficacy in Differentiated Instruction: A Self-regulated Flipped Learning Approach** Chih-Hung Chen and Dian-Jyun Shih Taichung University of Education p.35	**The Analysis of Scene Teaching Application Based on Augmented Reality** Fan Yuan and Weidong Chen Suzhou University of Science and Technology p.61
Embracing Digital Teaching and Learning: A Systematic Review of Innovation in Higher Education upon COVID-19 Edith M. Y. Yan BNU-HKBU United International College p.55 **Pedagogical Challenges in Online Learning: 'Maxiagogy' as a Transformative Panacea Owing to the COVID-19 Outbreak** Maximus Gorky Sembiring Universitas Terbuka p.55	**Constructing an IOS-based Adaptive Question Bank for English Grammar Tests** Wang Lei Peking University Wang Ting No. 1 High School of Liaoyang p.48	STEAM education **No Pain, No Gain: The Necessary Initial Struggles to Enable Doctoral Research Work** Yifan Zhang, Matthew Pike, and Dave Towey University of Nottingham Ningbo China p.58	Mobile and ubiquitous learning **Research on the Application of Interactive Narrative in Online Education** Wenshuo Ge and Weidong Chen Suzhou University of Science and Technology p.50

Prof. Dirk Ifenthaler

Professor and Chair of Learning,
Design and Technology
University of Mannheim

UNESCO Deputy Chair of Data Science in
Higher Education Learning and Teaching
Curtin University

Prof. Dirk Ifenthaler is Professor and Chair of Learning, Design and Technology at University of Mannheim, Germany and UNESCO Deputy Chair of Data Science in Higher Education Learning and Teaching at Curtin University, Australia. Prof. Ifenthaler's research focuses on the intersection of cognitive psychology, educational technology, data analytics, and organisational learning. His research outcomes include numerous co-authored books, book series, book chapters, journal articles, and international conference papers, as well as successful grant funding in Australia, Germany, and USA. He is the Editor-in-Chief of the Technology, Knowledge and Learning, Senior Editor of Journal of Applied Research in Higher Education, and Deputy Editor-in-Chief of International Journal of Learning Analytics and Artificial Intelligence for Education (www.ifenthaler.info • dirk@ifenthaler.info).

Keynote address

Drivers for Successful Adoption of Learning Analytics

Recent research focussing on the adoption of learning analytics reports high interest among educational organisations. At the same time, the maturity level of available organisation-wide learning analytics systems is still low, i.e., organisations are aware of learning analytics and start experimenting with dashboards for students and teachers, however, they are far from organisational transformation. Accordingly, learning analytics remains an interest for educational organisations rather than a major priority.

In this keynote speech, current research findings regarding the effectiveness of learning analytics are critically examined and implications for organisational change as well as pedagogical practice will be provided. Examples of actionable frameworks and adoption models for successful integration of learning analytics systems into educational organisations will be presented, and challenges encountered during the adoption of learning analytics in educational organisations will be highlighted.

Prof. Bart Rienties
Professor in Learning Analytics
Institute of Educational Technology
Open University UK

Prof. Bart Rienties is Professor of Learning Analytics and programme director of the learning analytics and learning design research programme at the Institute of Educational Technology at the Open University UK. As programme director he leads a group of academics who provide university-wide learning analytics and learning design solutions and conduct evidence-based research of how students and professionals learn. As educational psychologist, he conducts multi-disciplinary research on work-based and collaborative learning environments and focuses on the role of social interaction in learning, which is published in leading academic journals and books. His primary research interests are focussed on Learning Analytics, Professional Development, and the role of motivation in learning. Furthermore, Prof. Rienties is interested in broader internationalisation aspects of higher education. He has successfully led a range of institutional/national/European projects, and has received a range of awards for his educational innovation projects. He has published over 200 academic outputs, and is the 4th most cited author and contributor in Learning Analytics in the period 2011-2018 (Adeniji, 2019), the 5th most published author on internationalisation in the period 1900-2018 (Jing et al. 2020), the 7th most published author on social network analysis in social sciences in the period 1999-2018 (Su et al. 2020), and the 14th most published author on educational technology in the period 2015-2018 (West & Bodily, 2020).

Keynote address

Implementing Learning Analytics and Learning design@scale. What have we Learned a Decade of Research and Practice of Big and Small Data at OU UK

The Open University UK (OU) has been implementing learning analytics and learning design on a large scale since 2012. With its 170+ students and 4000+ teaching staff, the OU has been at the forefront of testing, implementing, and evaluating the impact of learning analytics and learning design on student outcome and retention. A range of reviews and scholarly repositories (e.g., Web of Science) indicate that the OU is the largest contributor to academic output in learning analytics and learning design in the world. However, despite the large uptake of learning analytics at the OU there are a range of complex issues in terms of buy-in from staff, data infrastructures, ethics and privacy, student engagement, and perhaps most importantly how to make sense of big and small data in a complex organisation like the OU. Our latest research for example shows that:

- Training of teachers to make sense of technology is essential, but non-linear

- Despite working harder and more, not all groups of learners are necessarily performing better over time

- What drives one learner to action by providing feedback may backfire for another learner

During this ICOIE 2021 keynote I would like to share some of my own reflections of how the OU has implemented learning analytics and learning design, and how these insights are helping towards a stronger evidence-base for data-informed change. Furthermore, by sharing some of the lessons learned from implementing learning analytics and learning design within the OU and other organisations we have worked with on a large scale I hope to provide some dos and don'ts in terms of how you might consider to use data in your own practice and context.

Prof. Yeping Li
Professor
Department of Teaching, Learning,
and Culture
Texas A&M University

Prof. Yeping Li is a Professor at the Department of Teaching, Learning, and Culture at Texas A&M University, USA. He was also named by Shanghai Municipal Education Commission as "Eastern Scholar" Chair Professor at Shanghai Normal University, China. His research interests include STEM education, mathematics education and teacher education. He is the founding editor-in-chief of the *International Journal of STEM Education* (#1 journal in STEM education research worldwide) and *Journal for STEM Education Research*, both published by Springer, and is also the editor of several monograph series including, *Advances in STEM Education* also published by Springer. In addition to publishing over 15 books and special journal issues, he has published more than 100 articles in topic areas that he is interested in. His work has been supported by various funding agencies, including the U.S. National Science Foundation and Spencer Foundation. He also organized and chaired many group sessions at various national and international professional conferences, such as the American Educational Research Association (AERA) annual meetings, the 10th International Congress on Mathematical Education (ICME-10) in 2004, ICME-11 (2008), ICME-12 (2012), and ICME-13 (2016). He received his Ph.D. in Cognitive Studies in Education from the University of Pittsburgh, USA.

Keynote address

Global Trends and Hot Topics in STEM Education

The emerging field of science, technology, engineering and mathematics (STEM, later also STEAM by adding "Arts", STREAM by adding "Reading") education presents some fascinating opportunities for transforming school education, not only due to the fact that STEM is important for students' learning now and in the future. Historically, STEM education as discipline-based education has long been in place with a focus on mathematics and science. Recent calls for a broader focus on STEM education have generated more and more interest in exploring and understanding different forms and approaches of this movement in many education systems. Correspondingly, research development in STEM education has experienced dramatic changes over the past decade, providing much-needed scholarship support to further STEM education within and across education systems. With the rapid increase in the number of scholarly publications on STEM education in recent years, knowing and understanding the status and trends in STEM education internationally support the development of the field. In this talk, I will first provide a review of research development in STEM education with surveys of journal publications in various scopes. The review then provides an empirical base for further discussion of global trends and hot topics in STEM education as presented in literature.

Prof. Gwo-Jen Hwang is currently a Chair Professor at the Taiwan University of Science and Technology. Prof. Hwang serves as an editorial board member and a reviewer for more than 30 academic journals of educational technology and e-learning. He is currently the Editor-in-Chief of *Australasian Journal of Educational Technology* (SSCI), *Computers & Education: Artificial Intelligence*, *International Journal of Mobile Learning and Organisation* (Scopus, Q1), and *Journal of Computers in Education* (Scopus, ESCI). He has also been the principal investigator of more than 100 research projects funded by "Ministry of Science and Technology" as well as "Ministry of Education" in Chinese Taiwan. His research interests include mobile and ubiquitous learning, flipped learning, digital game-based learning, and artificial intelligence in education.

Prof. Hwang has published more than 700 academic papers, including more than 350 journal papers and 350 conference papers. Among those publications, more than 250 papers are published in SSCI journals. Owing to the reputation in academic research and innovative inventions in e-learning, he received the annual most Outstanding Researcher Award from the "Science Council of Taiwan" in the years of 2007, 2010 and 2013. Moreover, in 2016, he was announced by Times Higher Education as being the most prolific and cited researcher in the world in the field of social sciences (https://www.timeshighereducation.com/news/ten-most-prolific-and-most-cited-researchers).

Prof. Gwo-Jen Hwang
Chair Professor
Graduate Institute of Digital Learning
and Education
Taiwan University of
Science and Technology

Keynote address

Approaches to Conducting STEM Research in the Mobile Era

STEM (science, technology, engineering, and mathematics) refers to the cross-disciplinary learning design for engaging students in applying integrated knowledge to complete a project or solve a complex problem. It has been recognized by many scholars for its educational significance. On the other hand, it is generally challenging for researchers and school teachers to design STEM research and tasks.

This talk aims to introduce the educational objectives and research trends of STEM as well as the methods for designing STEM research. In addition, several learning design approaches and measuring tools for STEM activities are presented as well. This talk will be of great value to researchers and school teachers who are interested in developing STEM research and applications.

Prof. Sanna Järvelä
Professor
Learning and Educational Technology
Research Unit
Department of Educational Sciences
University of Oulu

Prof. Sanna Järvelä is a professor in the field of learning and educational technology and one of the heads of the Learning and Educational Technology Research Unit (LET) in the Department of Educational Sciences, University of Oulu, Finland. Her main research interest deal with self-regulated learning and computer supported collaborative learning. Prof. Järvelä and her research group is internationally recognized in theoretical and methodological advancement of social aspects of self-regulated learning (socially shared regulation in learning) and processes oriented and multimodal research methods. She has published more than 180 scientific papers in international refereed journals and about 50 book chapters and three edited books. She is the co-Chief Editor in the *International Journal of Computer Supported Collaborative Learning* and invited member of the expert group of the OECD's PISA 2024 'Learning in the Digital World'. Prof. Järvelä is the member of the Finnish Academy of Science and Letters, the past EARLI (European Association for Research on Learning and Instruction) president.

Keynote address

Implementing Multimodal Data and Learning Process Analytics to Optimize Collaborative Learning

There is much interest to advance digital technologies into intelligent technologies supporting teaching, learning and education. Yet, many initial ideas, e.g., about artificial intelligence in education, still lack systematic understanding of human learning process. In this talk I leverage my long term self-regulated learning research, socially shared regulation in collaborative learning in specific, to intelligent learning technologies in order to understand and support better learning. In my research we have been implementing multimodal methods to identify when, how, and what makes regulation in collaborative learning functional.

I will introduce the theoretical progress in understanding socially shared regulation and discuss how our multidisciplinary research implementing various multimodal data channels, advanced analytics and instructional design help us to better understand and support regulation of collaborative learning.

Flexibility in Open and Online Learning: Challenges and Ways Forward

Forum Facilitator

Dr Kam Cheong Li
Chair
Organizing Committee

Forum Speakers

Prof. Alan Tait
Emeritus Professor of
Distance Education and Development
Open University UK

Professor Alan Tait is Emeritus Professor of Distance Education and Development at the Open University UK, and Fellow at the Centre for Distance Education, University of London. From 2013 – 2015 Professor Tait was Director of International Development and Teacher Education at the Open University; was Pro-Vice Chancellor (Academic) 2007 – 2012; and from 2004 – 2007 Dean of the Faculty of Education and Language Studies. He was Editor of the *European Journal of Distance and E Learning* (EURODL) 2005 – 2013, was from 1989-1998 Editor of the journal *Open Learning*, was President of the European Distance and E-Learning Network (EDEN) from 2007 – 2010, and Co-Director of the Cambridge International Conference on Open and Distance Learning (1988 – 2013). In 2012 Professor Tait was awarded an Honorary Doctorate by Moscow State University for Economics, Statistics and Informatics; appointed Visiting Senior Online Consultant at the Open University of China in 2013; and an Honorary Doctorate by the State University of New York in 2021. Professor Tait is founding Emeritus Editor of the Journal of Learning for Development (www.jl4d.org), produced from the Commonwealth of Learning; Visiting Professor, Amity University, India 2018 – 2019; Distinguished Visiting Professor Open University of Hong Kong 2015 – 2018; Visiting Professor at Aalborg University, Denmark 2012-2016; senior member of St Edmunds College, University of Cambridge, and transformation advisor for the Commonwealth of Learning at Botswana Open University 2011 – 2016. Professor Tait was Special Advisor to the International Council for Open and Distance Education (ICDE) 2018 – 2019, and has recently worked on the establishment of open universities in Botswana, Kazakhstan and Myanmar. Professor Tait is Chair of Trustees at Mind for Cambridgeshire, Peterborough and South Lincolnshire (https://www.cpslmind.org.uk).

Forum Speakers

Prof. Melinda dela Peña Bandalaria
Chancellor and Professor
University of the Philippines Open University

President
Asian Association of Open Universities
(2017–2019)

Professor Melinda dela Peña Bandalaria is a professor at the University of the Philippines Open University and is currently serving as its Chancellor since 2016. She also served as President of the Asian Association of Open Universities for the term 2017 – 2019 and continues to chair the Asian MOOCs Steering Committee. She has been actively involved in developing course modules for open online courses and teaching in this mode of instruction for more than 20 years. Her current research interests include open online learning, Universal Design for Learning as integrated in open online learning, learning analytics, ICT4D, CSR communication, and communication for social mobilization. An advocate of open education, she can be considered to have spearheaded the development and offering of MOOCs in the Philippines and its use by Higher Education Institutions in the country under the model MOOCs as OERs as one strategy to improve the quality of education.

She has led the university's initiative #OPENFight against COVID-19 to help the educational institutions in her country to transition from classroom instruction to remote teaching and learning to ensure that learning continues even during the time of COVID-19 pandemic. She is currently leading her university's work on University of the Future in the context of open universities.

Prof. Kandarpa Das
Vice Chancellor
Krishna Kanta Handiqui State
Open University

Professor Kandarpa Das, presently Vice Chancellor of the Krishna Kanta Handiqui State Open University did his post-graduation in Russian Language and Literature from the Jawaharlal Nehru University, New Delhi and obtained his Doctorate degree from the Moscow State University, Russia.

Professor Das served as the Director of the Institute of Distance and Open Learning, Gauhati University for two terms during 2006 – 2011 & 2011 – 2016. As Director of the Institute, he was responsible for transforming it into a pioneer institution of distance and open learning in the country. With a combination of experience and exposure at grass root level in the University system and educational administration at high level, Professor Das has earned the recognition from the academic fraternity as a successful educational administrator and institution builder.

Professor Das has published several research papers in the field of Russian Studies, Comparative Literature, Cultural Studies and Open and Distance Learning. Since, the year 2000, he has been supervising doctoral candidates in Gauhati University and till date successfully supervised 19 (nineteen) scholars for the degree of Doctor of Philosophy. He has edited and published two books in the field of Open and Distance Learning & Cultural studies.

Professor Das was honoured with important positions at national and state level bodies and has actively participated in policy making and consultations of various national and international bodies. In 2016, he was nominated as the member of the Steering Committee of the "Asian MOOCs", an initiative of the Asian Association of Open Universities.

Abstracts of Papers

An effort has been made to classify the abstracts under the conference sub-themes to which they primarily relate, although in some cases they obviously span more than one sub-theme.

Multilevel Structural Equation Modelling for the Relationships Among ICT-related Factors, Country Economic Indices, and Student Academic Achievement

Seoyeon Park and Wenting Weng
Texas A&M University

Using Random Forest to Examine the Relationship between Student Reading Competencies and ICT-related Factors

Wenting Weng and Seoyeon Park
Texas A&M University

The purpose of this study is to analyse the relationship between ICT-related factors, students' academic achievements, and the moderating effects of country-level economic factors on their relationships.

We employed multilevel structural equation modelling (MSEM) using Bayes estimation to investigate the moderating effect of country-level economic variables on the relationship between the student-level ICT use variables and their academic achievements, using the PISA 2015 data of ninth-grade students across 39 countries. Student-level ICT-related factors included ICT use for studying at school, ICT use for studying at home, ICT use for entertainment, students' interest in ICT use, students' perceived ICT competence, and students' perceived ICT autonomy. At the student level, we included gender and family socio-economic status as control variables. At the country level, we utilized the 2015 GINI index of each country when creating the GINI index variable. We also created the latent factor, 'Achievement', using three plausible scores (maths, reading and science) to address multiple outcome variables concurrently.

The findings indicated that (i) students' interest in ICT and their perceived ICT competence had a positive impact on their academic performance; (ii) students' perceived ICT autonomy had a significant positive impact on their academic performance; (iii) students' ICT use for studying or entertainment showed negative associations with achievements; (iv) GDP per capita had minor or no significant interaction effects on the relationship among ICT-related factors and students' academic performance; and (v) income inequality had a broader and more extensive impact on the relationship between ICT-related attitudes and students' achievement than a country's wealth itself.

This study contributes to the education field by conducting a multilevel analysis of the relationship between student-level ICT factors, students' academic achievement, and the moderating effect of national-level economic indices on these relationships. The results indicated that the effects of ICT-related factors on achievement should be interpreted carefully in the context of national-level wealth and income inequality. Considering that most previous studies conducted a series of univariate hierarchical linear analyses separately for multivariate outcome variables regarding students' academic achievement, which can inflate the Type I error rate, the model in this study provides a comprehensive analysis of the relationship among ICT use, achievement, and country economic status with less statistical error.

This paper examines the relationship between student reading competencies and ICT-related factors using data mining techniques.

We analyzed the PISA 2018 data of ninth-grade students in the United States. We applied Random Forest (RF) regression and used 70% of the data to train the model, which was deployed to predict the remaining 30% testing dataset. The ICT-related factors used in the analysis included students' ICT use for social interaction, at school, studying at school, outside of school, at home, studying at home, during lessons, for entertainment, and ICT resources. We also included students' attitudes toward ICT use: their interests in ICT use, their perceived ICT competence, and their perceived ICT autonomy.

We employed RF regression to examine the relationship between student reading competencies and ICT-related factors. According to the RF regression results, ICT resources, ICT used for social interactions, and student interest in ICT use were the top three attributes that predicted student reading competencies. These findings indicate that providing students with sufficient ICT resources support can help them improve their reading competencies. Increasing student technology use in their social interactions also had positive effects on their reading performance. Additionally, increasing students' interests in ICT can enhance their reading competencies. In contrast, the three least important attributes were students' perceived ICT autonomy, students' perceived ICT competence, and ICT use during lessons. Although these three ICT-related factors had little influence on student reading competencies compared to other ICT-related factors, they might be important in considering student learning performance in other subjects.

This paper employed RF regression to probe the relationship between student reading competencies and ICT-related factors. The results provide meaningful insights for school administrators and teachers to support student learning via the use of ICT. Increasing ICT resources, encouraging students to use ICT in their social interactions, and cultivating student interest in using ICT can benefit their improvement in reading.

Research on Personalized Learning Intervention Based on a Collaborative Filtering Algorithm and Knowledge Map

Yingge Zhou, Ruofan Wang, Yirong Yao, Xindong Ye and Changlei Gao
Wenzhou University

Learning intervention refers to the efforts and attempts which are intended to enable learners to achieve certain goals. The traditional learning intervention mainly takes the teacher as the main body and often takes group intervention as the main method — although, in recent years, the growing 'one-to-one shadow education' has helped to alleviate this phenomenon. However, it is costly, poorly accessible and leads to educational inequalities. In recent years, many reliable technologies can be used in personalized education. For example, the use of a knowledge map makes knowledge points more organized, and the personalized learning recommendation method based on a collaborative filtering algorithm provides personalized intervention.

This study proposes a personalized learning intervention method based on a collaborative filtering algorithm and knowledge map, which carries out teaching experiments. The subjects of the study are 152 seventh-grade students, 76 in the experimental group and 76 in the control group. The experimental group used personalized learning intervention methods, and the control group used traditional learning intervention methods. In the experimental group, the recommendation system uses a combination of a collaborative filtering algorithm and knowledge map to realize the personalized learning recommendation. After collecting the post-test scores, we analysed the experimental data.

The results showed that the personalized learning intervention method proposed in this research is more effective than the traditional learning intervention methods in improving students' learning performance. The individualized learning intervention improves the learning confidence of students with intermediate and advanced knowledge levels and reduces the learning anxiety of students with a low knowledge level.

The findings show that the method proposed in this study is effective in improving the learning effect, and also has a certain effect on the students' psychology. According to the results, this study provides a reference on implementing learning interventions for researchers, educators, and decision- managers.

Preparing SQA Professionals: Metamorphic Relation Patterns, Exploration, and Testing for Big Data

Zhihao Ying, Dave Towey, and Anthony Bellotti
University of Nottingham Ningbo China
Zhi Quan Zhou
University of Wollongong
Tsong Yueh Chen
Swinburne University of Technology

Computer science (CS) has been rapidly growing in popularity, partly due to the great growth of big data (BD) and other new technologies, and the services that support them. BD involves data sets that are too large to be captured, curated, analysed, or processed (for an acceptable time and cost) using traditional CS techniques. Although BD has changed our way of living and working, it may still frequently encounter software quality assurance (SQA) problems — when testing BD systems, it may be too difficult to check whether the system behaves correctly or produces the correct output. This situation is known as the Oracle Problem, and is a major challenge for current and future (student) SQA professionals.

Metamorphic testing (MT) has been identified as an effective approach to alleviating the Oracle Problem. MT makes use of metamorphic relations (MRs) across multiple test case executions to help to identify program faults. Metamorphic exploration (ME) is a related approach that can enable a better understanding, and thus testing, of a system. Both MT and ME rely on MRs for their successful implementation. However, identification of MRs is often a manual task requiring creative thinking, and a good understanding of the system. Metamorphic relation patterns (MRPs) are abstractions, or templates, for multiple actual MRs.

This paper reports on an experience using MRPs to guide the identification of MRs for the implementation of ME/MT as a step towards training the next generation of SQA professionals.

The ME/MT experience is examined through reflection and comparison with existing MRP studies reported in the literature. Our case study involved using MRPs to identify MRs for ME/MT of BD systems. In addition to MRP-derived MRs, other MRs were derived directly from the user perspective, or from previous studies in the literature. The future use of MRP as a pedagogical tool to help train CS students and SQA professionals is examined.

We found that MRPs are useful in guiding, teaching and training the identification of MRs for MT/ME. Testers and students are able to implement MT/ME easily since the identification of MRs is a vital step in conducting MT/ME.

This is, we believe, the first report on using MRPs to support ME/MT as a step towards training and teaching SQA professionals. We highlight the importance of BD SQA, and how MT/ME can support this. We show the usefulness of ME to prepare for MT, and MRPs to prepare good MRs to support MT/ME. We also outline several directions for follow-up action, relating to both MRP-based research and training.

An Investigation of Students' Engagement in Different Blended Learning Models

Zhang Rui, Zhai Miao, Qiu Hong, and Chen Jie
TongJi University

Blended learning is widely adopted in Chinese university education, and our group has used different blended models in teaching university physics since 2014. This paper investigates the impact on student learning engagement of a non-flipped classroom model, a flipped classroom model and a broadcast model. In the flipped classroom model, five flipped lectures are given on the course each semester. In 2020, video broadcasts blended with an online courses model was used in physics teaching in Tongji University during the period of the pandemic. In this paper, a questionnaire survey and data mining methods are used to investigate the influence of the blended models on student engagement.

In the survey, NSSE-China was used to measure the students' behavioural and cognitive engagement. In the data mining method, structural equation models were used to calculate students' engagement. By comparing the different models, the following variables for behavioural engagement were determined: student attendance; discussion in the Web course; the ratio of homework completed; the ratio of finished online tests; and online test results. The variables for cognitive engagement included the results for student homework and classroom response results.

The correlation coefficients between cognitive engagement and the final examination results showed that the results for data mining were more reliable than those from the survey method. In the survey results, the students in the flipped classroom model had on average higher behavioural engagement and cognitive engagement than those in the non-flipped blended model; and students in the broadcast model also had a higher behavioural engagement but the same cognitive engagement compared with the results from the non-flipped classroom. However, the structural equation models showed that the flipped classroom yielded a lower cognitive engagement (weak effect, $z=-0.30$), while the broadcast model had an even lower cognitive engagement (middle effect, $Z=-0.70$).

The results are not very trustworthy if the students are asked to sign their names on the survey sheets. The drop in engagement in the flipped model might be related to sample difference. The pandemic has a negative impact on student learning achievement even with the help of online broadcasts and online courses.

How to Integrate ICT into a Class: Video Analysis of 229 Excellent School Classes from Beijing

Jiyou Jia
Peking University

In order to investigate how information and communication technology is used in classroom teaching and learning, we analysed 229 videos selected from the excellent classes in Beijing's primary and secondary schools which had been given an award by the Ministry of Education in China.

We used a mixed approach for analysing the 229 class videos comprehensively, considering the reliability of the results, the time spent, and the cost incurred. On the one hand, we designed and programmed a universal class behaviour analysis system (UCBAS Version 1.0) with both a Chinese and English interface to facilitate manual encoding based on Flanders' coding schema for classroom teacher and student speech acts and its variants, and to visualize and analyse the coding result. On the other hand, we adopted emerging artificial intelligence technologies to automatically recognize the speech text and bodily behaviour, such as the Xunfei speech to voice engine, and real-time face recognition and object detection based on YOLOv3 and dlib.

Large-screen presentation equipment, such as a computer projector with a large screen and a large-screen TV monitor, was used in the 225 classes for the presentation of teachers' slides or other teaching documents, as well as for the playback of video and audio files. The other equipment used most included an interactive whiteboard or TV monitor, an iPad or other tablet computers, smartphones, and an object projector. The overall teacher-student speech time ratio was about two to one on average, although this ratio varies dramatically among different classes. The sum of the speech time of the teacher and student occupied two-thirds of the whole class time. Nearly a third of the whole class time was dominated by the students' 'chaotic' discussion or completing assignments.

Our contribution to class behaviour analysis is that the Universal Class Behavior Analysis System has been put on to GitHub for free download and usage, as such a kind of free software is hard to find. The attempt to apply artificial intelligence in the class behaviour analysis is also valuable for related research. The popularity of the use of ICT equipment and software in classroom instruction in the research findings suggests that embracing ICT in school education is unavoidable. The time distribution of the teacher's speech, a single student's speech and collective discussion or assignment completion provide an important reference for excellent curriculum design in primary and secondary schools.

Learner Support Services in Online Learning: Strategy Design Based on Learner Personas

Jun Xiao
Shanghai Open University
Xuejiao Li
East China University of Science and Technology
Zhujun Jiang
Shanghai Normal University

A learner persona is a new application of learning analytics. By collecting data about students' learning in a big data environment, learners' characteristics are analysed in multiple dimensions and presented as labels to form learner personas, so as to provide accurate learning support services, such as early warning and intervention services. The strategy for online learning support services is a collection of methods used to provide support services for online learners. The purpose of this study is to design a strategy for an online learning support service based on learner personas, in order to provide more accurate online learning support services for learners and improve the quality of online education.

Four stages were covered: First, learner personas were used to analyse group service preference and behaviour characteristics. Second, the strategy design framework for online learning support services was built with data analysis technology. Third, the appropriate service content and mode for different groups of learners were selected, taking into consideration the cost, technology and other environmental factors. Finally, a thorough data collection, portrait analysis and strategy design were carried out for 351 learners on a course in Shanghai Open University; a report on a visual online learning support service strategy was formed; and the relevant support service personnel conducted an evaluation of applications. Ten teachers were invited to provide perspectives which were collected and analysed by surveys and interviews.

Through the application of a learning support service strategy during and after learning, students' learning needs in the learning process were met, and their participation and learning experience were improved. All the teachers believe that the service strategy based on the analysis of the learners' group characteristics was correct. Most teachers thought that the implementation of a group service was helpful for controlling the input of human resources and cost (90%), and the design of the service strategy based on the three stages of the learning process could ensure the accuracy of service implementation in the whole teaching process (90%).

The learner persona can identify online learners in groups, thus solving the problem of increased human resources and cost due to the implementation of large-scale online learner personality support services. The strategy design of the online learning support services based on learner personas can effectively achieve accurate support services; improve the online learning experience; promote participation in learning; and improve academic performance.

Research on a Personalized Recommendation of MOOC Resources Based on Ontology

Yuanmin Li, Zehui Zhan, and Xitian Yi
South China Normal University
Dexin Chen,
Hubei University

With massive learning resources, it is a key issue for MOOC platforms to provide a recommendation services and help learners to find suitable content efficiently. However, there were problems in the process of personalized recommendation of learning resources, such as a cold start (i.e. difficulty in recommending resources to new users) and over-specialized recommendations. This study aims to establish an effective personalized recommendation model for MOOC by linking the characteristics of users and MOOC resources to provide learners with effective MOOC learning support.

This study proposes a personalized recommendation model for the recommendation of MOOC resources that combines a calculation of semantic similarity and an analysis of user characteristics. The method is based on the construction of a MOOC resource ontology and a learner ontology. By calculating the hierarchical correlation and attribute correlation among MOOC ontologies, we analysed the semantic correlation among MOOC resources and combined the user ontology characteristics to personalize the recommendation of MOOC resources. Finally, we used simulation experiments to verify the effectiveness of the recommendation method.

This study showed that the recommendation scheme matches the user preferences and personal characteristics through simulation experiments. On the one hand, we found that the construction of a user ontology can solve the problem of a cold start to a certain extent. On the other hand, we found that using a semantic similarity calculation based on the combination of the hierarchical correlation and attribute correlation can avoid the problem of over-specialized recommendations.

This study formed an effective model for the personalized recommendation of MOOC resources. It provides a new idea for connecting MOOC learners and resources, and helps to solve the problems which exist in the current process of learning resource personalization recommendations (i.e. relying on user scores, over-specialized recommendations, and a static knowledge structure of recommended resources). In follow-up research, it is necessary to further optimize the construction of learner ontology and MOOC resource ontology. In the process of personalized recommendation of MOOC resources, this study only considers the learner's occupation when analysing the characteristics of learners, and more factors should be taken into account in the follow-up study to achieve more accurate recommendations.

A Novel Online Autonomous Learning Path Analysis by Eye-tracking: An Empirical Study

Su Mu and Meng Cui
South China Normal University
Xiaodi Huang
Charles Strut University

A learning path can reproduce the real learning process, which is of great significance for an accurate understanding of the way students learn and then help to improve learning. The current data type for learning path analysis is usually one-dimensional log data. However, log data cannot reflect students' micro cognitive processes.

Inspired by multimodal learning analysis, we applied eye-tracking to learning path analysis and propose a novel online autonomous learning path analysis method. For this purpose, we first present a conceptual model and analysis framework of the learning path. Based on this model and framework, we then conducted empirical research to prove that learning path analysis based on eye movement data can mean it is easier to find rules of learning that cannot be discovered by log data, especially at the micro-cognitive level.

Our main findings are: (a) Eye movement information has the greatest correlation with the completion rate and learning status of learning but little correlation with test scores; (b) The eye movement indicators of different types of learning task are significantly different; (c) The learning process is very complicated.

It is necessary to combine several methods such as qualitative analysis, quantitative analysis and visual analysis, and comprehensively use data from different dimensions to accurately understand the students' learning process.

Application of Data-Stream Processing in Smart Education

Yidan Wang, Wei Yuan and Xin Wang
The Open University of China

The emergence of big data technologies facilitates smart education and smart e-learning by integrating data analytics effectively into the smart and intelligent learning systems. With the advances of big data technology and artificial intelligence, smart education offers an intelligent and adaptive environment that engages and motivates learners. Moreover, an intelligent learning system can provide personalised learning experiences and deliver digital resources to fit personal needs. We utilise smart devices (smartphones, laptops, etc.) and online tools to collect learners' data and monitor learning activities.

The enormous amount of educational data derived from open education and online learning are valuable in understanding personal requirements and general trends. However, traditional data processing methodologies may fail to deal with such data. The reasons include but are not limited to data storage capacity for maintaining the entire set of data and the challenge of processing the geographically distributed data with short delays. Therefore, we investigated the potential of applying data-stream processing in smart education. Data-stream processing is proposed as a practical paradigm to deal with big data in the format of information flows.

In this paper, we review the closely related concepts and techniques in smart education and big data. Then we examine existing work about the application of big data technologies in education and propose several scenarios in which stream processing can be applied. For instance, a detailed study of the correlation between learners' online activity and examination outcomes enables us to make predictions about learners' performance.

With the real-time data-processing engines, it is possible to provide instant feedback on certain activities conducted by a specific learner, to improve the learner's performance. Furthermore, we discuss the benefits of applying data-stream processing in smart learning systems and explore the potential of enhancing the learning environment and enriching individualised learning experiences.

Design and Implementation of an Intelligent Tutoring System in the View of Learner Autonomy

Huixiao Le and Jiyou Jia
Peking Univeristy

In the literature, few intelligent tutoring systems have taken learner autonomy into consideration. In most of the designs, learners are given limited authority and are forced to obey the decisions of the system which might not satisfy their needs. Failure to grant learners sufficient autonomy can yield unexpected effects that hinder learning, including undermining learners' motivation, and causing learners' aversion to the algorithm. On the contrary, granting learners overwhelming autonomy can also be harmful as the absence of learning support and choice overload would have a negative impact on learning. This research designs and implements an intelligent tutoring system that offers learners the proper level of autonomy.

The learning content in the system is the Pythagorean theorem, and the learners are junior high school students. The main learning activity in the system is doing exercises, by completing which learners can earn virtual credits. Based on item response theory, the exercises are presented to the learners at a proper level of difficulty. A recommended difficulty parameter is predicted by the system, but learners can manually modify the difficulty of the exercises, and earn more credits by finishing more challenging exercise. Meanwhile, a pedagogical agent is embedded, with two dispositions, namely 'aggressive' and 'accommodating.' Learners can customize these dispositions on the basis of system recommendation. The more 'aggressive' the agent is, the higher the probability of triggering a competition event when learners are doing exercises. In the competition event, learners can earn double credits if they submit a correct answer faster than the agent; otherwise the credits earned are reduced by half. Similarly, the more 'accommodating' the agent is, the higher the probability of triggering a hint event. The system judges whether the learner is faced with difficulty based on the time which has currently elapsed. If so, hints are presented to learners but the credits earned are reduced by half.

An intelligent tutoring system with proper learner autonomy is designed and implemented.

Few papers in the literatures have noted the potentially important role that learner autonomy plays in an intelligent tutoring system. Learning canbe facilitated by means of such a design.

Research on Social Presence in Chinese Language MOOCs from the Perspective of Facilitators

Wang Chenxin
Shanghai International Studies University

Design for Blended Learning in Distance Education via the Moodle Platform

Yuehui Zhong, Huiping Fu, Zhicheng Gan and Quan Zhou
The Open University of China

Chinese has now become one of the most popular languages to learn worldwide. More than 100 Chinese language eMOOCs have been made online and are being followed by thousands of learners. To date, *Introduction to Chinese: pronunciation* has been the unique Chinese pronunciation MOOC. According to previous research, online learners rely heavily on the support of facilitators. However, what kinds of support do learners actually need; what kinds of support should facilitators provide; and what can we do to make facilitators understand their responsibility when they join MOOCs online construction? The answers to these questions are still unknown, and since no research has been carried out on this topic, it is necessary to fill this academic gap.

In this research, interviews with facilitators and instructors were planned and used to find out the thinking and reflection on these two principal roles in MOOC education. Content analysis of the comments made by learners and facilitators in the MOOC was carried out in order to find out what learners really need as support and what facilitators have provided. A survey was used to collect the learners' ideas on the support they want to receive from the facilitators. This study has used both qualitative and quantitative methods. Conclusions were drawn based on the interviews, and the result of the content analysis and survey.

Taking this course on Chinese pronunciation as the object of research, this article shows that teaching assistants have an impact on the cognitive, social, and teaching presence in the MOOCs, but they have failed to understand that they need to promote *social presence* by providing the emotional supports which most learners need while doing online learning — especially when learners complain about the difficulty of the course. To solve this problem, relevant training should be planned and implemented beforehand.

This study was developed from the perspective of facilitators who have played an important role in MOOC construction, but who have not received enough attention so far in academia. Mixed research methods were used in this study, which probably helped to come to more objective findings. Suggestions and advice are illustrated, which refer to the training of Chinese MOOCs facilitators before they take up their positions.

The Open University of China (OUC) started to implement blended learning (BL) in distance education based on the Moodle platform in 2013. However, according to the researchers' ongoing observations since then, the current practice of BL at the OUC involves either 'more face-to-face (F2F), less online' or 'F2F equal to online', both of which are heavily dependent on the traditional knowledge transfer from teachers to learners. In this context, it will be of significance to investigate the learners' experience in the practice of BL; explore the pedagogy suitable for the distance learners at the OUC; and discuss how to concretely design for and implement BL courses via the Moodle platform so as to carry out a more mature and effective BL mode.

This study was carried out at Nanhai Experimental College in the OUC through employing *A Survey on the Learners' Experience in the Practice of BL*. The questionnaire was published on the website www.wjx.cn (a popular platform for online surveys in China) to collect anonymously the relevant information from distance learners at the end of the autumn semester of 2019. It was administered for two weeks, and 257 valid responses were received.

The survey of learners' experience of participating in the current BL modes deployed at the OUC shows that tutors need to pay attention to the diversity of learning approaches, the autonomy of learning habits, and the innovation of learning tasks when designing for BL courses.

The BL pedagogy suitable for distance education should be directed by contemporary learning theories, committed to engaging learners in a dynamic learning process and guiding them to autonomously construct new knowledge based on the online learning materials and activities, so as to leave F2F tutorials for in-depth discussion between the tutor and the learners on key issues to realize the assimilation of knowledge. Gradually, the mode of 'more F2F, less online' should be abandoned to adopt that of 'more online, less F2F'.

Can Rubrics Actualize Assessment for Learning? Perspectives from Students and Educators

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Assessment plays a significant role in higher education because it influences the career prospects of university students. Assessment is challenging owing to its competing functions, for evaluation and for learning. The dominant discourse of assessment has been using it for evaluation; however, in the past two decades, the focus of assessment has evolved to promoting learning (ways as defined by learners). When the focus of assessment is to promote learning in any format, it is called Assessment for Learning (AfL). There are various pedagogical innovations to facilitate AfL. Rubric is a tool that has demonstrated ability to mediate learning in assessment in the Western context. However, it is unclear if and how rubrics actualize this concept in a Confucian-influenced culture like Hong Kong. The purpose of this study was to explore if and how rubrics actualize AfL from the perspectives of university students and educators.

This study adopted a phenomenological approach, in order to explore students' and educators' lived experience in actualizing rubrics in one university in Hong Kong. Purposive sampling, based on the author's belief in participants' unique contributions, was used to recruit educator participants from various disciplines. Students were recruited based on educators' suggestions of their willingness to participate. Semi-structured interviews were employed to collect qualitative data from educators, and focus groups were used for the student participants. Each semi-structured interview lasted for about an hour, and each focus group lasted for about 75 minutes. All interviews were audio-recorded and transcribed into English for thematic analysis. Fourteen educators and 10 students joined the study.

Findings illustrate interesting themes: all participants agreed with the learning functions of rubrics, but actualizations were complicated by pragmatic barriers, especially in the eyes of the educators. The barriers spanned various domains, including the nature of rubrics, time and knowledge limitations in rubric development, and the "research-first" culture of the university. In addition, tensions between and within stakeholder groups were obvious when participants of both groups assumed responsibilities of the other group or people for ideal rubric actualization. The feeling of powerlessness with rubric actualization for AfL was complex.

Findings shed light on innovative strategies that can potentially target the barriers of rubric actualizations, such as nurturing assessment literacy as a university initiative that involves *all* stakeholders, including students. It takes all stakeholders' participation to scale up AfL.

Transferring the Physical into Digital to Extend the Reach of Museum Access

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Opportunities exist for physical learning environments or spaces, such as museums, to provide online experience. Being online allows greater reach and exposure into rural, regional, interstate, and overseas locations to benefit from interacting and engaging with physical exhibits, or some of their artefacts, in a virtual environment. Advances in information technology (IT) can bridge gaps between physical and online spaces to support learning and knowledge acquisition irrespective of the learner's location. The online learning unit produced and presented in this paper complements a physical exhibit from a museum.

To envision the online learning unit, the physical museum and exhibit were reviewed and analysed to better understand the content, prominent themes, and the layout. The museum provides some online replicas of the physical artefacts, but not the complete experience. Reviewing the online material along with an examination of pre-existing online experience from museums helped to guide the design of the prototype to be tested. This work is focused on extending the reach of a physical museum exhibit. A mixed methods approach was taken in the heuristic evaluation for pre-user testing and evaluation, and participant testing.

Creating and testing the interactive online learning unit demonstrated the advantageous capabilities of using authentic artefacts to benefit learners unable to attend and engage in the physical museum. The complementary online and interactivity in the learning unit assists in creating a connection with learners who then engage with the experience. The design provided autonomy over individual learning needs or interests and, being experiential, also provided maximum impact. The use of web-related technologies facilitated and provided access and broadened the reach and appeal of the museum exhibit beyond the physical space and boundaries.

Using available media with the intention of broadening the appeal, exposure, knowledge transfer and understanding directly benefits the learners while providing appropriate additional support and recognition for the role museums play in the community. The benefits for individual learners are evident, as is the potential for online learning units to be considered in educational settings in rural or regional areas where physical distance is problematic. Health and safety concerns encourage enhancing museums' efforts in digitizing aspects of their exhibits and adapting and incorporating these into intended and specialized learning units that benefit the museum and learners. Where feasible, maximum benefit is achievable from being physically inside the museum coupled with online learning units. If this arrangement is not possible, learners are not significantly disadvantaged given the incorporated content.

Creativity During the Coronvirus Pandemic: Inspiring Language Learning at University During Lockdown

Peter Carter
Kyushu Sangyo University

One of the pleasures of learning a foreign language is the interaction with classmates and instructors it entails. With schools closed because of the pandemic, for many learners around the world the immediacy of the language classroom has been replaced by screens. Even worse, the creative aspects of developing skills in a second language do not extend well to the learning management system-based solutions typically favoured by colleges and universities.

What this paper does, then, is to explore ways of fostering student creativity during lockdown. We specifically cover what can be done for students learning English as a foreign language, and do this in two ways: first with regard to creativity in the case of discrete skills such as writing and presenting, and second as a progression in terms of students' level from beginners to more advanced learners. In other words, we propose a comprehensive approach for inspiring students to produce creative work in spite of challenging conditions.

To accomplish this, we focus on three aspects linked to creativity: how creativity has previously been envisioned in education; creativity as it relates to students' grade level and specific skills; and key learnings about student creativity during the lockdown period and what we can take away from them.

There are several ways in which creativity can suffer when learning takes place without access to the physical campus. For example, overreliance on learning management systems promotes convergent thinking over divergent thinking. Skills that are in theory being honed are subordinated to the software's limitations. In addition to concerns about skill development, task design is also an issue. Many creative tasks require an incubation period and an iterative process, both of which need supporting. For language learners, the balance between structure and creativity in task design is a fine one requiring a nuanced approach. In short, creativity is a critical aspect of learning if learning is to mean more than rote memorization.

Participants will find that the solutions we discuss are all relatively simple in terms of their technical complexity, will be posted online for their own use, and can be adapted to a number of classroom contexts.

Enhancing Architecture Students' Engagement Through Gamification

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This research describes the first stage of implementing a creative game for sustainability in an architecture course. The aim of the research is to explore gamification as an innovative pedagogy to enhance students' engagement. The game was developed as part of a teaching and learning research project which involved collaboration between Architecture and Product Design to apply gamification as a learning tool in architecture education. Product Design belongs to the research/experiment method section, where the educational product is the card set, and the participants are teachers and architecture students.

Greenicity is a game involving combinations of cards to generate new concepts of green spaces for specific places in cities. The cards are classified into basic green ideas, placement, community actors, and wild and lucky cards. Every team of two participants plays in rounds by combining two or more cards with a placement card, then announcing the idea to the whole group. Cards have values and in combination make the score of the team. Moderation takes place when participants are unsure about the idea or cards combinations. The first version of the game was explored as a teaching tool for second year undergraduate architecture students. A workshop was offered to test the game with a group of five participants, and a second larger workshop was offered to 32 participants to support the development of the game. The sessions were part of the module *Integrated Design in Architecture 2*, in which a learning outcome is to be aware of 'creation of a sustainable environment'. Participants provide feedbacks in various formats, and the larger session was monitored by a PhD candidate, a Product Design students and tutors.

The preliminary results are based on the two workshops to test the game to improve it. Participants offered feedback, such as a request to communicate using drawings, and the need for an improved scoring system. They engaged in playing the game in different ways, which is related to individual characteristics — some are score-oriented, while others focus on cards combinations. During the workshops, some key engagement indicators for this research were observed: participation, cooperation and fun.

This research applied a serious game into architecture education to improve engagement and encourage creativity by creating a joyful learning atmosphere. An active learning environment was set up to support 'learning by doing' and cooperation was established. This, the only educational game for architecture, aims at creating ideas for green cities, which is an essential attribute for future architects.

Promoting Student Engagement Through Publication for the Community

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This presentation considers the benefits of promoting student engagement by means of an online student publication for the benefit of the community.

Legal Scribes is an online journal which contains publications, most of which are written and edited by students on the LLB and JD programmes in the School of Law at the Singapore University of Social Science (SUSS). The School of Law at SUSS is Singapore's newest law school which accepted its first batch of students in January 2017. Many of the students on the LLB and JD programmes at the SUSS School of Law are mature students who are working and studying at the same time. This presentation is concerned with the question of how to engage working adults in legal pedagogy.

Legal Scribes gives students the opportunity to analyse recent legal developments, to edit each other's work, and to benefit from the helpful comments of faculty advisers. The author is the editor of *Legal Scribes*, and will explain how it is an innovative educational tool that contributes greatly to student engagement.

Legal Scribes was conceived with the goal of filling a gap in the body of current legal information. There appeared to be limited availability of commentaries on recent legal developments that were easy to understand and suitable for the educated layperson. *Legal Scribes* attempts to fill this gap.

In the process of serving as editor of *Legal Scribes*, the author has found that there are several advantages to this educational tool that go beyond the confines of the classroom. By giving students the opportunity to comment on recent legal developments, they are encouraged to update themselves on the law and think critically. Students develop an analytical mindset in learning how the doctrinal principles that they have studied in class have been applied in recent cases. This leads them to develop an incisive and creative approach to legal work. The methodology relating to these findings will be discussed in the presentation. In publishing pieces that are intended for the benefit of the community, *Legal Scribes* is in line with the focus of the School of Law at the SUSS, which aims to train community lawyers. This presentation will also discuss the challenges faced in running and editing *Legal Scribes*, such as training students to write in a manner that is suitable for publication, and helping students who are also working to prioritize their time to meet the demands of writing for the journal. The experiences of the students in writing and editing pieces for *Legal Scribes* will also be discussed.

The issues considered in this presentation will play a valuable role in introducing *Legal Scribes* to other educators. It is a useful piece of applied research which is directed towards the question of how to engage working adult students in legal pedagogy in a way that transcends the classroom. To the best of the author's knowledge, this is the only student law journal in Singapore which is specifically geared towards community readership by the public-at-large (rather than a specialized readership). By exploring the advantages of this innovative educational project, it is hoped that this presentation may serve as an inspiration to other educators to adopt creative approaches to education that focus on analysing recent developments and contribute to the community.

Language Learning by Synchronous CMC: A Study in Japan

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Hokkai-Gakuen University

Evaluating Expectations and Engagement with Emergency Remote Teaching: A Cross-faculty Case Study of a Sino-British University

Derek Irwin, Amarpreet Gill, Lauren Knowles, David Krygier, Chiew-Foong Kwong, Matthew Pike, Dave Towey and James Walker
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The aim of this study is to examine the benefits and drawbacks of synchronous computer-mediated communication (CMC) from the perspective of Japanese undergraduate university students who have completed year-long English language courses with weekly speaking-focused lessons. The focus is placed upon students' thoughts and attitudes toward online versus face-to-face interactions and which of these approaches they prefer.

Students' feedback was collected through a self-reported online survey provided to six classes of students on completion of one of three courses taught by one of the authors. The question items were adapted from Spitzberg's survey on the model of computer-mediated communication competence (2006) which analyses effectiveness, expressiveness, and motivation with respect to students' online learning experiences. Tabulated data are presented in the results and are discussed together with qualitative feedback from students and additional observations made by the instructor during the class.

The results showed that many students had a growing willingness to engage in online spoken language activities and demonstrate an increased enthusiasm toward the CMC learning approach when compared to the in-class English language activities they had experienced previously. Students also showed considerable interest in utilizing internet resources when completing their assigned tasks. However, some students' commonly exhibited self-consciousness when asked to speak English during online meetings, showing a reluctance to interact with the instructor or their peers. Some students also reported technical difficulties and unique personal circumstances as factors detrimental to their motivation and enthusiasm for learning.

The context of a global pandemic has presented a unique opportunity to assess the value of online learning tools as they have suddenly become a necessity. This is especially significant in Japan where previously there has been very little experimentation with remote learning and limited adoption of online resources. This study surveys a group of Japanese students' very first fully remote learning experiences using video conferencing. While the sample size is small, the findings indicate that understanding individual students' technical and psychological circumstances is indispensable for mitigating undue stress and encouraging engagement and enthusiasm. In addition, recognizing how Japanese students' unique socio-cultural attitudes may influence trends in their learning preferences, specifically with regards to online interactions, presents it as an important area to be explored in future research.

The University of Nottingham Ningbo China (UNNC) was the first Sino-foreign (Sino-British) higher education institution to be established in the People's Republic of China (PRC). As the impact of the COVID-19 pandemic was being felt in the PRC in the Spring semester of 2020, the UNNC found itself under a strict lockdown, with many academic staff stranded overseas, and many of its 8,000-strong student population restricted from entering the campus. The UNNC was forced to devise a strategy for Emergency Remote Teaching (ERT), with large numbers of courses adapted for online delivery of teaching and learning (T&L), and assessment. This case study examines the student expectations and engagement over that period; and it explores the different approaches adopted for ERT and assessment, highlighting how a gap in skills and prior exposure to the relevant technology, for both teachers and students, influenced the experience.

Drawing on data from multiple surveys, supported by cross-faculty interviews and focus-group discussion, and reflective examination of individual experiences, this paper explores the different expectations, engagements and perceptions of facing the challenges caused by the pandemic.

Disconnects between expectations (of both staff and students) and how the semester actually evolved are exposed. Reasons for these disparities, including the unpredictable nature of the pandemic at that time, are examined, with suggestions for how to better insulate T&L moving forward. Training and familiarity with appropriate tools are identified as key elements for more smooth adaptation to the ERT T&L. This paper offers insights into best practices for managing similar situations in the future.

The UNNC was the first Sino-foreign university to return to face-to-face T&L, in May 2020, and thus its experience is unique and of interest to the wider community. The identified disconnects between expectations and reality indicate clear opportunities for where institutions can bolster staff (and student) competencies, to better prepare for the 'new normal' in post-pandemic T&L.

Student Mentorship Programmes: Students as the Real Teachers?

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The Sino-foreign higher education institutions (SfHEIs) in the People's Republic of China (PRC) grew as an innovative response to a (then) pressing PRC education problem — providing a sufficiently high quality and quantity of higher education (HE) opportunities. These SFHEIs have also been centres of innovation, with many exciting initiatives being developed to address the ongoing challenges that SfHEIs have faced. This paper looks at a key element of many such initiatives — that of students as change agents (SACA), where students themselves become the agents to make the changes they seek. In this instance, a recent Student Mentorship Programme (SMP) is explored.

The paper is structured around a report on a partially student-led initiative at the University of Nottingham Ningbo China (UNNC), the first SfHEI in the PRC. Identifying several challenges and opportunities surrounding undergraduate student learning, and the potential for senior undergraduate students to gain teaching experience, a small group of proactive final year Computer Science (CS) students collaborated with CS staff to create an SMP, whereby senior students would volunteer to support more junior students in their learning. This involved supporting computer lab sessions, and also offering advice on general study strategy. They were also able to serve as an additional line of communication between students and the faculty, providing both feedback and advice to students and staff.

This report highlights a number of advantages to SACA initiatives in general, and this SMP in particular. The mentored students reported increased satisfaction; the relevant teachers received additional feedback and support for their teaching; and the mentoring students also gained valuable insight into teaching as a potential future career direction. An additional gain was the newfound ability to provide teaching-related comments in the mentors' graduate study applications. The overall experience resonated with an earlier experience of one of the authors, a decade earlier, at another SfHEI (United International College, UIC), where a spectrum of four types of Teaching Assistants (professional; graduate students; foreign language; and undergraduate students) were deployed to support UIC's teaching. These two experiences are contrasted, and recommendations for best practice identified.

The COVID-19 situation has again emphasized the need for adaptability in education and in other fields. The findings and recommendations in this paper, especially in the context of peer support and peer learning, will be of interest to educators seeking more opportunities for student feedback, and seeking to engage their students more deeply in the learning journey.

Transformation of Design Education: Adaptation to Hybrid Classrooms During the Pandemic

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The suspension of face-to-face classes during the COVID-19 pandemic has posed a new challenge for design education. The pandemic necessitates an abrupt transition of design education from the conventional studio practice to the hybrid learning model. While classroom lectures and practical workshops were halted in accordance with the public health measures, design educators navigated the multidimensional challenges associated with hybrid teaching amid the uncertainties ahead. This pilot study investigates the impact of hybrid teaching on the learning experience of the diverse learners in the Advertising, Fashion Design and Product Design programmes in a higher education institute in Hong Kong, and discusses its implications from the perspective of the teaching staff on the front line of design education.

This exploratory study adopts convenience sampling, leveraging easy access to students and teaching staff of the above programmes, who possess first-hand hybrid classroom experience from the period of the COVID-19 pandemic. Adopting the e-learning framework developed by Khan (2007) as the key theoretical framework for this research, interviews with open-ended questions were conducted with the target respondents by the end of the semester following a pilot-tested interview protocol. The qualitative data collected were then manually coded and analysed in a triangulation process to come up with the findings.

This study aims to provide actionable insights to improve the teaching and learning experience under the hybrid learning model. The implications are discussed in terms of how to better integrate multiple teaching platforms and different teaching modes to engage students successfully in this new pedagogy. The research also provides recommendations on how to optimize the learning experience with a balanced mix of the face-to-face and online learning modes in design education, where teaching has traditionally relied heavily on the dialogic process in studio tutorial settings.

This study fills the research gap in the implementation of hybrid teaching in design education by providing a timely reflection on the current practices and addressing upcoming challenges if the design disciplines are going to adopt this new pedagogy widely in the future.

How Online Learning Can Disrupt the Development of Students' Key Relationships in Higher Education

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Learning online is different from in-person teaching, but it is possible to create an interactive and supportive virtual learning environment (Ross and Bayne, 2016). When the pandemic hit, a generous response helped faculty staff to rapidly adapt course content and assessment for online delivery (Wong and Kwong, 2020). While some students adapted readily to the online shift, others struggled, experiencing anxiety, fear and stress (Tinsley, 2020). Anecdotal reports suggest that some students chose to avoid synchronous online learning completely.

Quinlan (2016) states that learning is relational and higher education students develop four relationships which are key: to Subject, to Teachers, to Peers and to Self. The quality of these relationships can influence students' enjoyment of their course, study habits and attainment. Is it possible that some aspects of synchronous online learning have disrupted the development of these key relationships? Also, is it possible to mitigate these issues through adjustments to pedagogical practice? This study analyses a subset of data (n=496) from a survey of students' experience of online learning, collected in November 2020. Participation was voluntary and responses were anonymized. The participants were asked if they had avoided synchronous online teaching and could provide a free text response explaining why. A two-step thematic analysis (Watts, 2014), using a coding frame derived from Quinlan's four key relationships, was conducted.

Analysis indicated that participants' experience of synchronous teaching had a negative impact on the development of all four key relationships. The relationship to Peers seemed to be most disrupted, with participants describing their peers as unfamiliar strangers. This led to inhibited and awkward interactions online. Anxiety about being judged negatively by these unfamiliar peers also had an impact on the relationships with Teachers, as participants declined to interact or ask questions during teaching. Many participants felt isolated and disengaged, affecting their developing relationships to Subject and Self.

This paper extends Quinlan's work by showing that all four key relationships are disrupted when the design of online learning includes limited opportunities for meaningful social interaction. It further argues that, in an online environment, the quality of the Peer relationship mediates the development of the other key relationships. It concludes with empirically derived suggestions for adjustments to pedagogical practice to enable the development of Peer relationships in online learning. This study is of interest to curriculum designers, programme leaders and teachers delivering blended and online learning in higher education.

Peer Observation of Hybrid Teaching in a University

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This study aims to investigate the challenges that instructors encountered when delivering course content in a hybrid teaching mode, real-time mode and face-to-face mode simultaneously. This mode was adopted by a university in Hong Kong in 2020, during the pandemic.

In this exploratory study, from 22 September 2020 to 3 December 2020, eight 2-hour recorded online Zoom tutorials conducted by two instructors of a subject offered by a university were studied. This study employs Gosling's (2002) Peer Review Model and an adapted checklist of peer-observation of an online course (Centre for Teaching Support and Innovation, University of Toronto, 2017). Narrative log is used for reporting descriptive behaviour. The observed aspect of teaching is primarily on course delivery.

The findings include common practices of both instructors: (a) providing an outline of the organisation of the class, (b) using a variety of examples to explain content, and (c) offering real-world application. In this hybrid teaching mode with students on Zoom and in the classroom simultaneously, instructors varied in course delivery. First, on giving responses to students, instructors explained in words that from time to time it was a challenge to manage this aspect for all students on both sides. Specifically, response time to a question in Chatbox was not immediate, and hence another student posted an answer instead. Next, on engaging students in discussion, there appear to be responses from students in the classroom than from students on Zoom. In Chatbox, response time to an instructor's question was time-lagged technically, so waiting time for soliciting this type of response should be taken into account. Third, on delivering content with the aid of the camera on Zoom in the classroom, the instructor 'showing the face' to the camera for students' viewing on Zoom was not found. Another instructor primarily opted to sit and look at the camera for the entire class. To conclude, this study is non-judgmental, but mutual reflection and the above observed descriptive behaviour have pointed to the fact that instructors encountered new challenges in this hybrid teaching of real-time mode and face-to-face mode simultaneously.

It is hoped that the findings of the observed descriptive behaviour can shed some light on understanding the practice of teaching and of instructors' challenges in this new context. It is also hoped that new instructors can understand how to develop adaptable strategies in this hybrid teaching mode.

Promoting EFL Students' Metacognition and Self-efficacy in Differentiated Instruction: A Self-regulated Flipped Learning Approach

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English is regarded as a prevalent language worldwide, and English as a foreign language (EFL) has been a crucial issue in interdisciplinary research. Owing to the discrepancy in resources for social support, the achievement gap of EFL learners has emerged in recent decades. A great deal of research has shown that differentiated instruction (DI) can be a great benefit to students with high and low achievements. On the other hand, with the remarkable advances in technology and wireless networks, learners are capable of collecting materials and learning at anytime and anywhere. In a flipped classroom, students can gain basic learning concepts outside the classroom, and conduct high-order learning activities during class time. Furthermore, students' metacognition and self-efficacy play a crucial role in flipped learning. Students without self-regulated ability may not obtain excellent learning outcomes in a flipped learning environment. Therefore, this study aims to design a self-regulated flipped learning approach in differentiated instruction (SRFL-DI) for promoting students' metacognition and self-efficacy.

This study developed the SRFL-DI approach for fifth grade students, in order to facilitate their metacognition and self-efficacy. In this research, the metacognition questionnaire comprised two dimensions: self-monitoring and self-evaluation. A total of 47 students from two fifth grade classes (10 or 11 years old) were recruited for the experiment from an elementary school. All the participants took part in the learning activities for four weeks. During these learning activities, the experimental group adopted the SRFL-DI approach, while the control group used the conventional flipped learning approach in a differentiated instruction (CFL-DI) approach.

The experimental results showed that the students who were learning EFL with the SRFL-DI approach made significant gains in their self-monitoring, self-evaluation, and self-efficacy compared to those learning EFL with the CFL-DI approach.

The SRFL-DI approach is beneficial to students in an EFL environment as it enhances their self-monitoring, self-evaluation, and self-efficacy. Such an approach can be designed with DI learning activities in other courses by replacing the learning objects and materials. The SRFL-DI approach could be a good reference for implementing an EFL learning environment, so as to promote students' metacognition and self-efficacy.

Multilevel Challenges in Learning Design: An Investigation of Novice Learning Designer Teams

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The overarching problem for the present study is to address the need for courses that provide novice learning designers (LDers) with the necessary conceptual understanding as well as the professional and technical skills to undertake the full spectrum of learning design (LD) decisions from course to task and resource levels to achieve coherence, alignment and effectiveness with regard to identified learning outcome goals for targeted learner communities. Two key scaffolding supports were provided for the students' LD process: (1) a 7-step LD model centering around a Learning Design Triangle (LDT) framework that includes the design of learning analytics (LA) and feedback and evaluation to highlight LD as an iterative process of improvement, and (2) a technology platform, the Learning Design Studio (LDS), that students can use to develop their evolving designs following the 7-step model.

The case study reported in this paper was carried out in the context of a Master level course on Learning Design and Technology that aimed to provide a comprehensive introduction to the multiple levels of LD from course to resource levels. Course participants were novice LDers with diverse academic and professional backgrounds. They were required to work in teams to design a mini-course. At the end of the course, Students had to submit their LDs in three representational formats: a course outline, LD documentation on the LDS, and their course design implemented on the Moodle learning management system (LMS).

The findings reveal challenges encountered by novice LDers at different design junctures and the diverse trajectories experienced by different design teams. The use of the conceptual and technological LD tools and the need to progressively develop multiple representational formats in tandem for the same mini-course prompted the novice LDers to articulate their pedagogical reasoning during the LD process, heightening their awareness of the alignment (or lack of) of their LD at different design levels.

The study also shows the value of the LDT framework and LDS in supporting the professional development of novice LDers. Implications for theory and practice in the professional development of novice learning designers are discussed.

A Blended Physics Experiment Teaching Environment: What Do We Expect?

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During the time of the COVID-19 epidemic, the College Physics Experiment course with its practical curriculum accepted the challenges and reflected on them. Compared with the traditional teaching method of demonstration, learning with online resources has many advantages, such as the ease of updating content and providing more time to experiment and explore. The direction of reform in the Physics Experiment course after the epidemic was under control involved an increase in the proportion of online resources and the enhancement of the integration of online and offline teaching. This paper aims to introduce our approach and share our experience with other researchers for reference.

Based on Bandura's Reciprocal Determinism, we developed a platform for the teaching of physics experiments which could be used on a mobile phone. With guidance from an experiment shown on the project module, students did an experiment on 'measuring a signal with an ST16A oscilloscope' and accomplished it by themselves. To evaluate the effects on students, we adapted the URSSA scale (Undergraduate Research Student Self-Assessment) and investigated four aspects — their satisfaction with teaching support, knowledge acquisition, personal income and the experimental attitude and behaviour.

The results showed that online resources can achieve the basic knowledge acquisition; and there was no significant difference in the satisfaction with teaching support between the experimental and control groups. However, it was also found that the students in the experimental group were not as good as those in the control group in their experimental literacy, motivation for learning and the desire to explore. This may have been due to insufficient interaction in the design of the online resources. The lack of contact with offline activities leads to the lack of teachers' influence and a learning atmosphere.

This paper analyses students' learning capacity in the application of practical teaching. We know that in the development of online resources, we should pay more attention to the connection with offline teaching activities, rather than focusing on the content construction alone.

Online Exams in Online Distance Education: Current Practices, Challenges and Solutions

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Due to the pandemic, many educational institutions have continued their teaching through online education instead of cancelling their educational activities. However, the transition to online education has brought many problems, one of which is measurement and assessment. While it is often difficult to assess students in face-to-face learning environments, it has become even more difficult and complex in online education. At this point, the question of how safe it is to give online exams, which are an important part of learning, has been raised. To date, there are insufficient studies to propose solutions for future practices related to online exams.

To handle this gap in the literature, this study aims to explore the current practices of online exams, the challenges faced, and possible solutions for the future practices. For this aim, a rapid evidence assessment review method was used to summarize and synthesize the research findings in the literature. A purposeful sampling method was used to retrieve as much relevant literature as possible for refinement of the results for online exams. In order to identify the articles that are relevant to this research, we searched the common databases (i.e. Scopus, WoS, Google Scholar) with key words which produced 218 results. This study is limited to the studies written in English from 2012 to 2021. A content analysis was used in data analysis.

The preliminary results of this study show that academic dishonesty is common in online exams and the exam results do not fully measure the course outcomes. While online proctoring is seen as an important solution, it has significant limitations. Some other solutions that are used to make online exam fairer do not seem to last in the long run. In this context, more effective and reliable solutions should be sought instead of removing online exams completely. A few of them are as follows: adopt homework-based assessment; do formative assessment; arrange exams to measure analysis and synthesis skills; provide students with supervised exam opportunities.

While online exams have been used increasingly in online distance education, especially during the pandemic, few research studies have comprehensively reviewed the current practices and challenges. Given the critical role of online exams, this study aims to provide such a comprehensive review of the application of online exams.

Should I Complete My Degree Online? Perspectives of International Students During the COVID-19 Pandemic

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Due to the COVID-19 pandemic, many international students have difficulty in returning to the host country and university. As a result, university administrators established technologically-assisted teaching and learning platforms for students who cannot come to the campus for their courses. However, most of the British taught Master's degrees only require students to complete their programme in one full-time year. The current study aims to understand the motivation and reason why these students decide to study completely online instead? For this purpose, two research questions were established:

(1) Why did these postgraduate students decide to complete their Master's degrees completely online during the COVID-19 pandemic?

(2) How would these students describe their experience of, and decision-making process for, pursuing a Master's degree online?

This study employed the Social Cognitive Career Theory as the framework for understanding the motivation and reasoning of these groups of Master's degree students who chose to complete their degree completely online during the COVID-19 pandemic. The general inductive approach was employed. The 156 participants were invited to complete an online-based inductive survey about their motivation and reasons based on the theoretical framework. The survey questions involved both open-ended and semi-structured questions. The grounded theory approach to data analysis was employed. Based on the open-coding and axial-coding techniques, the researchers merged two themes and three subthemes.

Based on the participants' sharing, the researchers captured the understanding and description of how the current social situation, financial considerations, and the limitations on international travel could have a strong impact on the decision-making process. Potential themes were outlined, including the same valued between on-campus and off-campus courses, and financial considerations.

The results may contribute to the current knowledge and practice about how postgraduate students select their learning method, the decision-making process for programme selection, and future programme development. University leaders, department heads, programme developers, university students and researchers may use the findings of this study to reform their online-learning platform and programme design in order to meet the needs of future postgraduate degrees and online-based programmes.

Calm Amidst the Storm: Reflections and Predictions for Higher Education

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The COVID-19 pandemic has caused enormous pain and suffering, with the impact on health and daily life having been catastrophic. The impact on industry and professions has been severe, with many seeing widespread redundancy and closures. Although there have been silver linings — in the shape of resilience and adaptations, for example — the disruptions from COVID-19 have mostly been negative. Higher education (HE) is no exception, with many HE professionals losing their jobs, and others enduring stress and hardship to adapt to the emergency delivery styles of online teaching and learning (T&L). Individuals (and their institutions), under enormous stress, have had to quickly reevaluate their skills and strengths, addressing immediate and future challenges. This paper, drawing from over 20 years of HE experience, offers reflections on pre-pandemic approaches to HE practice, and predictions and analyses of post-pandemic HE life.

This paper is structured around reflections on various aspects of life for an academic professional, before and during the COVID-19 lockdown. Reflective practice, guided by autoethnography, and critical analyses of relevant literature form the main methodologies. The paper also includes (and addresses) informal and focus-group discussion surrounding the pandemic-related HE disruptions.)

In the face of increasing uncertainty, with so much stress at the individual, institution, and even sector level, it is easy to understand the pervasive pessimism reported throughout HE. However, although COVID-19 has changed HE, many of these changes had actually been predicted, and even advocated, before the epidemic. The COVID-19 online and blended T&L, microlearning, expanded use of OER, and many other innovations can be seen not only as emergency teaching strategies, but as opportunities for HE practice and professionalism to evolve. This paper highlights opportunities and other potentially positive outcomes from the current COVID-19 challenges.

While many countries are still in lockdown, some (including China, the context for the author) are emerging and acclimating to the 'new normal.' Many of the disruptions caused by COVID-19 may actually have simply been expedited evolutions that many had anticipated, and even advocated. In addition to continuing reflective practice, and Kaizen-like (re)-evaluations, there are several clear opportunities now that HE educators and administrators should seize. In spite of the currently abounding stress and pessimism, there is reason for hope and optimism about HE's future.

Education in the New Normal: University of the Philippines Los Baños Students' Readiness for Remote Learning

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With the outbreak of COVID-19 in China which led the World Health Organization (WHO) to declare a global health emergency in March 2020, education has taken a new norm. The prevalence of remote learning has created a need to understand students' readiness for the new educational set-up. This study was conducted to assess the readiness of students for remote learning at the University of the Philippines Los Baños. It aims to determine the expectations of the students on a remote learning set-up, the challenges they face, and the assistance they need in order to recommend ways and interventions to address the challenges while ensuring an effective educational delivery through remote learning.

This study was conducted through a survey of 238 undergraduate and graduate student respondents. The remote learning readiness survey was adapted from the Online Readiness Assessment by Vicki Williams that consists of such areas as expectations, self-direction, learning preferences, study habits, learning strategies, language skills, technology skills, technology-mediated communication skills, and hardware/software requirements as the main basis for determining the readiness of the students for remote learning. In addition, a Likert scale with scores 1 (strongly disagree) to 4 (strongly agree) was used to determine the students' responses.

The results showed that the majority of the respondents strongly agreed on their expectation that a remote course is not easier than a face-to-face one; most were self-directed to finish what they had started; and more than half agreed on a learning preference that they learn well from auditory content. Similarly, the majority agreed to dedicate a specific time of the day or night to doing course work; to reflect on what they learned in every lesson; and to have confidence in their reading skills. For technology and technology-mediated skills, the majority of the respondents agreed that they are comfortable in navigating the internet and communicating via email and/or other synchronous means, while more than half agreed that they have a computer that runs reliably on Windows or Mac OS. Some of the challenges encountered were a poor/unstable internet connection; the financial cost of studying; too heavy an academic workload; proper time management; the unavailability of gadgets and internet data; difficulty in managing distractions; and anxiety and mental health issues.

Faced with these challenges and difficulties, academic support, financial assistance, and support for mental health are some of the interventions proposed in the study.

Gamification and Effectiveness of Different Digital Teaching and Learning Tools used in Online Tertiary Education Classrooms during the Pandemic

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This research compares and evaluates the success of gamification and the effectiveness of various digital teaching and learning tools used in motivating students in university classrooms in Hong Kong during the pandemic. The study also focuses on the psychological and physical behaviours of teachers and students towards the adaptability to game-based learning platforms and the success and effectiveness for English Language acquisition among university and college students in Hong Kong during the pandemic. In addition, it looks at the application of different technological aids and digital gaming platforms. The research further investigates the popularity and ease of applicability of different gaming tools in relation to the disciplines and contexts of English Language learning and teaching, with reference to the learners' and the educators' technological literacy and training received, and equipment support offered by educational institutions in tertiary education in Hong Kong.

The methodology of the research includes the collection of data from questionnaires and surveys distributed and interviews conducted among university and college students and teachers in Hong Kong, in corresponding to their perceptions, attitudes, motivation, interests, preferences, feelings of ease and other psychological responses to the application of different gaming tools for English Language learning and teaching.

It was found that most university students and teachers are comfortable using different gaming tools to enhance the interactive learning environment in English language classrooms. When students engage in creating games together, either competitive learning or collaborative learning can create an interactive classroom simultaneously. With the concept of level-up, learners are motivated to proceed to the next level or to being elevated to an advanced subsequent course. In this regard, learning becomes a process, and students are motivated to create the learning outcomes with their peers.

The research explores the possibility and limitations of applying the notion of gamification in virtual classrooms. This accelerates future course development with the possibility of course redesign and assessment restructuring with a switch to the new mode of technology as the trend. It also provides a framework to the further study of the application of gamification in other subjects and different classrooms around the globe, with the reference to the motivating force and physical and psychological behaviours of individuals in the learning contexts in tertiary education.

E-learning Practices in the Pre-pandemic Phase: Impacts on the Teaching Practices in Higher Education in the Macau SAR

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The 21st century has been marked by several transformations. Technological evolution, the most obvious one, has been used to improve various social domains, in particular contemporary pedagogical experiences and innovative practices. Also, since the current COVID-19 pandemic began, it has never seemed as relevant as now to shift away from outworn rote educational practices. However, with distance learning becoming the 'new normal' in many parts of the globe and having COVID-19 as an inflection point for innovation in the e-learning paradigm, the fragilities an unplanned and rapid shift to online learning bring to the learning and teaching experiences of this nature may also result in the reduction of significant learning and holistic teaching practices, that new fundamental on pedagogies, in harmony with social constructivist theories, have been trying to ensure in the open education movement.

These vulnerabilities — mostly marked by the lack of training, insufficient understanding of the distance education domain, and little preparation — had already been explored, prior to the pandemic in a 2019 case study about e-learning and the integration of emerging pedagogies in two institutions of higher education (HE) in the Macau Special Administrative Region (MSAR). The questions interconnected with the research are as follows:

(1) What technologies are being used in the context of higher education teaching/learning by its teachers?

(2) What is the teachers' 'digital profile'?

(3) What is the impact on students when they adopt e-learning practices in higher education?

(4) What are the teachers' e-learning practices?

(5) What are the reasons behind the adoption of certain technologies in higher education teaching practices?

In this study — which aims at outlining an authentic representation of the dynamics and pedagogical practices of e-learning in two distinct institutional realities — patterns of technological integration in the teaching-learning process, teaching staff digital skills, and methodologies for technological adoption were closely analysed through a structured questionnaire which was filled in, anonymously and confidentially by higher education teachers. The survey focused on the intersection of four axes that combined the problem with the research purposes. A selective blend of qualitative and quantitative approaches was integrated into this research.

The major findings of the study indicated that, overall, the technology being used in these institutions alluded merely to the support of pedagogical practices and were not being incorporated in a significant emerging way. Institutional support and development of such practices were also determined to be inefficient, while concepts of openness were revealed to be not only underdeveloped but typically misapprehended by the participants and institutions.

The research and scope of the study provide valuable insights into the e-learning scene in Macau, which led to the outlining of a feasible preliminary framework on e-learning practices being developed/implemented in MSAR higher education, as well as an accurate digital profile of the teaching staff in the said level of education. Suggestions and recommendations were offered which were intended to improve the findings of the study.

Hidden under the Fog of Remote Teaching with Zoom: At-risk Student Detection in a Pandemic-impacted Course

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Early detection of academically at-risk students is critical for retention. Remedial measures for these students can be administered in time to bolster the chance of their passing a course. Building a reliable model for identifying at-risk students is both desirable and challenging. A selection of predictive and observable model variables is required. Predictive variables contribute to model accuracy, and practically the variables must come from observable footprints of students left behind during their interactions with a course. As the set of observable footprints and their predictive power can change from one educational context to another, a universal model for at-risk student identification cannot exist. To seek predictive model variables in a new situation, scientific evaluation of the observable footprints is necessary for model building.

The social lockdown induced by the COVID pandemic has drastically altered the educational context in higher education. The replacement of face-to-face teaching with Zoom teaching is an emergency arrangement that has clouded the status of students. For example, students' attention level in classes is not observable due to poor video resolution or switched-off cameras. Fortunately, Zoom makes available several digitized footprints of learning activities that are potential model variables for detection of at-risk students. The aim of this research study is to evaluate the effectiveness of these footprints for the prediction of the academic performance of students in a computing course during the spring 2021 semester.

The Zoom footprints evaluated include attendance and polling records of students. The polling was designed as a formative quiz with questions about the materials covered previously. Each Zoom session had one to two formative quizzes. The downloaded footprints and their derivatives were used as input model variables for the prediction of their summative assessment results with a supervised machine learning algorithm. The effectiveness of a variable was measured by Mean Decrease Accuracy, which is defined as the decrease in prediction accuracy after the removal of the variable. The feasibility of early detection of at-risk students was also evaluated by comparing a sequence of models built from footprints of shorter time spans.

The most effective variables for predicting at-risk students found in experiments were related to summative assessment. When summative assessment was not available, formative assessment could make significant contribution. The variables related to attendance were irrelevant. The prediction accuracy of the best models reached over 0.80 based on fivefold cross-validation.

Accurate detection of at-risk students is inherently challenging in courses affected by the pandemic, because many relevant factors become hidden in online teaching. This study showed that regular formative quizzes could offer the footprints effective for the detection of these students. The findings have added to the body of knowledge in understanding the predicting of the academic performance of students in Zoom teaching.

Evaluation of Hybrid Teaching Effectiveness: Feedback from Academics

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The COVID-19 pandemic has significantly changed the mode of education delivery for universities across the globe, for which hybrid teaching — which allows students flexibility in attending face-to-face or online classes — has been the major alternative. This paper reports on an evaluation study on the effectiveness of hybrid teaching in a university in Hong Kong during the pandemic.

The evaluation focuses on the perspective of academics, including their observations of students' learning, and the perceived benefits and challenges of hybrid teaching and suggestions for improving it. Two sessions of focus group discussion and a questionnaire survey were conducted, in which 86 academic staff participated. Cronbach's alpha for various parts of the survey results ranged from .66 to .96, which indicates an overall high consistency among them.

The academics who participated in the study observed that students usually had no problem in attending online classes and understanding lesson content during hybrid teaching. However, they also noted that students tended to have a lower level of engagement, in-class interaction with teachers and study performance. The participants noted the challenges they faced in areas such as the workload for class preparation, the design of interactive teaching, the monitoring of students' progress, and attention to both face-to-face and online students simultaneously. They tended to prefer face-to-face teaching to hybrid teaching, and suggested ways to improve hybrid teaching, such as the provision of software and relevant training for enhancing students' engagement online.

It is foreseeable that hybrid teaching will continue to be used widely by universities during or even after the pandemic. The findings of this study contribute to revealing the challenges and potential areas for improving the practice of hybrid teaching, as well as the support which could help academics to deliver teaching in the hybrid mode effectively.

The Business Digitalization Track: An Industry-in-Curriculum Approach

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The Business Digitalization track (BDTrack) arose from an urgent need to prepare students for a world of work that was rapidly changing, demanding new and more extensive sets of digital skills in traditionally non-IT professions. The existing curriculum, while containing skills training in information technology, would be too little and too late to achieve the above objectives in a three-year programme. The BDTrack was thus conceived as a disruptive but optional pathway for final year students to acquire digital skills that would prepare them for jobs through greater involvement of industry professionals. This paper describes the design of the BDTrack, the pedagogical approach, the preliminary findings, the results achieved and the value it has brought. The BDTrack is a one-year programme that replaces the final year curriculum of the Business Studies Diploma programme.

The BDTrack is unconventional in its structure, teaching and learning strategies, and assessments. Instead of learning five academic modules concurrently, students acquire skills in six competency areas (CAs) that are run sequentially. In place of conventional lectures and tutorials, students learn through attending seminars conducted by industry practitioners, online courses, hackathons, and learning journeys. Year-end examinations are replaced by formative quizzes, industry-based projects and research, industry certifications, and a viva voce to assess each student's attainment of competencies. Students are assigned multiple internships to gain wider industry exposure and opportunity to apply their acquired skills in different work environments. They are required to organize and run an annual unconference to highlight their work and research as well as to learn from others.

The teaching and learning experience has generally been positive, though challenging due to the COVID-19 lockdowns and movement restrictions in 2020. The BDTrack was conducted remotely via Zoom. The unconference was converted into a webinar and in-class presentations were changed to pre-recorded ones. Studuents' performance was not adversely affected by these changes and invited speakers delivered their lessons online without difficulty. Students' feedback suggested that the course's unconventional structure and the way it was taught had helped them to learn better. Students feel that the design of the BDTrack encourages independent learning, and has taught them to think critically and on their feet, and enhanced collaboratve learning. Students have also acquired knowledge and skills beyond what is taught in the curriculum.

This is a pioneering programme within the Polytechnic system of education in Singapore, which follows a tertiary education model characterised by lectures, tutorials and authentic assignments. The BDTrack retains many of these characteristics but is pedagogically designed to build skills-competency through independent, self-directed and collaborative learning, bring the industry into the classroom, and make it accessible to alumi and the public who may be interested in extending their knowledge in new skills areas in a just-in-time fashion. The design of the BDTrack allows it to be simultaneously extended to the Continung Education & Training (CET) programmes.

Blended Learning as an Innovative Modality for Communication Theology: Assessing Achievement and Motivation

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Communication is a fundamental principle and essential dimension of theology. The Catholic Church encourages theological institutes, priests, and seminarians to be well informed, critical, and creative users of information and communications technologies (ICT). The recent advancements in ICT in education make its integration imminent in theological institutes. The theological institutes, at present, mostly use conventional or traditional face-to-face teaching methods. The researcher introduced a blended learning course and carefully studied its outcomes. This paper seeks to explore the student achievement and motivation for learning Communication Theology using a blended learning modality.

A brand-new relevant theology subject — Communication Theology — was taught in Saint Peter's Pontifical Institute of Theology, Bangalore, using a blended learning lab-rotation model for one semester. The blended learning course in this study was designed using the ADDIE (analysis, design, development, implementation, and evaluation) model, developed, implemented and evaluated for 21 first-year theology students. The researcher used descriptive (online questionnaire) and quasi-experimental (one-group pretest-posttest) methods to assess student achievement and motivation. The online questionnaire contained the statements on a 5-point Likert scale, and the pretest-posttest questionnaire included the questions on subject knowledge.

The results revealed a statistically significant difference in achievement, and that students were motivated and readily adapted to learning through MOODLE. They were highly satisfied with the blended learning course. The positive results revealed that the future priests were willing to integrate ICT into their life and mission.

This micro-study and the first attempt to implement blended learning for the *Communication Theology* course explored the possibility of its implementation in theological institutes. This research proposed a new student-centred teaching-learning method and opened an era of ICT integrated education in the theology curriculum. The increased student achievement and motivation enhance their engagement and enable seminarians to gain a deeper understating of the subject. Further, it augments the capacity to unfold the human potentials as they manage to learn independently.

The Robots Will Rule: Improving Coursework Marking and Feedback Through an Automated System

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Delivering high-quality, timely and formative feedback for students' code-based coursework submissions is a problem faced by computer science (CS) educators. Automated feedback systems (AFSs) can provide immediate feedback on students' work, without requiring them to be physically present in the classroom — an increasingly important consideration for education in the context of COVID-19 lockdowns. There are concerns, however, surrounding the quality of the feedback provided by existing AFSs, with many systems simply presenting a score, a binary classification (pass/fail), or a basic error identification ('The program could not run.'). Such feedback, with little guidance on how to rectify any problems, raises doubts about whether these systems can stimulate deep engagement with the related knowledge or learning activities. This paper presents experience in developing and deploying a new AFS that attempts to address the current deficiencies identified.

We developed an AFS to mark and provide feedback to 160 CS students studying an introductory Databases class. The experience of designing, deploying, and evolving the AFS is examined through reflective practice, and focus-group (involving peer teachers) analysis. The student experience of the AFS is explored through formal university-level feedback systems, and a follow-up survey and interviews.

In contrast to most introductory-level coursework feedback and marking, which typically generate significant student reaction and requests for change, our AFS deployment resulted in zero grade-challenges. There were also no identified marking errors, or suggested inconsistencies or unfairness. Student feedback on the AFS was universally positive, with comments indicating an AFS-related increase in student motivation. Interesting perspectives that emerged from our reflections and analysis included the issues of how much impact our own software engineering training and approach to building and deploying the AFS had on this success.

Our successful experience of building and using an AFS will be of interest to the entire teaching community, not just CS/SE educators. The associated increases in marking and feedback reproducibility, accountability, and automation represent an important advance in AFS technology. In collaboration with our students, we are currently evolving the AFS into an autonomous learning object that they will be able to use independently of regular classes. Eventually, we hope to release the AFS to a wider audience as an open educational resource (OER).

Understanding the Cybersickness Effects of Using Virtual Reality-based Classrooms for Undergraduate Students: A Preliminary Study

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Virtual reality (VR) technologies have expanded their domain of application towards education, offering various pedagogical advantages such as an immersive environment, teaching innovation, and in-depth user engagement by allowing the students to experience real-life scenarios of the taught subject through virtual simulations. Motion sickness, as one of the long-standing key challenges of VR utilization, even in gaming, often becomes a barrier for VR users to fully engage with the content developed in the virtual world. Thus, this work presents a preliminary study on understanding the symptoms of motion sickness — which will be referred to later as 'cybersickness' — in the teaching and learning (T&L) context.

A VR-based virtual classroom (V-Room) was developed and tested, in which 60 undergraduate students at the University of Nottingham Ningbo China (UNNC) participated. In this study, the students were equipped with the same VR headset and had the same V-Room environment. Data were collected through a two-step questionnaire, using both qualitative and quantitative measures, that was distributed to the participants before and after the study session. The severity of cybersickness was categorized into low-impact, medium-impact, and high-impact symptoms, alongside an overall comfort level experienced in the V-Room. Using the ANOVA F-test statistical approach, the data were analysed based on the following two research questions: (1) Has gender an influence on the presence of cybersickness symptoms?; and (ii) Does students' academic background (i.e. natural sciences and social science) also affect their experience in using VR for learning?

The results demonstrated that approximately 47% of the participants had experienced cybersickness during the V-Room experiential journey, of whom 64% were females. With a confidence level of 95% ($\alpha=5\%$), the p-value obtained for the respective gender and study discipline categories against the cybersickness symptoms were all smaller than 0.05, indicating that there was a significant difference between the two compared variables. Likewise, the F-statistical value was larger than the F-critical value, showing that both gender and study discipline have a considerable impact on the cybersickness. Moreover, it is worth highlighting that the top three factors that caused the cybersickness were the speed of the virtual movement, the perspective angle, and the visual properties of the virtual environment.

It is hoped that the results of this study provide valuable pointers for future VR-based virtual classroom developers to minimize the cybersickness symptoms in the higher education T&L context that would enable an effective learning environment for the students.

A Pilot Study Investigating Students' Perception of a Virtual Classroom Environment in Higher Education

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Virtual reality (VR) offers many desirable features for education, including an immersive and low-distraction experiences, and visually-attractive virtual environments. This paper reports on a pilot study investigating student response to VR in higher education (HE). It is part of an ongoing university-scale project, named V-ROOM, which aims to develop a comprehensive VR teaching and learning (T&L) platform, which aligns with the digital T&L transformation strategy at the first Sino-foreign HE institution in China — the University of Nottingham Ningbo China (UNNC).

This study involved 55 undergraduate students — 21 in engineering programmes, and 34 in non-engineering programmes — being immersed in a virtual classroom environment (VCE). The instrumentation included a Likert-scaled survey and follow-up interviews. The survey explored the overall student perceptions of the VCE, and this was followed by an interview that enabled clarification and expansion of the responses. Response data were evaluated across four factors: learning motivation; engagement in the learning journey; the attraction of the VCE; and satisfaction with the VR experience. Correlations were also analysed between students' overall perception and various other elements (including VCE features, gender, and study programme).

The reliability of the survey data was examined using Cronbach's coefficient, which was greater than 0.8 for all factors, confirming the internal consistency of the set parameters. The results also showed that students had a very positive attitude towards using VR for learning, with an average score of 4.01/5.00. The VCE features, which involved a multi-sensory experience, appeared to have a higher positive correlation with the students' overall perception than gender or study programme, with the visual features being the strongest influence compared to interaction (kinesthetic) or audio (auditory) features of the VCE.

The results of the pilot study showed that the respondents, who were 18 to 21 year old UNNC undergraduate students, had an overall positive perception and learning experience of using VR for HE T&L activity, especially in the context of integrating multi-sensory learning elements in the VCE developed. The key findings from the current study will be used to enhance the VCE interaction features that will support a variety of students' learning styles and expectations for a virtual classroom. In a broader context, the authors hope that this paper will contribute to providing a pedagogical infrastructure where the use of VR for learning is not a binary option; rather, it could be implemented as an innovative digital T&L method, complementing conventional T&L, and the existing online and blended learning strategies.

A Comparison of Experienced K-12 Administrators' and Teachers' Attitude and Perception Towards One-to-one Digital Learning

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This study aims to investigate the attitude and perception towards one-to-one digital learning among experienced k-12 administrators and teachers, and to explore the difference in attitude and perception between these two groups.

Sixty-six k-12 administrators and 1,535 teachers from Guangdong province were selected as participants for this study because they had experience in one-to-one digital learning ranging from several months to years. On the basis of a literature review and an adaptation of Lindqvist's original instrument for examining superintendents' and teachers' attitude and perception towards one-to-one digital learning (Lindqvist, 2015), a survey which contained three parts was proposed. These parts were: (1) ethnographic information — sex, teaching ages, school type, grade, ICT self-efficiency, and length of experience; (2) attitude items — ever positive about the future, willingness to participate, confidence in students' attitude, and confidence in each other's attitude; and (3) perception items — impact factors of success, influence for students and teachers, and evaluation of current situation. The Cronbach's alpha values were 0.960 and 0.981, and the KMO values were 0.849 and 0.97which suggested that the instrument had good reliability and validity. SPSS22.0 was used to analyse the data.

Firstly, the results showed that experienced teachers' and administrators' attitude and perception were positively influenced by their ICT self-efficiency and length of experience. Teaching ages had a negative influence on teachers' attitude and perception, but only on administrators' perceptioon. Secondly, the administrators' attitude was more positive than that of teachers. As regards perception, there was a significant difference between the two groups. Administrators agreed on the factors that have an impact on the success of one-to-one digital learning programmes and a positive influence on students and teachers more. However, both groups agreed that the other's attitude was more positive and the current situation of their programmes was not so satisfactory.

This study contributes to giving new insight into the attitude and perception of experienced school staff towards one-to-one digital learning. Also, useful suggestions can be extracted such as being careful about the difference, seeking common comprehension, improving ICT literacy, and being patient about the time needed for the final success of one-to-one digital learning initiatives in k-12 schools.

Technology-enabled Automation Process Improvement Framework (TEAPIF): A Case of Optimization and Efficiency at the University of Waterloo's Centre for Extended Learning

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The purpose of this paper is to present a case study of an empirical technology-enabled automation process improvement framework (TEAPIF). The TEAPIF framework applies automation to streamline and optimize key activities and incorporates multi-constituent notifications, bookings, and visual reporting enhancements, while minimizing human reliance. It thus decreases manual errors, compounding omissions, and wasteful redundancy for quicker and more efficient administrative support results for online learners within the Centre for Extended Learning (CEL) at the University of Waterloo.

The design aims to address antiquated support processes surrounding academic integrity risks for CEL online learners that over time became laboriously complicated, inefficient, and error-prone. The TEAPIF framework decouples all elements of the processes, and then identifies the key resources essential for performing the processes in a LEAN, quicker, and more reliable manner. The approach includes value stream mapping techniques to illustrate and analyse the process areas by defining value-add (VA) and non-value-add (NVA) sections within the process, and measurements of the process flow and its duration between each activity.

The application of the TEAPIF conceptual framework along with value stream mapping was used to decouple the process components, categorizing them between VA versus NVA elements. Further task isolation provided increased visibility into these activities, identifying key elements that would deliver consistent, reliable results for improved efficiencies from conversion to automation. Working from this new technology-enabled baseline allowed more opportunities to layer additional enhancements not originally considered, and apply ongoing continuous quality improvement refinements.

This research provides a theoretical technology-enabled automation process improvement framework (TEAPIF) model — an innovative educational technology-based tool — as a potential solution in the automation of some complicated and sensitive processes such as risks to academic integrity for online learners that reside within institutional academic units that provide and administer online teaching and learning. Planned future work includes further testing on various additional processes and their measured results to streamline for improvements in efficiency and optimization using the theoretical TEAPIF framework model.

Employees' Attitudes Towards Ubiquitous Library-supported Professional Learning: An Empirical Investigation in the Beauty Spa Industry

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The present study aims to explore the influencing factors of employees' attitudes towards ubiquitous library-supported professional learning (AULPL) when they adopted the ubiquitous library (including professional materials and training courses) in the workplace.

In this study, beauticians trained by a spa training institution in Taiwan were recruited as the participants; and they were required to have experience of mobile learning and DS Library learning (for at least five months) to be qualified for this research. Questionnaires were distributed through the internet and the participants filled them in after logging into the DS Library. A total of 164 valid questionnaires were collected and analysed using exploratory factor analysis to validate the job characteristics; the SRL and AULPL questionnaires; Pearson correlation analysis to explore the relationships among the employees' perceptions of job characteristics, SRL and AULPL; and path analysis to examine the effects of the employees' job characteristics and self-regulated learning on their attitudes towards ubiquitous library-supported professional learning.

The present study aims to examine the effects of employees' job characteristics and self-regulated learning on AULPL when adopting a ubiquitous library (DS library) for professional learning. The results indicate that the employees' job characteristics (i.e. job control and social support) and self-regulated learning can predict their attitudes towards ubiquitous library-supported professional learning. In addition, self-regulated learning acted as a mediator between job characteristics and AULPL. Basic self-regulated learning mediates the relationships between job control in job characteristics and perceived usefulness for AULPL. Advanced self-regulated learning mediates the relationship between job control in job characteristics and AULPL (i.e. perceived usefulness, perceived ease of use, affection, and behaviour).

Most of the studies on ubiquitous library-supported professional learning focus on employees' usage. From the perspective of employees, this study investigated the relationships among their job characteristics, self-regulated learning and AULPL. Besides, the current study lays a foundation for ubiquitous library-supported professional development, which is an important issue for industries nowadays.

A Case Study to Sustain Student Interest in Science General Education Subjects

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In order to give our students a rounded education and prepare them to adopt the characteristics of lifelong learners, blended learning with different forms of activities to foster a better learning experience in undergraduate courses is increasingly important. However, the large variation in students' learning progress causes the teaching of our Science General Education (GE) subjects (ABCT1D09 and ABCT1D10) to become challenging due to their broad academic backgrounds. The purpose of this paper is to present our current practice of blended learning activities to enhance students' engagement and motivation in learning science.

We incorporate various blended learning activities for subjects with students who have a very varied academic background, and present our current practice of blended learning for the foundation year subjects noted above. This study investigates the implementation of various modes of blended learning activities using a virtual learning environment (e.g. Blackboard, Panopto, MS Teams, EDTools, and MS Form) to improve students' learning experience by enhancing their engagement in this large GE class with around 100 students. The effectiveness of this model will be evaluated by a survey and students' academic performance.

Among the activities designed in the learning management systems we utilize (Blackboard and MS Teams), we find it interesting that our students are happy to have the laboratory and project to supplement their learning in our teaching subjects. Most of our students (75%) are satisfied with the pedagogy (score 4.2 out of 5). Further investigation is required to confirm the findings.

The blended learning approach can be useful for science education for university students who are both science majors and those specializing in other subject areas.

Podcasts as Metacognitive Prompts: A Case Study of Graduate Students' Metacognition Regarding Citations

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The purpose of this study is to explore the potential for 'integrated' podcasts to act as metacognitive prompts that might stimulate graduate education students to reflect on the nature and purpose of citing and citations, and on their metacognitive knowledge of the cognitive strategies they employed when using citations for academic purposes.

A qualitative, interpretivist stance was adopted for this study. Two full professors in an education faculty were interviewed regarding their understanding of the nature and purpose of citing and citations, and the cognitive strategies they employed when using citations for academic purposes. These interviews were edited into two separate audio-podcast episodes and made available to students in a graduate-level education research methodology course via the University's online platform. Four students in a class of 15 consented and participated fully in the study, engaging with the podcasts. Their knowledge of the nature and purpose of citing and citations, and the cognitive processes they employed when using citations, were explored pre- and post-engagement with the podcasts, using questionnaires and semi-structured interviews. Comparisons between individual students' pre- and post-self-reports were investigated, and thematic analysis was undertaken for the whole corpus of data.

Students reported that the content of the podcasts prompted them to reflect consciously on their understanding of the nature and purpose of citing and citations, and the cognitive strategies they employed when using citations. The podcasts acted as metacognitive prompts, as intended. They reported that each of the professors' views was informative, noting also the similarities and variations between the professors' metacognitive knowledge and their own. Students variously reported changes to their cognition as a consequence of engagement with the podcasts.

The potential of podcasts for targeting specific cognitive strategies and the metacognition related to that cognition are underexplored. Given the popularity, ease of production, and accessibility to podcasts, the potential for such use in higher education is demonstrated through this study. Future research into the use of podcasts for targeting other specific academically-oriented cognition and metacognition is proposed.

Constructing an IOS-based Adaptive Question Bank for English Grammar Tests

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With the development of computer science and the application in educational measurement, many question banks have been built in higher educational institutions throughout China. One example is the math and physics question bank projects initiated by the Ministry of Education. English education at various levels in China is also facing new challenges posed by modern educational technology. It is now a requirement to reform the current test methodology in order to improve its efficiency and effectiveness.

We designed a new algorithm based on previous methods to formulate adaptive questions in constructing a question bank. The test points were categorized in accordance with English grammar subjects summarized by experienced grammarians. Each question is weighted by its attributes stored in databases.

By conducting surveys among students who have used the question bank, we found that the attributes describe in detail the way a question can assess a particular grammar skill fairly accurately, e.g. NMET, CET Band 4/6 and NGET. The system also enables students to practice their English grammar skills in a seamless-learning way with their IOS devices and provides an efficient and effective way to predict English learners' grammar proficiency.

Our research presented in this paper helps to deal with three issues in English grammar tests in both the high schools and colleges of China: 1. Most paper-based tests are not adaptive, which means students' aptitude cannot be assessed accordingly and will result in an inaccurate report of their learning. 2. Instructors usually have a heavy workload in creating both test and practice papers for students, because these have to be done manually. 3. Test papers cannot be reused once released to students, which is neither very economical nor environmentally friendly.

Will I Continue Teaching Sustainable Development Online? An International Study of Teachers' Experiences During the COVID-19 Pandemic

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K-12 education has undergone drastic change due to the COVID-19 pandemic. Education for sustainable development (ESD) requires an interdisciplinary and student-centred approach to empower students with critical thinking, collaboration and problem-solving skills. Can the learning objectives of ESD be achieved via online learning? Currently, very few studies have evaluated the effectiveness and feasibility of teaching sustainable development online. Since online learning has become the trend in the current education environment, this study aims at investigating the significant factors influencing teachers' perception of teaching sustainable development online during the COVID-19 pandemic. It identified the personal and contextual factors which can be predictors of the teachers' choices on teaching sustainable development online in the post-pandemic era. This study is guided by three research questions:

1   How do teachers describe their experience of teaching sustainable development online?

2   Why do teachers desire to continue teaching sustainable development online in the post-pandemic era?

3   Why do teachers desire to stop teaching sustainable development online in the post-pandemic era?

This study adopts Social Cognitive Career Theory as the theoretical framework for investigating teachers' experience of teaching sustainable development online and presenting their decision-making process on continuing to teach sustainable development online in future. Guided by interpretative phenomenological analysis, the researchers conducted two one-on-one semi-structured interviews with five in-service teachers internationally to examine their online teaching experiences. A general inductive approach was employed in data analysis to generate three themes and six subthemes.

By an in-depth study of the participants' teaching experiences and decision-making process, the researchers encapsulated and categorized personal and contextual factors — such as personal beliefs, the attainment of teaching goals, and the school support — which influenced their perception and decision on whether to continue to teach sustainable development online.

This is a unique international study which examines the interrelation between personal and contextual variables which influence teachers' perception of teaching sustainable development online by adopting an SCCT lens. Since the United Nations highlighted education for sustainable development (ESD) as a critical step to achieve a win-win situation among people, the planet and prosperity, the findings from this study provide insights for educators, institutes, education policy-makers and school management in reviewing the current implementation of learning sustainable development online and probe into the possibility of implementing online teaching as a regular component in ESD.

The Exploration of Teaching Behaviours in a Mobile Learning Context

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Research on the Application of Interactive Narrative in Online Education

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Mobile learning increases students' motivation and autonomy, and is a way of achieving self-directed and lifelong learning. Many educational institutions have promoted mobile learning, hoping that it could enhance the educational level. However, teachers face complex challenges when conducting mobile learning, including preparation of the teaching context, class management, and hardware maintenance. Educators need to clarify the important tasks for teachers when conducting mobile learning. By using behavioural analysis, teachers' teaching behaviours can be clarified.

This study used a sequential analysis to examine the teaching behaviours of teachers in using mobile learning. The sample selected for this study was a natural science teacher in Taiwan who had been teaching mobile learning for three years. This teacher's teaching process was divided into three stages: student self-learning, teacher instruction, and student reflection. The teaching process was videotaped in ten sessions of 40 minutes each. A coding scheme was used to code the teacher's teachign behaviours. In addition, the validity of the coding was verified by inviting another teacher to code one video. The Kappa value was 0.97, indicating that the coding results were highly consistent.

The results revealed that, during the self-directed learning stage, the teacher's behaviours were related more to classroom management such as encouragement and stopping students' misbehaviour. During the instructional stage, he performed more behaviours on presenting materials on mobile devices and delivering knowledge. In the reflection stage, the teacher's behaviours were classroom management and guiding students in knowledge synthesis. Therefore, it seems clear that teachers put the most effort into classroom management and learning autonomy rather than teaching.

From the results, it is suggested that future teacher training programmes should focus on (1) teachers' familiarity with technology; (2) the design of teaching activities; and (3) a model for classroom management. In mobile learning, classroom management is the biggest challenge for teachers. The result also reflected the importance of cultivating students' self-directed learning skills. Educators need to focus on the ways of 'learning with technologies.' In addition, teachers need to learn how to be good learning facilitators for students.

In the context of the development of mobile communication technology and artificial intelligence, many forms of online education resources have appeared in the field of education. Interactive storytelling, a concept that transcends video games, seeks to create more engaging experiences on top of existing human-computer interactions. The purpose is to solve the problem of current online education resources through interactive narration and achieve the integration of teaching content and teaching form.

The methodology used in this study was case analysis, user interview, and observation.

It was found that for the content and the teaching form of online education resources, there are still some problems. Some examples are abstract teaching content, scattered teaching structure, popular teaching method and simple teaching form.

By grasping the content structure and the layout of resources in the form of teaching, interactive narrative not only makes the teaching content integrated, but also enhances the interest and engagement in learning. In addition, the information generated in the interaction process can be used as a data source for teaching evaluation in the background of resources, to design targeted teaching programs for students and promote the development of personalized education. The significance of this study is that it is innovative for the teaching structure of online education resources and achieves the integration of immersion and experience by combining the interaction and the narrative of resources.

Bilibili Interactive Teaching Video — A Supplement to the Undergraduate Course on Operational Research

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With the rapid development of the video-sharing website, traditional classroom teaching has been supplemented to some extent. This paper aims to explore the influence of the video-sharing website on improving the teaching effect on the operational research course. In addition, methods for enhancing students' enthusiasm for learning and performance by the video-sharing website are proposed.

An experiment has been designed to demonstrate the effect of the video-sharing website on students' performance using 'Bilibili' with its property of a barrage. The course on operational research was uploaded. The advantages of the teaching method were analysed according to the background data and comments on the website. The students can fire the barrage while watching the video. All the audiences can respond by sending the barrages to each other, which is useful for geting the explanation for the question during the learning process.

Bilibili provides a teaching platform to communicate widely, like having a worldwide classroom. From a survey on the audiences, it was found that the students on different levels like to choose their own teaching speed or repeatedly watch a certain episode of the teaching video, due to the speed set and repeated play function. This kind of video-sharing website has removed the restraints in the classroom, and the role of the teacher has changed from being in a high position to becoming a sharer, so that teachers and students get closer to each other and the students can absorb knowledge more easily.

This mode of learning allows students to study in a more relaxed way. Learning is like playing. The students' interest in learning can be stimulated to a greater extent by this interactive teaching mode. The communication method of barrages can make students braver in expressing their questions and ideas. Such learning in a video-sharing website provides a good supplement to traditional classroom teaching.

The Dilemmas of the Teaching Staff Construction of the Open University of China, Based on the Visualization Analysis of the Literature Indexed in CNKI

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Using the visualization analysis of the relevant literature indexed in the Chinese National Knowledge Infrastructure (CNKI) from several perspectives, this paper tries to reveal some prominent problems. The focus is on the teaching staff in the Open University of China during the transition period.

The research method in this paper is the visualization analysis of the relevant literature indexed in the CNKI. The basic steps are: 1. Typing in the keywords, collecting and selecting the valid sample data; 2. Using the CiteSpace service provided by the CNKI, the effective sample data is visualized and quantified to generate relevant charts and figures; 3. Illustrating the visualized data; 4. Analyzing the current academic research on the problems of the teaching staff, based on the analysis of the visualized data in the Open University of China, we try to reveal some new problems compared with the current research results based on the literature review.

This paper reveals some additional problems in teaching and the academic development of the teaching staff in the Open University of China from several perspectives. Firstly, since the process of teaching is separate from the process of learning in time and space, the relationship between teacher and student is distant. The sense of the teacher's professional happiness and achievement are not very high, so the effect of teaching and learning decline. Secondly, there are two main problems in the professional development of the teaching staff: the limited talent for teaching and the low teaching capability. Thirdly, teamwork efficiency is relatively low. Finally, the inequality in the traditional social evaluation system, academic evaluation system and educational policies has exerted some adverse effects on the teaching and academic development of the teaching staff in the Open University of China.

From the perspective of research on the sample data collected from CNKI by using the visualization analysis method, this paper provides a new perspective for analyzing the current problems in the teaching and academic development of the teaching staff of the Open University of China.

Sendai Youth Leadership Program: A Community-initiated Open Education Program in Areas Affected by the 2011 East Japan Earthquake and Tsunami

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The Great East Japan Earthquake of 2011 followed by the tsunami is considered one of the most catastrophic events in human history. Enormous resources and efforts have been invested in rebuilding the infrastructures and restoring the lives of affected individuals in the past 10 years. Here, I report on a community-initiated educational program open to young students who survived this disaster.

Sendai Youth Leadership Program (Sendai YLP) is part of an emerging movement in which bottom-up initiates drive the rebuilding of a society damaged by disaster. Sendai YLP offers eight two-hour sessions to enable high-school students in northeastern Japan (Tohoku region) to develop their communication and leadership skills. It is conducted in English, which is the second language of our target participants.

This experimental educational program is innovative in the following ways: (1) it is open to all interested students—it has no proficiency test or pre-screening selection—which differs from the design of most mainstream educational practices; (2) the core competence addressed in this program (English public speaking ability) is rarely provided in formal English educational curriculum in Japan; (3) it includes community members as coordinators, sponsors, and mentors, which enriches the landscape of frontline interaction and provides flexibility not available in the typical school curriculum.

After the 2011 Great East Japan Earthquake, Japanese people had less trust in the central government, but public trust of local government continued to grow (Kikuchi, 2013). The experience of a major natural disaster has promoted voluntary activities and involvement of local community members in the subsequent decision-making process. Sendai YLP can be seen as an example of the way local residents identify and participate in post-disaster reform and reconstruction in youth education. It fills the gap in formal educational curricula.

The content of this program follows the guidelines provided by Toastmasters International, a global non-profit educational organization that teaches public speaking and leadership skills. The coordinators receive support from this global network and adjust the details based on the actual local needs. Due to the pandemic, the program in 2021 was conducted virtually online, in order to safeguard the health of participating students and volunteers. The format provides additional opportunities, including international student participants from neighbouring countries (Taiwan, the Philippines, Vietnam) and international exchanges with similar programs in other regions (Canada, the US). This project can be insightful for parents, teachers, and the community to rethink the way we should prioritize youth education, especially when a region recovers from a disaster and returns to a global world.

The Quality Evaluation Model of Learning Support Service for Open University, Based on Connectivism Theory

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Learning support service is an important part of distance education for the Open University. It is a guarantee to promote effective learning in distance education and improve the quality of the Open University. Previous research has paid more attention to the overall quality of the Open University; there have been few studies on the evaluation of the quality of evaluation of learning support services. Learning support service quality evaluation focuses on the learning needs of learners from enrollment to graduation, based on the service quality measurement theory. In the Internet age, connectivism is an important theory for adults' learning. This research aims to construct a quality evaluation model of learning support service for the Open University, based on the connectivism theory.

First, a learning support service quality evaluation model based on the connectivism theory was initially constructed through a literature review. Second, the two-round Delphi method was adopted to support the model. Third, a questionnaire survey was conducted for the learners of the Open University; 512 distance learners from Jiangsu Open University participated in the survey. The recovery rate is 90%. SPSS 25.0 and Amos 23.0 were used to analyze the data and verify the model.

The quality evaluation model of learning support service based on the connectivism theory included 4 primary dimensions, 12 secondary dimensions and 23 indicators. The 4 primary dimensions are Operation Interaction Support, Social Network Support, Knowledge Aggregation Support and Cognitive Development Support.

In order to improve the quality of the Open University's learning support services, it is recommended that university's learning support services return to learning itself and respect the rules of distance learning. The university should pay attention to operational interaction and create a good learning experience, choose learning strategies and help students to build social networks, optimize knowledge aggregation, make full use of technology and data, orient lifelong learning and pay attention to cognitive development for learners. From the perspective of the connectivism theory, the quality evaluation model of learning support services can provide guidance for the practice of the Open University.

Study on How Change in Carbon Footprint of Online Education in China under COVID-19 Epidemic Conditions Impacts Sustainable Development

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As COVID-19 spreads across the world, online education has become a norm. In such a context, this study aims to explore the impact of carbon footprint change in online education on sustainable development.

This study tries to introduce the concept of carbon footprint, an indicator for quantifying natural resource consumption, to the field of education. Through horizontal comparison and individual evaluation, this study constructs an online education carbon footprint indicator calculation system. The system quantitatively calculates the scale of carbon footprint in three scenarios: the complete online learning stage at the height of the epidemic; the stage in which offline learning, as the main education mode, is supplemented with online learning; and the combination of online and offline education modes in future.

The following outlines the features of carbon footprint in China according to the research findings. First, the carbon footprint of transport of primary and secondary school students decreased significantly during the epidemic. Second, the carbon footprint from meals of college and university students since the epidemic outbreak has been significantly higher than before. Third, when online education accounts for 60% and offline learning accounts for 40%, the carbon footprint will reduce. Fourth, the per capita carbon footprint of transport from college and university students in China is lower than that of foreign students, but more carbon footprint is generated from daily life.

This study is expected to provide useful reference to research on the impact of China's online education on green campus construction and low-carbon sustainable development. It shall therefore be strong support for China's implementation of the 'carbon peak and carbon neutrality' strategy.

Does Technology Matters? The Success of Accelerated Learning

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The purpose of this study is to investigate factors which affect the effectiveness of accelerated learning. Previous research results have not been consistent, with both positive and negative findings (Kulik and Kulik, 1984). Accelerated learning is defined as intensive learning which not only shortens the duration of a course but also uses creative methodology (Celuch eta al., 2017).

An introductory programming class was used to test the effectiveness of accelerated learning. In 2020, a seven-week schedule was implemented instead of the normal 13 week semester. After the whole course had been completed, in-depth interviews were conducted separately with the lecturer and students involved in the accelerated learning. Scripts were transcribed and coded. In order to avoid possible bias based on the subjective judgement of a single coder, two independent coders were involved in the process (Neuendorf, 2002 to increase the reliability of selection (Duriau et al., 2007). If there was a dispute between two researchers, discussion between coders was encouraged to resolve the discrepancy (Krippendorff, 2013). A third researcher might be invited to join the assessment and the final decision was based on discussion among the team members. Several themes were identified, and student performance and satisfaction were compared with the class operating at the normal learning speed.

It was found that attentiveness and learning attitude could influence the learning effectiveness. Technology facilitated the two-way interaction between the teacher and students. Also, there was no significant difference in student performance and satisfaction between classes with accelerated learning and normal learning speed.

Technology with blend learning strategies certainly helps the accelerated learning. Accelerated learning was found to be effective for some foundation courses that didn't contain many difficult concepts. The current study provides the following recommendations for accelerated learning:

(1) Advise teachers to give answers immediately during tutorials;

(2) Increase student participation and engagement with technology; and

(3) Provide flexibility in how students learn. Supplementary exercises definitely help those who are falling behind.

Research on College English Teaching from the Perspective of Ecological Linguistics

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With universal English language education in China for the past decades, the college students have acquired knowledge of the language at different levels after years of studying it. However, there exists a common phenomenon that most of them lack the ability to use the language and cannot conduct smooth intercultural communication. Researchers from different disciplines have tried to find a solution to this problem from different perspectives such as linguistics, pedagogy or brain science, but the problem has still not been solved effectively. Ecological linguistics focuses on the dynamics and systematicness of language learning, which provides a new perspective for research on language teaching and theoretical support for the construction of a more positively developed model of language teaching. This can provide a certain enlightenment for changing the current situation of college English teaching in China.

In terms of method, this study involved a literature review and inductive analysis.

From the perspective of ecolinguistics, this research regards the language teaching and learning process as a micro-ecological system, and conducts a comprehensive and dynamic investigation of English teaching. The interaction among learners, teachers, language and the learning environment in the system is studied from multiple perspectives. The ecological design of English teaching is carried out from the aspects of teaching objectives, teaching contents, teaching methods and a teaching evaluation system, so as to improve college English teaching methods and the efficiency of college English learners.

Ecolinguistics considers the ecological environment of language comprehensively and regards English teaching as a dynamic ecosystem. In this system, teachers and students are the subjects of activities, with English language as the carrier, and Chinese and Western social culture as the living environment. All the elements in the system are interrelated. The sustainable development of the system needs an appropriate ecological environment, namely a classroom environment, a campus cultural atmosphere, a social cultural atmosphere, and policies and regulations. In addition, teachers and students need to give full play to their active initiatives. Teachers should guide students to choose their learning content and methods independently, help them to solve learning problems independently, and regulate their learning process. Students should participate actively in language teaching activities rather than just receiving knowledge from teachers passively. Only in such a dynamic system can students put what they have learned into practice and improve their ability in intercultural communication.

Embracing Digital Teaching and Learning: A Systematic Review of Innovation in Higher Education upon COVID-19

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The sudden outbreak of COVID-19 forced most schools and universities around the world to abruptly change their instructional delivery from the traditional face-to-face to the fully online mode, which posed many challenges to students, teachers and educational institutions. On the other hand, the COVID-19 crisis may present an opportunity to mitigate the challenges of online teaching and learning. Faculty members, including those resistant to adopting tools for instruction before the crisis, had to implement online teaching and learning during the pandemic and realized the advantages and limitations of e-learning solutions; and the experience may motivate them to couple e-learning with face-to-face instruction in the post-pandemic world. Therefore, this study surveyed empirical studies that were conducted between January and July 2020 on university teaching and learning in order to provide a picture of how the new mode of teaching and learning has evolved in higher education settings.

Two databases, Scopus and IEEE Xplore, were searched in early to mid-August 2020. Inclusion and exclusion criteria were set to identify the studies to be included in the review. This produced 29 journal articles and five conference papers for in-depth review on (1) new teaching and learning methods/strategies/technologies that were reported as being used; (2) learning skills and practical knowledge that students gained when taking part in the teaching and learning activities; and (3) aspects of teachers' professional development when implementing the teaching and learning activities. Thematic analysis was employed to analyse the literature.

The results showed that the empirical research on new teaching and learning methods/strategies/technologies used during the pandemic tended to focus on common e-learning applications/platforms/resources/devices (60%); preference for e-learning (32%); engaging e-learning techniques/strategies (24%); online adaptation to practice-based courses (20%); and specific e-learning applications/platforms (8%). In addition, the empirical research showed that, during the online teaching and learning, there was a gain in the levels of independent learning, self-directed learning and technological knowledge by students, and an increase in the level of technological pedagogical knowledge by teachers.

The surge in e-learning resources and activities during the pandemic provides the opportunities for educators and researchers on higher education to consider how to adopt these materials in the post-pandemic era in such a way as to help learners shift towards deeper phases of learning and higher order thinking. This paper ends with a discussion of transformational and transcendent use of new technologies in teaching and learning for higher education in the future.

Pedagogical Challenges in Online Learning: 'Maxiagogy' as a Transformative Panacea Owing to the COVID-19 Outbreak

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The COVID-19 pandemic has forced all sectors, including education sectors, to make impulsive adjustments. In the implementation, educational institutions at all levels have undergone rapid changes as they had to adopt online learning. This study investigates the underlying factors that raise questions and complaints from stakeholders due to the changes in delivery from the face-to-face mode to online learning.

The critical factor identified as a cause of the social confusion is a pedagogical issue. The pedagogical crisis presumably occurred due to the sudden changes from face-to-face teaching to the online learning mode. To untangle these tangled threads, this study collected data from various sources in an effort to understand the importance of the pedagogical issue in online learning. This issue needs to be investigated from diverse perspectives, ranging from: (1) the contexts that drive the acceleration of the use of online learning; (2) the evolution of the online learning generation; (3) open education, online learning, and the conception of higher education; (4) the system of online learning; and (5) the evolution of pedagogy in online learning. Methodologically, the approach is a descriptive-qualitative one through some literature review activities and a series of focus group discussions on the critical analysis. The data collected are entirely secondary data in the form of content analysis. The sources were: (a) journals; (b) reports; (c) search engines; (d) websites containing scientific articles; (e) research papers; and (f) unpublished academic papers.

This study succeeded in proposing a breakthrough alternative pedagogy that needs to be criticized as a transformative pedagogy, i.e. 'maxiagogy' based on communalism. We were familiar with pedagogy, andragogy, and heutagogy (including peeralogy and cybergogy) and cognitive-behaviourism, constructivism, and connectivism. This study finally confirmed 'maxiagogy' as the (new) transformative pedagogy (communalism-based) with its drawbacks and strengths. This is in line with the spirit of online learning for the 21st century — that is, learning is exciting, enjoyable, accessible, easy to find, reliable, and flexible.

The rise of the new transformative pedagogy will not solve the real pedagogical crisis in online learning. However, this study shows that 'communalism-based maxiagogy' can be used as a transformative pedagogy with respect to the pressures of the 21st century and the demands of millennial learners, regardless of whether the Covid-19 crisis occurred or not. 'Maxiagogy' ultimately places learners at the centre of learning, with two fundamental beliefs — flexibility and trust — becoming self-directed and self-determined learners.

The Effect of the Engineering Integrated Science Curricula on Elementary Students' Learning Performance

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In recent years, K-12 engineering education has been attracting more and more attention all over the world. As integrating engineering into K-12 science classrooms becomes an inevitable trend to advance science education reform, a growing number of researchers advocate that there is a great need to integrate engineering and science based on China's current conditions. Although some evidence shows that the implementation of engineering education is helpful in stimulating students' interest and promoting their learning, such an interdisciplinary teaching practice focusing on sound and acoustics has not received much attention in the literature. Also, there are few empirical studies which try to explore the change in elementary students. Therefore, this study aims to investigate the effect of applying 'EiS' (Engineering integrated Science)' in elementary science classrooms.

This study consists of two components: (1) Design a specific unit about sound and develop a specific instructional framework based on the concept of 'EiS'; and (2) Put this design into practice. A quasi-experimental pre-/post-test design was employed, with the use of qualitative and quantitative instruments, to explore whether 'EiS' can improve students' science learning performance. Two classes of fourth grade students (N=80) from an elementary school in Shanghai participated in the experiment. One class with 39 students was the experimental group, and the other class of 41 students was the control group. In the seven-lesson programme, their learning material was a unit named 'Sound and vibration' in the existing elementary science curriculum. Descriptive statistics and a t-test were used to analyse data.

The results suggest better performance during 'EiS' practice. After the programme, the experimental group got much higher scores, and a significant difference in learning performance was shown between the two classes, which indicates that 'EiS' exerts a positive effect on the improvement of students' scientific achievement. Subsequent evaluations and interviews showed that the 'EiS' curriculum was acceptable and agreeable to students.

This paper concludes that engineering integrated into the science classrooms can lead to better learning performance, and further confirms the feasibility and effectiveness of 'EiS' curricula. In addition, this empirical study helps to provide references for the development of learning strategies and the design of 'EiS' curricula in subsequent science teaching practice.

Confidence in Implementing Project-based Learning in STEM Education: Perspectives of Hong Kong In-service Teachers

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In response to the advance of technology and its impact on society, STEM education has been advocated in this decade. Teachers are highly encouraged to apply a project-based learning approach to promote STEM education. However, due to the cross-disciplinary nature of STEM education, nurturing students in STEM education using this learning approach is a challenging task. This study aimed to explore whether in-service teachers are confident in applying a project-based learning approach in STEM education.

This study adopted the survey research method to collect opinions from the participants. Thirty-seven in-service teachers of primary and secondary schools in Hong Kong who attended STEM pedagogical workshops delivered by the researcher were invited to fill out an online questionnaire.

All participants in this study, both primary and secondary school teachers, said that they are not very confident in applying a project-based learning approach to nurture students in STEM education.

The success of STEM education, to a great extent, depends on teaching effectiveness. This study reveals that although teachers are highly encouraged to apply a project-based learning approach to engage students in learning STEM, they are not confident enough in using this pedagogical method in STEM education. This suggests that more professional training in project-based learning in STEM education for teachers is required.

The Integration of WSQ Knowledge Constructing Approach for Supporting Students' STEM Science Learning

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STEM education provides opportunities for hands-on work, which enables students to acquire higher-level thinking skills and complex scientific problem-solving skills. For science knowledge acquisition in STEM education, except learning from doing the project, integrated knowledge-building activities during STEM activities are essential.

To this end, this study adopted the Watch-Summary-Question (WSQ) approach to help students construct knowledge before their STEM project. In the WSQ procedure, the approach guided students to watch and acquire science knowledge. Then, they summarized important knowledge content. After summarizing the content, students raised questions related to the topics. It was expected that the WSQ approach could help students check whether they fully understood and applied the knowledge. To examine the effectiveness of the WSQ approach, we conducted an experiment in a university STEM course. This course instructed students to make cosmetics. We recruited 20 students as the experimental group, and they used the WSQ-based STEM learning mode. The other class, the control group (22 students), was conducted in the conventional STEM learning mode.

The results show that the experimental group outperformed the control group in learning achievement. At the same time, students in the experimental group performed better than did the control group in deep learning strategies. In the drawing test, it was found that students in the experimental group performed better in sanitation, materials and instruments, positive emotion, and notice after the drawing analysis.

This study proved that the WSQ knowledge construction approach can enhance students' understanding of science by guiding them to acquire knowledge and raise questions, thus improving their performance. Through the knowledge construction approach, students may improve their problem-solving skills by making connections across domain knowledge during the learning process.

No Pain, No Gain: The Necessary Initial Struggles to Enable Doctoral Research Work

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This paper reports on experiences at the start of a software engineering (SE) PhD, where the candidate encountered and overcame multiple challenges in setting up his research environment, which included online learning (and supervision) elements. When preparing a replication study, the candidate faced both hardware and software problems as he lacked the necessary equipment and the experience to run the project. Eventually, the candidate changed his mindset to see challenges as opportunities, reached out to various others to seek advice, and identified solutions for his problems. This paper shares these (necessary) challenging experiences, and the insights gained from them. As an integral part of the development of doctoral study skills, this paper may help other students, advisers, and administrators to be aware of, and prepare for, these challenges.

The various experiences are reflected on by the PhD candidate, and examined and analysed by him, his academic advisers, and other relevant stakeholders. Comparisons are drawn with similar doctoral candidates, and other related experiences recorded in the literature. The unbounded nature of the problems encountered at the start of the doctorate was a shock to the candidate, and required expanding his perception of the problem- (and solution-) space, and the fast development of new problem-solving skills. Supported by his advisers, the candidate unknowingly followed a self-directed, exploratory learning framework, making use of online learning techniques and resources.

The candidate reports that he now knows the importance of seeking help when unable to solve a problem. Through identification and communication with a mentor, the student has also seen the value of presenting perceived challenges quickly and accurately. While overcoming challenges, he learned to brainstorm, and control panic, thus strengthening his independent researcher potential. Another potentially culturally-related insight is the professed importance of prompt honest communication with the adviser, who — unlike the undergraduate assessor role — has more responsibility for guidance and giving advice. Although our findings relate to experiences prompted by an SE replication study, they will resonate with many other research situations.

Challenges are common at the start of a PhD, but there is little in the literature explicitly discussing this, or the necessity of overcoming them to enable doctoral study. This paper proposes a framework that can provide guidance for both PhD students and supervisors. It also serves as a reminder to relevant administration staff of the provisions needed to enable, and ensure that the PhD candidate emerges ready, mentally and skill-wise, from the experience.

Influence of Virtual Reality Fidelity on Oral English Learners' Learning in Different Cognitive Styles

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As indicated in the literature, virtual reality (VR) can provide learners of English as a Foreign Language (EFL) with scenarios close to real life in order to improve their learning. However, certain research has also shown that pursuing excessive authenticity in VR may have a negative influence on learners.

To study learners' requirements for various virtual learning environments, this research designed and developed a system based on VR with different degrees of fidelity, in order to study and evaluate how VR fidelity affects oral English learners with different cognitive styles.

The research adopts a pretest-posttest quasi-experimental design. Sixty-nine college students took the Group Embedded Figures Test (GEFT) to group their cognitive styles in order to determine whether they were field independent or field dependent. Then the subjects with the same initial oral English level entered different virtual fidelity environments to explore the changes in their level of oral English learning.

The experimental results showed that cognitive style and virtual environment fidelity have a significant interaction with learners' learning achievement. In the lower fidelity environment, the learning achievements of field-dependent and field-independent oral English learners did not exhibit any significant differences. However, in the higher fidelity environment, field-dependent learners had much better achievement, while field-independent learners were not influenced by the fidelity of the environment. The research results mentioned above indicate that not only fidelity but also learners' learning habits should be taken into consideration when designing VR systems.

The findings show that the virtual learning environment can affect the learning achievement of some learners. Therefore, when designing the virtual reality learning system, we should consider the fidelity of the learning environment and the individual characteristics of the learners to provide a suitable learning environment for different learners and leading research for the construction of a virtual English learning environment in the future.

OXREF: Open Extended Reality for Education Framework

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Extended reality (XR) has gained traction as the next evolutionary step in teaching and learning accelerated by the COVID-19 pandemic. Increasingly, many governments and institutions around the world are making major investments in virtual reality (VR) and augmented reality (AR) technologies to prepare education systems for the future. However, many of these investments remain isolated pilot projects which tease at what the potential future of education could be, but is unlikely due to scalability and sustainability. This paper introduces the Open Extended Reality for Education Framework (OXREF), which is a conceptual framework proposing a holistic solution to XR object creation, implementation and deployment covering pedagogical, technical and administrative perspectives. The novelty of this framework is the ability to build immersive XR projects in a scalable and sustainable manner which promotes openness, accessibility, equity, reuse and collaboration by harnessing the full potential of OER and free and open-source software (FOSS) while utilizing cloud-based infrastructure for large-scale distribution and outreach.

The OXREF conceptual framework is formulated on the basis of an extensive review of the literature and case studies strengthened by the author's personal experience as a technology expert, researcher, practitioner and senior administrator in the higher education sector.

Based on the literature and empirical evidence, it has been identified that the major barriers to the wider adoption of XR in education are (a) the lack of content, tools and skills; (b) the lack of sound pedagogy and instructional design; and (c) sustainability. The OXREF framework is proposed as a scalable and sustainable solution to mainstreaming XR in education. The OXREF addresses the three major barriers identified at three distinct levels: Level 1 — creation of the XR environments; Level 2 — pedagogical and instructional design input; and Level 3 — sustainability through open educational practices (OEP), including open access and OER.

The contribution of the OXREF framework is a holistic approach to XR mainstreaming in education starting with the creation of objects following OEP, deployment using the latest cloud-based technologies and FOSS, and policy creation for scalability and sustainability.

The Effects of Virtual Reality Fidelity and Social Anxiety on Oral English Learning

P Putonghua

Yao Yirong, Yingge Zhou, Ruofan Wang, and Xiaozhi Li
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Design and Realization of Virtual Simulation Experiments in Engineering Distance Education

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Studies have shown that social anxiety is an important factor in the learning process of oral English learners, and how to eliminate its influence is a matter of concern for language researchers. With the increasing application of virtual reality technology in language learning, the construction of a virtual environment suitable for language learners has attracted the attention of researchers. However, there is still a lack of research on which learning environment can improve the oral learning of students who have social anxiety. Based on the index of virtual reality fidelity, this paper discusses what kind of virtual reality environment is suitable for the oral English learning of students with different levels of social anxiety.

This empirical study investigates the impact of using virtual reality to support 72 non-English-major undergraduate students in China with different levels (high vs low) of social anxiety in developing oral English skills. The system used for this experiment was made from the Mindshowa platform for the design and development of an oral English virtual reality learning environment. The system consists of four subsystems: a training system, a learning system, a testing system and a data storage system.

Through experimental research, we identified the following points: in a virtual reality learning environment, learners with a high level of social anxiety can get a better academic performance; and students with low social anxiety scored higher in high virtual reality fidelity than in low virtual reality fidelity. However, students with high social anxiety can achieve a better academic performance in a virtual environment with low virtual reality fidelity.

This research shows that virtual reality fidelity is an important indicator, which can be used in the construction of the virtual learning environment of a learning system, and a system with this indicator can adapt to students with different levels of social anxiety. Designers should design virtual reality learning scenes according to the actual situation of the learners, rather than blindly pursuing a high level of virtual reality fidelity, so as to achieve effective adaptation to learners and let them get better academic achievement.

Underlying new engineering, practical teaching is the focus and difficulty of quality assurance in distance education. Distance education has developed rapidly in recent years in China, but practical teaching is not satisfactory. How to effectively solve these problems and construct a distance education practice course teaching model suitable for training new engineering talent is a topic that must be studied and considered.

This study analyses the problems of practice teaching in distance education and the roles of virtual simulation experiments in practice teaching. It develops a virtual simulation practice platform based on project modularity to apply to the practice teaching process.

Lack of personal experience in actual training venues is not conducive to the formation of students' safety awareness. Through the student data of the operation of the virtual simulation experiment, we know the construction of the virtual simulation experiment breaks the traditional form of face-to-face education, breaks time and space boundaries between teachers and students, and provides a new multidimensional mixed teaching mode for practice teaching. Students can not only acquire theoretical knowledge but also simulate practical training in the learning process. This is conducive to cultivating the innovative consciousness and practical ability of students.

This study is a useful exploration to improve the teaching of engineering in distance education.

The Analysis of Scene Teaching Application Based on Augmented Reality

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Putonghua

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The purpose is to make augmented reality technology (AR) scientifically applicable in scene teaching, so that teaching can achieve the effect of empathy and give learners better immersion learning.

Through literature research, the ability characteristics of scene teaching application from the perspective of technology are summarized. Then the application forms of technology are extracted through case analysis. Finally, the collocation and use of AR technology and teaching scenes are sorted out.

It was found that the development of teaching and digital technology is not synchronized. This has resulted in the separation of teaching and learning, single teaching form, abstract teaching content, and rigid teaching methods. Teachers and learners are still in a passive and solidified situation. Due to the development and application of XR (Extended Reality) and artificial intelligence, scene teaching has attracted more attention in the field of education. Scene teaching can produce the empathic experience of learners. The support of AR technology can create more possibilities in the shaping of teaching scenes and achieve good teaching results.

Based on the core characteristics of AR technology application scenario teaching, space, space interaction in three dimensions, different forms of application to comb out the corresponding scientific AR and the application of scene teaching, visualize the teaching content, teaching process games, and interactive form diversification, strengthen the initiative of the learners and engage them. The significance of this study lies in that it is an innovative teaching form of scene teaching resources. By using the presentation mode and interaction design, it makes scene teaching extensible, more intuitive and more interactive. It enhances the sense of immersion and experience and promotes effective learning.

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