

# **International Conference on Cognition and Exploratory Learning in Digital Age (CELDA 2023)**

Porto, Portugal  
15-18 July 2023

## **Editors:**

**Demetrios G. Sampson**  
**Dirk Ifenthaler**  
**Pedro Isaías**

ISBN: 978-1-7138-8470-5

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2023) by International Association for Development of the Information Society (IADIS)  
All rights reserved.

Printed with permission by Curran Associates, Inc. (2024)

For permission requests, please contact International Association for Development of the Information Society (IADIS) at the address below.

International Association for Development of the Information Society (IADIS)  
Rua Sao Sebastiao Da Pedreira  
No. 100, 30, 1050-209  
Lisbon, Portugal

Phone: 351 21 3151373

Fax: 351 21 3151244

[secretariat@iadis.org](mailto:secretariat@iadis.org)

**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  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## **FULL PAPERS**

VISUALIZATION ONBOARDING DESIGNED BY USERS: AN EMPIRICAL STUDY .....	3
<i>Margit Pohl, Benjamin Potzmann, Christina Stoiber, Wolfgang Aigner</i>	
SCORE PREDICTION FROM PROGRAMMING EXERCISE SYSTEM LOGS USING MACHINE LEARNING .....	11
<i>Tetsuo Tanaka, Mari Ueda</i>	
THE EFFECTS OF AGE AND LEARNING WITH EDUCATIONAL ROBOTIC DEVICES ON CHILDREN'S ALGORITHMIC THINKING .....	18
<i>Charoula Angeli, Panayiota Diakou, Vaso Anastasiou</i>	
INTEGRATING LARGE LANGUAGE MODELS IN ART AND DESIGN EDUCATION.....	25
<i>Alberto Giretti, Dilan Durmus, Massimo Vaccarini, Matteo Zambelli, Andrea Guidi, Franco Ripa Di Meana</i>	
EXPLORING INFRANODUS: A TEXT ANALYSIS TOOL .....	34
<i>Irina Tursunkulova, Suzanne De Castell, Jennifer Jenson</i>	
IMPLICIT EPISTEMOLOGY - THE BELIEFS OF STUDENTS OF EDUCATION SCIENCES .....	43
<i>Anita Gramigna, Giorgio Poletti</i>	
ON THE PREDICTORS OF COMPUTATIONAL THINKING SELF-EFFICACY .....	51
<i>Josef Guggemos</i>	
ONLINE PRESENCE, METACOGNITION, AND COURSE DESIGN WITHIN THE COMMUNITY OF INQUIRY .....	60
<i>Larisa Olesova, Ayesha Sadaf</i>	
THE USE OF METACOGNITIVE STRATEGIES IN STORYTELLING TO EXAMINE PRESCHOOL CHILDREN'S LISTENING COMPREHENSION SKILLS .....	67
<i>Mahani Abdul Malik</i>	
RELATIONSHIP BETWEEN TEACHING PRESENCE AND SHARED-METACOGNITION IN ONLINE CASE-BASED COURSES.....	77
<i>Ayesha Sadaf, Stella Yun Kim, Adrie Koehler</i>	
THE APPLICATION OF FUZZY DELPHI METHOD IN CONTENT VALIDITY ANALYSIS .....	84
<i>Mohd Azli Jailani, Chong Kim Loy</i>	
HYBRID SIMULATION OF A SCIENTIFIC CONFERENCE: INQUIRY-BASED LEARNING TO ENABLE MASTER'S DEGREE STUDENTS TO ACQUIRE RESEARCH SKILLS.....	91
<i>Patricia Brockmann</i>	
PATTERN ELEMENTS IN HIGHER VISUAL ART EDUCATION .....	99
<i>Antonina Korepanova, Kai Pata</i>	
THREE FRAMEWORKS FOR DATA LITERACY .....	107
<i>Stephen Downes</i>	

STUDENT CENTERED METHODS, SOFT SKILLS AND COMPETENCY BASED LEARNING FROM THE VIEW OF ENGINEERING AND TECHNICAL TEACHER STUDENTS.....	116
<i>Ibolya Tomory</i>	
POTENTIAL OF ADAPTIVE E-LEARNING FOR KNOWLEDGE HETEROGENOUS GROUPS OF STUDENTS IN ENGINEERING DESIGN EDUCATION .....	125
<i>Frederike Kossack, Eike Uttich, Beate Bender</i>	
CAPACITY BUILDING ACROSS HIGHER EDUCATION AND RURAL YOUTH IN WINNOVATORS SPACE .....	133
<i>Kai Pata, Kristi Jüristo, Matej Zapašek, Nathalie Leiba, Sanja Popovic Pantic, Vladan Devedzic, Sonja Radenkovic, Mirjana Devedzic, Marija Blagojevic, Danijela Milošević</i>	
PRIVACY CONCERNS DURING REMOTE EMERGENCY LEARNING IN HIGHER EDUCATION IN QATAR.....	142
<i>Byrad Yyelland, Alan S. Weber, Robert Bianchi, Wajdi Zaghouni, Khawla Kittaneh, Ryad Ghanam, Selma Fejzullaj, Huda Iqbal, Afreena Niaz</i>	
TAP OR SWIPE: INTERACTION'S IMPACT ON COGNITIVE LOAD AND REWARDS IN A MOBILE MENTAL MATH GAME.....	153
<i>Patrick Jost, Sebastian Rangger, Andreas Künz</i>	
ARE NEWLY UNDERGRADUATES SELF-DIRECTED, RESILIENT, AND SKILLFUL DURING ONLINE LEARNING?.....	163
<i>Mohd Tajudin Md Ninggal, Rohaizak Omar, Azleen Ismail</i>	
THE IMPACT OF A PROJECT-BASED LEARNING ENVIRONMENT ON THE DEVELOPMENT OF UNDERGRADUATE STUDENTS' DIGITAL LITERACY SKILLS.....	171
<i>Ourania Miliou, Charoula Angeli</i>	
MATHEMATICAL PROBLEM-SOLVING BY MEANS OF COMPUTATIONAL THINKING AND PROGRAMMING: A USE-MODIFY-CREATE APPROACH .....	179
<i>Nils Kristian Hansen, Said Hadjerrouit</i>	
HOW TO DEAL WITH AI-POWERED WRITING TOOLS IN ACADEMIC WRITING: A STAKEHOLDER ANALYSIS .....	187
<i>Michael Burkhard</i>	
ANALYSING AFFORDANCES OF THE ASSESSMENT SYSTEM NUMBAS IN MATHEMATICS EDUCATION FROM AN ACTIVITY THEORY PERSPECTIVE .....	199
<i>Said Hadjerrouit, Celestine Ifeanyi Nnagbo</i>	
HOMOGENEITY OF TOKEN PROBABILITY DISTRIBUTIONS IN CHATGPT AND HUMAN TEXTS .....	207
<i>Dragica Ljubisavljevic, Marko Koprivica, Aleksandar Kostic, Vladan Devedžic</i>	
THE "FERNSTUDENT". ENHANCING THE POTENTIAL OF HYBRID TEACHING BASED ON USER-CENTERED DESIGN .....	214
<i>Daniel Ullrich, Andreas Butz, Sarah Diefenbach</i>	
USING GRAPH-BASED HEURISTICS TO ANALYZE A SYSTEMATIC LITERATURE REVIEW AND VALIDATE AN EXPERT-BASED TAXONOMY .....	223
<i>Nadine Schlomske-Bodenstein, Bernhard Standl, Pablo Pirnay-Dummer</i>	
MINING, ANALYZING, AND MODELING THE COGNITIVE STRATEGIES STUDENTS USE TO CONSTRUCT HIGHER QUALITY CAUSAL MAPS.....	233
<i>Allan Jeong, Hyoung Seok-Shin</i>	

ANCHORING CONCEPTS INFLUENCE ESSAY CONCEPTUAL STRUCTURE AND TEST PERFORMANCE .....	241
<i>Roy B. Clariana, Ryan Solnosky</i>	
“I’M AFRAID TO FAIL THE TEST” - MOTIVATIONAL ORIENTATION, STATISTICS ANXIETY AND ACADEMIC DISHONESTY .....	249
<i>Yovav Eshet, Pnina Steinberger, Keren Grinautsky</i>	
EFFECTS OF AN IMMERSIVE, MULTILINEAR FUTURE SCENARIO FOR EDUCATION PURPOSES .....	257
<i>Flurina Hilber, Thomas Keller, Elke Brucker-Kley</i>	
GROUPING STUDENTS’ LEARNING PATTERNS WITH MANABA’S LOG DATA BY K-MEANS .....	265
<i>Kai Li</i>	
EDUCATION TO PREVENT HUMAN MECHANISATION IN A FACULTY OF INFORMATICS: DEVELOPING LEARNING MATERIALS TO IMPROVE STUDENTS’ VERBAL COMMUNICATION SKILLS .....	273
<i>Mari Ueda, Isoharu Nishiguchi, Hiroshi Tanaka, Kazunori Matsumoto, Tetsuo Tanaka</i>	
TEACHING REFLECTIVE USE OF TECHNOLOGY: A PILOTED WORKBOOK BASED ON EVACUATIONS.....	280
<i>André Greubel, Julia Wenkmann, Hans-Stefan Siller, Martin Hennecke</i>	
VALUE AND CHALLENGES IN DEVELOPING OUTCOMES-BASED STUDENTS-CENTRED PROGRAMME .....	289
<i>Aliza Ali</i>	
POTENTIAL CHALLENGES AND SUPPORT MECHANISMS FOR STUDENTS TRANSITIONING TO UNIVERSITY LIFE.....	297
<i>Liga Zvirgzdina, Anda Zeidmane, Natalija Sergejeva</i>	
SYSTEMATIC LITERATURE REVIEW OF THE EFFORT OF GAMING ELEMENTS ON E-LEARNING PLATFORMS.....	305
<i>Tobias Harald Popp, Heidi Schuhbauer</i>	
THE TRIGGER-BASED DISCUSSION-ORIENTED CONTINUOUS LEARNING MODEL.....	313
<i>Dina A. Zekry, Gerard T. McKee</i>	
KEYBOARD AS A STIMULATOR IN TIMBRE RECOGNITION TRAINING .....	321
<i>Adam Rosinski</i>	
EVALUATING POPULAR MOOC PLATFORMS BY GENERATIVE ARTIFICIAL INTELLIGENCE (AI) ROBOTS: HOW CONSISTENT ARE THE ROBOTS? .....	329
<i>Victor K. Y. Chan</i>	
CHARACTERIZATION OF PHYSICAL COMPUTING DEVICES BY ATTRIBUTES FROM A PEDAGOGICAL PERSPECTIVE.....	337
<i>Eric Schätz, Alke Martens</i>	
LEVERAGING EMOTIONS TO ENHANCE LEARNING SUCCESS IN ONLINE EDUCATION: A SYSTEMATIC REVIEW .....	345
<i>Nicolai Plintz, Dirk Ifenthaler</i>	

AUGMENTED REALITY AND VIRTUAL REALITY IN PRESERVICE TEACHER PREPARATION: A SYSTEMATIC REVIEW OF EMPIRICAL LITERATURE.....	353
<i>Joan Ann Swanson</i>	

LEGAL ISSUES AND RISKS OF INSTRUCTION VIA MASSIVE OPEN ONLINE COURSES (MOOCS): SMALL MACAO VS. SOME MAJOR JURISDICTIONS .....	361
<i>Victor K. Y. Chan</i>	

CHATGPT AND BARD IN EDUCATION: A COMPARATIVE REVIEW .....	369
<i>Gustavo Simas Da Silva, Vânia Ribas Ulbricht</i>	

FOSTERING PROBLEM SOLVING AND CRITICAL THINKING IN MATHEMATICS THROUGH GENERATIVE ARTIFICIAL INTELLIGENCE .....	377
<i>Alice Barana, Marina Marchisio, Fabio Roman</i>	

### **SHORT PAPERS**

MAIN FACTORS FOR IMPROVING THE EFFECTIVENESS OF MATHEMATICS STUDIES.....	389
<i>Anda Zeidmane, Natalija Sergejeva</i>	

SHAKING THE “FOUNDATIONS OF EDUCATIONAL TECHNOLOGY” .....	393
<i>Suzanne De Castell, Jennifer Jenson</i>	

APPLICATION OF MOBILE EEG FOR COGNITIVE TESTING IN NEURODEVELOPMENTAL DISORDERS .....	397
<i>Natalia Georgara, Spyridon Doukakis</i>	

HIGHER EDUCATION TRAINING ACTIVITIES IN INTERNATIONAL ENVIRONMENTS FOR DEVELOPING SKILLS OF CIVIL-MILITARY COOPERATION .....	402
<i>Antonino Cambria, Marina Marchisio, Enrico Spinello</i>	

THE EFFECTS OF LEARNING ANALYTICS-BASED FEEDBACK ON KNOWLEDGE ACQUISITION: THE ROLE OF FEEDBACK LITERACY.....	407
<i>Mustafa Tepgeç, Joana Heil, Dirk Ifenthaler</i>	

PROMOTING SOCIO-EMOTIONAL LEARNING WITH A VIRTUAL ROBOT FACILITATOR OF SMALL GROUP DISCUSSIONS: A CROSS-CULTURAL STUDY .....	411
<i>Goren Gordon, Laura Di Giunta, Chiara Riccioni, Clementina Comitale, Giulia Gliozzo, Carolina Lunetti</i>	

USAGE OF AND ATTITUDES TOWARDS AI-TECHNOLOGY IN THE LEARNING PROCESSES OF FIRST-YEAR STUDENTS .....	417
<i>Jan Delcker, Joana Heil, Dirk Ifenthaler, Sabine Seufert, Lukas Spirgi</i>	

PROFESSIONAL DEVELOPMENT OF FOREIGN LANGUAGE TEACHERS: OPPORTUNITIES, CHALLENGES AND DEVELOPMENT PATHWAYS .....	421
<i>Zhang Yajuan, Maria Da Piedade Vaz Rebelo, Maria Augusta Pereira Nascimento</i>	

STUDY ON THE TRAINING TO IMPROVE EMPLOYEES' EMOTIONAL WELL-BEING AT WORKPLACE .....	427
<i>Anna Vintere</i>	

MOBILE SYSTEM FOR SIMULATION OF PHYSICAL CIRCUIT OPERATION AND APPLICATION TO EDUCATION INVOLVING CIRCUIT CONSTRUCTION .....	433
<i>Atsushi Takemura</i>	

EARLY CONCEPT FOR A GENERIC AND DOMAIN AGNOSTIC SERIOUS GAME  
FRAMEWORK ..... 439  
*Daniel Atorf, Sergius Dyck, Ehm Kannegieser*

**REFLECTION**

THE POWER OF DIGITAL PLATFORMS: FACILITATING THE COLLABORATION OF  
UNDERGRADUATE COMPUTER SCIENCE PROJECT TEAMS..... 445  
*Margaret R. Scaturro Heil*

**Author Index**