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# TABLE OF CONTENTS

## PAPERS

### POLICY AND STRATEGY

<b>Toward The Age Of Augmented Cognitive Capacities: The Next Challenge Of The Knowledge Society And E-Learning</b> .....	1
<i>Roni Aviram, Yoav Armony</i>	
<b>ICT As A Catalyst To Enhance Equity In European Higher Education: Which Way Forward?</b> .....	3
<i>Fabio Nascimbeni</i>	
<b>From Distance To Online Education: Educational Management In The 21<sup>st</sup> Century</b> .....	9
<i>Tor Soderstrom, Jorgen From, Jeanette Lovqvist, Anette Tornquist</i>	

### ELECTRONIC EDUCATION FOR SUSTAINABLE DEVELOPMENT

<b>A Joint Virtual-Campus Master’s Degree Design On Information And Communications Technology (ICT) In Education For Sustainable Development (ESD)</b> .....	16
<i>Vassilios Makrakis, Nelly Kostoulas-Makrakis, Charlotte Holland</i>	
<b>Promoting Eco-Citizenship With Multimedia Learning Resource</b> .....	23
<i>Gerard Casanova</i>	
<b>How And Why Does Education For A Sustainable Future Call For New Views Of Assessment?</b> .....	27
<i>Allyson Macdonald</i>	
<b>eLAB, A Personal Learning Environment for the Green Open Innovation Platform</b> .....	34
<i>Pau Yanez Vilanova, David Maniega Legardo, Pablo Lara Navarra, Jose Lopez Ruiz</i>	
<b>Tensions And Contradictions In Supporting Learning For Sustainability</b> .....	39
<i>Vivien Hodgon, Judi Marshall, Yvonne Latham</i>	
<b>Higher Education, Rural Development And Sustainability: Views From Iceland And Scotland</b> .....	46
<i>Anna Guarun Edvardsdottir, Allyson Macdonald</i>	
<b>Lifelong Learning Ecologies And Teachers’ Professional Development: A Roadmap For Research</b> .....	54
<i>Albert Sangra, Montse Guitert, Maria Perez-Mateo, Pauline Ernest</i>	
<b>Sustainable Accreditation And Learning In International Rehabilitation Professional Development</b> .....	60
<i>Alan Bruce, Michelle Marme, Chrisann Schiro Geist, Regina Robertson, David Perry, Karen Barrett</i>	
<b>Serious Gaming As A Means To Change Adolescents’ Attitudes Towards Saving Energy – Preliminary Results From The EnerCities Case</b> .....	66
<i>Peter W. De Vries, Erik Knol</i>	
<b>Evaluation Of Serious Games, As A Tool For Education For Sustainable Development</b> .....	73
<i>Georgia Liarakou, Eleni Sakka, Costas Gavrilakis, Costas Tsolakidis</i>	
<b>Sustainability Science And Higher Education: An Analysis Of A Bologna Three Cycle System</b> .....	80
<i>Filomena Amador, Carla Padrel Oliveira, Paula Bacelar Nicolau, Sandra Caeiro, Ana Paula Martinho, Paula Vaz Fernandes</i>	

### SUSTAINABILITY IN THE LEARNING ORGANISATION

<b>Sustainable Use Of Technology For Effective Learning In Ireland</b> .....	86
<i>Ann Fitzgibbon, Carina Girvan, Elizabeth Oldham</i>	
<b>Rethinking E-Learning In Higher Education As A Sustainability Contributor</b> .....	93
<i>Efthymiou Ilias, Vitsilakis Chryssi</i>	
<b>Methodological Issues Of Sustainable Learning</b> .....	102
<i>Andrasne Balogh, Andras Benedek, Judit Videkine Remenyi</i>	
<b>The Contribution Of Enriched Communication And Collaboration Media To Sustainable E-Learning: A Case Study</b> .....	108
<i>Nikolaos Tapsis, Ilias Efthymiou, Chryssi Vitsilaki</i>	

## **OPEN EDUCATIONAL RESOURCES IN SUSTAINABILITY CONTEXT**

<b>Positioning The OER Business Model Of Open Education</b> .....	115
<i>Marlies Bitter-Rijkema, Frank De Langen</i>	
<b>Some Issues Affecting The Sustainability Of Open Learning Courses</b> .....	126
<i>James Aczel, Simon Cross, Andreas Meiszner, Patrick McAndrew, Doug Clow</i>	
<b>The Lived Experience Of Sustainable Learning: The Lech-E OER Project Bridging Formal And Non-Formal Lifelong Learners</b> .....	132
<i>Antonio Teixeira, Paula Nicolau, Sandra Caeiro, Lieve Dams, Kees-Jan Van Dorp, Gordon Wilson</i>	
<b>Open Educational Resources: Reusability Of A Media Wiki To Provide Sustainability In A Blended Learning Environment</b> .....	138
<i>Elizabeth Katzlinger-Felhofer, Ursula Windischbauer</i>	
<b>Networked Learning As A Process Of Identification In The Intersection Of Collaborative Knowledge Building – Fostering Creativity, Awareness And Re-Use Of OER</b> .....	145
<i>Rina Ostergaard, Elsebeth Korsgaard Sorensen</i>	
<b>Sustainability Of Open Educational Resources – Providing Tools And Services For Adaptation: The Opencout Experience</b> .....	150
<i>Uta Schwertel, Jan M. Pawlowski, Henri Pirkkalainen, Alexander Mikroyannidis</i>	
<b>OER, Resources For Learning – Experiences From An OER Project In Sweden</b> .....	157
<i>Alastair Creelman, Ebba Ossiannilsson</i>	
<b>Identifying E-Learning Resources For Reuse</b> .....	163
<i>Thomas Richter</i>	

## **NEW MEDIA AND ICT APPLICATIONS**

<b>Added Value Of Teaching In A Virtual World</b> .....	171
<i>Ilaria Mascitti, Francesco Fedele, Paolo Degasperi, Mikail Feituri, Cristina Stefanelli</i>	
<b>Blended Culture: Creating A Synergy Between Digital And Visual Competences In Education</b> .....	178
<i>Andrea Karpati, Valeria Poczos</i>	
<b>Lights... Camera... Learning! Behind The Scenes At The Medea Awards</b> .....	183
<i>Deborah Arnold, Sally Reynolds</i>	
<b>Sustainable Aspects Related To The Use Of Videoconferencing And (Live) Streaming Media In Continuing Education Programmes Organized By The K.U.Leuven And Its Campus Kortrijk</b> .....	186
<i>Piet Bonte, Wim Malfait, Wim Van Petegem</i>	
<b>Global Best Practices In An Interactive Video Conferencing And Streaming-Enabled Blended Learning Environment</b> .....	193
<i>Marci Powell, Reggie Smith, Booz Allen Hamilton</i>	
<b>Shared Social Video In Higher Education ‘Blended’ Business Programmes</b> .....	200
<i>Denis Cullinane</i>	

## **NEW GENERATION LEARNING SOLUTIONS ON MOBILE DEVICES**

<b>I-Learning – Stage 2 Of The Enculturation Of 21<sup>st</sup> Century Life And Sustainable Learning</b> .....	206
<i>Daithi O. Murchu</i>	
<b>iUOC: Enhanced Mobile Learning at UOC</b> .....	212
<i>Eva P. Gil-Rodriguez, Xavier Aracil, Irene Manresa, Eva Loste</i>	
<b>Mobile Sustainability: Using M-Learning In Employment Contexts</b> .....	216
<i>Alan Bruce, Teemu Patala, Pekka Pirttiah</i>	
<b>Learning Of Algorithms On Mobile Devices Through Bluetooth, SMS And MMS Technology</b> .....	221
<i>Ricardo Barcelos, Liane Tarouco</i>	

## **COLLABORATION IN ONLINE LEARNING COMMUNITIES**

<b>Implementation Of Web 2.0 Tools In A Blended ICT Course As A Modeling Of Online Pedagogy</b> .....	233
<i>Tami Seifert</i>	
<b>Wikis – Tools For Creativity And Collaboration – 3 Case Studies From IADT</b> .....	238
<i>Hannah Barton, Marion Palmer, Laurence Riddell, Lynda Devanney</i>	
<b>Activity Patterns In Social Networks Of Academic Higher Education Institutes In Israel</b> .....	245
<i>Alona Forkosh-Baruch, Arnon Hershkovitz</i>	

<b>Building And Sustaining A Learning Community For Professional Educators In A Web 2.0 World</b> .....	251
<i>Neal Sumner, Olivia Fox</i>	
<b>The Developing Role Of The Educator In Web 2.0 And OER Environments</b> .....	256
<i>Tina Wilson</i>	
<b>Sustainable Digital Learning Objects &amp; Pre-Service Student Teachers – A Step Too Far?</b> .....	262
<i>Alison Egan</i>	
<b>MyStory – Integrating Learning Objects In Social Collaboration And Developing User Support</b> .....	269
<i>Alan Bruce, Anca Cristina Colibaba, Stefan Colibaba, Lucia Petrescu, Al I. Cuza, Grigore T. Popa</i>	
<b>Web 2.0 And 3D Virtual Environment For A Sustainable Knowledge Society: St. Art Project</b> .....	274
<i>Ilaria Mascitti, Francesco Fedele, Daniela Di Marco, Monica Fasciani</i>	
<b>On Line Interactions And Learning Ecosystems – A Complex Learning Experience</b> .....	280
<i>Laura Vettrai, Eleonora Guglielma, Giovanni Sorrentino, Valentina Castello, Marco Guspini</i>	
<b>Podcasting: A Tool For Sustainable Online Learning Environments - Experimental Analysis Of The New Opportunities</b> .....	286
<i>Antonella Poce, Laura Corcione</i>	
<b>Sustainability Concerns On Project Assignments – A Study Carried Out In A Undergraduate Programme On Environmental Sciences</b> .....	293
<i>Carla Padrel Oliveira, Filomena Amador, Ana Paula Martinho, Sandra Caeiro, Paula Bacelar Nicolau, Paula Vaz Fernandez</i>	

## **STRATEGY AND IMPLEMENTATION IN E-LEARNING SYSTEMS**

<b>Sustaining Lifelong Learning: A Review Of Heutagogical Practice And Self-Determined Learning</b> .....	300
<i>Lisa Marie Blaschke</i>	
<b>Impact Of Ecosystem Change On Institutional Strategies To Sustain E-Learning Durability In Higher Education: The University Of Lausanne Experience</b> .....	309
<i>Nadia Spang Bovey, Celine Restrepo Zea, Emmanuel Fernandes</i>	
<b>Moving To Open Learning Ecologies: From Open Educational Resources To Open Educational Practices</b> .....	316
<i>Ulf-Daniel Ehlers, Abel Caine</i>	
<b>Knowledge-Pull Education: Strategies To Promote Student Retention In E-Learning Environments</b> .....	324
<i>Kathleen Deery, Christopher Smith</i>	

## **METHODOLOGY – DIFFERENT E-LEARNER NEEDS, STYLES AND PERCEPTIONS**

<b>An Investigation And Evaluation Of Online Learning Strategies Within Asynchronous And Synchronous Learning Environments</b> .....	328
<i>Jenny Kilgore</i>	
<b>Overseas Students Studying Computer Science At A Distance Learning Environment</b> .....	335
<i>Tamar Benaya, Ela Zur</i>	
<b>Saving Money Or Adding Value? What Students Say About The Move To Digital Learning Resources</b> .....	342
<i>Mark Brown, Rebecca Argyle, Lee Kendall, Pat Sandbrook</i>	
<b>Student Perceptions And Preferences For Tertiary Online Courses: Does Prior High School Distance Learning Make A Difference?</b> .....	350
<i>Dale Kirby, Dennis B. Sharpe, Michael K. Barbour</i>	
<b>Factors That Affect Student Engagement On A Teacher Education Programme</b> .....	357
<i>Siobhan Cahillane McGovern</i>	
<b>On Predicting The Graduation Time Of Bachelor’s Degree Students In China's Open Universities</b> .....	364
<i>Wei Shunping</i>	
<b>Stress, Anxiety And Burnout Syndrome In Students Of A Distance Learning Program: The Open University Of Cyprus Experience</b> .....	381
<i>Andreas Pavlakis, Tasos Anastasiou</i>	

## **E-LEARNING METHODOLOGY – CONCEPT AND PRACTICE**

<b>Sustainable Learning: The Potential Of Cloud Computing For Distance Education</b> .....	388
<i>Griff Richards, Brian Stewart, Rory McGreal</i>	
<b>The Rehabilitation Of Language Labs In Modern Foreign Language Learning – A Greener, More Sustainable Trend In The 21<sup>st</sup> Century</b> .....	392
<i>Ana Paula Teixeira, Rosa Bizarro</i>	

<b>Learning About Natural History And Environmental Education Through The Use Of Digital Technologies.....</b>	400
<i>Sofoklis Sotiriou, Ellinogermaniki Agogi, Nikos Manouselis, Xenophon Tsilibaris</i>	
<b>Research To Support E-Learning .....</b>	405
<i>Maria Luisa Sevillano Garcia, Genoveva Levi Orta</i>	

## **GLOBALIZING E-LEARNING – INTERNATIONAL CASES**

<b>A Sustainable Community Of Learning: The Case Of EL-Gate .....</b>	412
<i>Antonio Teixeira, Isolina Oliveira, Maria Do Carmo Teixeira Pinto</i>	
<b>Virtual Mobility In International Work Placements .....</b>	419
<i>Mariet Vriens, K. U. Leuven, Mart Achten, Ilse Op De Beeck, Wim Van Petegem</i>	
<b>Assessment Of Sustainable Intercultural Competence Increase In Transnational Internships.....</b>	426
<i>Gabriele Abermann, Rosalyn Eder, Yassuf Erdil</i>	

## **QUALITY AND ASSESSMENT**

<b>The Assessment Dilemma – ‘Less Time’ Available, ‘More Feedback’ Needed .....</b>	434
<i>Mary Bolger</i>	
<b>Excellence For Organic Food? A Quality Assessment Concept For Agro E-Trainings.....</b>	440
<i>Ulf-Daniel Ehlers, Cornelia Helmstedt</i>	
<b>Transforming Teaching And Learning In Computer Science: Making Effective Use Of Pedagogy To Foster Good Practice .....</b>	446
<i>David Smith</i>	
<b>How To Ensure Quality Of E-Courses By Motivating And Awarding Teachers? .....</b>	453
<i>Anne Villems, Ene Koitla, Kerli Kusnets, Juri Lossenko</i>	
<b>Using The Community Of Inquiry Framework For Multi-Level Evaluation Of Online Programs .....</b>	456
<i>Phil Ice</i>	
<b>Extending the Concept of the ALPS CETL Competency Mapping and Interprofessional Assessments Processes To Enhance Student Learning and Employability Skills Beyond Health and Social Care.....</b>	462
<i>Catherine Coates, Julie Laxton, Jill Taylor, S. V. Smith</i>	
<b>Sustainability And Efficiency In Creating Educational Services And Additional Programs.....</b>	470
<i>Christian-Andreas Schumann, Sabine N. Tittmann, Stephan Ruhling Sven Weibflog</i>	

## **CONSTRUCTION AND MANAGEMENT OF KNOWLEDGE**

<b>On-Line Learning And Performance Support In Organizational Environments Using An EPSS.....</b>	476
<i>Eran Gal, Rafi Nachmias</i>	
<b>Professional Uses Of Web 2.0 In Walloon SME’s Are Shaping Up!.....</b>	482
<i>Helene Raimond</i>	
<b>Embedding Teaching Quality Enhancement: Peer Support And Collaborative Observation Online (COOI) .....</b>	489
<i>Shirley Bennett, Patrick Lynch, Lyz Howard</i>	

## **E-LEARNING SOLUTIONS FOR WORKFORCE DEVELOPMENT**

<b>Supporting ICT Situated Learning And Virtual Skills Rehearsal In Workforce Development .....</b>	496
<i>Stephen Farrier, Keith Quinn, Alan Bruce, John M. Davis, Nick Bizas</i>	
<b>Sharing Strategies For A Creative And Sustainable Learning: Creanova In The Basque Country.....</b>	503
<i>Idoia Fernandez, Pilar Ruiz De Gauna, Maite Arandia, Marta Barandiaran, A. Elizagirre, I. Etxebarria, E. Torres, A. Ezeiza</i>	
<b>The Impact Of Innovation (Vouchers) In The Classroom.....</b>	510
<i>Andrew Power, Tim McNichols, John Dempsey, John Montayne</i>	
<b>Sustainable Learning Fosters Entrepreneurs? Free – Fostering Return To Employment Through Entrepreneurship Innovation And Creativity .....</b>	516
<i>Mette Christensen, Pedro Costa, Ana Dias</i>	

## **E-LEARNING FOR SOCIAL INTEGRATION**

<b>Local Support For Online Learners With Possible Learning Disabilities .....</b>	<b>522</b>
<i>Torstein Rekkedal</i>	
<b>Distance Education Technologies As A Sustainable And Sustaining Tool In Vocational Rehabilitation Of Incarcerated Individuals.....</b>	<b>528</b>
<i>Chrisann Schiro-Geist, Emer Broadbent, Maurice Williams, Peter G. Brown, Brittany Sansbury, R. John Sawyer, Donnalyn Constantine</i>	
<b>Fostering Sustainability Of Society And Work Of Disadvantaged Women By Using E-Learning.....</b>	<b>532</b>
<i>Isabelle De Vriendt</i>	

## **SOCIETAL CONTEXT OF E-LEARNING – NATIONAL CASES**

<b>Mobile Learning: An Asset For Sustainable Development In Developing Countries? .....</b>	<b>537</b>
<i>Maria Jose Casany Guerrero, Marc Alier Forment</i>	
<b>E-Learning Strategies For Developing Societies: Lessons Learned From Anthropology.....</b>	<b>543</b>
<i>Eva Seiler Schiedt</i>	
<b>Strengthening University And School Partnerships To Improve And Sustain The Integration Of Technology In Schools: Three European Case Studies .....</b>	<b>548</b>
<i>David Smith, Christian Reimers, Alexander Nischelwitzer</i>	
<b>eFESTO Project: A Definite Step Towards E-Inclusion.....</b>	<b>554</b>
<i>Elena Intorcica, Maria Riccio, Jozefina Osowska, Valetina Castello, Francesco Zoino</i>	
<b>Developing A Constructivist Classroom With Technology: Towards An Understanding Of The Process In Bulgaria.....</b>	<b>559</b>
<i>Roumiana Peycheva-Forsyth, Iona Sarieva</i>	

## **CASE STUDIES OF INSTITUTIONAL INNOVATION**

<b>Sustainability – A Key Principle Of The Bavarian Virtual University .....</b>	<b>565</b>
<i>Paul Ruhl, Ingrid Martin</i>	
<b>The Coact Framework For Enabling Higher-Order Learning In The Design Of Learning Materials For The Online Environment .....</b>	<b>572</b>
<i>Lori Johnston, Nicholas Breakwell</i>	
<b>E-Didact – Engineering Pedagogy At Universities In Saxony. - A Research And Further Education Project Of TU Dresden And University Of Applied Sciences Zittau/Görlitz .....</b>	<b>581</b>
<i>Steffen Kersten, Thomas Kohler, Hartmut Simmert</i>	

## **POSTERS**

### **MOBILE TECHNOLOGY, VIRTUAL CLASSROOM**

<b>Apps For iPhones To Sustain And Structure Learning.....</b>	<b>586</b>
<i>Julie Laxton, Nancy Davies, James Rone, Tamsin Treasure-Jones</i>	
<b>M-Learning Manager – A New Challenge In Job Role Recognition And Training.....</b>	<b>590</b>
<i>Nevena Mileva, Desmond Keegan</i>	
<b>M-Learning As A Part Of E-Learning.....</b>	<b>595</b>
<i>Vladimir Slepov, Olga Grishina, Elena Sidorova</i>	
<b>ICT And Mobile Technologies Based Learning: Opportunities And Challenges.....</b>	<b>598</b>
<i>Danguole Rutkauskienė, Daina Gudoniene, Carline Michalak</i>	
<b>Opportunities And Challenges Of Using E-Portfolio In Higher Education.....</b>	<b>606</b>
<i>Sandra Kucina Softić, Zvonko Martinović, Tona Perisic Pintek, Zoran Bekić</i>	
<b>The Use Of ICT And Emerging Technologies In Higher Education – Cases Of Good Practice .....</b>	<b>612</b>
<i>Geir Hareide Hansen</i>	
<b>The E-View Project – Promoting Sustainability In Learning Through The Creation Of A European Virtual Environment For Work-Based Learning .....</b>	<b>619</b>
<i>Abi Reynolds, Sally Reynolds, Margarida Amaral, Sarah Frame</i>	

## **INSTRUCTIONAL DESIGN AND STUDENT SUPPORT**

<b>Improve E-Learning Through Reading - Automated Tailored Texts To Enhance Comprehension .....</b>	<b>623</b>
<i>Francesco Agrusti</i>	
<b>Learning Network And Social Metacognition For Sustainable (Peer) Learning .....</b>	<b>629</b>
<i>Ulf Olsson</i>	
<b>E-Learning Sustainability: Freedom In Learning And Recognition In Certification.....</b>	<b>632</b>
<i>K. P. Hewagamage</i>	
<b>Sustainable Education Through E-Learning And The Use Of Web 2.0 Tools: Showcase Use Of E-Portfolio In An Adult Education Program .....</b>	<b>641</b>
<i>Branka Vuk, Mirta Janes</i>	
<b>Equipping Tutors With Strategies To Effectively Mediate Online Learning Spaces.....</b>	<b>648</b>
<i>Michael Hallissy</i>	
<b>Tool TIPLS – Tool To Improve Transparency Of Professional Foreign Language Skills .....</b>	<b>650</b>
<i>Alan Bruce, Anca Cristina Colibaba, Stefan Colibaba, Lucia Petrescu, Al. I. Cuza, Grigore T. Popa</i>	
<b>Designing A Digital Textbook For Learning English As A Foreign Language.....</b>	<b>652</b>
<i>Heeok Heo, Jeongim Choi, Kyu Yon Lim, Ilhyun Jo</i>	

## **LEARNING AND SUSTAINABILITY 1**

<b>Lifelong Learning And Distance Education – Sustainability Strategies Or Survival Techniques? .....</b>	<b>659</b>
<i>Eva Sandor-Kriszt, Anita Orosz-Csesznak, Tamas Radvanyi</i>	
<b>Eco-Resources: A New Metaphor For Open Educational Resources.....</b>	<b>667</b>
<i>Paolo Tosato, Juliana Raffaghelli</i>	
<b>Raising Awareness On Sustainable Learning. An Online Teacher Training Programme To Support The Development Of Key Competences.....</b>	<b>674</b>
<i>Angela Tesileanu, Ligia Sarivan</i>	
<b>Meeting The Old And New Ecosystems .....</b>	<b>681</b>
<i>Zoltan Kun</i>	
<b>Issues Emerging From The Geta Project In Iceland: Educational Action For Sustainable Development.....</b>	<b>683</b>
<i>Audur Palsdottir, Allyson Macdonald</i>	
<b>Educating Engineers For A Sustainable Society – Green Challenge At The Technical University Of Denmark (DTU) .....</b>	<b>689</b>
<i>Christa Trandum, Peter M. Hussmann</i>	
<b>An Experience Of Organization Of A Course Of 3<sup>rd</sup> Cycle On Social Sustainability And Development.....</b>	<b>692</b>
<i>Filomena Amador, Carla Oliveira</i>	
<b>Go Green: A Personalised Green Training Center For European SMEs .....</b>	<b>697</b>
<i>Dimitra Voulgaridou, Ioanna Ioannidou, Evgenia Tzanetopoulou, Olga Stavropoulou-Salamouri</i>	
<b>VIRQUAL: Developing A Model For Virtual Mobility.....</b>	<b>703</b>
<i>Rita Falcao</i>	
<b>Learning Outcomes And The European Qualifications Framework In Higher Education – Awareness And Attitudes Of Stakeholders Across Different European Countries.....</b>	<b>706</b>
<i>Daniela Proli, Thomas Kretschmer</i>	
<b>Mandatory Use Of Tests In The Basic Competence In Working Life Programme?.....</b>	<b>708</b>
<i>Ingrid Radtke, Marit Gunneng</i>	
<b>Training Rural Population On Using ICT Services.....</b>	<b>712</b>
<i>Argiris Tzikopoulos, Anna Zoakou, Ellinogermaniki Agogi</i>	
<b>From “E-Senior” Magazine And “E-Senior In Action” To “Learn With Grandma” .....</b>	<b>720</b>
<i>Anna Grabowska</i>	
<b>New Frontiers In The Digital Age: Learning Everywhere .....</b>	<b>723</b>
<i>M. Gea, R. Montes-Soldado</i>	
<b>Occupations On Verge Of Extinction And New Products: An Educational Project In The Context Of Sustainable Development .....</b>	<b>728</b>
<i>Mary Kampouroupolou, Costas Tsolakidis, Persa Fokiali</i>	
<b>Rural Development In Greece With Women’s “Fragrance”. But They Do Need Training .....</b>	<b>733</b>
<i>Ioannis Chotzakianis</i>	



## **LEARNING AND SUSTAINABILITY 2**

<b>Sustainability As Core Value At Kasavuori Dream School.....</b>	738
<i>Riitta Rekiranta, Allan Schneitz, Sirkku Nikamaa-Berg</i>	
<b>The Role Of Sustainable Education At Otava Folk High School.....</b>	744
<i>Kaisa Lindstrom, Jenni Linturi, Enrique Tessieri</i>	
<b>A Model Of Sustainable Distance Education Based On The Principle Of Inclusion: National Autonomous University Of Mexico.....</b>	748
<i>Ofelia Contreras, Jorge Leon, Pedro Rocha</i>	
<b>Creating Sustainable Learning Environment For Education On Water Transport In Croatia Supported By E-Learning.....</b>	754
<i>Zvonko Kavran, Natalija Jolic, Katarina Mostarac</i>	
<b>Project Educational Problems Of Elementary Schools.....</b>	759
<i>Eva Dvorakova</i>	
<b>European Dental Schools’ Provision Of Sustainable Lifelong Learning Through An E-Module – Step 1: The CPD Inventory.....</b>	764
<i>Argyro Kavadella, Anastasia Kossioni, Kostas Tsiklakis</i>	
<b>Using Excel In The Conception Of Questionnaires And Data Analysis A Case Study In E-Learning For Lifelong Learning Teachers.....</b>	768
<i>Carla A. Martinho, Paula Vaz Fernandes</i>	
<b>Relevance Of Research And Study Groups In Ict-Based Continuous Teacher Preparation On Sexuality Education.....</b>	775
<i>Celia Regina Rossi, Isabel Chagas</i>	

## **LEARNING AND SUSTAINABILITY 3**

<b>Consumer Friendly Portal Practices – Creating Sustainable Learning Environment.....</b>	781
<i>Tatyana Logutenkova, Irina Tretyakova</i>	
<b>Sustainable Learning On Ph.D. Level – Project Based Online Research Training In The Education &amp; Technology Research Network.....</b>	788
<i>Thomas Kohler, Claudia Borner, Hartmut Simmert, Steffen Kersten</i>	
<b>The Challenge Of Eco-Designing Sustainable Development Of Elearning At Sorbonne Nouvelle: A Chance To Change.....</b>	794
<i>Claudine Muhlstein-Joliette</i>	
<b>The Use Of The Learning And Content Management System “Opal” As A Teaching Arrangement.....</b>	796
<i>Hartmut Simmert, Thomas Kohler, Steffen Kersten</i>	
<b>Artificial Intelligence In E-Learning Systems.....</b>	801
<i>Richard O’Connell</i>	
<b>No More Paper “T.O.D.A.Y” – Topical On-Line Discussions For Active Youth.....</b>	809
<i>Annalis Iovine</i>	
<b>Competency Matching Between Vocational Education And The Workplace With The Help Of Ontologies.....</b>	813
<i>Gabor Kismihok, Stefan Mol, Francesco Zoino, Giovanni Sorrentino, Valentina Castello, Gruppo Dida, Ildiko Szabo, Reka Vas</i>	
<b>Author Index</b>	

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# SERIOUS GAMING AS A MEANS TO CHANGE ADOLESCENTS' ATTITUDES TOWARDS SAVING ENERGY; PRELIMINARY RESULTS FROM THE ENERCITIES CASE

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## Introduction

Reduction of energy consumption, and thus CO<sub>2</sub> emissions, has become the focal point of energy and environmental policies worldwide. The 1997 Kyoto Protocol and The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) have spurred the European Union (EU) to substantially curtail emissions (20% below 1990 levels by 2020). The "Peak Oil" phenomenon will further influence nations' energy household for the coming decade. In this light it is interesting to see new developments in the field of e.g. electric and hybrid vehicles that consume no or limited fossil fuels.

The substantial efforts that are required to reduce energy consumption and migrate towards sustainable energy sources have widespread repercussions, however, for industry and transportation as well as for the household. In fact, some have argued that focusing on household appliances and domestic lighting constitutes a cost-effective way to achieve energy savings [5]. Organic LEDs for lighting applications, for instance, constitutes an eye-catching technological development enabling low energy lighting. Although current and future technology (e.g. double-paned windows, insulation technology, and organic LED (Light-Emitting Diode) for lighting applications) may reduce energy consumption by an estimated 30 % [5], we cannot afford to overlook the role of consumer behaviour and psychology (cf. [10]). Indeed, influencing consumers to change their behaviour may substantially add to modern technology's energy-saving potential. In fact, some researchers suggest that focused attempts to do so may result in an energy reduction of at least 10 % ([6]; cf. [2]).

## Educating the Net Generation teenagers about energy saving

A considerable part of the energy consumers of tomorrow are today's secondary school students. Policymakers therefore increasingly focus on adolescents to stimulate awareness of sustainability and energy saving. Media channels and institutes, e.g. schools, offer excellent possibilities to stimulate youngsters to do so. Nevertheless, non-interactive media channels and traditional education programmes to some extent seem to mismatch with the information-processing styles, communication and social routines of today's young people. Often called the Net Generation or Digital Natives [11], they have literally grown up in a world in which computers, (mobile) internet, social networks, cell phones and video games are pervasive [4]. For example, Robert & Foehr [15] report that based on a study in the US in 2004, 15- to 18-years olds played computer games for approximately half an hour per day. It may be expected that these days this figure will be substantial higher due higher penetrations of (free) online games via e.g. online social networks and special interests community sites. Typically, this particular age group is proficient at multitasking, prefers visual information over textual, is cross-media oriented, and is highly active on social network sites. In order to be successful, strategies aiming to educate young people about energy conservation should be designed accordingly.

Educational or serious games are often regarded as effective learning tools [3] due to their engaging character and are used in various contexts (e.g. [8]). Serious games go beyond what is labelled as "edutainment games" or "elearning games" which are primarily learning tools with additional elements to give it some gaming and/or entertainment characteristics. Serious games, on the other hand, are more strongly focused on the fun and enjoyment of the gaming experience while the learning elements are not fully obvious or centrally positioned in the game. Serious games can be categorised using four dimensions [14]: the primary educational content (e.g. health oriented, energy oriented), the primary learning principle (e.g. practicing skills, knowledge gain through exploration, cognitive problem solving), the targeted age group, and platform used (e.g. PC-based with variants such as online and offline games; console-based games played on Nintendo Wii, Sony Playstation etc.).

The actual effectiveness of serious games as a means to influence attitudes and behaviour of teenagers has not been established unequivocally. As indicated by Graesser et al. [9], available reviews and meta-analyses over the last few years have not provided overwhelming support that serious games enhance learning of content, strategies, or skills. In the current project, we will therefore test the effectiveness of the serious game EnerCities, developed to positively influence energy-related household behaviours. As our target group, adolescents, typically lives in with their parents, many energy-related behaviours that occur in the household are not theirs, and therefore are unlikely to be influenced by the playing the game. Hence, with our approach we do not focus on learning effects in terms of actual behaviour, but on a change in behavioural attitudes instead.

### EnerCities: a serious game about energy

EnerCities [12] is a European project that rolls out a serious game in which players are challenged to build a sustainable city. It runs online ([www.EnerCities.eu](http://www.EnerCities.eu)) and on Facebook (<http://apps.facebook.com/enercities>) and is currently available in six EU languages. The browser-based 3D technology of EnerCities is the Unity3D plugin. This 3D technology leads to 3D perspectives, smooth scrolling and zooming and animated graphics. In this way EnerCities appears to the teenagers - in comparison with browser-based Flash games - as a modern browser game with attractive / nice graphics. The game and related educational materials are freely available for schools and individuals across Europe. Large-scale usage of the game on schools started as from September 2010; in parallel, individuals are invited to sign up and play the game. Game players and control group members are asked to fill in questionnaires, the results of which will used to ascertain the game's effectiveness in changing energy-related attitudes and several household energy-related behaviours.

Although data proving EnerCities' effectiveness in terms of learning and behaviour change has only recently become available, elearning professionals and teachers had early on already indicated the EnerCities game as valuable. It was awarded the title of "Best Learning Game 2010" by the European platform "ENGAGE Quality Awards"; this platform "recognise[s] excellent contributions from teachers, educational practitioners, game developers and producers to the quality of game-based learning". The award for Best Learning Game focuses on "digital games for teaching and learning that stand up to methodological, didactical and technical standards". In addition, the Dutch game industry awarded EnerCities with the title "Best Online Game 2010". This suggests that EnerCities is not only a learning tool but also has attractive gaming elements making EnerCities fun and enjoyable.



Figure 1 Screen shots taken during various stages in the EnerCities game

The game starts with a small village and a small piece of land to build on. A drag-and-drop interface lets players build structures (e.g. residential and industrial areas, renewable / non-renewable energy sources, green zones) to expand the city. The gamer needs to balance *People*, *Planet* and *Profit* while supplying the growing city with sufficient electricity, implementing energy conservation and CO<sub>2</sub> emission measures and minimizing fossil fuel use. Each player's decision influences the scores for people, planet and profit. When done well, players receive more potential city space to expand their city and to utilise extra available game options (see fig 1). The game allows players to execute several strategies and see the results of their actions on the long term. The duration of the game is approximately 15-45 minutes, depending on the player's strategies. Playing the game on Facebook

gives players additional functionalities to share scores and experiences with Facebook friends. In this way, involving the player's social network could lead to intensified competitions among youngsters to break the EnerCities high scores.

## Procedure

To test the intervention effectiveness of the game on several energy-related attitudes, a between-participants design was adopted. Thus, measurements of attitudes of the experimental and control group were compared. Questionnaires were composed in six European languages (Dutch, English, German, Greek, Slovenian, and Spanish), and placed on [www.EnergyQuestionnaire.eu](http://www.EnergyQuestionnaire.eu).

Looking at the every day life setting of youngsters, several specific energy-related variables form the core of the analysis. The questions asked dealt with respondents' attitudes towards saving energy at home, turning off lights when leaving an unoccupied room, switching off the TV instead of using standby, and taking shorter showers. Initially, lowering living room thermostat was also incorporated, but this item was dropped later on, as this specific energy-related behaviour is not relevant in warm southern European countries as Spain and Greece. Each attitude measure consisted of three items, requiring respondents to rate on 7-point scales how good vs. bad, pleasant vs. unpleasant, and useful vs. not useful they thought each of these behaviours was. These three items were subsequently averaged to form one attitude measure for each specific behaviour (Cronbach's Alphas .77, .81, .79, and .78, respectively).

## Results

### *Description of sample and preparation of the dataset*

Towards the end of May 2011, data had been collected from more than 800 respondents from various European countries. However, some respondents (both from the experimental and control group) had stopped answering questions well before reaching the end of the questionnaire. In addition, some respondents had filled out parts of the questionnaire with invalid data (e.g., scoring each single item the same), and a few had filled it out multiple times. After omitting these, 653 cases remained, 325 related to the experimental group and 328 being part of the control group.

The sample used for our analyses comprised 36 % females and 64 % males. The average age was 16.40 years ( $SD = 3.21$ ).

### *Effects of exposure to EnerCities*

The analysis reported below served to show whether any change in attitudes towards energy-consuming household behaviours had taken place.

To reduce the risk of an inflated Type 1 error, a multivariate ANOVA was conducted. The dependent variable list consists of four attitude constructs, indicating participants' stance towards 1) *Saving energy at home*, 2) *Switching off lights in unoccupied rooms*, 3) *Turning off TVs rather than using standby functions*, and 4) *Taking shorter showers*. This analysis yielded a significant multivariate effect,  $F(4, 648) = 2.76, p < .03$ ; Wilks' Lambda = .98. Subsequent inspection of the univariate effects yielded significant effects, indicating that playing EnerCities increased participants' attitudes towards saving energy at home, turning off TVs rather than using standby functions, and taking shorter showers. In contrast, only attitudes towards switching off lights in unoccupied rooms showed no significant effect. Means, standard deviations, and significance levels are displayed in table 1.

Table 1 Means and standard deviations of attitudes towards energy-related behaviours for the experimental and control group, and significance of their differences (7-points scale; higher scores indicate more positive awareness)

	Experimental Group*		Control Group*		Significance**	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i> (1, 651)	<i>p</i>
Attitude towards saving energy at home	6.19	1.16	5.96	1.30	5.59	.018
Attitude towards switching off lights in unoccupied rooms	6.31	1.11	6.18	1.11	2.06	Ns.
Attitude towards turning off TV instead of using standby	5.95	1.28	5.73	1.44	4.44	.036
Attitude towards taking shorter showers	4.82	1.71	4.41	1.82	8.90	.003

\* Experimental Group N = 325; Control Group N = 328; data gathering period: February 2011 – May 2011

\*\* Ns. = not significant

## Conclusion

In sum, it appears that playing the EnerCities game has resulted in higher attitudes towards saving energy at home in general, as well as towards performing specific energy-related household behaviours, i.e., attitudes towards turning off the TV after use instead of using the standby function, and taking shorter showers showed a pronounced, significant difference between the experimental and control group.

These results beg the question why these specific behavioural attitudes were affected, whereas attitudes towards switching off lights were not. This lack of effect regarding switching off lights is especially surprising in light of both the ease with which this particular behaviour can be adopted, and the discussion about and eventual phasing out of the inefficient incandescent light bulbs for general lighting purposes in the European Union. Regarding the latter, one would expect light regulation to have become increasingly salient as a means to reduce household energy. On the other hand, this increased salience may also have led to highly positive light-switching attitudes in the first place; emphasis in popular media on conventional light bulbs as highly inefficient may well have highlighted light regulation behaviour as an easy-to-perform and worthwhile way to reduce household energy consumption. Possibly, the resulting high a-priori attitude may have left little room for a further increase by means of our experimental manipulation. Some evidence for this contention may be found in the average attitude ratings being highest for light regulation, both in the experimental and control condition.

Also surprising is the finding that of all four attitude measures, the attitude towards taking shorter showers shows the most pronounced effect of the experimental manipulation. Many people would probably associate taking showers with comfort and relaxation, while comfort is less strongly associated with switching off TVs or light in unoccupied rooms. Nevertheless, our findings suggest that people are especially willing to sacrifice some of this comfort for the benefit of saving energy.

The mean scores on the attitude ratings were rather on the high end of the scale. Overall, it seems that saving energy in the household is something that our target group, tomorrow's energy consumers, takes quite to heart. It also appears that these attitudes are not etched in stone, and that serious gaming may well be a successful means to influence them even further.

This study suggests that interaction with a serious game about sustainability and energy affects attitudes towards energy-related behaviours. Interestingly, however, the game and the behaviour mismatch in the level of specificity. The EnerCities game required its players to adopt a global stance and build and expand a city, thereby continually choosing between construction and city-planning options each with their own specific consequences for comfort, revenues, energy consumption and CO<sub>2</sub> emission. The questionnaire, on the other hand, focuses on a more microscopic level of behaviour, namely energy-related behaviours in the household. In light of this difference in scope, it is intriguing to find that the game nevertheless seems to have affected attitudes. Apparently, members of our target group experienced very little difficulty in connecting the one with the other. This finding has significant consequences for the design of serious games. It suggests that game designers have greater latitude in their efforts to design a game with the object to change public opinion in that one does not necessarily need to focus on the specific behaviour to be changed but could choose behaviour that are dissimilar but nevertheless related.

When focusing on changing actual behaviour rather than attitudes, other factors should be taken into account as well, such as the mitigating effects of the nature of the behaviour under consideration. The degree to which behaviour is repetitive, for instance, is of major importance. Many studies have suggested that simple behaviour that occur in the household, such as light regulation and waste recycling, tend to become habitual when they are frequently performed (e.g. [13], [1]). In essence, this means that these behaviours are instigated and performed in a more or less automatic fashion, and hence are difficult to control by consciously forming intentions [7]. As such, strategies aiming to influence behaviours by creating awareness or increasing relevant knowledge among the target group may be less successful if these behaviours are habitual.

Strictly speaking, we have to be careful in attributing the effects found purely to the game. The game, after all, was often not played in isolation, but rather in the presence of fellow students or as a part of classroom learning activities with guidance of inspired teachers. It is, in principle, possible that these factors external to the game itself have contributed to its apparent success. Future research, we feel, should target the beneficial effects of this social aspect of online serious gaming.

The positive effects of exposure to EnerCities reported here, suggests that serious gaming has the potential to change public opinion. The specific aspects of serious games that bring about these changes therefore warrant further scientific scrutiny and testing. Hopefully, this will enable scientists and games designers to use these specific parameters, so as to design serious games with far greater effectiveness while at the same time being fun to play.

## References

1. AARTS, H., DIJKSTERHUIS, A. (2000). *The automatic activation of goal-directed behaviour: the case of travel habit*. Journal of Environmental Psychology, 20 (pp. 75-82)
2. ABRAHAMSE, W., STEG, L., VLEK, C., ROTHENGATTER, T. (2005). *A review of intervention studies aimed at household energy conservation*. Journal of Environmental Psychology, 25 (pp. 273-291)
3. ANNETTA, L. (2008). *Video games in education: Why they should be used and how they are being used*. Theory Into Practice, 47(3) (pp. 229-239)
4. BENNETT, S., MATON, K., KERVIN, L. (2008). *The 'digital natives' debate: A critical review of the evidence*. British journal of educational technology, 39(5) (pp. 775-786)
5. BERTOLDI, P., RICCI, A., DE ALMEIDA, A. (2000). *Energy Efficiency in Household Appliances and Lighting*. Berlin: Springer-Verlag
6. DARBY, S. (2000). *Making it obvious: Designing feedback into energy consumption*. In Bertoldi, P., Ricci, A., De Almeida, A. (Eds.), *Energy Efficiency in Household Appliances and Lighting*. Berlin: Springer-Verlag (pp. 685-696)
7. De VRIES, P., AARTS, H., MIDDEN, C. (2011). *Changing simple energy-related consumer behaviors: How the enactment of intentions is thwarted by acting and non-acting habits*. Environment and Behavior (in press) xx(x) (pp. xx-xx) Paper available at: <http://eab.sagepub.com/content/early/2011/01/12/0013916510369630.full.pdf>
8. GUSTAFSSON, A., KATZEFF, C., BÅNG, M. (2009). *Evaluation of a pervasive game for domestic energy engagement among teenagers*. Computers in Entertainment, 7(4)
9. GRAESSER, A., CHIPMAN, P., LEEMING, F., BIEDENBACH, S. (2009). *Deep learning and emotion in serious games*. Serious games: mechanisms and effects (pp. 83-102)
10. HERRING, H. (2006). *Energy efficiency - a critical view*. Energy, 31 (pp. 10-20)
11. JONES, C., RAMANAU, R., CROSS, S., HEALING, G. (2010). *Net generation or Digital Natives: Is there a distinct new generation entering university?* Computers and Education, 54(3) (pp. 722-732)
12. KNOL, E., DE VRIES, P.W. (2010). *EnerCities: Educational game about energy*. Proceedings CESB10 Central Europe towards Sustainable Building
13. OUELLETTE, J.A., WOOD, W. (1998). *Habit and intention in everyday life: The multiple processes by which past behavior predicts future behaviour*. Psychological Bulletin, 124 (pp. 54-74)
14. RATAN, R., RITTERFELD, U. (2009). *Clarifying serious games*. Serious games: mechanisms and effects (pp. 10-24)
15. ROBERTS, D.F., FOEHR, U.G. (2008). *Trends in media use*. The future of children, 18/1 (pp. 11-37)
16. WRAY-LAKE, L., FLANAGAN, C., OSGOOD, D.W. (2010). *Examining trends in adolescent environmental attitudes, beliefs, and behaviors across three decades*. Environment and Behavior, 42(1) (pp. 61-85)