

# **2021 Tenth International Conference of Educational Innovation through Technology (EITT 2021)**

**Chongqing, China  
16 – 20 December 2021**



**IEEE Catalog Number: CFP2145Z-POD  
ISBN: 978-1-6654-2758-6**

**Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP2145Z-POD
ISBN (Print-On-Demand):	978-1-6654-2758-6
ISBN (Online):	978-1-6654-2757-9
ISSN:	2168-944X

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2021 Tenth International Conference of Educational Innovation through Technology (EITT) **EITT 2021**

## Table of Contents

Message from the Conference Chairs .....	xiv
Organizing Committee .....	xv
Editorial Board .....	xvii
Keynote Speakers .....	xxi
Sponsor .....	xxiii

### Session 1: Theories and Practices of Educational Technology Integration into Curriculum

The Design and Implementation of New Chemistry Classroom Instructional Model Under the Condition of “Internet Plus” .....	1
<i>Yuanyuan Zhang (Southwest University, China), Liang Yu (Southwest University, China), Chao Shen (Southwest University, China), and Jing Wang (Southwest University, China)</i>	
Strategic Design and Innovative Reforms of Food Biochemistry Course in the New Era .....	7
<i>Jiaoyan Ren (South China University of Technology, China), Xiong Xiang (South China University of Technology, China), William Kwame Amakye (South China University of Technology, China), Fang Lu (South China University of Technology, China), Min Wang (South China University of Technology, China), Chuanli Hou (South China University of Technology, China), Wenjie Zheng (South China University of Technology, China), Wensha Lin (South China University of Technology, China), and Erdong Yuan (South China University of Technology, China)</i>	
Construction Mechanism and Learning Outcomes Evaluation of Engineering Ethics Curriculum Based on Knowledge Engineering .....	12
<i>Xin Peng (Xiangtan University, China), Bin Duan (Xiangtan University, China), Jing Zhang (Hunan University, China), and Changqing Liu (Xiangtan University, China)</i>	
Research on the Application of O2O Blended Teaching Mode in the Practical Course of Fashion Design .....	18
<i>Qing Xiao (Southwest University, China), Xinyue He (Southwest University, China), and Xuerui Zhang (Chongqing College of Humanities, China)</i>	

Building Design Thinking into an Authentic Internet of Things Instruction .....	24
<i>Hengtao Tang (University of South Carolina, USA), Sharon Gumina (University of South Carolina, USA), and Shuyan Wang (University of Southern Mississippi, USA)</i>	

## Session 2: Theories and Practices for Teacher Education and Development

Which One is More Effective for Pre-Service Teachers' Learning, Online or Blended Flipped Learning with Gamification? .....	28
<i>Guo Su (Central China Normal University, China), Yuanjie Zheng (Central China Normal University, China), and Taotao Long (Central China Normal University, China)</i>	
The Construction and Application of the “Theory-Training-Practice (TTP)” Model of Teacher Education Based on OBE .....	33
<i>Rui Zhang (South China Normal University, China), Wenjing Luo (South China Normal University, China), Youru Xie (South China Normal University, China), Yucheng Bai (South China Normal University, China), and Yi Qiu (South China Normal University, China)</i>	
A Large-Scale Survey on K-12 Teachers' ICT Teaching Experience: Difference Analyzing and Improvement Strategies .....	39
<i>Jingjing Xu (Key Laboratory of Modern Teaching Technology [Ministry Education], Shaanxi Normal University, China), Hang Lu (Zhejiang Normal University, China), and Weiping Hu (Key Laboratory of Modern Teaching Technology [Ministry Education], Shaanxi Normal University, China)</i>	
The ICT Competency Training Design for University Teachers .....	45
<i>Junfeng Diao (Tsinghua University, China) and Juan Yang (Tsinghua University, China)</i>	
Research on the Strategies of Promoting the Professional Ability of College Art Teachers by Network Research During the Epidemic Period .....	52
<i>Jianming Wang (SIAS University, China) and Zhen Meng (Zhengzhou Yuhua Experimental School, China)</i>	

## Session 3: Theories and Practices of Open and Distance Education

Construction of Online Distance Learning Risk Prediction Model Based on Data Mining .....	58
<i>Qixin Xu (Southwest University, China), Yilin Ren (Southwest University, China), Yan Liang (Southwest University, China), Ming Liu (Southwest University, China), Caiqiang Li (Southwest University, China), and Li Liu (Chongqing University, China)</i>	
College Teachers' Attitudes Towards Online Teaching and the Influencing Factors: Lessons from China .....	63
<i>Peiyu Wang (Central China Normal University, China), Tianjiao Chen (Central China Normal University, China), Gege Li (Central China Normal University, China), Qinna Feng (Central China Normal University, China), Shuxian Xu (Central China Normal University, China), and Heng Luo (Central China Normal University, China)</i>	

The Basic Problems of Virtual Simulation Experimental Teaching in Higher Education .....	69
<i>Hang Lu (Zhejiang Normal University, China), Jingjing Xu (Shaanxi Normal University, China), Lianghui Wang (Zhejiang Normal University, China), and Wentao He (Zhejiang Normal University, China)</i>	
Research on the Effects of Online Teaching and Influencing Factors in Primary and Secondary Schools .....	75
<i>Ying Chen (Ningxia Medical University, China; Southwest University, China), Min Wu (Southwest University, China), and Geping Liu (Southwest University, China)</i>	
A Review of the Application of Artificial Intelligence in the Virtual Learning Environment.....	79
<i>Wei Xiaodong (Northwest Normal University, China) and Jia Hongxue (Northwest Normal University, China)</i>	

## Session 4: STEM/STEAM Education

Learning by Drawing in STEM: A Meta-Analysis .....	83
<i>Yi Zhang (Central China Normal University, China), Xin Guo (Central China Normal University, China), Zhongling Pi (Shaanxi Normal University, China), and Jiumin Yang (Central China Normal University, China)</i>	
Factors Influencing K-12 STEM Teachers' Interdisciplinary Teaching Competency .....	88
<i>Rong Zhou (Shaanxi Normal University; Shaanxi Normal University Branch of Collaborative Innovation Center of Assessment toward Basic Education Quality, China), Lunrong Liu (Fengxi Experimental School, China), and Jialin Yu (Shaanxi Normal University, China)</i>	
The Promotion of Maker Education to Traditional Education .....	95
<i>Kelong He (Northwest Normal University, China), Mingyan Jiao (Northwest Normal University, China), and Zhenhua Liu (Northwest Normal University, China)</i>	
Promoting Junior School Students' Spatial Ability through 3D Printing .....	100
<i>Lin Wang (Southwest University, China), JiangHua Luo (Southwest University, China), LaMei An (Southwest University, China), XinShan Zhou (Southwest University, China), ChunJie Yin (Southwest University, China), and HongLiang Ma (Shaanxi Normal University, China)</i>	
The Integration of Personal Response Systems into Online Flipped Classroom: Student Performance and Perception .....	106
<i>Hongjiang Wang (South China Normal University, China), Jingyuan Xi (South China Normal University, China), and Zuokun Li (South China Normal University, China)</i>	

## Session 5: Technology Challenges in E-Learning During the Global Emergency

Online Academic Performance During the COVID-19: Evidence from a Rural High School in Western China .....	112
<i>Lan Zeng (Central China Normal University, China) and Heng Luo (Central China Normal University, China)</i>	

Research on Influencing Factors of Elementary School Students' Perceptions of Online Learning Resources During the COVID-19 Pandemic .....	117
<i>Yinghui Shi (Central China Normal University, China), Qiuyu Pu (Central China Normal University, China), Ling Chen (Central China Normal University, China), Yu Jiang (National Center for Educational Technology, China), and Harrison Hao Yang (Central China Normal University, China; State University of New York at Oswego, USA)</i>	
Investigating the Online Learning Experience of College Students During COVID-19 .....	123
<i>Qing Zhou (Central China Normal University, China), Jia Sun (Central China Normal University, China), Yu Shi (Central China Normal University, China), Mingwen Tong (Central China Normal University, China), Taotao Long (Central China Normal University, China), and Yafei Shi (Central China Normal University, China)</i>	
Opportunities and Challenges of Educational Technology in the Post Epidemic Era .....	129
<i>Fangcai He (Guangxi Normal University, China), Xuemei Gan (Guangxi Normal University, China), Shun Hu (Guangxi Normal University, China), and Jian He (Guangxi Normal University, China)</i>	
The Status of College Students' Online Learning Power Under the COVID-19 .....	134
<i>Xiaomei Huang (South China Normal University, China), Min He (South China Normal University, China), Kunyan Li (South China Normal University, China), and Yujie Xu (South China Normal University, China)</i>	

## **Session 6: Global Perspectives in Online and Blended Environments**

Design and Validation of an Online Collaborative Learning Motivation Scale for a PBL Translation Classroom .....	137
<i>Qing Li (Chongqing University of Science and Technology, China) and Nanxi Meng (University of North Texas, USA)</i>	
The Effect of Blended Learning Environment-Based, Flipped Classroom Practice on College Students' Learning Performance .....	142
<i>Xinya Chen (Zhejiang University, China), Min Yang (Zhejiang University, China), Xiaoling Ying (Zhejiang University, China), and Yan Li (Zhejiang University, China)</i>	
Research on the Influencing Factors of Cognitive Engagement in Pre-Class Learning of Flipped Classroom .....	148
<i>Yubei Chang (Central China Normal University, China), Qingtang Liu (Central China Normal University, China), Lei Mei (Central China Normal University, China), Guoqing Lu (Central China Normal University, China), and Jiaojiao Wang (Central China Normal University, China)</i>	
A Preliminary Study of International Students' Experiences in Online Courses .....	153
<i>Chiedza Fungra (Central China Normal University, China), Edwin Tawanda Mudzingwa (Central China Normal University, China), Harrison Hao Yang (Central China Normal University, China; State University of New York at Oswego, USA), and Yinghui Shi (Central China Normal University, China)</i>	

Designing Teacher Training Scaffolds: Improving Blended Teaching Competencies and Attitudes .....	157
<i>Wanrong Guo (Beijing Normal University, China) and Xiaoying Feng (Beijing Normal University, China)</i>	

## **Session 7: Technology, Structure, and Standards Related to Information System in Education**

Designing a Real-Time ASL Auto-Recognition Tool Using Deep Learning .....	163
<i>Pakhi Agarwal (The Pennsylvania State University, USA), Jian Liao (Southwest University, China), Simon Hooper (The Pennsylvania State University, USA), and Rayne Sperling (The Pennsylvania State University, USA)</i>	
Design of Blended Collaborative Learning in the Vocational Education and Training(VET) System: An Under-Investigated Domain in China .....	167
<i>Wanruo Shi (Tsinghua University, China), Yingqun Liu (Tsinghua University, China), and Xibin Han (Tsinghua University, China)</i>	
Construction and Practice of Precision Teaching Model Incorporating “Big Idea”: Take the "Plants and Soil" Unit as an Example .....	173
<i>Lixuan Shao (College of Zhejiang University, China), Xinya Chen (Zhejiang University, China), Yang Zhou (Zhejiang University, China), and Yan Li (Zhejiang University, China)</i>	
Design and Effect Verification of Cognitive Ability Diagnosis and Intervention System .....	178
<i>Zhenhua Liu (Northwest Normal University, China), Minsheng Fan (Northwest Normal University, China), and Binli Wang (Northwest Normal University, China)</i>	
Design of Metacognitive Scaffolding for k-12 Programming Education and its Effects on Students' Problem Solving Ability and Metacognition .....	182
<i>Pinghong Zhou (Central China Normal University, China), Jingfei Li (Central China Normal University, China), Futing Chen (Central China Normal University, China), Hongqian Zhou (Central China Normal University, China), Shaojun Bao (Central China Normal University, China), and Mengnan Li (Central China Normal University, China)</i>	

## **Session 8: MOOC and Video-Assisted Learning in Distance Learning Conditions**

Research on Epistemic Networks of Teacher and Learners in a cMOOC Course .....	187
<i>Shuhan Luo (Beijing Normal University, China), Xiaoying Feng (Beijing Normal University, China), and Luoying Huang (Beijing Normal University, China)</i>	
Construction and Effect Analysis of MOOC-Based Self-Organized Teaching and Research Model for Primary and Secondary School Teachers .....	193
<i>Youru Xie (South China Normal University, China), Yachun Liu (South China Normal University, China), Wenjing Luo (South China Normal University, China), and Jiayao Wu (South China Normal University, China)</i>	

cMOOC Design Principles to Promote Concept Interactions: A Design-Based Research .....	199
<i>Luoying Huang (Beijing Normal University, China), Xiaoying Feng (Beijing Normal University, China), and Ruixue Wang (Beijing Haidian Teachers Training College, China)</i>	
MOOCs and Flipped Classroom A Qualitative Study on Blended Teaching Practices of Local University Teachers in China .....	205
<i>Chao Qin (Yunnan Minzu University, China) and Xiaohong Zeng (Yunnan Minzu University, China)</i>	
Mining Teachers' MOOC TPD Enrollment Analysis Based on their Engagement with Student-Centered Teaching Strategies .....	210
<i>Carina Titus Swai (Central China Normal University, China), Qingtang Liu (Central China Normal University, China), and Linjing Wu (Central China Normal University, China)</i>	

## **Session 9: Innovation of Language Teaching in a Digital Learning Environment**

An Empirical Study on the Implementation of AI Assisted Language Teaching for Improving Learner's Learning Ability .....	215
<i>Liqiao Nong (Southwest University, China), Geping Liu (Southwest University, China), and Chunwen Tan (Southwest University, China)</i>	
Discussions in the Second Language Class: A Case Study of Cooperative Learning in a HyFlex Course .....	222
<i>Yun Li (Sichuan University, China), Xiao Hu (Sichuan University, China), and Xinyi Wei (Sichuan University, China)</i>	
From Feedback to Revision — How Can Collaborative Peer Feedback Make a Difference? .....	228
<i>Lu Huang (South China University of Technology, China)</i>	
Using Semi-Supervised Deep Learning for Identifying Cognitive Engagement in Online Learning Discussion .....	233
<i>Zhi Liu (Central China Normal University, China), Weizheng Kong (Central China Normal University, China), Shiqi Liu (Central China Normal University, China), and Xi Kong (Central China Normal University, China)</i>	

## **Session 10: Learning Engagement in the Learning Community**

Understanding Student Engagement Based on Multimodal Data in Different Types of Agent-Based Collaborative Learning Contexts .....	239
<i>Xin Li (Beijing Normal University, China), Haogang Bao (National Institute of Education Sciences of China, China), and Yanyan Li (Beijing Normal University, China)</i>	
Evaluation Methods Influence the Learning Effects and Engagement of CSCL .....	245
<i>Caixia Liu (Central China Normal University, China), Lujie Tu (Northeast Normal University, China), and Jiumin Yang (Central China Normal University, China)</i>	



Influence of Learners' Online Interaction Characteristics on Collaborative Knowledge Building in a Knowledge Forum .....	251
<i>Hesiqi Bin (Central China Normal University, China), Jingsi Ma (Central China Normal University, China), Yi Zhang (Central China Normal University, China), and Yuanyuan Zhan (Central China Normal University, China)</i>	
The Relationship between Social Media Self-Efficacy and Learning Engagement of College Students .....	257
<i>Yong Xie (Beijing Normal University, China), Jianxia Cao (Wuhan University of Technology, China), and Yonghe Zheng (Beijing Normal University, China)</i>	
A Framework and Indicators for Information Literacy of Vocational School Students .....	261
<i>Jian Sun (Tsinghua University, China), Shu Yuan Yang (Tsinghua University, China), and Xibin Han (Tsinghua University, China)</i>	

## Session 11: Big Data and Learning Analytics

Research on Online Learning Behavior Supported by Learning Analysis Technology .....	266
<i>Nuo Cheng (Northeast Normal University, China), Wei Zhao (Northeast Normal University, China), and Xiaoqing Xu (Northeast Normal University, China)</i>	
Using Learning Analytics in Understanding Students' Behavior in Block-Based and Text-Based Programming Modality .....	271
<i>Dan Sun (Zhejiang University, China), Fan Xu (The Ohio State University, USA), and Yan Li (Zhejiang University, China)</i>	
Mining and Analysis of Self-Regulated Learning Process Model: Based on Hidden Markov Model. ....	276
<i>Qiao Lifang (Northeast Normal University, China), Zhao Wei (Northeast Normal University, China), and Xu Xiaoqing (Northeast Normal University, China)</i>	
Learning Analysis Path Construction and Empirical Research Based on Rasch Model in Electronic Schoolbag Environment .....	282
<i>Shiyan He (Northwest Normal University, China), Minsheng Fan (Northwest Normal University, China), and Zhenhua Liu (Northwest Normal University, China)</i>	

## Session 12: Multidisciplinary/Interdisciplinary Learning or Teaching

Current Situation and Trend Analysis of the Education of Autistic Children in China from the Social Network Perspective .....	288
<i>Chenyue Hu (Chongqing Normal University, China), Yan Ma (Chongqing Normal University, China), Lan Hong (Chongqing Normal University, China), and Ming Guo (Chongqing Normal University, China)</i>	
Challenges Regarding Assistive Technology in Special Education .....	293
<i>Courtney Isgett (The University of Southern Mississippi, USA) and Dr. Shuyan Wang (The University of Southern Mississippi, USA)</i>	

Avatarizing Children with Autism Spectrum Disorder Into Serious Games for Social Communication Skill Intervention .....	299
<i>Leyuan Liu (Central China Normal University, China), Jie Meng (Central China Normal University, China), Xiaohui Wu (Central China Normal University, China), and Jingying Chen (Central China Normal University, China)</i>	
How Teacher Training Supported Improvement of Teacher Development in Deep Poverty Areas of China .....	304
<i>Shiyuan Lin (Beijing Research Institute of Education Sciences, China), Xiaoying Feng (Beijing Normal University, China), Xiaoqiang Ma (National Center for Educational Technology, China), and Shuhan Luo (Beijing Normal University, China)</i>	
Curriculum Design of Artificial Intelligence in Middle School – Taking Posture Recognition as an Example .....	310
<i>Wei Deng (Central China Normal University, China), Xinglei Huang (Central China Normal University, China), Qingtang Liu (Central China Normal University, China), and Zhibin Wang (Central China Normal University, China)</i>	

## **Session 13: Educational Information Strategies, Policies, and Assessment**

Research on the Prediction of Students' Academic Performance Based on XGBoost .....	316
<i>Danping Duan (Guangdong Food and Drug Vocational College, China), Chunping Dai (Guangdong Food and Drug Vocational College, China), and Ruivei Tu (Guangdong Food and Drug Vocational College, China)</i>	
Who can Benefit from Immersive Virtual Reality in Education? Effectiveness of IVR in Teaching Using Meta-Analysis .....	320
<i>Huifen Guo (Chongqing Normal University, China), Ma Yan (Chongqing Normal University, China), Wang Aizhu (Chongqing Normal University, China), Xiang Zhu (Chongqing Normal University, China), Deng Lijiao (Chongqing Normal University, China), and Fan Wenxiang (Hangzhou Normal University, China)</i>	
Comparative Analysis of Urban and Rural Teachers' Classroom Teaching Behavior .....	326
<i>Yuting Li (Guangxi Normal University, China), He Jingru (Guangxi Normal University, China), Wei Yulang (Guangxi Normal University, China), and He Lei (Guangxi Normal University, China)</i>	
An Investigation on the Information Literacy of Primary and Secondary School Teachers in one Province of Western China .....	330
<i>Le Zhang (North Minzu University, China), JunLing Yang (Ningxia Education Information Management Center, China), Yun Li (Ningxia Education Information Management Center, China), Tao Wu (Ningxia Preschool Teachers College, China), and Fang Wu (Ningxia University, China)</i>	
Construction and Application of Interactive Assessment Environment Based on Document Cloud. ....	334
<i>Guangjie Ren (South China Normal University, China), Tingting Wang (South China Normal University, China), and Dongqing Wang (South China Normal University, China)</i>	

## Session 14: Other Topics Related to Technology Integration into Instructional Design, Curriculum, and Assessment/Evaluation

A Study on the Paths of Learners' Emotional Transition in Different Teaching Activities .....	340
<i>Xiaoqing Xu (Northeast Normal University, China), Wei Zhao (Northeast Normal University, China), and Hongxia Liu (Northeast Normal University, China)</i>	
The Application of Physiological Feedback to the Evaluation of Academic Emotion: A Literature Review .....	346
<i>Xiaodong Wei (Northwest Normal University, China) and Jinfang Yin (Northwest Normal University, China)</i>	
The Relationship Between Self-Regulated Learning and Learning Behaviors of Chinese Middle School Students in a Smart Classroom .....	350
<i>Shuang Li (Beijing Normal University, China), Jing Qi Sun (Beijing Normal University, China), Zhi Xia Huang (Beijing Normal University, China), and Jia Qi Chen (Beijing Normal University, China)</i>	
Research on School Principals' Willingness to Adopt Artificial Intelligence Education and Related Influencing Factors .....	356
<i>Zhaojie Hao (Henan University, China), Enhui Miao (Central China Normal University, China), and Manman Yan (Ocean University of China, China)</i>	
The Impact of Different Types of Scaffolding in Project-Based Learning on Girls' Computational Thinking Skills and Self-Efficacy .....	362
<i>Yunbo Jin (Shaanxi Normal University, China), Junmei Sun (Shaanxi Normal University, China), Hongliang Ma (Shaanxi Normal University, China), and Xiaohong Wang (Shaanxi Normal University, China)</i>	
<b>Author Index</b> .....	<b>367</b>