STE2022

3RD INTERNATIONAL CONFERENCE ON SCIENCE AND TECHNOLOGY EDUCATION

6-7 October 2022
FEUP, Porto - Portugal

TOPICS OF INTEREST

. science and technology epistemologies
. science and technology learning mechanisms
. science and technology learning systems
. science and technology diversity and inclusiveness
. science and technology assessment

U. PORTO
FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

Book of abstracts of the

3rd International Conference on Science and Technology Education 2022 (STE 2022)

Porto – Portugal
6-7 October 2022

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PREFACE

This conference is held every year. The conference is chaired by Lucas F. M. da Silva (University of Porto, Portugal) and co-chaired by António Ferreira (University of Porto, Portugal). The focus is on education in science and technology. The conference provides an international forum for the sharing, dissemination and discussion of research, experience and perspectives across a wide range of teaching and learning issues. The conference includes abstracts/papers related to the following topics:
- science and technology epistemologies (what makes science and technology thinking and knowledge),
- science and technology learning mechanisms (how people develop knowledge and competencies),
- science and technology learning systems (institutional practices),
- science and technology diversity and inclusiveness (how society in general contributes to science and technology processes and pro-ducts), and
- science and technology assessment (development and use of assessment methods, instruments, and metrics).

56 abstracts (47 oral and 9 poster) are presented in this book of abstracts, representing 20 countries. Portugal and the USA are most represented countries. The main themes treated are learning mechanisms, diversity and inclusiveness, learning systems, assessment and epistemologies.

These themes will also be treated in the form of themed special issues with full papers from the conference to be published in *International Journal of Mechanical Engineering Education* (SAGE), *Education Sciences* (MDPI), *U.P. Journal of Engineering* (University of Porto) and *Journal on Teaching Engineering* (University of Porto).

The best oral presentation and the best poster presentation will be awarded with a certificate and a free registration for the 3rd International Conference on Science and Technology Education 2022 (STE 2022).

Chairmen

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Thursday 6 October 2022	
8:30	**STE2022 Opening (Room A101 (Auditorium))**
	Session 1 – Learning mechanisms I (Chair: LFM da Silva and AM Ferreira)
	Room A101 (Auditorium)
8:40	Engineering and didactics: Blended approach for designing and studying STEM learning in digital age **(STE22_54)** M Tchoshanov (University of Texas at El Paso, USA)
9:00	"I'm not your science teacher": Perspectives on a dedicated STEM elementary school initiative **(STE22_38)** FP Nelson (California State University, USA), R Yerrick, F Arciniega
9:20	Active learning and visualisation of electric current in the lower secondary school science teaching **(STE22_29)** D Rihtaršič (University of Ljubljan, Slovenia), M Lavrič, K Susman
9:40	Investigating pre-service preschool teachers' self-directed learning in distance and traditional design and technology education **(STE22_14)** B Kurent (University of Ljubljana, Slovenia), S Avsec
10:00	Circulation concepts graphically represented in a game-like manner to support a project process in architecture **(STE22_31)** ER Victorio (University of Campinas, SP, Brazil), DCCK Kowaltowski
10:20	Bonder - A didactic tool for consolidating knowledge on adhesive bonding technology **(STE22_27)** AQ Barbosa (INEGI, Portugal), A Duarte, C Leite, D Barbieri, L Barts, CSP Borges, LFM da Silva
10:40-11:00	**COFFEE BREAK (Room under the Auditorium)**
	Session 2 – Learning mechanisms II (Chair: AZ Sampaio and FP Nelson)
	Room A101 (Auditorium)
11:00	Using competitions as a teaching technique for cyber security education: The case of the National Cyber League (NCL) **(STE22_2)** C Toregas (The George Washington University, USA), D Manson, S Miller
11:20	Enhancing the efficacy of identifying visual patterns and novel anomalies of cyber-defenders with 3D immersive VR (3DIVR) **(STE22_12)** D Passig (Bar-Ilan University, Israel), R Hochman
11:40	3D with artificial intelligence technology contributes science and technology education development **(STE22_22)** H Jiang (H Cruiser Research Group, Germany), XL Liu, MX Tang
12:00	Teaching ergodicity of WSS random processes using MATLAB **(STE22_15)** GJ Dolecek (National Institute INAOE, Mexico)
12:20	The blockchain technology applications in higher education **(STE22_49)** B Vasconcelos, JL Reis (University of Maia, Portugal), AV Sousa, JLM Santos
13:00-14:00	**LUNCH BREAK (Room under the Auditorium)**
	Session 3 – Learning mechanisms III (Chair: C Toregas and WWM So)
	Room A101 (Auditorium)
14:00	The agile science: Lessons from physics and physicists **(STE22_5)** G Yair (The Hebrew University of Jerusalem, Israel)
14:20	Influence of COVID-19 confinement and pandemic on the academic performance of students **(STE22_20)** I Tort-Ausina, J Molina-Mateo, A Vidaurre, JM Meseguer-Dueñas (Universitat Politècnica de València, Spain), J Riera, JA Gómez-Tejedor, M-A Serrano, S Quiles
14:40	On the design of a curriculum unit focused on the smart factory concept **(STE22_33)** A Azevedo (University of Porto, Portugal), A Almeida

15:00	Undergraduate engineering laboratories: A study exploring laboratory objectives and student experiences at an Irish University **(STE22_4)**	
	T O'Mahony (Munster Technological University, Ireland), M Hill, A Duffy	
15:20	Introduction of BIM methodology in structural engineering education **(STE22_24)**	
	AZ Sampaio (University of Lisbon, Portugal), TT Farinha, AM Gomes	
15:40	How to improve students' satisfaction and engagement in large classes? – a successful example of an innovative pedagogical approach which combined spaced learning and team-based learning **(STE22_48)**	
	L Gonçalves, B Matos, M Rodrigues, F Ribeiro, V Carlos, M Fardilha (University of Aveiro, Portugal)	
16:00-16:20	**COFFEE BREAK (Room under the Auditorium)**	
	Session 4 – Innovative pedagogical projects of DEMec/LEM-MEM (Chair: LFM da Silva and J Seabra)	
	Room A101 (Auditorium)	
16:20	The class as a theatrical play **(STE22_7)**	
	EAS Marques, RJC Carbas, PP Camanho, LFM da Silva (University of Porto, Portugal)	
16:35	"O docente tutor": A pilot project **(STE22_42)**	
	AM Lopes (University of Porto, Portugal), TMGP Duarte, RJC Carbas, EAS Marques, PJSM Coelho	
16:50	Interactive lab on advanced joining processes **(STE22_8)**	
	EAS Marques (INEGI, Portugal), RJC Carbas, LFM da Silva	
17:05	Virtual tool to support the teaching of technical drawing **(STE22_9)**	
	RJC Carbas (INEGI, Portugal), EAS Marques, JAS Almacinha, JJM Machado, LFM da Silva	
17:20	Virtual platform to improve teaching and studying of materials science and engineering **(STE22_18)**	
	CSP Borges (INEGI, Portugal), F Castro Sousa, TMGP Duarte, RJC Carbas, LFM da Silva	
17:35	Autonomous experimental practice with photovoltaic systems **(STE22_37)**	
	AI Palmero-Marrero (University of Porto, Portugal), AC Oliveira, J Mendes	
17:50	Force characterization using electromagnetic elements **(STE22_46)**	
	AR Silva (University of Porto, Portugal), F Vasques, AM Lopes	
18:05	FabLab – An integrative pedagogical experience **(STE22_61)**	
	D Pinheiro, G Wiechert, J Alegre, V Rodrigues, D Carvalho, J Almacinha, J Marafona, M Parente, A de Jesus (University of Porto, Portugal), JMRS Tavares	
19:00	**Poster session and RECEPTION**	

Learning mechanisms

Poster 1	Technologies and education: Some remarks from a "stimulus-means" perspective **(STE22_13)**	S Morganti, V Zudini (University of Trieste, Italy)
Poster 2	Academic short course: The BIM methodology in construction, structures and heritage buildings **(STE22_25)**	AZ Sampaio (University of Lisbon, Portugal), AM Gomes
Poster 3	From STEM to STEAM with educational robotics **(STE22_36)**	PK Kočková (University of Ostrava, Czech Republic), KK Kiliánová, KK Kostolányová
Poster 4	Exploring hybrid approaches in Engineering Thermodynamics during Covid-19 pandemic **(STE22_53)**	N Muñoz-Rujas (Universidad de Burgos, Spain), G Rubio-Pérez, R Briones-Llorente, M Lifi, F Aguilar, EA Montero
Poster 5	How can phenomenon-based learning be implemented in the context of a primary school? **(STE22_59)**	S Rantanen (University of Turku, Finland), M Veermans
Poster 6	Sensors embedded in mobile devices, gamification and interfacing of sensors and their use in STEM education **(STE22_60)**	P Boháčková (University of Ostrava, Czech Republic), KL Klubal, PK Kočková, KK Kostolányová

Learning systems

Poster 7	Update and reformulation of the European Adhesive Bonder Curricula using a modular and learning outcomes approach **(STE22_55)**	E Meiß, AQ Barbosa (INEGI, Portugal), A Almeida, T Avelino, F Mañas, M Uran, M Tonnhofer, LFM da Silva
Poster 8	Research and education systems of European universities concerned with laser welding and friction stir welding **(STE22_21)**	R Beygi (INEGI, Portugal), A Akhavan-Safar, EAS Marques, LFM da Silva

Assessment

Poster 9	Some factors influencing students' academic performance in the Integrated Master in Mechanical Engineering (MIEM) at FEUP **(STE22_43)**	TMGP Duarte (University of Porto, Portugal), AM Lopes, LFM da Silva

Friday 7 October 2022

Session 5 – Learning mechanisms IV (Chair: RD Adams and GJ Dolecek)

Room A101 (Auditorium)

9:00	Enhancing engineer and engineering perception through video design in STEM education **(STE22_52)** N Muñoz-Rujas (Universidad de Burgos, Burgos, Spain), A Pavani, J Baptiste, FEM Alaoui, E Montero
9:20	Strategies to provide future engineers with a global view of building performance **(STE22_40)** NMM Ramos (University of Porto, Portugal), PF Pereira
9:40	Knowledge and behavior with COVID-19 among Hong Kong primary students **(STE22_41)** WWM So (The Education University of Hong Kong, Hong Kong), WC Li, HM Lee, MS Man
10:00	Redesigning introductory computer programming in engineering education using innovative online modules **(STE22_47)** D Persano Adorno (University of Palermo, Italy)
10:20	A take home laboratory to support teaching electronics: Instructors perspectives and technical revisions **(STE22_50)** T O'Mahony (Munster Technological University, Ireland), M Murray, M Hill, R Onet, M Neag, L de la Torre Cubillo, D Zhou
10:40-11:00	*COFFEE BREAK (Room under the Auditorium)*

Session 6 – Learning systems (Chair: S Avsec and AM Lopes)

Room A101 (Auditorium)

11:00	Educating Engineers **(STE22_45)** RD Adams (University of Bristol, UK)
11:20	On the importance of discipline-culture paradigm of Science Education for Technology Education **(STE22_57)** I Galili (The Hebrew University of Jerusalem, Israel)
11:40	Promoting in-service teachers' expertise in STEAM and teaching in digital learning environments **(STE22_23)** M Veermans (University of Turku, Finland), S Rantanen, A Lahti
12:00	Adaptability and course complexity: An engineering department's response to external stimulus in terms of teaching practices and strategies **(STE22_30)** G Panther (University of Nebraska-Lincoln, Nebraska, USA), HA Diefes-Dux
12:20	Identifying design thinking profiles in technology-enhanced collaborative learning and investigating their relation to interpersonal skills in prospective design and technology teachers **(STE22_28)** S Avsec (University of Ljubljana, Slovenia)
12:40	Experimental and computational project: A new experience in the Bachelor of Mechanical Engineering at FEUP **(STE22_44)** A Afonso, A Arteiro, C Fernandes, MPL Parente (University of Porto, Portugal), AR Silva, P Sousa
13:00-14:00	*LUNCH BREAK (Room under the Auditorium)*

Session 7 – Diversity and inclusiveness (Chair: EAS Marques and CN Della)

Room A101 (Auditorium)

14:00	Two theory driven approaches toward a single goal: Retaining students in STEM **(STE22_6)** EM Dell (Rochester Institute of Technology, NY, USA), EM Weeden, J Christman, SP Mason, JA O'Neil
14:20	Information and communication technologies-mediated interventions to promote digital inclusion and healthy aging among older people in Costa Rica **(STE22_11)** MD Castro-Rojas (Universidad Nacional, Costa Rica), M Coto-Chotto, M Blanco-Molina
14:40	Novice teachers' technology integration and professional identity reframing in the Chinese as an additional language classroom **(STE22_16)** Y Gong (University of Macau, China)
15:00	Occupational identity work in engineering practice: Implications for engineering educators **(STE22_17)** KD Beddoes (San Jose State University, CA, USA)
15:20	Young voices - Exploring preschool children's perspectives about natural environments through art **(STE22_10)** Y Kesner Baruch (Levinsky College of Education, Israel)
15:40	Embedding technology in children's experiencing and learning of their urban nature environments. Educational uses of two citizen observatories in the context of an environmental education project **(STE22_56)** M Daskolia, M Pappa, Z Daskalaki, A Trigatzi, M Pliota (National and Kapodistrian University of Athens, Greece), A Joly, P Bonnet, R Arias, K Soacha, J Piera
16:00-16:20	*COFFEE BREAK (Room under the Auditorium)*

	Session 8 – Assessment (Chair: LFM da Silva and AM Ferreira)
	Room A101 (Auditorium)
16:20	"But what should be the grade?" A conceptual study of achievement standards **(STE22_3)** V Gynnild (Norwegian University of Science and Technology, Norway)
16:40	Performance of active learners at the University of Glasgow Singapore: An empirical evidence **(STE22_26)** CN Della (University of Glasgow, UK), I Lim, C Goh, V Dale
17:00	A multi-dimensional quality assessment instrument for engineering education **(STE22_34)** L Bernold, B Díaz (North Carolina State University, USA)
17:20	An empirically-based systematic design for science assessment **(STE22_39)** L Morell (University of California, USA)
17:40	The use of Discord in a learning environment at university level **(STE22_58)** R Soeiro (University of Porto, Portugal), G David, AMA Neves
20:00	*STE 2022 BANQUET (Porto Caves Calém)*

Information and communication technologies-mediated interventions to promote digital inclusion and healthy aging among older people in Costa Rica

MD Castro-Rojas[1], M Coto-Chotto[1], M Blanco-Molina[1]

[1]Universidad Nacional, Costa Rica. Heredia, 86-3000, Costa Rica.

Information and Communication Technologies (ICT) have the potential to promote healthy aging as defined by WHO (2015) by facilitating learning opportunities, physical activity, social interaction, and daily living activities to maintain functional ability and well-being in older age. Nevertheless, few people older than 60 years use ICT. In Costa Rica, for this age group, the digital divide is the largest and the most constant in the period between 2010 and 2017 (PROSIC, 2018). This study investigates the effect of an ICT-mediated learning intervention in cognitive performance and subjective well-being on older people living outside the main urban areas in Costa Rica.

Participants are two groups of older people (13 each) who will complete the learning intervention which includes ICT-learning strategies, memory training strategies, and strategies to cope with "computer anxiety". The effect of the learning intervention will be evaluated by pre and post-test of the variables of interest using internationally standardized measurements. The data will be analyzed using Chi-square test, T-test, ANOVA, and MANCOVA. In case of violation of statistical assumptions, non-parametric tests will be conducted. Expected outcomes include empirical data to support the efficacy of ICT-mediated interventions for promoting healthy aging by improving cognitive performance and subjective well-being. Finally, we will discuss the implications of this type of intervention for digital literacy programs and public policies aimed at older people.

[1] Word Health Organization. [WHO]. World report on ageing and health. World Health Organization.

[2] Programa Institucional Sociedad de la Información y el Conocimiento [PROSIC]. Hacia la sociedad de la información y el conocimiento en Costa Rica: Informe (2018).