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Benakli, N.a , Kostadinov, B.a , Satyanarayana, A.b , Singh, S.a

Introducing computational thinking through hands-on projects using R with applications to calculus, probability and data analysis

(2017) International Journal of Mathematical Education in Science and Technology, 48 (3), pp. 393-427.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85000997337&doi=10.1080%2f0020739X.2016.1254296&partnerID=40&md5=f7e8ebc07b44e3e40f40aead1d47632d

DOI: 10.1080/0020739X.2016.1254296

AFFILIATIONS: Mathematics Department, NYC College of Technology, CUNY, Brooklyn, NY, United States;

Computer Systems Technology Department, NYC College of Technology, CUNY, Brooklyn, NY, United States

ABSTRACT: The goal of this paper is to promote computational thinking among mathematics, engineering, science and technology students, through hands-on computer experiments. These activities have the potential to empower students to learn, create and invent with technology, and they engage computational thinking through simulations, visualizations and data analysis. We present nine computer experiments and suggest a few more, with applications to calculus, probability and data analysis, which engage computational thinking through simulations, visualizations and data analysis. We are using the free (open-source) statistical programming language R. Our goal is to give a taste of what R offers rather than to present a comprehensive tutorial on the R language. In our experience, these kinds of interactive computer activities can be easily integrated into a smart classroom. Furthermore, these activities do tend to keep students motivated and actively engaged in the process of learning, problem solving and developing a better intuition for understanding complex mathematical concepts. © 2016 Informa UK Limited, trading as Taylor & Francis Group.

AUTHOR KEYWORDS: computational probability with R; computational problem solving; data analysis with R; Monte Carlo games and simulations; scientific programming and simulations using R; Technology in mathematics education; visualization of Weierstrass functions

DOCUMENT TYPE: Article

SOURCE: Scopus

Huang, C.S.J.a , Su, A.Y.S.b , Yang, S.J.H.a c , Liou, H.-H.c

A collaborative digital pen learning approach to improving students' learning achievement and motivation in mathematics courses

(2017) Computers and Education, 107, pp. 31-44.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85007618577&doi=10.1016%2fj.compedu.2016.12.014&partnerID=40&md5=35f373c063e624a83590632e54534bd8

DOI: 10.1016/j.compedu.2016.12.014

AFFILIATIONS: Research Center for Science and Technology for Learning, National Central University, Taiwan;

Advanced Communication Laboratory, National Central University, Taiwan;

Department of Computer Science and Information Engineering, National Central University, Taiwan

ABSTRACT: Mathematics education in contemporary elementary schools is mainly conducted in a conventional way by giving lectures. A teacher would pass on knowledge to students by giving lectures, and this type of one-way teaching method is prone to cause poor learning achievement. Many researchers have suggested the use of a collaborative problem solving to improve the situation. This research proposed the use of a digital pen learning system (DPLS) with collaborative problem solving to improve learning achievement and learning motivation in a conventional mathematics courses. A quasi-experimental design was adopted to set up all of the teaching activities, which involved 64 fourth-grade students for four weeks. The results of the research show that the learning achievement of the two experimental groups was significantly better than control group. There was no significant difference between the two experimental groups and control group in terms of learning motivation. There was no significant difference between the three groups in terms of learning attitude. © 2016 Elsevier Ltd

AUTHOR KEYWORDS: Applications in subject areas; Architectures for educational technology system; Interactive learning environments

DOCUMENT TYPE: Article

SOURCE: Scopus

Kumar, V.a , Sharma, D.b

Cloud computing as a catalyst in STEM education

(2017) International Journal of Information and Communication Technology Education, 13 (2), pp. 38-51.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85012225908&doi=10.4018%2fIJICTE.2017040104&partnerID=40&md5=b0b584a66b41fc55c60753b4e06eabe5

DOI: 10.4018/IJICTE.2017040104

AFFILIATIONS: School of Business Studies, Sharda University, Greater Noida, India;

Jagannath University, Jaipur, India

ABSTRACT: The under representation of students in STEM disciplines creates big worries for the coming demands of STEM occupations. This requires new strategies to make curriculum interesting to enhance student's engagement in learning. Technology integration in curriculum makes more interesting and engaging, where students can learn with flexibility in time and place. This methodology creates and deepens interest in students towards learning with creativity and innovation. STEM students can work on authentic and real solutions within a technology-mediated learning environment, while inculcating higher order thinking skills. Technology-mediated environments support new ideas, real time collaboration and promotes peer learning. However, affordance as an adoption factor of technology in academics can be addressed by cloud computing technology. STEM education on cloud computing technology will gain access to its content rich features based on flexibility, accessibility, scalability, affordability, and reliability and enhanced agility. The cloud computing based STEM education infrastructure will inculcate development and experimentation skills in students. The present work (a) reviews scholarly work in cloud computing technology for simulations and prototypes for different STEM subjects, (b) outlines the benefits of using cloud computing technology for students pursuing STEM careers, and (c) presents the case studies of the successful implementation of cloud computing in STEM disciplines. © 2017, IGI Global.

AUTHOR KEYWORDS: Cloud Computing; Collaborative Computing; Elasticity; STEM Education; Virtual and Remote Laboratories

DOCUMENT TYPE: Review

SOURCE: Scopus

Kljajić, M., Škraba, A., Borštnar, M.K.

Learning and education experience in system dynamics of management students: Case studies

(2017) International Journal of Decision Support System Technology, 9 (2), pp. 21-38.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85013301560&doi=10.4018%2fIJDSST.2017040102&partnerID=40&md5=da1692a477c7e86ed68bc95d0ddd84a4

DOI: 10.4018/IJDSST.2017040102

AFFILIATIONS: University of Maribor, Maribor, Slovenia

ABSTRACT: Article describes experiences in the teaching of a modelling and simulation course for students at Faculty of Organizational Sciences. The course consists of time-continuous simulation based on System Dynamics (SD) and discrete event simulation (DES). It is held in the 3rd year of studies, at which point students have taken courses in mathematics, statistics, theory of systems, as well as organizational and economic courses. The final grade for the course is derived from the student's project and written exam. Students took part in an experiment where they had to solve a managerial decision problem supported by a simulation model. Experimental results were then analysed and discussed in the students' projects. Students' contributions were part of their final grade. The results show that students, taking the course of Modelling and Simulation, thought that application of the simulation model contributes to a greater understanding of the problem, the faster finding of solutions, and enhanced confidence of the participants. The results are explained and discussed using a learning model. © Copyright 2017, IGI Global.

AUTHOR KEYWORDS: Education; Experiment design; Group decision; Learning model; System dynamics

DOCUMENT TYPE: Article

SOURCE: Scopus

Putnik, Z.a , Štajner-Papuga, I.a , Ivanović, M.a , Budimac, Z.a , Zdravkova, K.b

Gender related correlations of computer science students

(2017) Computers in Human Behavior, 69, pp. 91-97.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006065028&doi=10.1016%2fj.chb.2016.12.009&partnerID=40&md5=f746114cabfdb66f84768e57668518f7

DOI: 10.1016/j.chb.2016.12.009

AFFILIATIONS: University of Novi Sad, Faculty of Science, Department of Mathematics and Informatics, Novi Sad, Serbia;

Faculty of Computer Science and Engineering, “Ss Cyril and Methodious” University in Skopje, Macedonia

ABSTRACT: In this article, statistical findings obtained by a large survey containing about 120 questions and options are presented. An inquiry using this survey was carried out on a considerable sample of students from four countries of Balkan region, studying different directions of computer science. Students belong to universities that are members of a joint educational project, plus three of the involved countries, emerged from the same country, former Yugoslavia, therefore the results are comparable. Data was analyzed and here we present the most interesting correlations and opinions about satisfaction and views about computer science studies and prospects. Students surveyed were of both female and male population, from two faculties of mathematics, and two faculties of electrical engineering from the four countries of the Balkan region. © 2016 Elsevier Ltd

AUTHOR KEYWORDS: Gender; Professional ambitions; Professional satisfaction; Success rate

DOCUMENT TYPE: Article

SOURCE: Scopus

Brunner, E.

Mathematics Teaching in Multi-Grade Classes of Primary School: A Description Related to Various Design Elements and the Teachers’ Convictions [Mathematikunterricht in Mehrjahrgangsklassen der Primarschule: Eine Deskription entlang verschiedener Gestaltungselemente und Einschätzungen der Lehrpersonen]

(2017) Journal fur Mathematik-Didaktik, 38 (1), pp. 57-91.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85013236889&doi=10.1007%2fs13138-016-0109-1&partnerID=40&md5=6afd30806b46e813cf23b62c5e365a3d

DOI: 10.1007/s13138-016-0109-1

AFFILIATIONS: Pädagogische Hochschule Thurgau, Unterer Schulweg 3, Kreuzlingen, Switzerland

ABSTRACT: The research to be presented in this article shows for a sample of 99 teachers who are in charge of multi-grade or mixed-age classrooms, how they describe their mathematics lessons under these specific structural conditions with respect to various elements of instructional design. The study asks about the frequency of using these elements of instructional design and certain organizational forms of mixed-age learning related to the area of mathematical content and the different phases of the learning process. Furthermore it addresses the teachers’ convictions about mixed-age learning in mathematics education and examine to what extent they can be related to the current research findings. The study inquires into the actual implementation of mixed-age learning in mathematics education and thus contributes to a topical issue in school development and asks from a content-specific perspective about the design of mathematics education in these multi-grade or multi-age classes. The results suggest that mathematics in multi-grade classrooms is mostly taught in a regular single-grade setting all the same. This does not match up to the expectations and intentions of current school development efforts. Moreover, the teachers consider the structural conditions in multi-grade mathematics classrooms to be very demanding. © 2016, GDM.

AUTHOR KEYWORDS: Educational research; Multi-age classes; Primary school; School development; Teachers

DOCUMENT TYPE: Article

SOURCE: Scopus

Lin, K.-Y.a , Williams, P.J.b

Two-stage hands-on technology activity to develop preservice teachers’ competency in applying science and mathematics concepts

(2017) International Journal of Technology and Design Education, 27 (1), pp. 89-105.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84946112514&doi=10.1007%2fs10798-015-9340-1&partnerID=40&md5=1e8f4fcb5dbb0b7f7c12e2f04a105150

DOI: 10.1007/s10798-015-9340-1

AFFILIATIONS: Department of Technology Application and Human Resource Development, National Taiwan Normal University, No. 162, Heping East Road Section 1, Taipei, Taiwan;

The Technology, Environmental, Mathematics and Science Education Research Centre, University of Waikato, Private Bag 3105, Hamilton, New Zealand

ABSTRACT: This paper discusses the implementation of a two-stage hands-on technology learning activity, based on Dewey’s learning experience theory that is designed to enhance preservice teachers’ primary and secondary experiences in developing their competency to solve hands-on problems that apply science and mathematics concepts. The major conclusions were that: (1) preservice teachers understood the science and mathematics concepts related to the hands-on activity, but they need more help in exploring practical products of applying discipline related concepts for the purpose of stimulating their design ideas; and (2) the two-stage hands-on technology learning activity served as useful prompts in developing preservice teachers’ primary and secondary experiences in applying science and mathematics concepts during the design process. However, it was evident that preservice teachers still needed more training in improving their design ideas by the application of more in-depth related science and mathematics concepts. © 2015, Springer Science+Business Media Dordrecht.

AUTHOR KEYWORDS: Mathematics; Preservice teacher; Science; Technology; Two-stage hands-on learning activity

DOCUMENT TYPE: Article

SOURCE: Scopus

McGarr, O., Lynch, R.

Monopolising the STEM agenda in second-level schools: exploring power relations and subject subcultures

(2017) International Journal of Technology and Design Education, 27 (1), pp. 51-62.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84944699021&doi=10.1007%2fs10798-015-9333-0&partnerID=40&md5=ccc9a362b580d01ff647ac75cc3b453f

DOI: 10.1007/s10798-015-9333-0

AFFILIATIONS: Department of Education and Professional Studies, University of Limerick, Limerick, Ireland

ABSTRACT: The ubiquitous and often pervasive expansion of the science, technology, engineering and mathematics (STEM) agenda across global education systems has largely gone uncontested. Strategic efforts to build on perceived natural subject synergies across the separate STEM disciplines are promoted as central to supporting the growth of economies through the development of human capital and by ensuring the supply of suitably trained individuals for vocational roles in these areas. However, these efforts are predicated on the assumption that such perceived natural subject synergies can easily support pedagogical complimentary and in so doing, often fail to acknowledge the social histories of the subjects involved. In this paper the authors examine the divergence in treatment of STEM subjects within the Irish second-level context through the lenses of subject hierarchies and social class. The cultural capital associated with studying each of the respective STEM subjects in school is considered and the objectives of the STEM agenda are problematised. © 2015, Springer Science+Business Media Dordrecht.

AUTHOR KEYWORDS: Cultural capital; STEM education; Subject subcultures; Technology education

DOCUMENT TYPE: Article

SOURCE: Scopus

Al Salami, M.K.a , Makela, C.J.a , de Miranda, M.A.a b

Assessing changes in teachers’ attitudes toward interdisciplinary STEM teaching

(2017) International Journal of Technology and Design Education, 27 (1), pp. 63-88.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84946120615&doi=10.1007%2fs10798-015-9341-0&partnerID=40&md5=e967e105414c8fbae5b949457e61baf6

DOI: 10.1007/s10798-015-9341-0

AFFILIATIONS: School of Education, Colorado State University, Fort Collins, CO, United States;

Department of Electrical and Computer Engineering, Colorado State University, Fort Collins, CO, United States

ABSTRACT: Integrating engineering and technology concepts into K-12 science and math curricula through engineering design project-based learning has been found to increase students’ interest in science, technology, engineering, and mathematics (STEM), however preparing teachers to shift to interdisciplinary teaching remains a significant challenge. Primarily teachers need to develop both skills and attitudes toward interdisciplinary teaching. In doing so, professional development (PD) is considered a key component in helping teachers through this transformation process. In an educational environment of accountability, measuring the effects of PD programs on teacher behaviors and capacity is essential but often elusive. The current study describes the change in attitudes to interdisciplinary teaching of 29 self-selected middle and high school teachers who participated a PD workshop and in delivering a 12–15 week interdisciplinary teaching and design problem unit that spanned multiple STEM subjects. This quasi-experimental pilot study implemented a single group pretest–posttest design using survey methods to collect data from the participants at two intervals; at the time of the PD workshop and at the completion of the teaching unit that emphasized a long-term engineering design problem. The goals of this research are to (1) assess the changes in attitudes to interdisciplinary teaching, attitudes to teamwork, teaching satisfaction, and resistance to change, (2) explore relationships among these changes, (3) and describe the variation in these changes across teachers’ gender, school level, discipline taught, and education level. © 2015, Springer Science+Business Media Dordrecht.

AUTHOR KEYWORDS: Engineering design; Interdisciplinary STEM teaching; K-12 STEM education; Teacher attitudes; Teacher professional development

DOCUMENT TYPE: Article

SOURCE: Scopus

Dhir, A.a b , Khalil, A.c , Lonka, K.b e , Tsai, C.-C.d

Do educational affordances and gratifications drive intensive Facebook use among adolescents?

(2017) Computers in Human Behavior, 68, pp. 40-50.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84996614733&doi=10.1016%2fj.chb.2016.11.014&partnerID=40&md5=a37830552842e920748f46eb914203c7

DOI: 10.1016/j.chb.2016.11.014

AFFILIATIONS: Department for Management of Science and Technology Development & Faculty of Social Sciences and Humanities, Ton Duc Thang University, Ho Chi Minh City, Viet Nam;

Department of Teacher Education, University of Helsinki, Finland;

Department of Computer Science and Information Technology, Abu Dhabi University, Abu Dhabi, United Arab Emirates;

Graduate Institute of Digital Learning and Education, National Taiwan University of Science and Technology, Taiwan;

Optentia Research Focus Area, North-West University, Vanderbijlpark, South Africa

ABSTRACT: Adolescents are active users of Facebook and are spending an increasing amount of their daily time on its use. Several recent studies have advocated the need to integrate Facebook use into our existing educational practices. However, at the same time, scholars and educators are wary of the fact that intensive Facebook use (IFU) may not translate into educational uses, learning outcomes and academic well-being. IFU represents an important service use concept that evaluates any user's emotional attachment, connectivity and integration with Facebook use. To address this gap, the present study investigated the role of different Facebook U&G and educational affordances in predicting the IFU among adolescents. A cross-sectional study with 942 adolescent Facebook users from India was conducted. The study results suggest that content U&G did not, while process, technology and social U&G did, play significant roles in predicting IFU. In comparison to Facebook U&G, different educational affordances, namely perceptions of Facebook use in Mathematics, Science and English education, perceptions of its formal use in classrooms and academic information seeking and sharing, did not significantly predict IFU. The study concludes with various theoretical and practical implications for scholars, educational solution developers, pedagogical experts as well as education policy makers. © 2016 Elsevier Ltd

AUTHOR KEYWORDS: Adolescents; Cross-sectional survey; Educational affordances; Facebook; High school students; Intensity of Facebook use; Intensity of service use; Uses and gratifications (U&G)

DOCUMENT TYPE: Article

SOURCE: Scopus

Thomas, V.G.a , Parsons, B.A.b

Culturally Responsive Evaluation Meets Systems-Oriented Evaluation

(2017) American Journal of Evaluation, 38 (1), pp. 7-28.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85013174657&doi=10.1177%2f1098214016644069&partnerID=40&md5=1a0f2238dce98c673da91712b8cadc7d

DOI: 10.1177/1098214016644069

AFFILIATIONS: Department of Human Development and Psychoeducational Studies, School of Education, Howard University, Washington, DC, United States;

InSites, Fort Collins, CO, United States

ABSTRACT: The authors of this article each bring a different theoretical background to their evaluation practice. The first author has a background of attention to culturally responsive evaluation (CRE), while the second author has a background of attention to systems theories and their application to evaluation. Both have had their own evolution of thinking and application of their respective conceptual traditions over the last 20+ years, influenced considerably by their involvement in the American Evaluation Association. They recently worked together to build evaluation capacity among evaluators of science, technology, engineering, and mathematics (STEM) education programs, in which they explored how these two conceptual and theoretical paths connect. In this article, the authors present their current thinking about the relationship between CRE and systems-oriented evaluation. In a case example, they illustrate the value of integrating the two perspectives to determine the guiding questions for an evaluation of a STEM education project. © 2016, © The Author(s) 2016.

AUTHOR KEYWORDS: culturally responsive evaluation; STEM education evaluation; systems change; systems-oriented evaluation

DOCUMENT TYPE: Article

SOURCE: Scopus

Wang, M.-T.a , Degol, J.L.a b

Gender Gap in Science, Technology, Engineering, and Mathematics (STEM): Current Knowledge, Implications for Practice, Policy, and Future Directions

(2017) Educational Psychology Review, 29 (1), pp. 119-140.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84954322922&doi=10.1007%2fs10648-015-9355-x&partnerID=40&md5=5e26d55ebbfe2a8ff2ff787cea98b14e

DOI: 10.1007/s10648-015-9355-x

AFFILIATIONS: University of Pittsburgh, 230 South Bouquet Street, Pittsburgh, PA, United States;

Penn State Altoona, 3000 Ivyside Park, Altoona, PA, United States

ABSTRACT: Although the gender gap in math course-taking and performance has narrowed in recent decades, females continue to be underrepresented in math-intensive fields of Science, Technology, Engineering, and Mathematics (STEM). Career pathways encompass the ability to pursue a career as well as the motivation to employ that ability. Individual differences in cognitive capacity and motivation are also influenced by broader sociocultural factors. After reviewing research from the fields of psychology, sociology, economics, and education over the past 30 years, we summarize six explanations for US women’s underrepresentation in math-intensive STEM fields: (a) cognitive ability, (b) relative cognitive strengths, (c) occupational interests or preferences, (d) lifestyle values or work-family balance preferences, (e) field-specific ability beliefs, and (f) gender-related stereotypes and biases. We then describe the potential biological and sociocultural explanations for observed gender differences on cognitive and motivational factors and demonstrate the developmental period(s) during which each factor becomes most relevant. We then propose evidence-based recommendations for policy and practice to improve STEM diversity and recommendations for future research directions. © 2016, Springer Science+Business Media New York.

AUTHOR KEYWORDS: Career preference; Gender gap; Lifestyle value; Motivation; Relative cognitive strength; STEM

DOCUMENT TYPE: Review

SOURCE: Scopus

Murphy, P.K.a , Firetto, C.M.a , Greene, J.A.b

Enriching Students’ Scientific Thinking Through Relational Reasoning: Seeking Evidence in Texts, Tasks, and Talk

(2017) Educational Psychology Review, 29 (1), pp. 105-117.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84988934671&doi=10.1007%2fs10648-016-9387-x&partnerID=40&md5=f985aa1db42a35f04ffe11560fa71630

DOI: 10.1007/s10648-016-9387-x

AFFILIATIONS: Department of Educational Psychology, Counseling, and Special Education, The Pennsylvania State University, 102 CEDAR Building, University Park, PA, United States;

The University of North Carolina at Chapel Hill, Chapel Hill, NC, United States

ABSTRACT: As reflected in the Next Generation Science Standards, concerns about the adequacy of education and career preparation in science, technology, engineering, and mathematics (STEM) fields have led to fundamental shifts in the focus of K-12 science education. Such shifts are also highlighted in many of the articles within this special issue, and the issue focus on the role of relational reasoning in learning in STEM domains. Within this commentary, we reflect upon how the articles within this special issue align with, and shed new light on, the Next Generation Science Standards (NGSS), specifically with respect to relational reasoning. We then describe a novel pedagogical approach designed to augment students’ acquisition of NGSS practices and core ideas (i.e., Quality Talk Science (QTs)) and how evidence from our research on QTs has shown increases in relational reasoning. In this section, we also provide multiple discourse excerpts that serve as exemplars for each of the four types of relational reasoning (i.e., analogy, anomaly, antinomy, and antithesis). Finally, we present specific exemplars from QTs that reinforce the ideas and findings forwarded by the authors of each of the papers within this special issue and propose some thoughts regarding future directions for research. © 2016, Springer Science+Business Media New York.

AUTHOR KEYWORDS: Classroom discussions; Critical-analytic thinking; Next Generation Science Standards; Relational reasoning

DOCUMENT TYPE: Review

SOURCE: Scopus

Hoeg, D.G., Bencze, J.L.

Values Underpinning STEM Education in the USA: An Analysis of the Next Generation Science Standards

(2017) Science Education, 101 (2), pp. 278-301. Cited 1 time.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85013076648&doi=10.1002%2fsce.21260&partnerID=40&md5=50c326e0af899d608c575c3b2b2cd3c2

DOI: 10.1002/sce.21260

AFFILIATIONS: Curriculum, Teaching and Learning, Ontario Institute for Studies in Education, University of Toronto, Toronto, ON, Canada

ABSTRACT: The Next Generation Science Standards (NGSS) were designed to address poor science and math performance in United States schools by inculcating globally competitive science, technology, engineering, and mathematics literacies relevant to participation in future society. Considering the complex network of influences involved in the development of the NGSS, the purpose of this paper is to evaluate how educational values are embedded in the discourse of the standards. Using critical discourse analysis and content analysis, we evaluated how themes related to (i) performance, (ii) accessibility, and (iii) innovation and creativity are discursively constituted in the NGSS. Our analysis indicates the NGSS prioritizes: measurable and reproducible performances; the standards appear to be based on a conception of accessibility closely aligned with equality, and self-investment, and; innovation and creativity are discursively constituted as attributes that can be developed through specific, prescribed practices. We discuss these findings in relation to the goals of the NGSS and potential teaching and learning outcomes resulting from education based on the standards. © 2017 Wiley Periodicals, Inc.

DOCUMENT TYPE: Article

SOURCE: Scopus

Gomez, C.J.a , Yoshikawa, H.b

Earthquake effects: Estimating the relationship between exposure to the 2010 Chilean earthquake and preschool children's early cognitive and executive function skills

(2017) Early Childhood Research Quarterly, 38, pp. 127-136.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84994050078&doi=10.1016%2fj.ecresq.2016.08.004&partnerID=40&md5=0a91fd3bd1065249c7e61a78ed327908

DOI: 10.1016/j.ecresq.2016.08.004

AFFILIATIONS: The RAND Corporation, United States;

New York University, New York, NY, United States

ABSTRACT: Little is known about how the experience of an earthquake affects young children's cognitive outcomes. On February 27, 2010, a severe earthquake shook southern Chile. The earthquake occurred during the course of a large-scale evaluation of an early childhood education intervention (child average age = 53 months) in Santiago, such that one cohort of children (n = 698) experienced baseline data collection 3–12 weeks after the earthquake occurred, while a different cohort of children (n = 720) did not. In this paper, we used these available evaluation data to conduct two sets of analyses that explore the relationship between preschool children's exposure to the 2010 Chilean earthquake and their early language, pre-literacy, mathematics and executive function outcomes. In the first set of analyses, we employed a propensity score analysis to estimate the short-term effect of the earthquake on preschool- aged children's early learning and executive function outcomes. Results suggest that children who experienced the earthquake had lower scores on some early language and pre-literacy assessments than those who did not, with effect sizes of approximately 20% of a standard deviation. Results from the second set of analyses suggest that among the families who experienced the earthquake, children whose parents reported more earthquake- related stressors performed significantly lower on some early language and pre-literacy outcomes. Implications of these findings for disaster relief efforts and future research are discussed. © 2016 Elsevier Inc.

AUTHOR KEYWORDS: Disasters; Early childhood development; Earthquakes; Propensity scores

DOCUMENT TYPE: Article

SOURCE: Scopus

Johnson, M.a , Monsen, E.W.b , MacKenzie, N.G.c

Follow the Leader or the Pack? Regulatory Focus and Academic Entrepreneurial Intentions

(2017) Journal of Product Innovation Management, 34 (2), pp. 181-200.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84995467182&doi=10.1111%2fjpim.12355&partnerID=40&md5=6811424b536168d7ae94a42650eb3dcd

DOI: 10.1111/jpim.12355

AFFILIATIONS: University of Strathclyde, United Kingdom;

United States, Germany, United Kingdom;

University of Cambridge, United Kingdom

ABSTRACT: Drawing on the academic entrepreneurship and regulatory focus theory literature, and applying a multilevel perspective, this paper examines why university academics intend to engage in formal (spin-off or start-up companies and licensing university research) or informal (collaborative research, contract research, continuous professional development, and contract consulting) commercialization activities and the role local contextual factors, in particular leaders and work-group colleagues (peers), play in their commercialization choices. Based on a survey of 395 science, technology, engineering, and mathematics (STEM) academics working in 14 Scottish universities, the research findings suggest that an individual's chronic regulatory focus has a direct effect on their formal and informal commercialization intent. The results reveal that the stronger an individual's chronic promotion focus the stronger their formal and informal commercialization intentions and a stronger individual chronic prevention focus leads to weaker intentions to engage in informal commercialization. In addition, when contextual interaction effects are considered, leaders and workplace colleagues have different influences on commercialization intent. On the one hand, promotion-focused leaders can strengthen and prevention-focused leaders can under certain circumstances weaken a promotion-focused academic's formal commercialization intent. On the other hand, the level of workplace colleague engagement, acting as a reference point, strengthens not only promotion-focused academics’ intent to engage in formal commercialization activities, but also prevention-focused academics’ corresponding informal commercialization intent. As such, universities should consider the appointment of leaders who are strong role models and have a track record in formal and/or informal commercialization activities and also consider the importance workplace colleagues have on moderating an academic's intention to engage in different forms of commercialization activities. © 2016 Product Development & Management Association

DOCUMENT TYPE: Article

SOURCE: Scopus

Afzal, M.a , Hussain, M.a , Ali Khan, W.a , Ali, T.a , Lee, S.a , Huh, E.-N.a , Farooq Ahmad, H.b , Jamshed, A.c , Iqbal, H.d , Irfan, M.c , Abbas Hydari, M.c

Comprehensible knowledge model creation for cancer treatment decision making

(2017) Computers in Biology and Medicine, 82, pp. 119-129.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85011636671&doi=10.1016%2fj.compbiomed.2017.01.010&partnerID=40&md5=8b6386a184c15e1dfffc11d4364bfe8e

DOI: 10.1016/j.compbiomed.2017.01.010

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College of Computer Sciences and Information Technology (CCSIT), King Faisal University, Alahsa, Saudi Arabia;

Shaukat Khanum Memorial Cancer Hospital and Research Center, Lahore, Pakistan;

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ABSTRACT: Background: A wealth of clinical data exists in clinical documents in the form of electronic health records (EHRs). This data can be used for developing knowledge-based recommendation systems that can assist clinicians in clinical decision making and education. One of the big hurdles in developing such systems is the lack of automated mechanisms for knowledge acquisition to enable and educate clinicians in informed decision making. Materials and Methods: An automated knowledge acquisition methodology with a comprehensible knowledge model for cancer treatment (CKM-CT) is proposed. With the CKM-CT, clinical data are acquired automatically from documents. Quality of data is ensured by correcting errors and transforming various formats into a standard data format. Data preprocessing involves dimensionality reduction and missing value imputation. Predictive algorithm selection is performed on the basis of the ranking score of the weighted sum model. The knowledge builder prepares knowledge for knowledge-based services: clinical decisions and education support. Results: Data is acquired from 13,788 head and neck cancer (HNC) documents for 3447 patients, including 1526 patients of the oral cavity site. In the data quality task, 160 staging values are corrected. In the preprocessing task, 20 attributes and 106 records are eliminated from the dataset. The Classification and Regression Trees (CRT) algorithm is selected and provides 69.0% classification accuracy in predicting HNC treatment plans, consisting of 11 decision paths that yield 11 decision rules. Conclusion: Our proposed methodology, CKM-CT, is helpful to find hidden knowledge in clinical documents. In CKM-CT, the prediction models are developed to assist and educate clinicians for informed decision making. The proposed methodology is generalizable to apply to data of other domains such as breast cancer with a similar objective to assist clinicians in decision making and education. © 2017 Elsevier Ltd

AUTHOR KEYWORDS: Algorithm selection; Decision support; Education support; Knowledge acquisition; Prediction model

DOCUMENT TYPE: Article

SOURCE: Scopus

Peng, C., Cao, L., Timalsena, S.

Gamification of Apollo lunar exploration missions for learning engagement

(2017) Entertainment Computing, 19, pp. 53-64.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85008889836&doi=10.1016%2fj.entcom.2016.12.001&partnerID=40&md5=c474c612b2fada5afc28105cfdd45a0d

DOI: 10.1016/j.entcom.2016.12.001

AFFILIATIONS: Department of Computer Science, University of Alabama in Huntsville, United States

ABSTRACT: The design, development, and evaluation of a serious game that gamifies the Apollo lunar exploration missions are presented. The gamification methodology and underlying implementation are motivated by the goal of game-based learning for youth and young adults and the intention to promote their interest in STEM learning. The game is a multidisciplinary composition that simulates a set of lunar roving activities including planning a traversing route, loading communication and science equipment onto the lunar rover, and driving the rover to explore the lunar surface. Accurate 3D terrains and spacecraft models are created and used in the game to maintain the high realism of the environment. Every gameplay step reflects real scientific procedures and behaviors that the astronauts performed in the past on the Moon. A usability study is conducted to gather feedback from a group of participants of different ages and with different game experience. The results of the study show the success of fostering great user engagement in STEM learning. © 2016 Elsevier B.V.

AUTHOR KEYWORDS: Game-based learning; Gamification; Serious games; Space science; STEM education

DOCUMENT TYPE: Article

SOURCE: Scopus

Resnick, I.a , Davatzes, A.b , Newcombe, N.S.c , Shipley, T.F.c

Using Relational Reasoning to Learn About Scientific Phenomena at Unfamiliar Scales

(2017) Educational Psychology Review, 29 (1), pp. 11-25.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84970003883&doi=10.1007%2fs10648-016-9371-5&partnerID=40&md5=4a5b2ce703085485772d456f30fc8d8a

DOI: 10.1007/s10648-016-9371-5

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ABSTRACT: Many scientific theories and discoveries involve reasoning about extreme scales, removed from human experience, such as time in geology and size in nanoscience. Thus, understanding scale is central to science, technology, engineering, and mathematics. Unfortunately, novices have trouble understanding and comparing sizes of unfamiliar large and small magnitudes. Relational reasoning is a promising tool to bridge the gap between direct experience and phenomena at extreme scales. However, instruction does not always improve understanding, and analogies can fail to bring about conceptual change, and even mislead students. Here, we review how people reason about phenomena across scales, in three sections: (a) we develop a framework for how relational reasoning supports understanding extreme scales; (b) we identify cognitive barriers to aligning human and extreme scales; and (c) we outline a theory-based approach to teaching scale information using relational reasoning, present two successful learning activities, and consider the role of a unified scale instruction across STEM education. © 2016, Springer Science+Business Media New York.

AUTHOR KEYWORDS: Analogy; Corrective feedback; Progressive alignment; Relational reasoning; Size and scale

DOCUMENT TYPE: Review

SOURCE: Scopus

Tesfaye, B.a , Atique, S.b , Elias, N.a , Dibaba, L.c , Shabbir, S.-A.b , Kebede, M.d e f

Determinants and development of a web-based child mortality prediction model in resource-limited settings: A data mining approach

(2017) Computer Methods and Programs in Biomedicine, 140, pp. 45-51.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85000580214&doi=10.1016%2fj.cmpb.2016.11.013&partnerID=40&md5=83a62720df3bfa71ea5fcef7337c7afd

DOI: 10.1016/j.cmpb.2016.11.013

AFFILIATIONS: Health Policy and Planning Directorate, Ethiopian Federal Ministry of HealthAddis Ababa, Ethiopia;

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University of Bremen, Health SciencesBremen, Germany

ABSTRACT: Background Improving child health and reducing child mortality rate are key health priorities in developing countries. This study aimed to identify determinant sand develop, a web-based child mortality prediction model in Ethiopian local language using classification data mining algorithm. Methods Decision tree (using J48 algorithm) and rule induction (using PART algorithm) techniques were applied on 11,654 records of Ethiopian demographic and health survey data. Waikato Environment for Knowledge Analysis (WEKA) for windows version 3.6.8 was used to develop optimal models. 8157 (70%) records were randomly allocated to training group for model building while; the remaining 3496 (30%) records were allocated as the test group for model validation. The validation of the model was assessed using accuracy, sensitivity, specificity and area under Receiver Operating Characteristics (ROC) curve. Using Statistical Package for Social Sciences (SPSS) version 20.0; logistic regressions and Odds Ratio (OR) with 95% Confidence Interval (CI) was used to identify determinants of child mortality. Results The child mortality rate was 72 deaths per 1000 live births. Breast-feeding (AOR = 1.46, (95% CI [1.22. 1.75]), maternal education (AOR = 1.40, 95% CI [1.11, 1.81]), family planning (AOR = 1.21, [1.08, 1.43]), preceding birth interval (AOR = 4.90, [2.94, 8.15]), presence of diarrhea (AOR = 1.54, 95% CI [1.32, 1.66]), father's education (AOR = 1.4, 95% CI [1.04, 1.78]), low birth weight (AOR = 1.2, 95% CI [0.98, 1.51]) and, age of the mother at first birth (AOR = 1.42, [1.01–1.89]) were found to be determinants for child mortality. The J48 model had better performance, accuracy (94.3%), sensitivity (93.8%), specificity (94.3%), Positive Predictive Value (PPV) (92.2%), Negative Predictive Value (NPV) (94.5%) and, the area under ROC (94.8%). Subsequent to developing an optimal prediction model, we relied on this model to develop a web-based application system for child mortality prediction. Conclusion In this study, nearly accurate results were obtained by employing decision tree and rule induction techniques. Determinants are identified and a web-based child mortality prediction model in Ethiopian local language is developed. Thus, the result obtained could support child health intervention programs in Ethiopia where trained human resource for health is limited. Advanced classification algorithms need to be tested to come up with optimal models. © 2016 Elsevier Ireland Ltd

AUTHOR KEYWORDS: Child mortality; Data mining; Developing country; Ethiopia; Sustainable development goals

DOCUMENT TYPE: Article

SOURCE: Scopus

Lake, W.a , Wallin, M.c , Woolcott, G.b , Boyd, W.b , Foster, A.b , Markopoulos, C.b , Boyd, W.a

Applying an alternative mathematics pedagogy for students with weak mathematics: meta-analysis of alternative pedagogies

(2017) International Journal of Mathematical Education in Science and Technology, 48 (2), pp. 215-228.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84992317440&doi=10.1080%2f0020739X.2016.1245876&partnerID=40&md5=802d92c28b8f5bb81de5ce4bffd89a81

DOI: 10.1080/0020739X.2016.1245876

AFFILIATIONS: School of Environment, Science & Engineering, Southern Cross University, Lismore, Australia;

School of Education, Southern Cross University, Lismore, Australia;

Library, Southern Cross University, Lismore, Australia

ABSTRACT: Student mathematics performance and the need for work-ready graduates to be mathematics-competent is a core issue for many universities. While both student and teacher are responsible for learning outcomes, there is a need to explicitly acknowledge the weak mathematics foundation of many university students. A systematic literature review was undertaken of identified innovations and/or interventions that may lead to improvement in student outcomes for university mathematics-based units of study. The review revealed the importance of understanding the foundations of student performance in higher education mathematics learning, especially in first year. Pre-university mathematics skills were identified as significant in student retention and mathematics success at university, and a specific focus on student pre-university mathematics skill level was found to be more effective in providing help, rather than simply focusing on a particular at-risk group. Diagnostics tools were found to be important in identifying (1) student background and (2) appropriate intervention. The studies highlighted the importance of appropriate and validated interventions in mathematics teaching and learning, and the need to improve the learning model for mathematics-based subjects, communication and technology innovations. © 2016 Informa UK Limited, trading as Taylor & Francis Group.

AUTHOR KEYWORDS: diagnostics; interventions; Mathematics pedagogy; meta-analysis; pre-university mathematics

DOCUMENT TYPE: Article

SOURCE: Scopus

Sparavigna, A.C.a , Baldi, M.M.b

Symmetry and the golden ratio in the analysis of a regular pentagon

(2017) International Journal of Mathematical Education in Science and Technology, 48 (2), pp. 306-316.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84988667363&doi=10.1080%2f0020739X.2016.1233587&partnerID=40&md5=81f4de8f63928e3181ba1a2b042cca09

DOI: 10.1080/0020739X.2016.1233587

AFFILIATIONS: Department of Applied Science and Technology, Politecnico di Torino, Torino, Italy;

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ABSTRACT: The regular pentagon had a symbolic meaning in the Pythagorean and Platonic philosophies and a subsequent important role in Western thought, appearing also in arts and architecture. A property of regular pentagons, which was probably discovered by the Pythagoreans, is that the ratio between the diagonal and the side of these pentagons is equal to the golden ratio. Here, we will study some relations existing between a regular pentagon and this ratio. First, we will focus on the group of fivefold rotational symmetry, to find the position in the complex plane of the vertices of this geometric figure. Then, we will propose an analytic method to solve the same problem based on the Cartesian coordinates, a method where we find the golden ratio without any specific geometric consideration. This study shows a comparison of the use of complex numbers, symmetries and analytic methods, applied to a subject which can be interesting for general education in mathematics. In fact, the proposed approach can convey and link several concepts, requiring only a general pre-college education, showing at the same time the richness that mathematics can offer in solving geometric problems. © 2016 Informa UK Limited, trading as Taylor & Francis Group.

AUTHOR KEYWORDS: Geometry; golden ratio; mathematics; mathematics education; symmetry

DOCUMENT TYPE: Note

SOURCE: Scopus

Chalmers, C., Carter, M.L., Cooper, T., Nason, R.

Implementing “Big Ideas” to Advance the Teaching and Learning of Science, Technology, Engineering, and Mathematics (STEM)

(2017) International Journal of Science and Mathematics Education, pp. 1-19. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85012237844&doi=10.1007%2fs10763-017-9799-1&partnerID=40&md5=f4639023f48d2b9e906b377777cd7721

DOI: 10.1007/s10763-017-9799-1

AFFILIATIONS: Queensland University of Technology, S Block, Victoria Park Road, Kelvin Grove, QLD, Australia

ABSTRACT: Although education experts are increasingly advocating the incorporation of integrated Science, Technology, Engineering, and Mathematics (STEM) curriculum units to address limitations in much current STEM teaching and learning, a review of the literature reveals that more often than not such curriculum units are not mediating the construction of in-depth STEM knowledge. In this paper, we conjecture that the challenge of generating integrated STEM curriculum units that overcome this limitation and facilitate in-depth learning of and about STEM can be met by the use of three types of big ideas: within-discipline big ideas that have application in other STEM disciplines, cross-discipline big ideas, and encompassing big ideas. We provide a six-component framework (together with an example of the framework in action) that can be used to scaffold pre- and in-service teachers’ development of integrated STEM curriculum units based around these types of big ideas. The paper concludes by discussing possible directions for future research and development in this field. © 2017 Ministry of Science and Technology, Taiwan

AUTHOR KEYWORDS: Big ideas; Integration; STEM; Themes

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

Ní Fhloinn, E.a , Carr, M.b

Formative assessment in mathematics for engineering students

(2017) European Journal of Engineering Education, pp. 1-13. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85012066446&doi=10.1080%2f03043797.2017.1289500&partnerID=40&md5=74557536c98c4ab29a63739ccc2bb5a2

DOI: 10.1080/03043797.2017.1289500

AFFILIATIONS: School of Mathematical Sciences, Dublin City University, Dublin, Ireland;

School of Multidisciplinary Technologies, Dublin Institute of Technology, Dublin, Ireland

ABSTRACT: In this paper, we present a range of formative assessment types for engineering mathematics, including in-class exercises, homework, mock examination questions, table quizzes, presentations, critical analyses of statistical papers, peer-to-peer teaching, online assessments and electronic voting systems. We provide practical tips for the implementation of such assessments, with a particular focus on time or resource constraints and large class sizes, as well as effective methods of feedback. In addition, we consider the benefits of such formative assessments for students and staff. © 2017 SEFI

AUTHOR KEYWORDS: assessment for learning; engineering mathematics; Formative assessments; low-stakes assessment; mathematics education

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

Schroeder, N.L.a , Traxler, A.L.b

Humanizing Instructional Videos in Physics: When Less Is More

(2017) Journal of Science Education and Technology, pp. 1-10. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85011596085&doi=10.1007%2fs10956-016-9677-6&partnerID=40&md5=784ab9fe84b12c24a544dd15e2669ea8

DOI: 10.1007/s10956-016-9677-6

AFFILIATIONS: Department of Leadership Studies in Education and Organizations, Wright State University, 3640 Colonel Glenn Highway, Dayton, OH, United States;

Department of Physics, Wright State University, 3640 Colonel Glenn Highway, Dayton, OH, United States

ABSTRACT: Many instructors in science, technology, engineering, and mathematics fields are striving to create active learning environments in their classrooms and in doing so are frequently moving the lecture portion of their course into online video format. In this classroom-based study, we used a two group randomized experimental design to examine the efficacy of an instructional video that incorporates a human hand demonstrating and modeling how to solve frictional inclined plane problems compared to an identical video that did not include the human hand. The results show that the learners who viewed the video without the human hand present performed significantly better on a learning test and experienced a significantly better training efficiency than the learners who viewed the video with the human hand present. Meanwhile, those who learned with the human hand present in the instructional video rated the instructor as being more humanlike and engaging. The results have implications for both theory and practice. Implications for those designing instructional videos are discussed, as well as the limitations of the current study. © 2017 Springer Science+Business Media New York

AUTHOR KEYWORDS: Force; Friction; Instructional video; Learner control; Pedagogical agent; Physics education

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

Foley, A.E.a , Herts, J.B.a , Borgonovi, F.b , Guerriero, S.b , Levine, S.C.a , Beilock, S.L.a

The Math Anxiety-Performance Link: A Global Phenomenon

(2017) Current Directions in Psychological Science, 26 (1), pp. 52-58.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85012045863&doi=10.1177%2f0963721416672463&partnerID=40&md5=f757cb420862c5e984ca41edd5c0c1be

DOI: 10.1177/0963721416672463

AFFILIATIONS: Department of Psychology, University of Chicago, United States;

Organisation for Economic Co-operation and Development, Paris, France

ABSTRACT: Demand for science, technology, engineering, and mathematics (STEM) professionals is on the rise worldwide. To effectively meet this demand, many governments and private organizations have revamped STEM education and promoted training to enhance math and science skills among students and workers. Education and training programs typically focus on increasing individuals’ math and science knowledge. However, data from laboratory studies and large-scale international assessments suggest that fear or apprehension about math, math anxiety, should also be considered when trying to increase math achievement and, in turn, STEM career success. This article reviews findings that shed light on antecedents of math anxiety, the bidirectional math anxiety-performance relation, underlying mechanisms, and promising routes to mitigating the negative relation between math anxiety and math performance. © 2017, © The Author(s) 2017.

AUTHOR KEYWORDS: international assessments; math achievement; math anxiety; STEM success

DOCUMENT TYPE: Article

SOURCE: Scopus

Ramos-Rodríguez, E.a , Flores Martínez, P.b , da Ponte, J.P.c

An Approach to the Notion of Reflective Teacher and Its Exemplification on Mathematics Education

(2017) Systemic Practice and Action Research, 30 (1), pp. 85-102.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84973160113&doi=10.1007%2fs11213-016-9383-6&partnerID=40&md5=89d4da872689c23d4817dd3877996781

DOI: 10.1007/s11213-016-9383-6

AFFILIATIONS: Pontificia Universidad Católica de Valparaíso, Avenida Brasil, Valparaíso, Chile;

Universidad de Granada, La Cartuja, s/n, Granada, Spain;

Instituto de Educação, Universidade de Lisboa, Alameda da Universidade, Lisbon, Portugal

ABSTRACT: Within research into the teaching profession, there are two main areas of interest, which have been thoroughly defined and consolidated: teacher’s knowledge and teacher’s professional development. This paper considers the latter area, and specifically sets out to define the concept of the reflective teacher and to show how we have applied this concept in our research. It aims at defining a more precise notion of teachers’ professional development linked to the concept of a reflective teacher, drawing on information from different interdisciplinary sources so as to frame the concept clearly. We discuss the conditions which determine the reflective teacher, and report on how these were put to use in a training course for practising teachers in which participants reflected on challenging episodes from their professional experience. We hope that clarifying this term will enable different educational agents (school teachers, teacher trainers or researchers) to have an informed view that can be interpreted and critiqued, and that it will also be of value to initial teacher training and to in-service courses. © 2016, Springer Science+Business Media New York.

AUTHOR KEYWORDS: Knowledge; Mathematics education; Professional development; Reflective practice; Thought

DOCUMENT TYPE: Article

SOURCE: Scopus

Giménez, V.a , Thieme, C.b , Prior, D.a , Tortosa-Ausina, E.c

An international comparison of educational systems: a temporal analysis in presence of bad outputs

(2017) Journal of Productivity Analysis, 47 (1), pp. 83-101.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010765004&doi=10.1007%2fs11123-017-0491-9&partnerID=40&md5=55f14ff9e4f2b0ee2df834ba9ab80893

DOI: 10.1007/s11123-017-0491-9

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Universitat Jaume I, Avenida de Vicent Sos Baynat, s/n, Castellón, Castelló, Spain

ABSTRACT: This study uses the global non-radial Malmquist index to measure performance change in the educational systems of 29 countries/economies participating in PISA 2003 and 2012 for students at age 15 in the disciplines of mathematics and reading. This methodology is particularly appropriate both for its desirable properties as well as its suitability for the educational context. Results indicate a positive evolution in educational systems’ performance during this period. This improvement is mainly due a positive efficiency change, which offsets the negative technological change observed. Nevertheless, a deeper scrutiny at the country level shows that results varied remarkably among them. © 2017, Springer Science+Business Media New York.

AUTHOR KEYWORDS: Education; Efficiency; Global non-radial Malmquist index; PISA

DOCUMENT TYPE: Article

SOURCE: Scopus

Williamson, K.C., IIIa , Williamson, V.M.b , Hinze, S.R.c

Administering Spatial and Cognitive Instruments In-class and On-line: Are These Equivalent?

(2017) Journal of Science Education and Technology, 26 (1), pp. 12-23.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84983436424&doi=10.1007%2fs10956-016-9645-1&partnerID=40&md5=207fac4003516d73252040602747db79

DOI: 10.1007/s10956-016-9645-1

AFFILIATIONS: Department of Construction Science, Texas A&M University, College Station, TX, United States;

Department of Chemistry, Texas A&M University, College Station, TX, United States;

Department of Psychology, Virginia Wesleyan College, Norfolk, VA, United States

ABSTRACT: Standardized, well-established paper-and-pencil tests, which measure spatial abilities or which measure reasoning abilities, have long been found to be predictive of success in the STEM (science, technology, engineering, and mathematics) fields. Instructors can use these tests for prediction of success and to inform instruction. A comparative administration of spatial visualization and cognitive reasoning tests, between in-class (proctored paper and pencil) and on-line (unproctored Internet) (N = 457), was used to investigate and to determine whether the differing instrument formats yielded equal measures of spatial ability and reasoning ability in large first-semester general chemistry sections. Although some gender differences were found, findings suggest that some differences across administration formats, but that on-line administration had similar properties of predicting chemistry performance as the in-class version. Therefore, on-line administration is a viable option for instructors to consider especially when dealing with large classes. © 2016, Springer Science+Business Media New York.

AUTHOR KEYWORDS: Chemical education research; Computer-based testing; First-year undergraduate; Reasoning abilities; Spatial abilities; Testing/assessment

DOCUMENT TYPE: Article

SOURCE: Scopus

Sullivan, A., Bers, M.U.

Dancing robots: integrating art, music, and robotics in Singapore’s early childhood centers

(2017) International Journal of Technology and Design Education, pp. 1-22. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010748070&doi=10.1007%2fs10798-017-9397-0&partnerID=40&md5=572f96acbe28413c26ea53a25af17a10

DOI: 10.1007/s10798-017-9397-0

AFFILIATIONS: The DevTech Research Group at Tufts University, 105 College Ave, Medford, MA, United States

ABSTRACT: In recent years, Singapore has increased its national emphasis on technology and engineering in early childhood education. Their newest initiative, the Playmaker Programme, has focused on teaching robotics and coding in preschool settings. Robotics offers a playful and collaborative way for children to engage with foundational technology and engineering concepts during their formative early childhood years. This study looks at a sample of preschool children (N = 98) from five early childhood centers in Singapore who completed a 7-week STEAM (Science, Technology, Engineering, Arts, and Mathematics) KIBO robotics curriculum in their classrooms called, “Dances from Around the World.” KIBO is a newly developed robotics kit that teaches both engineering and programming. KIBO’s actions are programmed using tangible programming blocks—no screen-time required. Children’s knowledge of programming concepts were assessed upon completion of the curriculum using the Solve-Its assessment. Results indicate that children were highly successful at mastering foundational programming concepts. Additionally, teachers were successful at promoting a collaborative and creative environment, but less successful at finding ways to engage with the greater school community through robotics. This research study was part of a large country-wide initiative to increase the use of developmentally appropriate engineering tools in early childhood settings. Implications for the design of technology, curriculum, and other resources are addressed. © 2017 Springer Science+Business Media Dordrecht

AUTHOR KEYWORDS: Early childhood; Programming; Robotics; STEAM

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

Huleihil, M.

3D printing technology as innovative tool for math and geometry teaching applications

(2017) IOP Conference Series: Materials Science and Engineering, 164 (1), art. no. 012023, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85012908491&doi=10.1088%2f1757-899X%2f164%2f1%2f012023&partnerID=40&md5=7a8aa1d5eea9f71c405ae91f48b58e30

DOI: 10.1088/1757-899X/164/1/012023

AFFILIATIONS: Arab Academic Institute of Education, Academic Institute Beit-Berl, Kfar Saba, Israel

ABSTRACT: The industrial revolution and automation of production processes have changed the face of the world. Three dimensional (3D) printing has the potential to revolutionize manufacturing and further change methods of production toward allowing in increasing number of people to produce products at home. According to a recent OECD (see Backer [1]) publication, "...tapping into the next industrial revolution requires actions on many levels and in many different areas. In particular, unlocking the potential of emerging and enabling technologies requires policy development along a number of fronts, from commercialization to regulation and the supply of skills through education." In this paper we discuss the role of schools and their responsibility to act as quickly as possible to design a plan of action that will prepare the future citizens to deal with this new reality. This requires planning of action in different directions and on different planes, such as labs, teachers, and curricula. 3D printing requires higher levels of thinking, innovation and creativity. It has the power to develop human imagination and give students the opportunity to visualize numbers, two- dimensional shapes, and three-dimensional objects. The combination of thinking, design, and production has immense power to increase motivation and satisfaction, with a highly probable increase in a student's math and geometry achievements. The CAD system includes a measure tool which enables and alternative way for calculating properties of the objects under consideration and allows development of reflection and critical thinking. The research method was based on comparison between a reference group and a test group; it was found that intervention significantly improved the reflection abilities of 6th grade students in mathematics.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Watfa, M.K.a , Audi, D.b

Innovative virtual and collaborative teaching methodologies

(2017) Behaviour and Information Technology, pp. 1-11. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010637687&doi=10.1080%2f0144929X.2016.1275806&partnerID=40&md5=603fad4ae3eccfeae0e8a0b021dad178

DOI: 10.1080/0144929X.2016.1275806

AFFILIATIONS: Faculty of Engineering and Information Sciences, University of Wollongong in Dubai, Dubai, UAE;

Mathematics Department, American University of Sharjah, Sharjah, UAE

ABSTRACT: This collaborative research work between multiple universities demonstrates and rigorously analyses a number of innovative and new teaching methodologies that incorporate the use of new technology to encourage students to participate and take an active role in learning. More precisely, we introduce the ‘Automatic Virtual Lecturing’ teaching methodology which utilises live student feedback to dynamically reorder the lecture slides content of the teacher combined with an online video repository to substitute repeated lecture presentations both during and after class. We also present research outputs of our patented teaching concept SHARED and collaborative learning which creates a paperless collaborative learning environment in our classrooms where students can take virtual notes on their wooden tabletops, while the teacher can give instant feedback on student progress without leaving his personal desk. The methodologies were researched thoroughly in a number of classrooms which resulted in a significant increase in the performance of the students, showing real promise of such unique teaching methodologies. © 2017 Informa UK Limited, trading as Taylor & Francis Group

AUTHOR KEYWORDS: automatic lecturing; collaborative learning; innovation; mathematics teaching; Virtual lecturing

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

Kaur, P., Singh, W.

Implementation of student SGPA Prediction System(SSPS) using optimal selection of classification algorithm

(2017) Proceedings of the International Conference on Inventive Computation Technologies, ICICT 2016, 2, art. no. 7824860, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85011022634&doi=10.1109%2fINVENTIVE.2016.7824860&partnerID=40&md5=9b9174881656b82d485410e9aef2c8dd

DOI: 10.1109/INVENTIVE.2016.7824860

AFFILIATIONS: Department of computer engineering, Punjabi University, India

ABSTRACT: The students have setup their goals before starting their engineering studies. To achieve their goals they need to succeed their engineering examinations with good marks and sit in the competition to get good job. The knowledge regarding success rate of students and factors affecting their performance is hidden in educational data set. Extraction of knowledge using data mining techniques helps students to know their weakness and work hard to improve it. In this study the Student SGPA Prediction System(SSPS) is developed which uses rules extracted from the best algorithm among J48, LMT, Random Tree and REP Tree algorithms to predict SGPA of students in first six semesters. These four classification algorithms are compared by building student performance prediction model based on student's social conditions and previous academic performance using WEKA. The records of 236 computer engineering students at Punjabi University are used to build these models. REP Tree algorithm with average accuracy (61.70%) and minimum average error rate(0.3608) is found to be better than the J48, Random Tree and LMT algorithms. © 2016 IEEE.

AUTHOR KEYWORDS: Classification; Data mining; Education data prediction

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Holmes, K.a , Gore, J.b , Smith, M.b , Lloyd, A.b

An Integrated Analysis of School Students’ Aspirations for STEM Careers: Which Student and School Factors Are Most Predictive?

(2017) International Journal of Science and Mathematics Education, pp. 1-21. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85009477594&doi=10.1007%2fs10763-016-9793-z&partnerID=40&md5=a7443322ef6362d6dd93759ffeade0d4

DOI: 10.1007/s10763-016-9793-z

AFFILIATIONS: School of Education, Western Sydney University, Sydney, Australia;

School of Education, University of Newcastle, Newcastle, Australia

ABSTRACT: Declining enrolments in science, technology, engineering and mathematics (STEM) disciplines and a lack of interest in STEM careers are concerning at a time when society is becoming more reliant on complex technologies. We examine student aspirations for STEM careers by drawing on surveys conducted annually from 2012 to 2015. School students in years 3 to 12 (n = 6492) were asked to indicate their occupational choices. A logistic regression analysis showed that being in the older cohorts, possessing high cultural capital, being male, having a parent in a STEM occupation and high prior achievement in reading and numeracy, were significant. This analysis provides a strong empirical basis for school-based initiatives to improve STEM participation. In particular, strategies should target the following: the persistent lack of interest by females in some careers, improving student academic achievement in both literacy and numeracy and expanding knowledge of STEM careers, especially for students without familial STEM connections. © 2017 Ministry of Science and Technology, Taiwan

AUTHOR KEYWORDS: Career aspiration; Gender; STEM education; Student achievement

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

Elliott, J.W.a , Thevenin, M.K.a , Bigelow, B.F.b

Promoting CM Student Success: Establishing an Academic Performance Benchmark Given Construction-Education Self-Efficacy, Motivation and Planned Behavior

(2017) International Journal of Construction Education and Research, pp. 1-15. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85009291804&doi=10.1080%2f15578771.2016.1249316&partnerID=40&md5=63586fca78788ca0b570836f95421934

DOI: 10.1080/15578771.2016.1249316

AFFILIATIONS: Colorado State University, Fort Collins, Colorado, USA;

Texas A&M University, College Station, Texas, USA

ABSTRACT: High levels of self-efficacy, motivation and intentions to perform well are necessary to achieve high grade point averages (GPA) in demanding academic programs including engineering, mathematics and the sciences. However, scant research has investigated these constructs within the domain of construction management (CM) education. The Construction Training Attitudes and Intentions Scale (CTAIS), which adapts self-efficacy, motivation and planned behavior constructs to the construction-education domain, was administered among CM and Non-CM students (n = 633) enrolled in courses required for a bachelor degree at three American Council for Construction Education accredited programs. Significant differences (p < .001) in construction-education domain-level constructs were observed for CM and Non-CM majors providing evidence of face validity. CM majors (n = 587) were separated for ANOVA. Significant differences in self-efficacy (p = .014) and planned behavior (p = .001) were observed by GPA. Post-hoc analysis revealed differences in these constructs based on GPA above, or below, 3.0. CM majors (n = 587) were aggregated using the 3.0 GPA benchmark (GPA > 3.0, n = 328; GPA< 3.0, n = 239). T-test results revealed significantly higher levels of self-efficacy (p = .001) and planned behavior (p < .001) among students with GPAs above 3.0. This study provides CM educators with a domain-specific measure to target students for interventions that promote success. Limitations and opportunities for further research are discussed. © 2017 Associated Schools of Construction

AUTHOR KEYWORDS: academic performance; Construction management; grade point average; motivation; planned behavior; self-efficacy

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

Srinivas, S.a , Khanna, S.a , Rahaman, J.a , Kumar, V.b

Designing a Game-Based Learning Environment to Foster Geometric Thinking

(2016) Proceedings - IEEE 8th International Conference on Technology for Education, T4E 2016, art. no. 7814798, pp. 72-79.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85013298035&doi=10.1109%2fT4E.2016.023&partnerID=40&md5=dbb0704690f95234c7c8e3e21295d9d9

DOI: 10.1109/T4E.2016.023

AFFILIATIONS: Centre for Education, Innovation and Action Research, Tata Institute of Social Sciences, Mumbai, India;

Department of Computer Science and Engineering, PES University, Bangalore, India

ABSTRACT: While there has been a steady rise in enrolment in secondary schools in recent years, many of the issues and concerns related to the quality of mathematics education have persisted. The challenges cut across several dimensions - access to resources, a gap between the intended and the implemented curriculum, and pedagogical practices that promote rote rather than reason, are a few important ones. These result in considerable learning gaps and limited opportunities for students to actively engage with the subject. In this paper, we describe the specific challenges of teaching geometry to high school students in India (as part of a project spanning four states), and argue that a carefully designed game-based learning environment, working in tandem with focused classroom discussions, could address some of the key challenges. We describe the design of our game-based learning environment and present the results of preliminary investigations that demonstrate its potential. © 2016 IEEE.

AUTHOR KEYWORDS: Game-based learning; Geometry learning in India; van Hiele levels of geometric thinking

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Kennedy, J.a , Quinn, F.a , Lyons, T.b

Australian enrolment trends in technology and engineering: putting the T and E back into school STEM

(2017) International Journal of Technology and Design Education, pp. 1-19. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85008500689&doi=10.1007%2fs10798-016-9394-8&partnerID=40&md5=b7db6d137a7cbb3f180257097c1dbd35

DOI: 10.1007/s10798-016-9394-8

AFFILIATIONS: School of Education, University of New England, Armidale, Australia;

Faculty of Education, Queensland University of Technology, Brisbane, Australia

ABSTRACT: There has been much political and educational focus on Science, Technology, Engineering and Mathematics (STEM) in Australian schools in recent years and while there has been significant research examining science and mathematics enrolments in senior high school, little is known about the corresponding trends in Technologies and engineering. Understanding these subjects is essential for educators and policy-makers alike if Australians are to embrace the challenges of an innovation economy. We have collected raw enrolment data from each of the Australian state and territory education departments from 1992 to 2014 and analysed this across five Technology and Engineering subject areas. We also consider some of the relationships between these subject areas and other areas of the STEM equation. The results of these analyses are discussed in terms of absolute enrolments, participation rates and sex balance. We have found that the total number of students in Year 12 increased year on year and that this growth is echoed, to a lesser extent, in the participation rates for design technology, food technology and engineering. Digital Technologies however, grew rapidly until 2000, after which time it has been in steady decline. We identify that while the trends mostly show growth, there is a concerning male bias to many of these subject areas. We suggest that the broadening of the upper high school curriculum, confusion surrounding vocational training enrolments, and gamesmanship of the university entrance system, may be contributing to the limited growth observed. Finally, we identify a number of important areas for further research in this key learning area. © 2017 Springer Science+Business Media Dordrecht

AUTHOR KEYWORDS: Digital technology; Engineering; Enrolment trends; Gender; High-school; STEM; Technology

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

Walsh, R.

A case study of pedagogy of mathematics support tutors without a background in mathematics education

(2017) International Journal of Mathematical Education in Science and Technology, 48 (1), pp. 67-82.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84984682104&doi=10.1080%2f0020739X.2016.1220028&partnerID=40&md5=12540b3c26e7b6b0ebb268ab1e917106

DOI: 10.1080/0020739X.2016.1220028

AFFILIATIONS: Department of Mathematics & Statistics, University of Limerick, Limerick, Ireland

ABSTRACT: This study investigates the pedagogical skills and knowledge of three tertiary-level mathematics support tutors in a large group classroom setting. This is achieved through the use of video analysis and a theoretical framework comprising Rowland's Knowledge Quartet and general pedagogical knowledge. The study reports on the findings in relation to these tutors’ provision of mathematics support to first and second year undergraduate engineering students and second year undergraduate science students. It was found that tutors are lacking in various pedagogical skills which are needed for high-quality learning amongst service mathematics students (e.g. engineering/science/technology students), a demographic which have low levels of mathematics upon entering university. Tutors teach their support classes in a very fast didactic way with minimal opportunities for students to ask questions or to attempt problems. It was also found that this teaching method is even more so exaggerated in mandatory departmental mathematics tutorials that students take as part of their mathematics studies at tertiary level. The implications of the findings on mathematics tutor training at tertiary level are also discussed. © 2016 Informa UK Limited, trading as Taylor & Francis Group.

AUTHOR KEYWORDS: mathematics tutor training; pedagogical content knowledge; Tertiary mathematics education; video analysis

DOCUMENT TYPE: Article

SOURCE: Scopus

Cook, S.A., Borkovitz, D.K.

Student Perceptions of a Mathematics Major for Prospective Elementary Teachers with an Inquiry‐Based Philosophy

(2017) PRIMUS, 27 (1), pp. 125-147.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84981731371&doi=10.1080%2f10511970.2016.1194341&partnerID=40&md5=ea9d77ed8bf6281dc51ad719b299e65b

DOI: 10.1080/10511970.2016.1194341

AFFILIATIONS: Department of Mathematics and Science, Wheelock College, United States

ABSTRACT: In this paper we present data from one-on-one interviews conducted with students who have taken intermediate and advanced inquiry-based mathematics courses in a program that prepares future preK-8 teachers. Many of these students entered college with a fear of math, but then gained confidence from a required introductory math course and chose to pursue a major in Mathematics for Teaching. These interviews help explain their choice to pursue this major and their general experiences in IBL math classes. These insights were used to improve our program and may also help other mathematics instructors and programs that hope to implement an inquiry-based approach in their departments. Copyright © Taylor & Francis Group, LLC.

AUTHOR KEYWORDS: elementary education; Inquiry-based learning; pre-service teachers; problem-based learning; research in undergraduate mathematics education

DOCUMENT TYPE: Article

SOURCE: Scopus

Haroutounian, J.

Artistic Ways of Knowing in Gifted Education: Encouraging Every Student to Think Like an Artist

(2017) Roeper Review, 39 (1), pp. 44-58.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85007137538&doi=10.1080%2f02783193.2016.1247397&partnerID=40&md5=f57339bf2baad9ab05916680215f5620

DOI: 10.1080/02783193.2016.1247397

AFFILIATIONS: George Mason University, United States

ABSTRACT: After decades of fluctuating presence in gifted education, the arts are surprisingly establishing themselves in academic classrooms, spurred by arts integration with science, technology, engineering, and mathematics (STEM) curricula or science, technology, engineering, art, and mathematics (STEAM). This renewed interest provides the opportunity to recognize the artistic process as an effective way to deepen and enlarge the scope of academic content. Teachers can readily identify potentially talented students in their classrooms who immerse themselves in arts activities. Students in every classroom, if provided with substantive arts integrated curricula, can learn to perceive with discrimination, metaperceptively mold creative interpretations, and communicate these performances/products expressively to others with insightful critiques. Artistic ways of knowing mirror the artistic process and provide the opportunity for every student in every classroom to think like an artist. Copyright © The Roeper Institute.

AUTHOR KEYWORDS: artistic ways of knowing; arts, arts talent identification; gifted; gifted education; metaperception; STEAM

DOCUMENT TYPE: Article

SOURCE: Scopus

Moussavou, D.E.a , Ouya, S.b , Sow, M.Y.b , Gueye, K.a , Lishou, C.a

Unified platform for both virtual and real equipment management of remote laboratories in science, technology, engineering and mathematics (STEM) education

(2017) Advances in Intelligent Systems and Computing, 545, pp. 328-343.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010042301&doi=10.1007%2f978-3-319-50340-0\_29&partnerID=40&md5=cc694c293f2e9afc6129c5da660dd073

DOI: 10.1007/978-3-319-50340-0\_29

AFFILIATIONS: Laboratoire de Traitement de l’Information, École Supérieure Polytechnique, Université Cheikh Anta Diop de Dakar, Dakar, Senegal;

Département Infrastructure et Système d’Information, Université Virtuelle du Sénégal, Dakar, Senegal

ABSTRACT: The recent development of Internet has increased exchanges. This new configuration has permitted to develop new services for virtual universities. The Senegalese government has achieved policies to encourage young people to be interested in Science, Technology, and Engineering and Mathematics (STEM) disciplines. Thus, nowadays STEM education becomes a national priority. However, the STEM disciplines demand students to carry out hands-on experiments in laboratories. It goes without saying that integrating STEM education in the context of virtual universities needs implementation of remote laboratory platforms to perform e-learning activities. So, this paper suggests a new unified access platform. This is to control real and virtual components from any university working in partnership; which will facilitate hands-on experiments. To make our approach more relevant, some concrete scenarios of both real and virtual laboratory experiences were set to be applied for mathematics and computer science students of Senegal Virtual University (UVS). Those students were taught how to achieve the remote laboratory experiments through the present platform. Students were also given full access to physical and virtual machines of the laboratory to perform hands-on experiments. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: E-learning; Remote laboratory; STEM education

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Zerpa, L.

The reification of mathematical notions in mathematics education: A four-stage model of concept development

(2017) International Journal of Science, Mathematics and Technology Learning, 24 (1), pp. 1-14.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85012899415&partnerID=40&md5=c5e06995e337e1d83fa2e48942e981e5

AFFILIATIONS: School of Social Sciences, Yachay Tech, Ecuador

ABSTRACT: A four-stage model of mathematical concept development is proposed in this article. The model is based on a distinction between a weak and a strong sense of reification in mathematics education. More specifically, the learner's language is reconstructed according to a distinction between the reification of functions, sets, and other mathematical concepts in terms of "constants" and the reification of those concepts in terms of "bound variables." The model is based on a detailed discussion of the traditional theory of reification, mainly due to Anna Sfard and her collaborators, as well as empirical data concerning the main difficulties experienced by students with the concepts of function and set. Furthermore, some remarkable episodes from the history of the concept of function in the twentieth century (including Schonfinkel's approach to functions) are examined from the perspective of the model. An example of reification of procedures in programming languages is also considered.

AUTHOR KEYWORDS: Epistemology of Mathematics; Logic and Mathematics Education; Mathematics; Mathematics Pedagogies

DOCUMENT TYPE: Article

SOURCE: Scopus

Bilek, M., Simonova, I., Machkova, V., Musilek, M., Manenova, M.

Professional and general education – Curricular bridges building

(2017) Advances in Intelligent Systems and Computing, 544, pp. 494-500.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010685225&doi=10.1007%2f978-3-319-50337-0\_46&partnerID=40&md5=892e135d3cd569e5858be9dea811a132

DOI: 10.1007/978-3-319-50337-0\_46

AFFILIATIONS: University of Hradec Kralove, Hradec Kralove, Czech Republic

ABSTRACT: Been applied as successful motivation and preparation for technical studies and future engineering professions, innovations in general mathematics and natural sciences education with orientation to inquiry based learning (IBL) and its connection to the world of work (WoW) are described and discussed in the paper. This topic is worked out within the 7th Framework Programme of EU Mascil (Mathematics and Science in Life) project. Its main objective is (1) to develop complex tasks for teaching and learning practice in mathematics and natural sciences highlighting the world of work and (2) to provide teachers the methodology courses to increase their professional skills. The project feedback from the Czech teacher’s environment is mostly positive, which provides chance to attract not only traditionally motivated teachers but also those expecting any outer motivation incentive. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: General and professional education; IBL; Mascil project; Teacher’s professional education; World of work; Wow

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Polly, D.a , Wang, C.b , Lambert, R.b , Martin, C.b , McGee, J.R.c , Pugalee, D.d , Lehew, A.e

Supporting Kindergarten Teachers’ Mathematics Instruction and Student Achievement Through a Curriculum-Based Professional Development Program

(2017) Early Childhood Education Journal, 45 (1), pp. 121-131.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84880408539&doi=10.1007%2fs10643-013-0605-6&partnerID=40&md5=b7a18921e5d90ff9535d2cb045bbc7c7

DOI: 10.1007/s10643-013-0605-6

AFFILIATIONS: Department of Reading and Elementary Education, UNC Charlotte, COED 367, 9201 University City Blvd, Charlotte, NC, United States;

Center for Educational Measurement and Evaluation, UNC Charlotte, Charlotte, NC, United States;

Appalachian State University, Boone, NC, United States;

Center for Science, Technology, Engineering, and Mathematics (STEM) Education, UNC Charlotte, Charlotte, NC, United States;

Charlotte-Mecklenburg Schools, Charlotte, NC, United States

ABSTRACT: This study investigates the impacts of a year-long professional development program on Kindergarten teachers’ beliefs and practices and the association of these changes with student achievement in mathematics measured by curriculum-based instruments. Although teacher content knowledge was not statistically significantly different before and after participation in the program, changes in teachers’ beliefs and practices were both noticed: a trend towards discovery/connectionist orientation and student-centered practices. Teachers’ gain scores on a measure of mathematics content knowledge was positively related to the linear growth rate of student achievement. © 2013, Springer Science+Business Media New York.

AUTHOR KEYWORDS: Common Core; Kindergarten; Mathematics education; Professional development; Reform-oriented pedagogies

DOCUMENT TYPE: Article

SOURCE: Scopus

Alaya, Z., Chemek, A., El Khil, G.K., Ben Aissa, M., Marzouk, A.

An integrated project for freshmen students in a software engineering education

(2017) Advances in Intelligent Systems and Computing, 544, pp. 209-216.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010637780&doi=10.1007%2f978-3-319-50337-0\_18&partnerID=40&md5=f077b548569d2541cdf172c67cf94524

DOI: 10.1007/978-3-319-50337-0\_18

AFFILIATIONS: ESPRIT School of Engineering, Tunis, Tunisia

ABSTRACT: Defining an integrated project for freshmen students in software engineering was a challenge but we were able to define one that includes the following disciplines: (1) Programming, (2) Multimedia, (3) English, (4) Embedded System and (5) Mathematics. The project respects also the Conceive, Design, Implement and Operate steps with professionals and parents participation. Despite the good results, we faced several other challenges, especially with teams problems and how to make a proper assessment. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: CDIO; Freshmen students; Project based learning; Software engineering

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Moussavou, D.E.a , Ouya, S.b , Faye, P.M.D.b , Lishou, C.a

Contribution to the standard of manufacturing the remote laboratory equipment for science, technology, engineering and mathematics (STEM) education

(2017) Advances in Intelligent Systems and Computing, 545, pp. 308-319.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010036688&doi=10.1007%2f978-3-319-50340-0\_27&partnerID=40&md5=fc71fc912251bc1ef473ac8e7543bc1d

DOI: 10.1007/978-3-319-50340-0\_27

AFFILIATIONS: Laboratoire de Traitement de l’Information, École Supérieure Polytechnique, Université Cheikh Anta Diop de Dakar, Dakar, Senegal;

Département Infrastructure et Système d’Information, Université Virtuelle du Sénégal, Dakar, Senegal

ABSTRACT: Manufacturers have been making effort for several years to integrate in their equipment Hypertext Transfer Protocol (HTTP) for remote access. Therefore, it is possible to command any kind of electronic equipment remotely. We believe that it is possible to find applications in the control of remote lab equipment in the context of e-learning activities in Science, Technology, Engineering and Mathematics (STEM). In addition, more and more companies are interested in manufacturing laboratory equipment; which shows that there is indeed a market in this sector. Our main purpose in this paper is to suggest specifications for a standard manufacturers of laboratory equipment should take into account. When laboratory equipment is being made, the producer should integrate an additional layer to enable the remote user to access and perform eLearning activities on it. This kind of equipment would be used by both traditional and virtual universities. To show relevance and feasibility of our proposal, we embedded an Extensible Messaging and Presence Protocol (XMPP) implementation with asterisk open source in TP-Link (TL-MR3020) router with OpenWRT. In fact, OpenWRT is the Linux distribution for embedded devices. To achieve our goal, we described scenarios of hands-on laboratory experiments in telecommunications where students perform activities with real laboratory equipment through internet in real time. We also showed how students control remote equipment through web portal. Preliminary experimental results confirmed that the proposed solution could be integrated in laboratory equipment. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: Remote laboratory; Stem education; WebRTC

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Warwick, J.

Dealing with mathematical anxiety: Should one size fit all?

(2017) Mathematics Enthusiast, 14 (1-3), pp. 161-174.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85011290977&partnerID=40&md5=4704304e83b191c13b72f49756f12c73

AFFILIATIONS: School of Business, London South Bank University, United Kingdom

ABSTRACT: Many students who have to study mathematics as an enabling subject within higher education experience mathematical anxiety to a greater or lesser extent. This affliction can impact student learning and achievement in mathematics and so a number of strategies have been suggested for alleviating mathematical anxiety or at least moderating its effects. This paper reports on a comparison of the mathematical anxiety experienced by two groups of students each studying a different subject discipline. The results indicate that the groups have quite different levels of anxiety and the differing contributing factors between the groups suggest that approaches to remediation need to be tailored to reflect these factors. © The Author(s).

AUTHOR KEYWORDS: Mathematical anxiety; Mathematics teaching; Student engagement

DOCUMENT TYPE: Article

SOURCE: Scopus

Fedorov, K.B.a , Imas, O.N.a , Sherstneva, A.I.a , Kriviakov, S.V.b

Blended learning and fundamental disciplines

(2017) Advances in Intelligent Systems and Computing, 545, pp. 142-153.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010022815&doi=10.1007%2f978-3-319-50340-0\_11&partnerID=40&md5=35d85d9ea764d078dee0cee44b84d7ed

DOI: 10.1007/978-3-319-50340-0\_11

AFFILIATIONS: National Research Tomsk Polytechnic University, Tomsk, Russian Federation;

National Research Tomsk State University, Tomsk, Russian Federation

ABSTRACT: Modern fast-paced technological world poses new requirement to graduates and their qualification. The educational systems of all countries accept the challenge by the national labour market. Tertiary education systems are forced to adapt to the requirements from employers. They are always looking for ways to accelerate students deepening their knowledge, sometimes by reducing their erudition and outlook. Thus, education is often focused on a particular client (employer, company, etc.). Russian universities resist this tendency. Wide basic training allows graduates to adapt quickly to any developing technologies and changing conditions of the labour market. At the same time, graduates have very low practical skills and employers need to retrain specialists. Nowadays, the market has changed. It requires graduates who are ready to use their skills immediately. The Russian education system is forced to innovate and use new educational technologies to correspond to the new economic conditions. Despite this, it is also very important to save the traditions of the Russian school. In this paper we research students’ attitude towards blended learning, based on survey results. B-learning is a new promising approach to studying Mathematics with continuous access to the course material from any device with an Internet connection. It is concluded that b-learning is currently the most preferable form of studying. We discuss the advantages of b-learning over the traditional forms and over pure e-learning. Grade ratings of Mathematics students that use b-learning tend to be higher, due to the fact that b-learning facilitates regular and systematic work during semester. Additionally, b-learning increases transparency in evaluation of students’ work. We establish that elements of e-learning in mathematical disciplines have their own peculiarities in comparison to other sciences, especially humanities. © Springer International Publishing AG 2017

AUTHOR KEYWORDS: Blended learning; E-learning; Inquiry; Mathematics; Survey

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Younas, N.a b , Asghar, Z.a b , Qayyum, M.a , Khan, F.c

Education and socio economic factors impact on earning for Pakistan - A bigdata analysis

(2017) Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering, LNICST, 185, pp. 215-223.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010032252&doi=10.1007%2f978-3-319-51207-5\_22&partnerID=40&md5=79e5a1e0aeaeb411d7b378fed1e8a8ed

DOI: 10.1007/978-3-319-51207-5\_22

AFFILIATIONS: Pakistan Institute of Development Econonics, Islamabad, Pakistan;

Department of Statistics, Quid-e-Azam University, Islamabad, Pakistan;

Department of Computer Science, Abdul Wali Khan University Mardan, Mardan, Pakistan

ABSTRACT: This paper give an insight on effect of education and socio economic factors on education on earning for Pakistan using data mining technique Regression tree and classification tree (CART). Labor force survey data used in this paper. Variables used as predictors in the study are Education, Gender, Status, Training, and Occupation, Location of working, Training, Experience, Age and Type of industry, where monthly income is used as an independent variable. In case of classification income is divided in Quintiles, which is used as a dependent variable for classification variable. Type of industry, education, age and occupation are found significant variables in both classification and regression tree. Regression trees shows that instead of education type of industry is the most important variable and sex and education are the least important variables. Classification tree also shows that Type of industry is the most significant variable which effects the earning of an individual, then age and occupation of an individual come and education is the least important variable where the rest of predictors play no role in earning of an individual. © ICST Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 2017.

AUTHOR KEYWORDS: CART; Classification and regression tree; Cross validation; Pruning

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Rodríguez, J.C.R., Martín-Pulido, E., Padrón, V.J., Alemán, J.A., García, C.R., Quesada-Arencibia, A.

Ciberlandia: An educational robotics program to promote STEM careers in primary and secondary schools

(2017) Advances in Intelligent Systems and Computing, 544, pp. 440-454.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010701055&doi=10.1007%2f978-3-319-50337-0\_42&partnerID=40&md5=9dab40eb0bf7a856dbe5b327ef829550

DOI: 10.1007/978-3-319-50337-0\_42

AFFILIATIONS: Department of Computer Science and Institute for Cybernetics, University of Las Palmas de Gran Canaria, Las Palmas, Spain

ABSTRACT: Robotics in education is considered as a powerful tool for motivating and training students. Thanks to its multidisciplinary character, it allows for the development of the contents of a multitude of materials, mainly those related to Science, Technology, Engineering and Mathematics (STEM). This has been demonstrated in many studies and experiences that have been developed around the world over recent years. However, despite the undoubted benefits and the various initiatives, many educational communities have serious difficulties implementing this tool in the development of their curriculums. The purpose of this article is to present Ciberlandia, a real learning experience that responds to these difficulties and helps to extensively promote careers in scientific and technological disciplines for youngsters. This initiative has celebrated 4 editions and has involved 2,480 participants from 53 primary and secondary schools in The Canary Islands. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: Educational robotics; Robotics competitions; STEM education

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Rüütmann, T.

Analysis of STEM teaching – Most common strategies and methods enabling deep understanding and interactive learning applied by graduates of technical teacher initial and continuing education programs in Estonia

(2017) Advances in Intelligent Systems and Computing, 544, pp. 405-414.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010699950&doi=10.1007%2f978-3-319-50337-0\_39&partnerID=40&md5=4ed84f4094d1a475b5bd85e520e3e722

DOI: 10.1007/978-3-319-50337-0\_39

AFFILIATIONS: Tallinn University of Technology, Tallinn, Estonia

ABSTRACT: The purpose of this paper is to introduce and analyze results of the research carried out at Estonian Centre for Engineering Pedagogy at Tallinn University of Technology (TUT). Micro-lessons of 260 technical teachers teaching at vocational schools, gymnasiums and universities have been analyzed with special matrix for lesson analysis. The research has been carried out in 4 groups: (1) STEM teaching at vocational schools, (2) STEM teaching at gymnasiums (high schools), (3) STEM teaching at universities (including colleges and universities of applied higher education), and (4) STEM continuing education in engineering companies. Most common teaching models, strategies and methods enabling deep understanding and interactive learning used in STEM teaching by technical teachers who have graduated from TUT either on master level or in continuing education have been determined and analyzed in the present article. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: STEM; Teaching methods; Teaching strategies

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Lammer, L.a , Lepuschitz, W.b , Kynigos, C.c , Giuliano, A.d , Girvan, C.e

ER4STEM educational robotics for science, technology, engineering and mathematics

(2017) Advances in Intelligent Systems and Computing, 457, pp. 95-101.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84992560725&doi=10.1007%2f978-3-319-42975-5\_9&partnerID=40&md5=62f6d809f53c7fd63afaef3ee820edf0

DOI: 10.1007/978-3-319-42975-5\_9

AFFILIATIONS: ACIN Institute of Automation and Control, Vienna University of Technology, Vienna, Austria;

PRIA Practical Robotics Institute, Vienna, Austria;

Educational Technology Lab, University of Athens, Athens, Greece;

AcrossLimits Limited, Hamrun, Malta;

Cardiff University, Cardiff, United Kingdom

ABSTRACT: Robotics is a popular vehicle to introduce young people to science, technology, engineering and mathematics (STEM) with various approaches worldwide that use robotics to teach or entertain or both, accompanied by various tools and repositories. However, the stakeholders involved have different goals and methods, thus difficulties in finding common ground. E.g. the focus in most cases is on increasing interest in STEM, but research methods are unspecified or vague; or despite the vastness of offerings, teachers are reluctant to incorporate activities in the classroom. In this paper, we introduce the Educational Robotics for STEM (ER4STEM) project that will realize a creative and critical use of educational robotics to maintain children’s curiosity in the world. An open and conceptual framework will bring three main stakeholders of educational robotics—teachers, educational researchers and organizations offering educational robotics—together through a user- and activity centered repository. © Springer International Publishing Switzerland 2017.

AUTHOR KEYWORDS: Educational robotics; Framework; Repository; Teachers

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Kyoung Ro, H.a , Lattuca, L.R.b , Alcott, B.c

Who Goes to Graduate School? Engineers’ Math Proficiency, College Experience, and Self-Assessment of Skills

(2017) Journal of Engineering Education, 106 (1), pp. 98-122.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010892523&doi=10.1002%2fjee.20154&partnerID=40&md5=5b544578c70bc5c99086e3c798a52825

DOI: 10.1002/jee.20154

AFFILIATIONS: Bowling Green State University, United States;

University of Michigan, United States;

University of Cambridge, United States

ABSTRACT: Background: Increasing human resources in engineering is a key concern for the United States. While some research has considered pathways to doctoral study, there is no clear empirical evidence on the role of undergraduate experiences in motivating engineers to continue to graduate school, both in engineering programs and more broadly. Purpose/Hypothesis: We investigated three influences on engineers’ decisions to enter graduate school: mathematics proficiency, self-assessments of engineering skills, and co-curricular experiences. Design/method: Using data from 1,119 engineers, we developed a hierarchical multinomial logistic model to examine engineers’ graduate school enrollment patterns. Results: Math proficiency, participation in undergraduate research, and self-assessed leadership skills are significant positive predictors of attendance in an engineering graduate program, although self-assessed teamwork skills are a negative predictor. For attendance in a nonengineering graduate school program, math proficiency, nonengineering community volunteer work, and engineering clubs were positive predictors, but none of the self-assessed skills were significant predictors. Conclusions: Our findings support past research that emphasized academic preparedness in mathematics, and further corroborate the claim that K–12 math education is a key policy lever to the engineering pipeline from undergraduate to graduate education. Our findings also indicate differences between engineering and nonengineering graduate study in relation to self-assessed skills and co-curricular experiences. Future research is needed on which types of preparation during college are needed for graduate school choice. © 2016 ASEE

AUTHOR KEYWORDS: extracurricular; mathematics; persistence; Postgraduate; professional skills

DOCUMENT TYPE: Article

SOURCE: Scopus

Ebner, M.a , Schön, S.b , Khalil, M.a

Maker-MOOC – how to foster stem education with an open online course on creative digital development and construction with children

(2017) Advances in Intelligent Systems and Computing, 545, pp. 230-236.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010042096&doi=10.1007%2f978-3-319-50340-0\_19&partnerID=40&md5=168f2597256c7e25af593142d832a2db

DOI: 10.1007/978-3-319-50340-0\_19

AFFILIATIONS: Educational Technology, Graz University of Technology, Graz, Austria;

Innovation Lab, Salzburg Research, Salzburg, Austria

ABSTRACT: The Maker Movement or do-it-yourself culture is a concept uses novel, mostly via digital applications and tools to emphasize the learningthrough-doing in the social environment. This culture inspires teachers through learning by construction and is seen as an important driver for education. In this chapter, we introduce the Maker Movement and describe how it contributes to the STEM education. The authors recite their experience through the project “Maker Days for Kids” which after that, was served as a fundamental base for a following Massive Open Online Course (MOOC). This online course brought some of the emerging technologies together with an appropriate didactical project about “Making activities for classrooms” to the public. It can be concluded that the MOOC assists in fostering the STEM education by rapidly transferring knowledge to the involved teachers. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: IMoox; Making; MOOC; Open educational resources; STEM Education

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Nel, H., Ettershank, M., Venter, J.

AfrikaBot: Design of a robotics challenge to promote STEM in Africa

(2017) Advances in Intelligent Systems and Computing, 545, pp. 500-509.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010060727&doi=10.1007%2f978-3-319-50340-0\_44&partnerID=40&md5=7bce07e08cb2628c11762ff6b0720bde

DOI: 10.1007/978-3-319-50340-0\_44

AFFILIATIONS: University of Johannesburg, Johannesburg, South Africa

ABSTRACT: Science, technology, engineering and mathematics education for high school learners in developing countries is a challenge for two significant reasons: equipment for education is expensive and complex, and economically-marginalized youth must be integrated in pre-engineering programs to prepare them for technical programmes at university. The goal of establishing AfrikaBot is to prepare high school learners to study engineering at the University of Johannesburg; thus to train teenagers from disadvantaged communities with no prior experience in STEM to participate in a challenge to build and program a robot. Also, AfrikaBot aims to equip teenagers from low-income households with technology and entrepreneurial skills in a repressed economy. AfrikaBot achieves the above with a build-it-yourself robot that can be used after the competition to invent systems with real world applications. Anticipated long-term outcomes of the AfrikaBot program will influence the structure of future robotics challenges, and promote a higher number of technical candidates from marginalized communities. By transferring enabling technology skills in a fun and engaging way, participants will rapidly build the confidence to pursue careers in STEM fields. Participants can also acquire entrepreneurial skills that may lead to the establishment of new businesses and the creation of local jobs in both the formal and informal sectors in Africa. This paper presents the organizational and physical design of AfrikaBot, a robotics challenge that will be held in the latter half of 2016. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: AfrikaBot; Entrepreneurship; Robotics; STEM

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Grella, C.T., Staubitz, T., Teusner, R., Meinel, C.

Can MOOCs support secondary education in computer science?

(2017) Advances in Intelligent Systems and Computing, 544, pp. 478-493.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010633338&doi=10.1007%2f978-3-319-50337-0\_45&partnerID=40&md5=5a572a5a3e8c90d9e07561020edffc3f

DOI: 10.1007/978-3-319-50337-0\_45

AFFILIATIONS: Hasso Plattner Institute for IT-Systems Engineering, University of Potsdam, Campus Griebnitzsee, Potsdam, Germany

ABSTRACT: Despite the importance of competencies in computer science for participation in the digital transformation of nearly all sectors, there is still a lack of learning material and technically experienced teachers in German schools. In the paper at hand, we investigate the potential of Massive Open Online Courses (MOOCs) for secondary education. Schools can profit from this learning content and format provided by well-known institutions. However, German schools provide some challenging conditions, which have to be taken into account for a meaningful integration of e-learning elements. Our statistical and qualitative results are based on the representative data of the National Educational Panel Study (NEPS), the learning data of more than 100,000 online learners from over 150 countries, and the outcomes of several workshops with teachers and school administrators. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: Flipped classrooms; K-12; Learning culture; MOOCs; STEM; Technical teacher training

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Vukolov, A.

Free and open source software applications for education of TMM discipline in Bauman university

(2017) Mechanisms and Machine Science, 43, pp. 253-260.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84988476243&doi=10.1007%2f978-3-319-44156-6\_26&partnerID=40&md5=8f8c5421cd96ebc45144fffd8818807f

DOI: 10.1007/978-3-319-44156-6\_26

AFFILIATIONS: Bauman Moscow State Technical University, Moscow, Russian Federation

ABSTRACT: According to modern tendencies, open source software conquest all areas of calculations. This paper shows only small aspect of its usage in Bauman University: tuition of “TMM” discipline. Now students are free to choose software for their tasks. Most software products that computers in Bauman are equipped with are proprietary. Rightsmanagement problems are worsening tuition process and stimulating to use free solutions instead. Several solutions, their (dis)advantages in comparison with proprietary products are explained in this paper with paying attention to specific tasks of TMM. © Springer International Publishing Switzerland 2017.

AUTHOR KEYWORDS: Bauman university; CAD; CAS ⋅ LibreCAD; Engineering; Free license; Free software; Lazarus; Mathematics; Maxima; Open source; TMM⋅ education

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Dziomdziora, A.a , Sin, D.N.a , Robertson, F.a , Mänysalo, M.a , Pattiselano, N.a , Duarte, A.a d , Malheiro, B.a b , Ribeiro, C.a c , Ferreira, F.a , Silva, M.F.a b , Ferreira, P.a , Guedes, P.a

Artistic robot – An EPS@ISEP 2016 project

(2017) Advances in Intelligent Systems and Computing, 544, pp. 225-238.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010703083&doi=10.1007%2f978-3-319-50337-0\_20&partnerID=40&md5=07e9c8c4bf821f54895744b17a0edd26

DOI: 10.1007/978-3-319-50337-0\_20

AFFILIATIONS: ISEP/IPP-School of Engineering, Polytechnic Institute of Porto, Rua Dr. António Bernardino de Almeida, 431, Porto, Portugal;

INESC TEC, Rua Dr. Roberto Frias, Porto, Portugal;

INEB, Rua do Campo Alegre, 823, Porto, Portugal;

REQUIMTE/LAQV, School of Engineering, Porto Polytechnic Institute, Porto, Portugal

ABSTRACT: This paper reports the design and development process of an artistic robot by a team of five engineering and design students from Belgian, Finland, Poland, Romania and Scotland. To contribute to this goal, the team designed and assembled GraphBot, a voice commanded drawing robot prototype, following the EPS@ISEP process. In addition, the team specified their target as young children and, in particular girls, and stated that their motivation was to introduce young generations to the world of science, technology, engineering and mathematics (STEM). In terms of outcomes, this project is expected to go beyond the boundaries of the traditional development of scientific and technical competences, by providing the students with a holistic learning experience, fostering also the development of personal and inter-personal skills within a multidisciplinary and multicultural teamwork set-up. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: Collaborative learning; Engineering education; European project semester; Robotic art

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Adamo-Villani, N., Anasingaraju, S.

Holographic signing avatars for deaf education

(2017) Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering, LNICST, 180, pp. 54-61.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84997173296&doi=10.1007%2f978-3-319-49625-2\_7&partnerID=40&md5=52d0687b1447d873508e69698a5a8c9a

DOI: 10.1007/978-3-319-49625-2\_7

AFFILIATIONS: Department of Computer Graphics Technology, Purdue University, 401 N. Grant Street, West Lafayette, IN, United States

ABSTRACT: The paper describes the development and initial evaluation of an Augmented Reality (AR) system aimed at improving deaf children’s competence in mathematics. The system allows for creating 3D animated avatars that translate from spoken English to Signed English (SE) in real time. The virtual sign language interpreters, displayed as 3D holograms in a mixed reality environment, can be used in the classroom to translate in real time the math lessons delivered by the teacher, at home to facilitate communication between hearing parents and deaf children, and at home or in the lab when children interact with math digital learning materials. An initial formative evaluation with deaf students, parents and educators supports the usability and usefulness of the AR system. © ICST Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 2017.

AUTHOR KEYWORDS: Augmented reality; Deaf education; Signing avatars

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Samuels, P.a , Poppa, S.b

Developing extended real and virtual robotics enhancement classes with years 10–13

(2017) Advances in Intelligent Systems and Computing, 457, pp. 69-81.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84992666010&doi=10.1007%2f978-3-319-42975-5\_7&partnerID=40&md5=128760e4c5f549ad943eaf695de84f2c

DOI: 10.1007/978-3-319-42975-5\_7

AFFILIATIONS: Centre for Academic Success, Birmingham City University, Birmingham, United Kingdom;

Lawrence Sheriff School, Rugby, United Kingdom

ABSTRACT: There is growing evidence of the potential of educational robotics to enhance science, technology, engineering and mathematics education provided that they are deployed carefully. This paper describes a developmental research project between a university and a secondary school in the UK to develop extended robotics enhancement classes, mainly using LEGO MINDSTORMS robotic kits, and GeoGebra, which was used to animate virtual robots. Two styles of class were deployed: student-led project creations and facilitator-led challenges. The pedagogical principles underpinning these classes and their design are discussed. Feedback generally indicated that the classes were successful and appreciated by the students but they experienced difficulties in incorporating the virtual robotic element. Lessons learnt from the project, including the development of employability skills, the potential impact on students with autism, and the effective use of peer students, are discussed. The possibility of combining the two styles of class together is proposed. © Springer International Publishing Switzerland 2017.

AUTHOR KEYWORDS: Developmental research; Employability skills; Geogebra; Learning by design; LEGO MINDSTORMS; Robotic kits; STEM education; Virtual robotics

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Lepuschitz, W., Koppensteiner, G., Merdan, M.

Offering multiple entry-points into stem for young people

(2017) Advances in Intelligent Systems and Computing, 457, pp. 41-52.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84992643452&doi=10.1007%2f978-3-319-42975-5\_4&partnerID=40&md5=7208107841538db6e5511f8edd1826cc

DOI: 10.1007/978-3-319-42975-5\_4

AFFILIATIONS: Practical Robotics Institute Austria, Wexstrasse 19-23, Vienna, Austria

ABSTRACT: Enrollment in the STEM fields (science, technology, engineering and math) is not keeping pace with the need. Recent reports indicate a decrease in the number of graduates from STEM fields and a shortage on the job market. Considering these issues, particular attention has been paid developing innovative methods and tools for improved teaching of STEM themes. This work presents an approach involving multiple entry points for young people to engage in the STEM fields. This approach is manifested in the non-profit association Practical Robotics Institute Austria (PRIA) with its activities designed to fill STEM gaps in the Austrian education system and to bring innovative engagement that cannot be found in the classrooms. Thus, STEM literacy is fostered as well as the development of systems thinking, problem solving, and teamwork skills. © Springer International Publishing Switzerland 2017.

AUTHOR KEYWORDS: After-school program; Camps; Education; Non-profit association; Research; STEM; Workshops

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Tzoumpa, D., Karvounidis, T., Douligeris, C.

Towards an ontology approach in teaching geometry

(2017) Advances in Intelligent Systems and Computing, 545, pp. 198-209.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010066742&doi=10.1007%2f978-3-319-50340-0\_16&partnerID=40&md5=3cd64283f936c2496f040e9f54aa565d

DOI: 10.1007/978-3-319-50340-0\_16

AFFILIATIONS: Department of Informatics, University of Piraeus, Piraeus, Greece

ABSTRACT: In this paper, we present the results of an experiment that took place in a classroom of a junior high school. Instead of using the traditional methods where the teacher presents the knowledge (of a daily lesson) and the students assimilate in a passive mood, we set students to active hypothesis searching, thinking, exploring, trying and proving rules. As ontologies gather the information in a well-organized form, where relations between geometrical objects are exposed and explained, we took advantage of the properties of the circle’s central and inscribed angles, we connected them to the notion of regular polygons and created the liaison between the two ontologies of the circle and the regular polygons. The purpose of this assignment was to improve the students’ view of Mathematics. This process allowed the students to realize that Mathematics is a subject worthy of exploration and not just memorizing properties of a geometrical object. In this assignment, the students undertook activities that allowed them to observe, cooperate, speculate, verify and connect geometrical meanings with mathematical concepts. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: Geometry; Ontologies; Regular polygons; Semantic web

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Fisher, D.

Reorganizing algebraic thinking: An introduction to dynamic system modeling

(2017) Mathematics Enthusiast, 14 (1-3), pp. 347-370.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85011281221&partnerID=40&md5=3e162c246c757a4e0a9e260b290c9a37

AFFILIATIONS: Portland State University, Portland, OR, United States

ABSTRACT: System Dynamics (SD) modeling is a powerful analytical method used by professional scientists, academics, and governmental officials to study the behavior patterns of complex systems. Specifically through use of the Stella software, it is a method that I and others have used for over two decades with high school, and even middle school, math and science students. In this paper I describe an introduction to SD modeling intended for an algebra class (in either middle or high school). In the body of the paper, a nested sequence of simple bank account examples, increasing in complexity, is used to demonstrate a comparison between using a closed form approach and using Stella to mathematize each situation. The comparison, showing equivalent recursive equations, closed form equations, and Stella modeling diagrams, is designed to give the reader (algebra teacher, mathematics education decision-maker, researcher, or whomever) an accessible introduction to understanding Stella model diagrams and the mathematical engine operating under the "hood" of the software. In particular, I highlight the limitations of closed form equations to capture the needed problem elements beyond a certain level of complexity, even when the problem is still simple enough for analysis by quite young students using Stella. In the final section, I discuss how, once students become comfortable with the software, the level of sophistication of problems they can analyze (including complex problems) by designing and building Stella models is extensive, significantly beyond what they can analyze with equations. Then I point to limitations in the traditional math curriculum, manifest in the Common Core State Standards, in terms of failure to prepare students for modeling of complex dynamic systems, and the related failure to exploit the potential of new representational resources. © The Author(s).

AUTHOR KEYWORDS: Algebraic thinking; Common Core State Standards; Complexity in models; Limitations of traditional curricula; Mathematical modeling; Mathematization; Software; System dynamics modeling; Technology in mathematics education; Traditional math curriculum; Young students' mathematical reasoning

DOCUMENT TYPE: Article

SOURCE: Scopus

Walker, L.H., Sherman, H.J.

Common core and STEM opportunities

(2017) Mathematics Enthusiast, 14 (1-3), pp. 413-434.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85011305896&partnerID=40&md5=5a8c1a1889402c10fb73d4b24f5c7fc9

AFFILIATIONS: University of Missouri - Saint Louis, United States

ABSTRACT: There is an increasing need for educators at all levels to equip more students with problem-solving skills that better fit our changing work force. Students are largely unaware of many science-, technology-, engineering-, and math-related (STEM) careers. They often do not understand the importance of those careers or what skills are required to pursue them. Students are exposed to some of those skills if they take Career Technical Education (CTE) classes, but rarely do they see the connections in their core math classes. Math teachers have pointed to their dense curricula as making STEM integration impractical. A study of the Common Core State Standards for Mathematics (CCSS-M), however, reveals open doors for integration. There are specific Algebra I CCSS-M that can be met through STEM-oriented, problem-based learning (PBL). STEM PBL has the potential for increasing students' cognitive engagement while, at the same time, introducing interesting STEM careers. These connections need to be integrated in curricula aligned to the CCSS-M. In order to further develop and implement evolving STEMPBL connections, there is a need for increased, ongoing dialog between educational leadership and representatives from the STEM working community. The end result can be that most US students will be exposed to a much broader range of STEM careers, STEM skills, and understand how the Algebra they learn is useful in the real world. © The Author(s).

AUTHOR KEYWORDS: Common core; Stem education; STEM-PBL connections

DOCUMENT TYPE: Article

SOURCE: Scopus

Jung, E.

A comparison of data mining methods in analyzing educational data

(2017) Lecture Notes in Electrical Engineering, 421, pp. 173-178.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85007371495&doi=10.1007%2f978-981-10-3023-9\_28&partnerID=40&md5=02fa2b3504a4e8b47be31b95eaece41d

DOI: 10.1007/978-981-10-3023-9\_28

AFFILIATIONS: Department of Computer Science, Anyang University, 602-14, Jungang-ro Buleun-myeon, Ganghwa-gun, Incheon, South Korea

ABSTRACT: Although data mining has been considered as a silver bullet which magically extracts valuable information from the stacked and unused data, its too many methods frequently confuse and mislead researchers. Therefore, in order to get a satisfying result, researchers need plenty of experience to choose a proper data mining method suitable to the purpose of their research. Unfortunately, in the education field, there are a few studies to point out this problem. In order to resolve this issue, in this paper, a study was conducted to compare Neural Network, Logistic Regression, and Decision Tree on educational data from Korea Youth Panel Survey (KYPS). The result showed the prediction accuracies of the methods were meaningfully different, but it doesn’t mean that the prediction accuracy is the only factor in decision of a specific method. Rather, the result suggested that researchers should consider various aspects of the methods to choose a specific method because each method has its own pros and cons. © Springer Nature Singapore Pte Ltd. 2017.

AUTHOR KEYWORDS: Data mining; Decision tree; Logistic regression; Neural network

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Hasegawa, M.

Collaboration among educational institutes, industries and citizens in a local community for realizing enhanced science literacy through successful science events

(2017) Advances in Intelligent Systems and Computing, 544, pp. 547-557.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010694692&doi=10.1007%2f978-3-319-50337-0\_52&partnerID=40&md5=fcfa54aeb7abe58c0d379b4c623f654e

DOI: 10.1007/978-3-319-50337-0\_52

AFFILIATIONS: Chitose Institute of Science and Technology, 758-65 Bibi, Chitose, Hokkaido, Japan

ABSTRACT: Youngster’s Science Festival in Chitose was started 10 years agok, and since then, this science event has been held once a year. Its original and main objective is laid in providing children in local community with opportunities for triggering their interests in various fields of natural science and technology through experiment demonstrations. In its early years, majority of demonstrators were active and retired teachers from elementary to ternary schools and educational institutes as well as university and high school students. Some people from industrial sectors also joined to serve as demonstrators explaining some technologies related to their corporate activities. The number of such participants from industry has been recently increasing. Moreover, scopes of the demonstrations have been expanded over the years so as to include certain fields in social sciences. For such fields, local residents who are voluntarily involved in lifelong educational activities have become main demonstrators who explain their achievements. Now, Youngster’s Science Festival in Chitose has become a successful science event in the local community which has been served as appropriate opportunities, not only for providing children with triggering opportunities for getting familiar with STEM (science, technology, engineering and mathematics) fields, but also for allowing wider generations from parents to grandparent ages to enjoy lifelong educational activities. In order to enhance advantages obtainable through the event, establishment of collaborations among various sectors in the local community is very important. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: Collaboration; Lifelong education; Outreach activities; Science event; Science literacy

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Yamakage, Y., Okamoto, S.

Toward AI for human beings: Human centric AI Zinrai

(2017) Fujitsu Scientific and Technical Journal, 53 (1), pp. 38-44.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85009288109&partnerID=40&md5=653ea9b3a4b981fd6f68ca2024eb8dcd

AFFILIATIONS: Fujitsu Laboratories Ltd., Japan

ABSTRACT: The demand for information and communications technology (ICT) has grown remarkably in recent years, with customers wanting to leverage it to transform their on-site work and create new business opportunities through innovations. In this climate, the deployment of artificial intelligence (AI) is attracting special interest. In the Fujitsu Group, Fujitsu Laboratories has been the hub of the research and development of AI since the 1980s, aiming to realize its practical application. Today, our knowledge and expertise in AI are integrated into a structured system-Human Centric AI Zinrai (hereafter, Zinrai). Based on Fujitsu's knowledge and know-how gained through cutting-edge research, Zinrai comprises the component technologies of sensing and recognition, knowledge processing, and decision-making and support, together with learning technologies that allow these features to be enhanced and grow. Fujitsu takes a unique approach to AI because these technologies are organically integrated to facilitate an ICT environment that helps enrich people's lives and society. This paper presents contextual accounts of AI development at Fujitsu, and describes innovative technologies that represent the four areas of technology within Zinrai: learning, sensory-media, knowledge, and mathematics. It also gives some accounts of collaborative initiatives with our customers to promote the AI business. © 2017, Fujitsu Ltd. All rights reserved.

DOCUMENT TYPE: Article

SOURCE: Scopus

Larkin, T.L.

What to teach and when: How important is topic order in introductory physics?

(2017) Advances in Intelligent Systems and Computing, 545, pp. 510-519.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010070480&doi=10.1007%2f978-3-319-50340-0\_45&partnerID=40&md5=ee5944a58925da0ef61658e8d272f07f

DOI: 10.1007/978-3-319-50340-0\_45

AFFILIATIONS: Department of Physics, American University, Washington, DC, United States

ABSTRACT: Introductory physics courses are a fundamental offering in physics departments around the globe. Most often, introductory physics is offered as a two-semester sequence with basic mechanics being taught in the first semester and electricity and magnetism in the second. Introductory physics is required for students pursuing engineering and many other STEM disciplines. There are timeless questions that arise pertaining to these foundation courses in physics. These questions include: What topics should be taught? When should these topics be taught? This paper will address these questions and include a brief discussion on student learning in a second-semester algebra-based physics course. An additional question to be raised is: Does taking the introductory course sequence “out of order” have an impact on student learning in physics? Finally broader implications regarding the content and topic order in introductory physics will be explored. This exploration will also include implications for the larger STEM communities. © Springer International Publishing AG 2017.

AUTHOR KEYWORDS: Assessment of student learning; Course content; Introductory Physics; Student learning in STEM; Topic order in introductory physics

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Blair, E.E.a , Miller, R.B.b , Ong, M.c , Zastavker, Y.V.d

Undergraduate STEM Instructors' Teacher Identities and Discourses on Student Gender Expression and Equity

(2017) Journal of Engineering Education, 106 (1), pp. 14-43.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010880260&doi=10.1002%2fjee.20157&partnerID=40&md5=9a7c50595480f73e9689c63ab5b41638

DOI: 10.1002/jee.20157

AFFILIATIONS: Beloit College, United States;

Harvard University, United States;

TERC, United States;

Franklin W. Olin College of Engineering, United States

ABSTRACT: Background: Despite long-standing initiatives to improve gender equity across STEM fields, women's representation in undergraduate engineering programs remains low. STEM faculty, as influential gatekeepers, can promote gender inclusivity in these fields. Yet, little is known about how faculty construct their responsibilities to advance gender equity. Purpose/Hypothesis: We investigated how STEM faculty teaching first-year engineering courses constructed teacher identities and responsibilities. Our research questions included: What discourses do faculty use to construct the meaning of student gender expression in their classroom? How do faculty discursively position themselves in relation to gender equity? What teacher identities and responsibilities do they construct through these discourses?. Design/Method: Utilizing a feminist, poststructural epistemology and discursive methodology, we analyzed 18 interviews with instructors in three undergraduate engineering programs. After coding data for ways instructors talked about gender in their work with students, we analyzed how faculty constructed their teacher identities in relation to each discourse and how these positions affected their promotion of gender equity. Results: Faculty used three dominant discourses to construct student gender expression and teacher identities: gender blindness, gender acknowledgment, and gender intervention. Faculty most frequently utilized discourses acknowledging gender inequity, which often limited their responsibilities to promote equity and highlights the pernicious nature of systemic gender bias. Conclusions: Findings suggest that institutions could expand discourse and better align faculty awareness of gender inequity with meaningful, pedagogical change strategies. © 2016 ASEE

AUTHOR KEYWORDS: discourse analysis; faculty; gender; qualitative research; STEM

DOCUMENT TYPE: Article

SOURCE: Scopus

Juhásova, A.a , Kazlov, I.b , Juhas, G.b , Molnár, L.c

How to model curricula and learnflows by Petri nets - A survey

(2016) ICETA 2016 - 14th IEEE International Conference on Emerging eLearning Technologies and Applications, Proceedings, art. no. 7802082, pp. 147-152.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85011283184&doi=10.1109%2fICETA.2016.7802082&partnerID=40&md5=8c0ca16e13fcb91c9c5afcdcc2452382

DOI: 10.1109/ICETA.2016.7802082

AFFILIATIONS: BIREGAL S.r.o., Bratislava, Slovakia;

Faculty of Electrical Engineering and Information Technology, Slovak University of Technology, Bratislava, Slovakia;

Interes.Institute S.r.o., Bratislava, Slovakia

ABSTRACT: Petri nets represent a prominent formal method for modeling distributed systems both visually and with sound mathematics. They are very successful in modeling different workflow processes. In particular, Petri nets can be used to model curricula including causal dependencies of courses, necessary and optional courses etc. Having a Petri net model of single courses and the model of the whole curriculum in a particular field, each run of the Petri net model will represent a possible individual learnflow of a student. In this survey we show how to construct Petri net models of courses, models of the whole curriculum and models of individual learnflows. The presented method is suitable both for planning, management and control of e-learning courses and study programs as well as for classroom courses and study programs. © 2016 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Chen, D.-G.D.a b , Chen, X.J.c , Zhang, K.d

An exploratory statistical cusp catastrophe model

(2016) Proceedings - 3rd IEEE International Conference on Data Science and Advanced Analytics, DSAA 2016, art. no. 7796895, pp. 100-109.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85011260314&doi=10.1109%2fDSAA.2016.17&partnerID=40&md5=d5681954306d11ff6a6b3148c565557d

DOI: 10.1109/DSAA.2016.17

AFFILIATIONS: School of Social Work AndDepartment of Biostatistics, Gillings School of Global Health, University of North Carolina, Chapel Hill, NC, United States;

Department of Statistics, University of Pretoria, Pretoria, South Africa;

Department of Epidemiology, College of Public Health and Health Professions, College of Medicine University of Florida, Gainesville, FL, United States;

Department of Statistics, University of North Carolina, Chapel Hill, NC, United States

ABSTRACT: The Cusp Catastrophe Model provides a promising approach for health and behavioral researchers to investigate both continuous and quantum changes in one modeling framework. However, application of the model is hindered by unresolved issues around a statistical model fitting to the data. This paper reports our exploratory work in developing a new approach to statistical cusp catastrophe modeling. In this new approach, the Cusp Catastrophe Model is cast into a statistical nonlinear regression for parameter estimation. The algorithms of the delayed convention and Maxwell convention are applied to obtain parameter estimates using maximum likelihood estimation. Through a series of simulation studies, we demonstrate that (a) parameter estimation of this statistical cusp model is unbiased, and (b) use of a bootstrapping procedure enables efficient statistical inference. To test the utility of this new method, we analyze survey data collected for an NIH-funded project providing HIV-prevention education to adolescents in the Bahamas. We found that the results can be more reasonably explained by our approach than other existing methods. Additional research is needed to establish this new approach as the most reliable method for fitting the cusp catastrophe model. Further research should focus on additional theoretical analysis, extension of the model for analyzing categorical and counting data, and additional applications in analyzing different data types. © 2016 IEEE.

AUTHOR KEYWORDS: Asymmetry; Bifurcation; Bootstrapping; Cusp Catastrophe Model; HIV prevention

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Zaharakis, I.D.a b , Sklavos, N.b c , Kameas, A.b d

Exploiting ubiquitous computing, mobile computing and the internet of things to promote science education

(2016) 2016 8th IFIP International Conference on New Technologies, Mobility and Security, NTMS 2016, art. no. 7792451, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85011294799&doi=10.1109%2fNTMS.2016.7792451&partnerID=40&md5=e281b973e8064ee9509232731e0d2c1a

DOI: 10.1109/NTMS.2016.7792451

AFFILIATIONS: Technological Educational Institute of Western Greece, Hellas, Greece;

Computer Technology Institute and Press 'Diophantus', Hellas, Greece;

Computer Engineering and Informatics Department, University of Patras, Hellas, Greece;

School of Science and Technology, Hellenic Open University, Patra, Hellas, Greece

ABSTRACT: Project UMI-Sci-Ed aims to investigate the introduction of Ubiquitous and Mobile technologies in science, technology, engineering and mathematics (STEM) education. By carefully exploiting state of the art technologies, tools and educational activities, the project will offer novel educational services, implement innovative pedagogies and enhance students' and teachers' creativity, socialization and scientific citizenship. By putting these technologies in practice, it will enhance the level of STEM education young girls and boys are receiving and at the same time make attractive the prospect of pursuing a career in related domains. To this end, communities of practice (CoPs) will be formed dynamically around STEM projects implemented at schools, including representatives of all necessary stakeholders. © 2016 IEEE.

AUTHOR KEYWORDS: Community of practice; Internet of things; STEM education; Ubiquitous and mobile computing

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Rollande, R.a b , Grundspenkis, J.b , Mislevics, A.b

Suitability analysis of graph visualization algorithms for personalized study planning

(2016) 2016 20th International Conference on System Theory, Control and Computing, ICSTCC 2016 - Joint Conference of SINTES 20, SACCS 16, SIMSIS 20 - Proceedings, art. no. 7790705, pp. 441-448.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010297316&doi=10.1109%2fICSTCC.2016.7790705&partnerID=40&md5=8d5d677317d992a1b6c3316a53ab9c9d

DOI: 10.1109/ICSTCC.2016.7790705

AFFILIATIONS: Engineering Research Institute, Ventspils International Radio Astronomy Centre of Ventspils, University College, Ventspils, Latvia;

Department of Systems Theory and Design, Riga Technical University, Riga, Latvia

ABSTRACT: In previous papers the present authors have covered personalized study planning framework, and also have implemented study planning system (SPS) prototype, which allows to create a personalized study program, and then to plan the course learning, setting the courses in the required sequence, and make structure analysis thus detecting the most significant nodes in the graph structure. In this paper authors describe the application of eight common graph visualization algorithms - Tree, Circular, EfficientSugiyama Fruchterman-Reingold - FR, BoundedFR, ISOM, Kamada - Kawai - KK; LinLog - for representing study plans and course structures in the personalized study planning system. © 2016 IEEE.

AUTHOR KEYWORDS: BoundedFR; Circular; EfficientSugiyama Fruchterman-Reingold - FR; graph visualizing algorithms; graphs; ISOM; Kamada - Kawai - KK; LinLog; personalized education; Tree

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Schwartz-DuPre, R.L., Morgan Parmett, H.

Curious about George: Postcolonial Science and Technology Studies, STEM education policy, and colonial iconicity

(2016) Textual Practice, pp. 1-19. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85008224773&doi=10.1080%2f0950236X.2016.1267038&partnerID=40&md5=cdb142a031ff9e2dd674942153dd52b9

DOI: 10.1080/0950236X.2016.1267038

AFFILIATIONS: Department of Communication Studies, Western Washington University, Bellingham, WA, USA

ABSTRACT: This essay addresses the colonial and cultural iconography of Curious George as a curious monkey and contemporary Science, Technology, Engineering, and Mathematics (STEM) ambassador. We critically consider how the United States’ political desire to compete globally through STEM leadership is both promoted and popularised through Curious George. Drawing on Postcolonial Science and Technology Studies, we argue it is crucial to critically read the colonial grounds under which popular figures are predicated in concert with the circulation of contemporary politics. Specifically, we attend to the colonial roots of curiosity and the frontier mentality that underlie Curious George’s push for STEM education while advocating for the rethinking of discourses that situate STEM as a value-free solution to global competitiveness. Through a postcolonial reading of Curious George, we demonstrate how the historical relationship between curiosity, primates, and science also produce colonial connotations that should provide scepticism to the current educational push that thrusts young learners to ‘get curious’. Understanding how the West constitutes themselves in opposition to the monkey icon better enables readers to understand how the trope of curiosity, essential in current scientific discourse, positions Curious George as a vehicle for directing citizens to read STEM educational policy as ideologically neutral. © 2017 Informa UK Limited, trading as Taylor & Francis Group

AUTHOR KEYWORDS: curiosity and iconicity; Curious George; Postcolonial Science and Technology Studies; STEM

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

El-Bawab, T.S.a , Effenberger, F.b

Project ISTEE: Integrating standards into telecommunication engineering education: The quest to advance standards education in STEM

(2016) 2016 IEEE Conference on Standards for Communications and Networking, CSCN 2016, art. no. 7785163, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010417603&doi=10.1109%2fCSCN.2016.7785163&partnerID=40&md5=73a9ede98296f6546d313cc49edcfa7f

DOI: 10.1109/CSCN.2016.7785163

AFFILIATIONS: Dept of Electrical and Computer Engineering, Jackson State University, Jackson, MS, United States;

Fixed Access Network Laboratory, Futurewei Technologies, Inc., Santa Clara, CA, United States

ABSTRACT: This paper provides a progress report on our project to advance and integrate knowledge of Telecommunication Standards into STEM Education. We discuss the problems facing standards education in US universities and outline the motivations for this project This is followed by an overview of the project's philosophy, organization, activities, and a description of the new course we are developing as a model for modern standards education. We provide and discuss some of the results obtained in our first offering of the new course. These results suggest that interactive instruction strategies are particularly suited to standards education. © 2016 IEEE.

AUTHOR KEYWORDS: Standards; Standards Education; Technical standards; Telecommunication Engineering; Telecommunication Engineering Education; Telecommunication Standards

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Sooraksa, P., Sakorntanant, S., Jansri, A., Klomkarn, K.

Tree robot: An innovation for STEAM education

(2016) 2016 IEEE International Conference on Real-Time Computing and Robotics, RCAR 2016, art. no. 7784050, pp. 338-341.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010042399&doi=10.1109%2fRCAR.2016.7784050&partnerID=40&md5=8a139453e4d093871739542591c472d2

DOI: 10.1109/RCAR.2016.7784050

AFFILIATIONS: Department of Computer Engineering, Faculty of Engineering, KMITL, Bangkok, Thailand

ABSTRACT: Embracing complexity in today's world makes students impatient to learn following the conventional chalk-and-talk style of teaching, and yet plenty of helpful IT-techniques are available and surrounded. This talk provides a care-and-feeding of STEAM education, namely 'Science, Technology, Engineering, Art, and Mathematics', offering a new way of utilizing matters of natural learning to be 'live'. A tree robot is created as an instrument to help students achieve the 21st century learning skills. As a result of many hours in experiments with the proposed pedagogy, the robot helps redefine what attention is and how to use it innovatively. © 2016 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Ulriksen, L., Holmegaard, H.T., Madsen, L.M.

Making sense of curriculum—the transition into science and engineering university programmes

(2016) Higher Education, pp. 1-18. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85003845708&doi=10.1007%2fs10734-016-0099-4&partnerID=40&md5=a82d3baa3642589cbcd639c652f5950c

DOI: 10.1007/s10734-016-0099-4

AFFILIATIONS: Department of Science Education, University of Copenhagen, Øster Voldgade 3, Copenhagen K, Denmark

ABSTRACT: Research on students’ transition, retention and experiences in science, technology, engineering and mathematics (STEM) has increasingly focused on identity formation and on students’ integration in the study programmes. However, studies focusing on the role of the curriculum in this process at the level of higher education are scarce. The present article analyses how the students’ transition into STEM higher education and their construction of a disciplinary identity is affected by the design of the curriculum. Twenty students entering a STEM higher education programme were followed through consecutive narrative interviews from the end of upper-secondary school and 1–3 times during first year at higher education. The data was analysed using a framework based on Bernstein’s concepts of classification and framing. Most students experienced strongly classified and strongly framed higher education programmes where the modules were isolated from each other, and the sequencing and pace made it difficult to experience the courses as meaningful. This impeded the students’ construction of a disciplinary identity. There are indications that weaker classification and framing offer the students a transition into first year where the students experienced the programmes as more meaningful. © 2016 Springer Science+Business Media Dordrecht

AUTHOR KEYWORDS: First-year experience; Science and engineering education; Student experience; Student identity; Transition

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

Salim, F., Ahmad, A., Waini, I., Miswan, N.H.

FTK Students' Performance in Mathematics: Comparison between SPM and First Year Exam

(2016) MATEC Web of Conferences, 87, art. no. 04002, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85009061078&doi=10.1051%2fmatecconf%2f20178704002&partnerID=40&md5=03b4bb25aa755f4892e9fe37b36aebf3

DOI: 10.1051/matecconf/20178704002

AFFILIATIONS: FTK, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, Durian Tunggal, Melaka, Malaysia

ABSTRACT: In the last 20 years, mathematics teaching and learning encounters quite a big problem, especially at the tertiary level. The main concern always surrounds the students' achievement in the subject matter. Students' performance in mathematics at first year is reflected by the students' mathematical background prior to the admittance into the university. The study examined 165 first year students in the Faculty of Engineering Technology (FTK) who took the Mathematics Competency test upon entering the university at the beginning of their first semester. A test consisted of 40 fundamental mathematical questions which students have learned them before. From the result, 84% of these students failed this test. However, looking at their Sijil Pelajaran Malaysia (SPM) mathematics result during Form Five (12th grade) in school, the majority did quite well in that exam. These students also took a first year mathematics course which is Technical Mathematics at the same semester. At the end of the semester, the result of their Technical Mathematics course seemed to be quite good. The performance of these three mathematics results was being compared and studied. © The Authors, published by EDP Sciences, 2017.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Hussin, N.H., Anuar, S.H.H., Hamzah, K., Mukhtar, M.F., Irianto

The Dependency of Engineering Technology Student's towards the Usage of Calculator in Mathematics

(2016) MATEC Web of Conferences, 87, art. no. 04003, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85009089667&doi=10.1051%2fmatecconf%2f20178704003&partnerID=40&md5=c860a79d639bf6fd456f965830c8b346

DOI: 10.1051/matecconf/20178704003

AFFILIATIONS: Faculty of Engineering Technology, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, Durian Tunggal, Melaka, Malaysia

ABSTRACT: Calculators are one of the important technology used to solve mathematical computations. It also can be the tool for learning mathematics if it is used appropriately. However, too much depends on calculator can be harmful to students ability to solve simple mathematical problem. The purpose of this study is to examine the dependency of students in Faculty of Engineering Technology (FTK), Universiti Teknikal Malaysia Melaka, on the usage of calculator to solve the mathematical problems. A sample of 383 first year Engineering Technology (ET) students' taking mathematics subject are selected from five different course. Students were examined based on the results of Mathematic Competency Test and the survey from a questionnaire that covers questions regarding the students' enjoyment on the usage of calculator and the usefulness of calculator in mathematic activities. The investigation yield a result showing that the students has a high dependency on using calculator to solve mathematical problem. © The Authors, published by EDP Sciences, 2017.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Khashi'Ie, N.S., Said, R.M., Zainal, N.A., Miswan, N.H.

A Comparison Study of Students' Performance in Pre and Post Result of A Mathematics Competency Test

(2016) MATEC Web of Conferences, 87, art. no. 04001, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85009141762&doi=10.1051%2fmatecconf%2f20178704001&partnerID=40&md5=f5124dc03d6c48eed3ba22b7ccc63d2b

DOI: 10.1051/matecconf/20178704001

AFFILIATIONS: Faculty of Engineering Technology, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, Durian Tunggal, Melaka, Malaysia

ABSTRACT: The objective of this study was to compare the performance of Engineering Technology (ET) students' in a Pre and Post Mathematics Competency Test during their first year of study at the Faculty of Engineering Technology (FTK), Universiti Teknikal Malaysia Melaka (UTeM). This article also aims to examine the student's understanding in the area of Mathematics, particularly in Algebra, Trigonometry and Functions. A total of 176 first year students from the Department of Mechanical Engineering Technology (JTKM) were chosen to answer the Mathematics Competency Test. The pre-test was held in the first week of the semester, while the post-test was held during the second semester. The results showed that the students' performance in post-test was better compared to that pre-test. However, statistical analysis on students' performance by each question showed that most of the students did not understand the basic concepts in Algebra, Trigonometry and Functions. © The Authors, published by EDP Sciences, 2017.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Khairani, A.Z.

Assessing Urban and Rural Teachers' Competencies in STEM Integrated Education in Malaysia

(2016) MATEC Web of Conferences, 87, art. no. 04004, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85009096914&doi=10.1051%2fmatecconf%2f20178704004&partnerID=40&md5=70803a40536c682ebf9ca4e968e176fa

DOI: 10.1051/matecconf/20178704004

AFFILIATIONS: School of Educational Studies, Universiti Sains Malaysia, Malaysia

ABSTRACT: In order to fulfil the need of sizeable skill workers, Malaysia will introduce STEM integration education in mainstream schools throughout the country. However, like any educational reform, one important issue that needs to be taken into account is the teachers' readiness especially in terms of their skills and competency in implementing the reform. As such, the purpose of this study is to assess differences between teachers' competency for STEM integration education between urban and rural teachers. A total of 244 teachers (urban = 129, rural = 115) are employed as sample in this cross-sectional quantitative study. Responses from an 18-item questionnaire were analysed using Rasch Model analysis to determine characteristics of item that measure competency between urban and rural teachers. The DIF analysis shows that items related to competency in (1) ICT integration, and (2) organizing co-curricular activities showed a significant difference in their measures between both sets of teachers. The result from this study would certainly provide useful information to relevant stakeholders, especially with regards to providing training for the teachers in the designated areas. © The Authors, published by EDP Sciences, 2017.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Simpson, A.a , Maltese, A.b

“Failure Is a Major Component of Learning Anything”: The Role of Failure in the Development of STEM Professionals

(2016) Journal of Science Education and Technology, pp. 1-15. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85004073498&doi=10.1007%2fs10956-016-9674-9&partnerID=40&md5=65699d68e31d205f92dcad3b151108c8

DOI: 10.1007/s10956-016-9674-9

AFFILIATIONS: Mathematics Education, W.W. Wright School of Education, Indiana University, 201 N. Rose Avenue, Room 3254, Bloomington, IN, United States;

Science Education, Adjunct Faculty in Geological Sciences, W.W. Wright School of Education, Indiana University, 201 N. Rose Avenue, Room 3054, Bloomington, IN, United States

ABSTRACT: The term failure typically evokes negative connotations in educational settings and is likely to be accompanied by negative emotional states, low sense of confidence, and lack of persistence. These negative emotional and behavioral states may factor into an individual not pursuing a degree or career in science, technology, engineering, or mathematics (STEM). This is of particular concern considering the low number of women and underrepresented minorities pursing and working in a STEM field. Utilizing interview data with professionals across STEM, we sought to understand the role failure played in the persistence of individuals who enter and pursue paths toward STEM-related careers. Findings highlighted how participants’ experiences with failure (1) shaped their outlooks or views of failure, (2) shaped their trajectories within STEM, and (3) provided them with additional skills or qualities. A few differences based on participants’ sex, field, and highest degree also manifested in our analysis. We expect the results from this study to add research-based results to the current conversation around whether experiences with failure should be part of formal and informal educational settings and standards-based practices. © 2016 Springer Science+Business Media New York

AUTHOR KEYWORDS: Career; Education; Failure; Persistence; STEM

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

Ashok, M.V.a , Apoorva, A.b

Data mining approach for predicting student and institution's placement percentage

(2016) 2016 International Conference on Computation System and Information Technology for Sustainable Solutions, CSITSS 2016, art. no. 7779381, pp. 336-340.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010468133&doi=10.1109%2fCSITSS.2016.7779381&partnerID=40&md5=d8043528beefcab5e3f27d60d69258b1

DOI: 10.1109/CSITSS.2016.7779381

AFFILIATIONS: Dept. of Computer Science, Teacher's Academy, Bangalore, India;

Dept. of MCA, GIMS, Bangalore, India

ABSTRACT: Placement of students is one of the very important activities in educational institutions. Admission and reputation of institutions mainly depends on placements. Hence all institutions strive to strengthen placement department. In this study, the objective is to analyze previous year's student's historical data and predict placement chance of the current students and the percentage placement chance of the institution. A model is proposed along with an algorithm to predict the placement chance of students. Data pertaining to the study were collected form the same institution for which the placement chance prediction and percentage placement need to be found from 2006 to 2015. Data collected is divided into historic data form 2016to 1014 and test data i.e, 2014; 2016 data is considered as current data. Suitable data pre-processing methods are applied. Students having better chance of placement are characterized as good if not bad. This proposed model is compared with other classification algorithms such as Naïve bayes, Decision tree, and Neural network with respect to accuracy, precision and recall. From the results obtained it is found that the proposed algorithm predicts better in comparison with other algorithms. © 2016 IEEE.

AUTHOR KEYWORDS: classification; Data mining; Decision tree; Naïve bayes; placement; prediction

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Gabriel, B., Valente, R., Dias-De-Oliveira, J., Neto, V., Andrade-Campos, A.

Methodologies for Engineering Learning and Teaching (MELT) approach: A way to bring young people to science (and science to young people)

(2016) CISPEE 2016 - 2nd International Conference of the Portuguese Society for Engineering Education, Proceedings, art. no. 7777724, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010303866&doi=10.1109%2fCISPEE.2016.7777724&partnerID=40&md5=35d64d6f225f3f2a0518aca0a0313089

DOI: 10.1109/CISPEE.2016.7777724

AFFILIATIONS: SEE Group, Department of Mechanical Engineering, University of Aveiro, Aveiro, Portugal

ABSTRACT: The goal of the Methodologies for Engineering Learning and Teaching (MELT) approach is to enhance the attractiveness of education through science, technology, engineering and mathematics subjects, while promoting awareness of STEM careers during upper secondary school. As a consequence, its main goal is to take into account students' aspirations and expectations during university programs and beyond, leading to an increased engagement in STEM careers. To accomplish these goals, a new, innovative and connected approach is presented, with a concept that encompasses the main stakeholders in scientific education, along with the main actors in society. A global and scalable education framework model is presented, aiming to provide guidelines for an improved collaborative approach to STEM education in the future. © 2016 IEEE.

AUTHOR KEYWORDS: Engineering Education; Stakeholders Engagement; STEM Careers

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Oliveira, M.J., Freitas, A.

Support system for learning mathematics in engineering higher education programmes: The case of the 'Mathematics Digital Practice Office'

(2016) CISPEE 2016 - 2nd International Conference of the Portuguese Society for Engineering Education, Proceedings, art. no. 7777737, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010390662&doi=10.1109%2fCISPEE.2016.7777737&partnerID=40&md5=b50995b3e19a1f384d9c463f5a62f14b

DOI: 10.1109/CISPEE.2016.7777737

AFFILIATIONS: Faculty of Engineering, University of Porto, Porto, Portugal

ABSTRACT: In 2013, a program called 'Mathematics Digital Practice Office' (CDM), was created at the School of Engineering of the University of Porto (FEUP). Its goals were to offer the students of mathematical courses (curricular units), more opportunities (besides contact hours/classes) to train the exercises, to clarify remaining and last minute doubts and to test their knowledge on the subjects throughout the semester, with the purpose of increasing academic success and mitigating dropout rates in mathematics curricular units/courses. In this scope, a program was implemented, covering, now, 642 students of six mathematics courses of engineering programs. It aims to provide additional support to the face-to-face classes, based on a distance education system, using technology and social networks to enhance learning, with multiple learning strategies (forum, videoconferences, multiple-choice tests, materials repository, etc). For the evaluation of the impact of this initiative, data was collected from different methods allowing us to realize that students are highly satisfied with the initiative and how it is being implemented, that they recognize the importance of the program for their academic success. Regarding students' academic results, the collected data revealed that final grades have increased, for all courses, since the CDM program has been implemented, as well as approval rates. Dropout rates after the first test are lower in courses supported by CDM. The main contribution of this work, is to describe how, in a high and constant academic failure and still relatively high dropout context, a distance learning program - able to be replicated in any course of any given higher education institution - was created and successfully mitigated this situation with the use of virtual platforms and social media to enhance formative assessment. © 2016 IEEE.

AUTHOR KEYWORDS: academic success; distance learning; educational technology; Engineering; mathematics

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Catarino, P.a b c , Nascimento, M.M.a b , Morais, E.a c , Campos, H.a b , Vasco, P.a c

Mathematical creativity's understanding in engineering students of a Portuguese university

(2016) CISPEE 2016 - 2nd International Conference of the Portuguese Society for Engineering Education, Proceedings, art. no. 7777730, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010427090&doi=10.1109%2fCISPEE.2016.7777730&partnerID=40&md5=133297ed1d429b647be942862931c470

DOI: 10.1109/CISPEE.2016.7777730

AFFILIATIONS: Departamento de Matemática da Escola de Ciencias e Tecnologia da UTAD, Vila Real, Portugal;

Lab-DCT Do CIDTFF, Aveiro, Portugal;

CMAT-UTAD, Polo Do CMAT, Vila Real, Portugal

ABSTRACT: Among today's attributes required to engineers is creativity. From the creativity domain, this work focused in mathematical creativity, since we teach students in Mathematics courses. This paper presents the study of 61 students' understanding of mathematical creativity of four engineering degrees that were in first year of a northeastern Portuguese university and we analyzed their texts to an open question in a Google Drive Form: "What do you understand by mathematical creativity?" Data collection was done in the first semester of 2014/2015 in the Linear Algebra course. The content analysis of students' answers focused on their texts led to three main categories that were crossed with students' gender, age, degree, and their liking for Mathematics. The results showed that "problem solving" category had the majority of the references, and there were no differences between the proportions of the categories by gender, age or liking mathematics or even independency. This exploratory study leaves clues about the connection that needs to be made between mathematical creativity and solving problems, in order to foster it in Mathematics courses in engineering degrees. © 2016 IEEE.

AUTHOR KEYWORDS: Creativity; engineering; higher education; mathematical creativity

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Abreu, S., Caldeira, A., Costa, A.R., Gomes, T., Roque, L.A.C.

Interdisciplinary team work: Applying working methods to a math project

(2016) CISPEE 2016 - 2nd International Conference of the Portuguese Society for Engineering Education, Proceedings, art. no. 7777729, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010460291&doi=10.1109%2fCISPEE.2016.7777729&partnerID=40&md5=6b5bdd23b182fe86d1ae02090cbb075e

DOI: 10.1109/CISPEE.2016.7777729

AFFILIATIONS: School of Engineering, Polytechnic of Porto, ISEP, LEMA, SYSTEC -ISR, Porto, Portugal

ABSTRACT: In this work, we describe an interdisciplinary teaching experiment involving three subjects of the scientific area of Mathematics and a fourth one in the area of Management. Using only one project, the students developed skills, in an integrated way, in the fields of the subjects involved. The structure of the project is described in detail. It is shown how the knowledge obtained in the different subjects is needed and how it connects together to answer the proposed challenges. We report the progress of the students' work, the main difficulties and the skills developed during this process. We conclude with a reflection on the main problems and gains that may arise in projects of this kind. © 2016 European Union.

AUTHOR KEYWORDS: Interdisciplinarity; mathematics teaching; soft skills; team work; working methods

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Ciolacu, M.a , Beer, R.b

Adaptive user interface for higher education based on web technology

(2016) 2016 IEEE 22nd International Symposium for Design and Technology in Electronic Packaging, SIITME 2016, art. no. 7777299, pp. 300-303.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010791395&doi=10.1109%2fSIITME.2016.7777299&partnerID=40&md5=1caa529530507efec50a3b23498d780c

DOI: 10.1109/SIITME.2016.7777299

AFFILIATIONS: Faculty of Business Informatics, Deggendorf Institute of Technology, Deggendorf, Germany;

Informatics Faculty, University Passau, Passau, Germany

ABSTRACT: We present an Adaptive User Interface (AUI) for online courses in higher education as a method for solving the challenges posed by the different knowledge levels in a heterogeneous group of students. The scenario described in this paper is an online beginners' course in Mathematics which is extended by an adaptive course layout to better fit the needs of every individual student. The course offers an entry-level test to check each student's prior knowledge and skills. The results are used to automatically determine which parts of the course are relevant for the student and which ones can be hidden, based on parameters set by the course teachers. Initial results are promising; the new adaptive learning platform in mathematics is leading to higher student satisfaction and better performance. © 2016 IEEE.

AUTHOR KEYWORDS: Adaptive User Interface; blended learning; digitalisation; higher education; Industry 4.0 in Education; innovation; interactivity; mathematics; mobile learning

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

CISPEE 2016 - 2nd International Conference of the Portuguese Society for Engineering Education, Proceedings

(2016) CISPEE 2016 - 2nd International Conference of the Portuguese Society for Engineering Education, Proceedings, 172 p.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010384466&partnerID=40&md5=b9986705d1d3a0bd3c5b09f361e2b619

ABSTRACT: The proceedings contain 25 papers. The topics discussed include: increasing adult students' learning opportunities with flexible learning pathways: evidence from a technology and industrial management graduate course; experimental classes of metallic materials challenges in identifying steel components; motivating first year students for an engineering degree; designing experiments with aspen HYSYS simulation to improve distillation systems; methodologies for engineering learning and teaching (MELT) approach - a way to bring young people to science (and science to young people); reconceptualizing planning - conceiving new ways of planning educational processes with authoring tools; include ethic education in the engineering courses' curriculum - the students' perspec; Portuguese and Brazilian students perceptions regarding the flow of knowledge in their courses - two different realities?; mathematical creativity definitions in engineering students in a portuguese university; a learning toolkit to promote creative and critical thinking in product design and development through design thinking; using the finite element method to understand calculus; take this waltz on creativity - the engineering students' conceptions; critical thinking for engineers and engineering critical thinking; and support system for learning mathematics in engineering higher education programmes the case of the "mathematics digital practice office.

DOCUMENT TYPE: Conference Review

SOURCE: Scopus

Alves, G.R., Fidalgo, A., Marques, A., Viegas, C., Felgueiras, M.C., Costa, R., Lima, N., Castro, M., Díaz-Orueta, G., Ruiz, E.S.C., García-Loro, F., García-Zubía, J., Hernández-Jayo, U., Kulesza, W., Gustavsson, I., Pester, A., Zutin, D., Schlichting, L., Ferreira, G., De Bona, D., Da Silva, J.B., Alves, J.B., Biléssimo, S., Pavani, A., Lima, D., Temporão, G., Marchisio, S., Concari, S., Lerro, F., Fernández, R., Paz, H., Soria, F., Almeida, N., De Oliveira, V., Pozzo, M.I., Dobboletta, E.

Spreading remote lab usage: A system - A community - A Federation

(2016) CISPEE 2016 - 2nd International Conference of the Portuguese Society for Engineering Education, Proceedings, art. no. 7777722, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010369433&doi=10.1109%2fCISPEE.2016.7777722&partnerID=40&md5=3c16a70045c43abb44ae7065cab2d8ef

DOI: 10.1109/CISPEE.2016.7777722

AFFILIATIONS: VISIR+ Project, Polytechnic of Porto, National Distance Education University, University of Deusto, Blekinge Institute of Technology, Carinthia University of Applied Sciences, Federal Institute of Santa Catarina, Federal University of Santa Catarina, Pontifical Catholic University of Rio de Janeiro, National University of Rosario, Brazil

ABSTRACT: Experiments have been at the heart of scientific development and education for centuries. From the outburst of Information and Communication Technologies, virtual and remote labs have added to hands-on labs a new conception of practical experience, especially in Science, Technology, Engineering and Mathematics education. This paper aims at describing the features of a remote lab named Virtual Instruments System in Reality, embedded in a community of practice and forming the spearhead of a federation of remote labs. More particularly, it discusses the advantages and disadvantages of remote labs over virtual labs as regards to scalability constraints and development and maintenance costs. Finally, it describes an actual implementation in an international community of practice of engineering schools forming the embryo of a first world wide federation of Virtual Instruments System in Reality nodes, under the framework of a project funded by the Erasmus+ Program. © 2016 IEEE.

AUTHOR KEYWORDS: Community of Practice; Engineering education; online labs federation; remote labs; VISIR; VISIR+1

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Vranić, M., Pintar, D., Humski, L.

Automated extraction and visualization of learning concept dependencies using Q-matrices and exam results

(2016) 2016 24th International Conference on Software, Telecommunications and Computer Networks, SoftCOM 2016, art. no. 7772122, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010442900&doi=10.1109%2fSOFTCOM.2016.7772122&partnerID=40&md5=9cb0d45585c6b1a87adfcfb03bdc42cc

DOI: 10.1109/SOFTCOM.2016.7772122

AFFILIATIONS: Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia

ABSTRACT: Information systems of educational organizations often represent a potential well of useful information which can be discovered and interpreted by using specific methods. Exam results in particular are commonly used as a single-use measure of individual knowledge states, after which they are archived and subsequently never used again. Our approach suggests using past exam results as a rich data source for extracting knowledge about learning concepts, especially regarding their mutual relationships. To achieve this goal, we adopt our method for interactive visualization of patterns in transactional data and apply it to knowledge state matrices generated from real-life exam results and Q-matrices constructed by domain experts, providing the end user with rich, easily interpretable and visually engaging dendrogram structures. © 2016 University of Split, FESB.

AUTHOR KEYWORDS: Annotated exams; Association rule; Concept maps; Education improvement; Frequent itemsets; Learning concepts; Q-matrix; Transactional data; Tree-like structures; Visualization

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Gomes, T.D.P.a , Goei, S.L.a b , Van Joolingen, W.c , Cai, Y.d

VR Biology, an interdisciplinary and international student project towards an inquiry-based pedagogy

(2016) Proceedings of the 3rd Asia-Europe Symposium on Simulation and Serious Gaming - 15th ACM SIGGRAPH Conference on Virtual-Reality Continuum and Its Applications in Industry, VRCAI 2016, pp. 169-171.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85009830167&doi=10.1145%2f3014033.3014044&partnerID=40&md5=173b9272c12a412e6c81fcda9a69cfe7

DOI: 10.1145/3014033.3014044

AFFILIATIONS: Windesheim University of Applied Sciences, Netherlands;

Free University of Amsterdam, Netherlands;

Utrecht University, Netherlands;

Nanyang Technological University, Singapore

ABSTRACT: Education in Science, Technology, Engineering, and Mathematics (STEM) is moving towards a more inquiry-based, and creativity stimulating pedagogy. Part of a curriculum based on such pedagogies should be challenging learning activities that engage students in investigation. At the same time, it is imperative that such activities are developed and validated in collaboration with the teachers who should incorporate them in their lesson planning. In this contribution we propose to develop innovative lessons in which such learning activities are embedded via the professional development method of Lesson Study with teachers Biology in (initial) teacher training in the Netherlands in close collaboration with students Mechanical Engineering in Singapore. Within this project both student groups will be using a model-based and VR-enabled solution created through an interdisciplinary and international collaboration between the Netherlands and Singapore.

AUTHOR KEYWORDS: Education in Science; Engineering and Mathematics; Inquiry-based pedagogy for biology; Lesson Study; Model based simulation; Models in Biology; Technology; Virtual Reality

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Veermans, K.a b , Jaakkola, T.b

Reflections from Research: Some considerations for the design of educational simulations (and games)

(2016) Proceedings of the 3rd Asia-Europe Symposium on Simulation and Serious Gaming - 15th ACM SIGGRAPH Conference on Virtual-Reality Continuum and Its Applications in Industry, VRCAI 2016, pp. 173-176.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85009740883&doi=10.1145%2f3014033.3014037&partnerID=40&md5=eef61035c7c95dfcb473acae702908ee

DOI: 10.1145/3014033.3014037

AFFILIATIONS: Turku Institute for Advanced Studies, University of Turku, Finland;

Department of Teacher Education, University of Turku, Finland

ABSTRACT: Educational simulations and serious games hold great potential for creating engaging and productive learning environments in STEM domains. In this paper we present and reflect on some of our research findings in a series of studies with a computer simulation in the domain electricity. These studies used the same simulation with varying instructional designs and over a range of grades. Interestingly, each design has always had a unique influence on student performance and/or engagement. We hope our results can provide some new insights for designers when designing simulations (or, serious games) for education and for educators utilizing these designs in practical settings.

AUTHOR KEYWORDS: Electricity; Simulation based learning; STEM

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Choi, S.a , Park, J.H.b

Minimum interference channel assignment algorithm for multicast in a wireless mesh network

(2016) Sensors (Switzerland), 16 (12), art. no. 2056, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85004008330&doi=10.3390%2fs16122056&partnerID=40&md5=a17469597f91b2ba865ebdbd73f1cf86

DOI: 10.3390/s16122056

AFFILIATIONS: Department of Computer Science, Swaziland Christian University, P.O. Box A624 Swazi Plaza, Mbabane, Swaziland;

Department of Computer Science & Engineering, Seoul National University of Science and Technology, Seoul, South Korea

ABSTRACT: Wireless mesh networks (WMNs) have been considered as one of the key technologies for the configuration of wireless machines since they emerged. In a WMN, wireless routers provide multi-hop wireless connectivity between hosts in the network and also allow them to access the Internet via gateway devices. Wireless routers are typically equipped with multiple radios operating on different channels to increase network throughput. Multicast is a form of communication that delivers data from a source to a set of destinations simultaneously. It is used in a number of applications, such as distributed games, distance education, and video conferencing. In this study, we address a channel assignment problem for multicast in multi-radio multi-channel WMNs. In a multi-radio multi-channel WMN, two nearby nodes will interfere with each other and cause a throughput decrease when they transmit on the same channel. Thus, an important goal for multicast channel assignment is to reduce the interference among networked devices. We have developed a minimum interference channel assignment (MICA) algorithm for multicast that accurately models the interference relationship between pairs of multicast tree nodes using the concept of the interference factor and assigns channels to tree nodes to minimize interference within the multicast tree. Simulation results show that MICA achieves higher throughput and lower end-to-end packet delay compared with an existing channel assignment algorithm named multi-channel multicast (MCM). In addition, MICA achieves much lower throughput variation among the destination nodes than MCM. © 2016 by the authors; licensee MDPI, Basel, Switzerland.

AUTHOR KEYWORDS: Channel assignment; Multi-radio multi-channel wireless mesh network; Multicast communication; Wireless mesh network

DOCUMENT TYPE: Article

SOURCE: Scopus

Muir, T., Beswick, K., Callingham, R., Jade, K.

Experiencing teaching and learning quantitative reasoning in a project-based context

(2016) Mathematics Education Research Journal, 28 (4), pp. 479-501.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84997112198&doi=10.1007%2fs13394-016-0176-0&partnerID=40&md5=7fa1e5005eb6c245f22faff8da6473be

DOI: 10.1007/s13394-016-0176-0

AFFILIATIONS: University of Tasmania, Launceston, Australia

ABSTRACT: This paper presents the findings of a small-scale study that investigated the issues and challenges of teaching and learning about quantitative reasoning (QR) within a project-based learning (PjBL) context. Students and teachers were surveyed and interviewed about their experiences of learning and teaching QR in that context in contrast to teaching and learning mathematics in more traditional settings. The grade 9–12 student participants were characterised by a history of disengagement with mathematics and school in general, and the teacher participants were non-mathematics specialist teachers. Both students and teachers were new to the PjBL situation, which resulted in the teaching/learning relationship being a reciprocal one. The findings indicated that students and teachers viewed QR positively, particularly when compared with traditional mathematics teaching, yet tensions were identified for aspects such as implementation of curriculum and integration of relevant mathematics into projects. Both sets of participants identified situations where learning QR was particularly successful, along with concerns or difficulties about integrating QR into project work. The findings have implications for educators, who may need to examine their own approaches to mathematics teaching, particularly in terms of facilitating student engagement with the subject. © 2016, Mathematics Education Research Group of Australasia, Inc.

AUTHOR KEYWORDS: Big Picture; Engagement; Motivation; Project-based learning; Quantitative reasoning

DOCUMENT TYPE: Article

SOURCE: Scopus

Skilling, K.a , Bobis, J.b , Martin, A.J.c , Anderson, J.b , Way, J.b

What secondary teachers think and do about student engagement in mathematics

(2016) Mathematics Education Research Journal, 28 (4), pp. 545-566.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84997482205&doi=10.1007%2fs13394-016-0179-x&partnerID=40&md5=23b12e05d73e2e1e815a51aaf0adc5df

DOI: 10.1007/s13394-016-0179-x

AFFILIATIONS: King’s College London, Waterloo Bridge Wing, Franklin-Wilkins Building, Waterloo Road, London, United Kingdom;

The University of Sydney, Education Building, A35, Sydney, NSW, Australia;

University of NSW, Goodsell Building, Kensington Campus, Kensington, NSW, Australia

ABSTRACT: What teachers’ think about student engagement influences the teaching practices they adopt, their responses to students and the efforts they make in the classroom. Interviews were conducted with 31 mathematics teachers from ten high schools to investigate their perceptions and beliefs about student engagement in mathematics. Teachers also reported the practices they used to engage their students during mathematics lessons. Teacher perceptions of student engagement were categorised according to recognised ‘types’ (behavioural, emotional and cognitive) and ‘levels’ (ranging from disengaged to engaged). The teachers’ reports emphasised immediate attention being paid to students’ behaviours and overt emotions towards mathematics with fewer and less extensive reports made about students’ cognitive engagement. Teachers’ abilities to implement practices considered supportive of student engagement were linked to a number of elements, including their self-efficacy. Perceptions of being powerless to engage their students resulted in many teachers limiting their efforts to attempt some form of intervention. © 2016, Mathematics Education Research Group of Australasia, Inc.

AUTHOR KEYWORDS: Mathematics; Student engagement; Teacher beliefs and practices; Teacher self-efficacy

DOCUMENT TYPE: Article

SOURCE: Scopus

Kytmanov, A.A., Noskov, M.V., Safonov, K.V., Savelyeva, M.V., Shershneva, V.A.

Competency-based learning in higher mathematics education as a cluster of efficient approaches

(2016) Bolema - Mathematics Education Bulletin, 30 (56), pp. 1113-1126.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006456821&doi=10.1590%2f1980-4415v30n56a14&partnerID=40&md5=141588be4b17ae6ae2e3174e20c3d179

DOI: 10.1590/1980-4415v30n56a14

AFFILIATIONS: Siberian Federal University, Department of Applied Mathematics and Computer Security, 79 Svo-bodny av., Krasnoyarsk, Russian Federation

ABSTRACT: This paper presents the research results of what the process of mathematics teaching should be under the competency-based approach allowing the development of a university student's mathematical competency. It indicates that integrative structure of mathematical competency containing cognitive, practical, motivational and value-based, reflexive and assessment-based components, updates the polyparadigm approach in teaching mathematics as an open cluster of approaches; their integrated utilization under the leading role of competency-based ap-proach contributes to developing all mathematical competency components. It justifies that competency-based, context-based, interdisciplinary, discipline-based and information technology approaches and fundamentalization play a critical part in the polyparadigm approach; the integrated utilization of all approaches results in a synergetic effect. Within this framework the basic principles of competency-based mathematics teaching as well as a coherent system to select the content of mathematics teaching for engineering educational institution students are developed.

AUTHOR KEYWORDS: Cluster of approaches; Didactic basis; Mathematical competency; Polyparadigm approach; System to select the content of mathematics teaching

DOCUMENT TYPE: Article

SOURCE: Scopus

Ashford, S.N.a , Lanehart, R.E.b , Kersaint, G.K.c , Lee, R.S.b , Kromrey, J.D.b

STEM Pathways: Examining Persistence in Rigorous Math and Science Course Taking

(2016) Journal of Science Education and Technology, 25 (6), pp. 961-975.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84994779413&doi=10.1007%2fs10956-016-9654-0&partnerID=40&md5=83aa0de1e5763823cb0891bf7f6ff48c

DOI: 10.1007/s10956-016-9654-0

AFFILIATIONS: Department of Occupational, Workforce, and Leadership Studies, Texas State University, 601 University Drive, Pedernales Building 110, San Marcos, TX, United States;

Center for Research, Evaluation, Assessment, and Measurement, University of South Florida, 4202 E. Fowler Avenue, EDU 105, Tampa, FL, United States;

Neag School of Education, University of Connecticut, 249 Glenbrook Road, Unit 3064, Charles B. Gentry Building, Storrs, CT, United States

ABSTRACT: From 2006 to 2012, Florida Statute §1003.4156 required middle school students to complete electronic personal education planners (ePEPs) before promotion to ninth grade. The ePEP helped them identify programs of study and required high school coursework to accomplish their postsecondary education and career goals. During the same period Florida required completion of the ePEP, Florida’s Career and Professional Education Act stimulated a rapid increase in the number of statewide high school career academies. Students with interests in STEM careers created STEM-focused ePEPs and may have enrolled in STEM career academies, which offered a unique opportunity to improve their preparedness for the STEM workforce through the integration of rigorous academic and career and technical education courses. This study examined persistence of STEM-interested (i.e., those with expressed interest in STEM careers) and STEM-capable (i.e., those who completed at least Algebra 1 in eighth grade) students (n = 11,248), including those enrolled in STEM career academies, in rigorous mathematics and science course taking in Florida public high schools in comparison with the national cohort of STEM-interested students to measure the influence of K-12 STEM education efforts in Florida. With the exception of multi-race students, we found that Florida’s STEM-capable students had lower persistence in rigorous mathematics and science course taking than students in the national cohort from ninth to eleventh grade. We also found that participation in STEM career academies did not support persistence in rigorous mathematics and science courses, a prerequisite for success in postsecondary STEM education and careers. © 2016, Springer Science+Business Media New York.

AUTHOR KEYWORDS: Career academies; Electronic personal education planner; Persistence; Rigorous math and science course taking; STEM-capable

DOCUMENT TYPE: Article

SOURCE: Scopus

Ngah, N., Ismail, Z., Tasir, Z., Mohamad Said, M.N.H.

Students’ ability in free, semi-structured and structured problem posing situations

(2016) Advanced Science Letters, 22 (12), pp. 4205-4208.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85011982901&doi=10.1166%2fasl.2016.8106&partnerID=40&md5=a5bac3b99e5b8b1a7ef80d1666e405fc

DOI: 10.1166/asl.2016.8106

AFFILIATIONS: Department of Educational Sciences, Mathematics and Creative Multimedia, Faculty of Education, Universiti Teknologi Malaysia, Malaysia

ABSTRACT: Problem posing is a new and inventive pedagogical approach in mathematics education. It has long been under the shadow of problem solving, until recently, when researchers started to realize its potentials, resulting in a fastgrowing recognition of the need to incorporate it into Mathematics classroom learning. Therefore, the purpose of this study was to identify students’ problem posing ability in free, semi-structured and structured problem posing situations. In addition, this study would also determine their view about problem posing. The sample consisted of twenty eight Form 2 secondary school students. Two instruments were used: The Mathematical Problem Posing Task and The Problem Posing Questionnaire. The results revealed that the students were capable of posing 63 solvable mathematical problems, out of which, 55 (87%) in the low level of complexity and 8 (13%) in the moderate level of complexity, within the problem posing tasks given. The result also revealed that, free problem posing situations are more demanding task compared to the semi-structured and structured problem posing situations. Besides, the findings also found that, students have positive views about problem posing. In conclusion, problem posing is a potential pedagogical approach that can be implemented realistically in Mathematics classrooms. © 2016 American Scientific Publishers All rights reserved.

AUTHOR KEYWORDS: Free problem posing situations; Mathematics education; Problem posing ability; Problem posing tasks; Semi-structured problem posing situations; Structured problem posing situations

DOCUMENT TYPE: Article

SOURCE: Scopus

Makonye, J.P.a , Fakude, J.b

A Study of Errors and Misconceptions in the Learning of Addition and Subtraction of Directed Numbers in Grade 8

(2016) SAGE Open, 6 (4), .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85008698666&doi=10.1177%2f2158244016671375&partnerID=40&md5=e4215cf94333ae6b3065f99fecc0a85c

DOI: 10.1177/2158244016671375

AFFILIATIONS: University of the Witwatersrand, Johannesburg, South Africa;

Jacob Mdluli High School, Nelspruit, South Africa

ABSTRACT: The study focused on the errors and misconceptions that learners manifest in the addition and subtraction of directed numbers. Skemp’s notions of relational and instrumental understanding of mathematics and Sfard’s participation and acquisition metaphors of learning mathematics informed the study. Data were collected from 35 Grade 8 learners’ exercise book responses to directed numbers tasks as well as through interviews. Content analysis was based on Kilpatrick et al.’s strands of mathematical proficiency. The findings were as follows: 83.3% of learners have misconceptions, 16.7% have procedural errors, 67% have strategic errors, and 28.6% have logical errors on addition and subtraction of directed numbers. The sources of the errors seemed to be lack of reference to mediating artifacts such as number lines or other real contextual situations when learning to deal with directed numbers. Learners seemed obsessed with positive numbers and addition operation frames—the first number ideas they encountered in school. They could not easily accommodate negative numbers or the subtraction operation involving negative integers. Another stumbling block seemed to be poor proficiency in English, which is the language of teaching and learning mathematics. The study recommends that building conceptual understanding on directed numbers and operations on them must be encouraged through use of multirepresentations and other contexts meaningful to learners. For that reason, we urge delayed use of calculators. © 2016, © The Author(s) 2016.

AUTHOR KEYWORDS: communication; curriculum; education; mathematics; perceptions; social sciences

DOCUMENT TYPE: Article

SOURCE: Scopus

Qazi, M.A.a , Shannon, D.M.b , Jenda, O.c , McCullough, B.d , Griffin, G.e , Lunn, A.M.f

A mentoring bridge model to prepare students with disabilities in the stem fields at Tuskegee university

(2016) Journal of Women and Minorities in Science and Engineering, 22 (3), pp. 183-197.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006375044&partnerID=40&md5=592a3fc60e82152b4d1e68351cd574de

AFFILIATIONS: Department of Mathematics, Tuskegee University, Tuskegee, AL, United States;

Department of Educational Foundations, Leadership, and Technology, Auburn University, Auburn, AL, United States;

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Office of the Provost-Special Projects and Initiatives, Auburn University, Auburn, AL, United States;

Departments of Biology & Psychology, Hope College, Holland, MI, United States;

Counseling Center, Tuskegee University, Tuskegee, AL, United States

ABSTRACT: This article seeks to describe programmatic elements of a successful novel model established at Tuskegee University, one of the oldest Historically Black Institutions in the country, to increase degree production among students with disabilities in Science, Technology, Engineering and Mathematics (STEM) and their representation in the STEM workforce. Qualitative and quantitative program outcomes are discussed. © 2016 by Begell House, Inc.

AUTHOR KEYWORDS: Broadening participation; Higher education; Mentoring bridge model; STEM fields; Students with disabilities

DOCUMENT TYPE: Article

SOURCE: Scopus

Ismail, R.a , Ismail, Z.a , Yusof, Y.M.b

Blended learning environment in tertiary education: A meta-analysis

(2016) Advanced Science Letters, 22 (12), pp. 4263-4266.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85011948995&doi=10.1166%2fasl.2016.8122&partnerID=40&md5=b98c6845151e4ad70aee6df052fb4f00

DOI: 10.1166/asl.2016.8122

AFFILIATIONS: Department of Educational Science, Mathematics and Creative Multimedia, Faculty of Education, UTM, Skudai, Johor, Malaysia;

Department of Mathematical Science, Faculty of Science, Universiti Teknologi Malaysia, UTM, Skudai, Johor, Malaysia

ABSTRACT: There are many ways to implement blended learning, among them are online learning, e-learning, mathematical softwares, and web-based learning. For new practitioners, it is important to determine the best practices in blended learning system to ensure successes. This paper studies a meta-analysis of a blended environment. It was conducted by searching previous studies between 2000 to present (2016), which used some keywords such as mathematical competency and blended learning. The aims of this meta-analysis are to investigate the types of blended learning implemented in the tertiary education, especially in mathematics education and their impact towards learning. The result shows e-learning most frequently used within 2000 to present. The embedded e-learning as a mediated-technology tool in a blended environment assists of conceptual understanding, especially in engineering courses and makes it easier to seek the solution in problem-solving. © 2016 American Scientific Publishers All rights reserved.

AUTHOR KEYWORDS: Blended learning; E-learning; Tertiary education

DOCUMENT TYPE: Article

SOURCE: Scopus

Connors-Kellgren, A.a , Parker, C.E.b , Blustein, D.L.a , Barnett, M.a

Innovations and Challenges in Project-Based STEM Education: Lessons from ITEST

(2016) Journal of Science Education and Technology, 25 (6), pp. 825-832.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84994475011&doi=10.1007%2fs10956-016-9658-9&partnerID=40&md5=b2517bb6585a42345a56dd78c3ce2a84

DOI: 10.1007/s10956-016-9658-9

AFFILIATIONS: Boston College Lynch School of Education, Chestnut Hill, Boston, MA, United States;

STEM Learning and Research (STELAR) Center at EDC, Waltham, MA, United States

ABSTRACT: For over a decade, the National Science Foundation’s Innovative Technology Experiences for Students and Teachers (ITEST) program has funded researchers and educators to build an understanding of best practices, contexts, and processes contributing to K-12 students’ motivation and participation in Science, Technology, Engineering, and Mathematics (STEM) activities that lead to STEM career pathways. The outcomes from these projects have contributed significantly to the national body of knowledge about strategies, successes, models, and interventions that support and encourage youth to pursue STEM careers. While the individual projects discussed in this special issue vary by geographic location, institution, populations served, primary focus, and topic, they are unified by ITEST’s programmatic intent and goals. This issue offers research-based insights into the knowledge generated by a decade of ITEST-funded work in STEM career development. The articles describe a multitude of approaches to project design, evaluation, and empirical research. Collectively, they contribute to the development of frameworks for STEM education and workforce development that are increasingly relevant for educators, project designers, researchers, and policy makers. The ITEST program has enabled creativity, experimentation, and cultural responsiveness in STEM education and workforce development and broadened participation in STEM initiatives to Native American communities, underresourced urban communities, girls, and populations underrepresented in STEM fields. By approaching research and evaluation with flexibility and resourcefulness, the authors provide empirical evidence for the value of innovative approaches to STEM education that promote STEM interest and career-related outcomes and that build the foundational skills of the scientific and engineering workforce of the future. © 2016, Springer Science+Business Media New York.

AUTHOR KEYWORDS: ITEST; Science education; STEM career development; STEM education; STEM engagement; Workforce innovation

DOCUMENT TYPE: Article

SOURCE: Scopus

Noori, N.a , Beveridge, A.b , Isler, V.a

Pursuit-evasion: A tool kit to make applications more accessible

(2016) IEEE Robotics and Automation Magazine, 23 (4), art. no. 7727949, pp. 138-149.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84994218523&doi=10.1109%2fMRA.2016.2540138&partnerID=40&md5=30d9fb133bfede18521e7206b576d0d6

DOI: 10.1109/MRA.2016.2540138

AFFILIATIONS: University of Minnesota, Minneapolis, MN, United States;

Macalester College, Saint Paul, MN, United States

ABSTRACT: A pursuit-evasion game takes place between two players. The pursuer is charged with capturing the evader while the evader tries to avoid getting caught. Many robotics applications such as search, tracking, and surveillance can be modeled as pursuit-evasion games. Equally important, these games can be modeled as fun mathematics problems to inspire newcomers to the field of robotics. We have witnessed this firsthand during summer Research Experiences for Undergraduates programs at the Institute for Mathematics and its Applications, located at the University of Minnesota. The subject is accessible, with many open problems that require creativity, insight, and strong algorithmic thinking. Our summer students digested the basics of the field and developed results that evolved into research publications [1], [2]. The purpose of this article is to provide a "tool kit" so as to make pursuit- evasion games accessible to a broader audience. We focus on a classical game known as the lion and man game, where the lion pursues the man, moving with equal speed. Rather than a traditional survey of literature on the lion and man game, the article is organized in a tutorial fashion. We start from simple motivating examples whose solutions are accessible to anyone with a high-school background in geometry and trigonometry. Our journey takes us to open variants such as pursuit-evasion on surfaces. Along the way, we introduce tactics that can be used as building blocks in different settings. The material in the earlier sections of the article provides a starting point for science, technology, engineering, and mathematics (STEM) educators looking for an engaging robotics problem accessible to high-school and undergraduate students. Simultaneously, we provide an introduction for researchers who would like to tackle one of the most challenging path-planning problems. We conclude with open problems for the researchers and exercises to engage students. Let's dive right in!. © 2016 IEEE.

DOCUMENT TYPE: Article

SOURCE: Scopus

Barrett, T.J., Hegarty, M.

Effects of interface and spatial ability on manipulation of virtual models in a STEM domain

(2016) Computers in Human Behavior, 65, pp. 220-231.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84984629793&doi=10.1016%2fj.chb.2016.06.026&partnerID=40&md5=f91457443f1bb837d4a55345a04584ec

DOI: 10.1016/j.chb.2016.06.026

AFFILIATIONS: Department of Psychological and Brain Sciences, University of California, Santa Barbara, United States

ABSTRACT: Virtual models are increasingly employed in STEM education to foster learning about spatial phenomena. However, the roles of the computer interface and students’ cognitive abilities in moderating learning and performance with virtual models are not yet well understood. In two experiments students solved spatial organic chemistry problems using a virtual model system. Two aspects of the virtual model interface were manipulated: display dimensionality (stereoscopic vs. monoscopic displays) and the location of the hand-held device used to manipulate the virtual molecules (co-located with the visual display vs. displaced). The experimental task required participants to interpret the spatial structure of organic molecules and to manipulate the models to align them with orientations and configurations depicted by diagrams in Experiment 1 and three-dimensional models in Experiment 2. Co-locating the interaction device with the virtual image led to better performance in both experiments and stereoscopic viewing led to better performance in Experiment 2. The effect of co-location on performance was moderated by spatial ability in Experiment 1, and the effect of providing stereo viewing was moderated by spatial ability in Experiment 2. The results are in line with the ability-as-compensator hypothesis: participants with lower ability uniquely benefited from the treatment, while those with higher ability were not affected by stereo or co-location. The findings suggest that increased fidelity in a virtual model system may be one way of alleviating difficulties of low-spatial participants in learning spatially demanding content in STEM domains. © 2016 Elsevier Ltd

AUTHOR KEYWORDS: Chemistry education; Interface design; Molecular models; Spatial ability; Stereo; Virtual environments

DOCUMENT TYPE: Article

SOURCE: Scopus

Stevens, S.a , Andrade, R.a , Page, M.b

Motivating Young Native American Students to Pursue STEM Learning Through a Culturally Relevant Science Program

(2016) Journal of Science Education and Technology, 25 (6), pp. 947-960.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85002763715&doi=10.1007%2fs10956-016-9629-1&partnerID=40&md5=7506db4b54272473b966dee5affe6f2a

DOI: 10.1007/s10956-016-9629-1

AFFILIATIONS: Southwest Institute for Research on Women, University of Arizona, 925 N. Tyndall, Tucson, AZ, United States;

Evaluation Research and Development, University of Arizona, Tucson, AZ, United States

ABSTRACT: Data indicate that females and ethnic/race minority groups are underrepresented in the science and engineering workforce calling for innovative strategies to engage and retain them in science education and careers. This study reports on the development, delivery, and outcomes of a culturally driven science, technology, engineering, mathematics (STEM) program, iSTEM, aimed at increasing engagement in STEM learning among Native American 3rd–8th grade students. A culturally relevant theoretical framework, Funds of Knowledge, informs the iSTEM program, a program based on the contention that the synergistic effect of a hybrid program combining two strategic approaches (1) in-school mentoring and (2) out-of-school informal science education experiences would foster engagement and interest in STEM learning. Students are paired with one of three types of mentors: Native American community members, university students, and STEM professionals. The iSTEM program is theme based with all program activities specifically relevant to Native people living in southern Arizona. Student mentees and mentors complete interactive flash STEM activities at lunch hour and attend approximately six field trips per year. Data from the iSTEM program indicate that the program has been successful in engaging Native American students in iSTEM as well as increasing their interest in STEM and their science beliefs. © 2016, Springer Science+Business Media New York.

AUTHOR KEYWORDS: Funds of Knowledge; Informal science; K-12; Mentoring; Native American; STEM learning

DOCUMENT TYPE: Article

SOURCE: Scopus

Gresham, K.C.a , Palma, C.b , Polsgrove, D.E.c , Chun, F.K.c , Della-Rose, D.J.c , Tippets, R.D.c

Education and outreach using the falcon telescope network

(2016) Acta Astronautica, 129, pp. 130-134.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84987974286&doi=10.1016%2fj.actaastro.2016.09.006&partnerID=40&md5=40ad1681690a48a45934a38e4eb00351

DOI: 10.1016/j.actaastro.2016.09.006

AFFILIATIONS: Universities Space Research Association, United States Air Force AcademyColorado, United States;

Department of Astronomy and Astrophysics, The Pennsylvania State University, United States;

Department of Physics, United States Air Force AcademyColorado, United States

ABSTRACT: The Falcon Telescope Network (FTN) is a global network of small aperture telescopes developed by the Center for Space Situational Awareness Research in the Department of Physics at the United States Air Force Academy (USAFA). Consisting of commercially available equipment, the FTN is a collaborative effort between USAFA and other educational institutions ranging from two- and four-year colleges to major research universities. USAFA provides the equipment (e.g. telescope, mount, camera, filter wheel, dome, weather station, computers and storage devices) while the educational partners provide the building and infrastructure to support an observatory. The user base includes USAFA along with K-12 and higher education faculty and students. The diversity of the users implies a wide variety of observing interests, and thus the FTN collects images on diverse objects, including satellites, galactic and extragalactic objects, and objects popular for education and public outreach. The raw imagery, all in the public domain, will be accessible to FTN partners and will be archived at USAFA. Currently, there are five Falcon telescopes installed, two in Colorado and one each in Pennsylvania, Chile, and Australia. These five telescopes are in various stages of operational capability but all are remotely operable via a remote desktop application. The FTN team has conducted STEM First Light Projects for three of the U.S. observatories, soliciting proposals from middle and high school students and teachers that suggest and then become what is observed as official STEM first-light objects. Students and teachers learn how to write and submit a proposal as well as how telescopes operate and take data, while university-level students at the U.S. Air Force Academy and The Pennsylvania State University learn how to evaluate proposals and provide feedback to the middle and high school students and teachers. In this paper, we present the current status of the FTN, details of and lessons learned from the STEM First Light Project, and feedback from middle and high school students and teachers. © 2016 IAA.

DOCUMENT TYPE: Article

SOURCE: Scopus

Peterman, K.a , Kermish-Allen, R.b , Knezek, G.c , Christensen, R.d , Tyler-Wood, T.c

Measuring Student Career Interest within the Context of Technology-Enhanced STEM Projects: A Cross-Project Comparison Study Based on the Career Interest Questionnaire

(2016) Journal of Science Education and Technology, 25 (6), pp. 833-845. Cited 1 time.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84961636950&doi=10.1007%2fs10956-016-9617-5&partnerID=40&md5=86b3f1821699474ff84cbdfa52d8b21f

DOI: 10.1007/s10956-016-9617-5

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Department of Learning Technologies, University of North Texas, 3940 N. Elm, Denton, TX, United States;

Institute for the Integration of Technology into Teaching and Learning, University of North Texas, Denton, TX, United States

ABSTRACT: This article describes Energy for ME and Going Green! Middle Schoolers Out to Save the World, two Science, Technology, Engineering, and Mathematics (STEM) education programs with the common goal of improving students’ attitudes about scientific careers. The authors represent two project teams, each with funding from the National Science Foundation’s ITEST program. Using different approaches and technology, both projects challenged students to use electricity monitoring system data to create action plans for conserving energy in their homes and communities. The impact of each project on students’ career interests was assessed via a multi-method evaluation that included the Career Interest Questionnaire (CIQ), a measure that was validated within the context of ITEST projects and has since become one of the instruments used most commonly across the ITEST community. This article explores the extent to which the CIQ can be used to document the effects of technology-enhanced STEM educational experiences on students’ career attitudes and intentions in different environments. The results indicate that the CIQ, and the Intent subscale in particular, served as significant predictors of students’ self-reported STEM career aspirations across project context. Results from each project also demonstrated content gains by students and demonstrated the impact of project participation and gender on student outcomes. The authors conclude that the CIQ is a useful tool for providing empirical evidence to document the impact of technology-enhanced science education programs, particularly with regard to Intent to purse a STEM career. The need for additional cross-project comparison studies is also discussed. © 2016, Springer Science+Business Media New York.

AUTHOR KEYWORDS: Career attitudes; Energy; Outcomes

DOCUMENT TYPE: Article

SOURCE: Scopus

Moreno, N.P., Tharp, B.Z., Vogt, G., Newell, A.D., Burnett, C.A.

Preparing Students for Middle School Through After-School STEM Activities

(2016) Journal of Science Education and Technology, 25 (6), pp. 889-897.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84986274553&doi=10.1007%2fs10956-016-9643-3&partnerID=40&md5=d2c3b931b78351ecdbe39534c3b8b72d

DOI: 10.1007/s10956-016-9643-3

AFFILIATIONS: Baylor College of Medicine, Houston, TX, United States

ABSTRACT: The middle school years are a crucial time for cultivating students’ interest in and preparedness for future STEM careers. However, not all middle school children are provided opportunities to engage, learn and achieve in STEM subject areas. Engineering, in particular, is neglected in these grades because it usually is not part of science or mathematics curricula. This study investigates the effectiveness of an engineering-integrated STEM curriculum designed for use in an after-school environment. The inquiry-based activities comprising the unit, Think Like an Astronaut, were intended to introduce students to STEM careers—specifically engineering and aerospace engineering—and enhance their skills and knowledge applicable related to typical middle school science objectives. Results of a field test with a diverse population of 5th grade students in nine schools revealed that Think Like an Astronaut lessons are appropriate for an after-school environment, and may potentially help increase students’ STEM-related content knowledge and skills. © 2016, Springer Science+Business Media New York.

AUTHOR KEYWORDS: After school; Engineering education; Middle school preparedness; STEM

DOCUMENT TYPE: Article

SOURCE: Scopus

Bass, K.M.a , Hu Dahl, I.b , Panahandeh, S.a

Designing the Game: How a Project-Based Media Production Program Approaches STEAM Career Readiness for Underrepresented Young Adults

(2016) Journal of Science Education and Technology, 25 (6), pp. 1009-1024.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84978757604&doi=10.1007%2fs10956-016-9631-7&partnerID=40&md5=80d800a62f6a10c754e1184e88aa7d8a

DOI: 10.1007/s10956-016-9631-7

AFFILIATIONS: Rockman et al, 595 Market Street, Suite 2570, San Francisco, CA, United States;

Bay Area Video Coalition, 2727 Mariposa Street, 2nd Floor, San Francisco, CA, United States

ABSTRACT: Numerous studies have indicated a need for a diverse workforce that is more highly educated in STEM and ICT fields, and one that is capable of responding creatively to demands for continual innovation. This paper, in response, chronicles the implementation of the Digital Pathways (DP) program, a two-time ITEST recipient and an ongoing initiative of the Bay Area Video Coalition. DP has provided low-income, underrepresented minority young people with 180 contact hours of activities in digital media production to prepare them to pursue higher education and technology careers. A design-based research approach synthesizes staff interviews with student observations, interviews and artifacts to identify a set of generalizable best practices or design principles for empowering young people to move from being consumers of digital media to producers. These principles are illustrated with a case study of the 3D Animation and Gaming track from the second ITEST grant. Researchers argue for the importance of attending to the noncognitive elements of learning and illustrate ways in which instructors encouraged creative expression, personal agency, and collaboration through long-term projects. They also identify strategies for sustaining young people’s participation through the establishment of a supportive community environment. © 2016, Springer Science+Business Media New York.

AUTHOR KEYWORDS: Digital media production; Gaming; Science Technology Engineering Arts and Mathematics (STEAM); Twenty-first-century skills; Workforce development

DOCUMENT TYPE: Article

SOURCE: Scopus

Liu, Y.-N.a , Chen, H.-Y.a , Gilani, S.M.M.b

A cloud-assisted architecture for content distribution in mobile peer to peer networks

(2016) Journal of Digital Information Management, 14 (6), pp. 403-412.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85010972068&partnerID=40&md5=478dd69ec164325e2daff594a03ec7d0

AFFILIATIONS: School of Communication and Information Engineering, Chongqing University of Posts and Telecommunications, Chongqing, China;

University Institute of Information Technology, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi, Punjab, Pakistan

ABSTRACT: Content distribution is a key technology to achieve data sharing among mobile terminals in Mobile Peer to Peer (MP2P) networks. Nevertheless, in the dynamic/mobile environment, the poor computing ability and storage capability of a single node make it difficult to share the content among nodes. In order to enhance the capability of the mobile terminals and improve the efficiency of content distribution, a cloud-assisted architecture to offload the heavy computation load from the mobile nodes to the cloud was put forward. Furthermore, a Multi-Tree Structure of Internal Node Disjoint (MTSIND) data transfer topology was proposed, in which their internal nodes are disjoint, thus each node can take part in the content delivery tasks. Finally, an exclusive-OR (XOR) network coding method based on vertex coloring problem was established to reduce the number of transmissions and power consumption. Simulation and numerical results were provided to support the analyses and results. Results show that the content distribution mechanism can reduce the total number of the data packets and the energy consumption. The study proves that the research of content distribution mechanism on MP2P has a great significance on reducing the number of data transmissions, lowering the power consumption of terminals and increasing the resource utilization of mobile nodes.

AUTHOR KEYWORDS: Cloud-assisted architecture; Content distribution; Mobile peer to peer network this work is partially supported by nsfc China (no. 61501075); Network coding; Scientific and technological research program of chongqing municipal education commission

DOCUMENT TYPE: Article

SOURCE: Scopus

Selcen Guzey, S.a , Harwell, M.b , Moreno, M.b , Peralta, Y.b , Moore, T.J.c

The Impact of Design-Based STEM Integration Curricula on Student Achievement in Engineering, Science, and Mathematics

(2016) Journal of Science Education and Technology, pp. 1-16. Article in Press.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-84997646360&doi=10.1007%2fs10956-016-9673-x&partnerID=40&md5=38f28eb52b8f1630a5e962e758040873

DOI: 10.1007/s10956-016-9673-x

AFFILIATIONS: Department of Curriculum and Instruction and Department of Biological Sciences, Purdue University, West Lafayette, IN, United States;

Department of Educational Psychology, University of Minnesota, Minneapolis, MN, United States;

School of Engineering Education, Purdue University, West Lafayette, IN, United States

ABSTRACT: The new science education reform documents call for integration of engineering into K-12 science classes. Engineering design and practices are new to most science teachers, meaning that implementing effective engineering instruction is likely to be challenging. This quasi-experimental study explored the influence of teacher-developed, engineering design-based science curriculum units on learning and achievement among grade 4–8 students of different races, gender, special education status, and limited English proficiency (LEP) status. Treatment and control students (n = 4450) completed pretest and posttest assessments in science, engineering, and mathematics as well as a state-mandated mathematics test. Single-level regression results for science outcomes favored the treatment for one science assessment (physical science, heat transfer), but multilevel analyses showed no significant treatment effect. We also found that engineering integration had different effects across race and gender and that teacher gender can reduce or exacerbate the gap in engineering achievement for student subgroups depending on the outcome. Other teacher factors such as the quality of engineering-focused science units and engineering instruction were predictive of student achievement in engineering. Implications for practice are discussed. © 2016 Springer Science+Business Media New York

AUTHOR KEYWORDS: Engineering curriculum; Engineering integration; STEM; Student learning

DOCUMENT TYPE: Article in Press

SOURCE: Scopus

Sharma, R., Shen, H., Goodwin, R.

Voluntary participation in discussion forums as an engagement indicator: An empirical study of teaching first-year programming

(2016) Proceedings of the 28th Australian Computer-Human Interaction Conference, OzCHI 2016, pp. 489-493.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85012012689&doi=10.1145%2f3010915.3010967&partnerID=40&md5=528bdb3736c1f774d0518295a36ac327

DOI: 10.1145/3010915.3010967

AFFILIATIONS: School of Computer Science, Engineering and Mathematics, Flinders University, Adelaide, Australia

ABSTRACT: Computer programming is a required skill for most STEM (Science, Technology, Engineering and Mathematics) students. However, teaching novices programming has long been considered a big challenge by computer science educators as manifested by the observation that first-year programming topics tend to have a higher failure rate than other first-year topics. Existing studies have discovered that lack of engagement in learning programming is a key determinant of a student's poor performance. Therefore, it is beneficial to perceive a student's lack of engagement so that appropriate actions can be taken ahead of time. However, first year topics especially programming topics usually have very large enrolments, making it hard for a lecturer to keep track of each individual student's engagement level. As learning management systems (LMS) have been widely adopted by universities, in this paper we suggest using a student's voluntary participation in a programming topic's discussion forum provided by LMS as an engagement indicator so that the lecturer can constantly monitor and re-engage those who present low or no engagement. This recommendation is based on an empirical study of a first-year programming topic that reveals a positive correlation between one's voluntary participation in peer interaction through the topic's discussion forum and one's learning outcome in the topic. Copyright © 2016 ACM.

AUTHOR KEYWORDS: Discussion forum; Empirical study; Engagement; First-year programming; Learning management system

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Kalloo, V.a , Mohan, P.a , Kinshukb

An investigative process for enhancing the design of a mathematics learning game

(2016) Proceedings - IEEE 16th International Conference on Advanced Learning Technologies, ICALT 2016, art. no. 7756937, pp. 117-119.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006856486&doi=10.1109%2fICALT.2016.20&partnerID=40&md5=5f2145f728c2bddc6d2f662554b1a365

DOI: 10.1109/ICALT.2016.20

AFFILIATIONS: Department of Computing and Information Technology, University of West Indies, Trinidad and Tobago;

School of Computing and Information Technology, Athabasca University, Canada

ABSTRACT: In this paper, the authors present an investigative process which can be used to enhance the design of mathematics learning games. Several techniques such as mathematics pedagogy and game design lenses [12] were studied in the development of this investigative process. Game design lenses are tools developed for examining game designs. The game design lenses were analyzed and mapped to several mathematics-specific teaching and learning theories. The authors present a mapping of the lenses to the learning theories and the resultant process investigates and incorporates suitable theories into a mathematics game design. This paper presents a process for incorporating necessary teaching and learning theories into mathematics learning games. © 2016 IEEE.

AUTHOR KEYWORDS: Educational game design; Game design; Game design lenses; Learning games; Mathematics learning games; Mathematics pedagogy; Serious games

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Zintgraff, C.a , Fuller, E.b

Why power and careers with mathematics: How middle school students responded in a virtual world

(2016) Proceedings - IEEE 16th International Conference on Advanced Learning Technologies, ICALT 2016, art. no. 7757045, pp. 538-539.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006886594&doi=10.1109%2fICALT.2016.144&partnerID=40&md5=1ed7aaf187b844b2861c2d308eb4911a

DOI: 10.1109/ICALT.2016.144

AFFILIATIONS: Department of Learning Technologies, University of North Texas, Denton, TX, United States;

Department of Education Policy Studies, Penn State University, University Park, PA, United States

ABSTRACT: Middle school students participated in WhyPower, a virtual power plant activity in Whyville, a learning-based virtual world for teens and tweens. Pre- And post-activity surveys included measurement of interest in careers involving mathematics. Statistical analysis revealed that students with strong positive views of mathematics-related careers were unaffected, but other students moved strongly toward interest in careers involving mathematics. Citing related literature, the authors speculate that student self-efficacy may have increased as students virtually experienced mathematics-related careers. © 2016 IEEE.

AUTHOR KEYWORDS: Careers; Mathematics; Self-efficacy; Virtual worlds; Whypower; Whyville

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Moore, C.P., Watterson, C.A., Eldgridge, J.A.

Practical laboratory classes to improve engagement and achievement amongst engineering students taking first-year mathematics

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757667, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006750224&doi=10.1109%2fFIE.2016.7757667&partnerID=40&md5=1cdc12bc151202779911faf64249c95c

DOI: 10.1109/FIE.2016.7757667

AFFILIATIONS: School of Engineering and Computer Science, Victoria University of Wellington, Wellington, New Zealand

ABSTRACT: We describe the planning, delivery, and assessment of laboratory classes offered as part of two first-year mathematics courses for engineering students. The laboratory classes, which use practical examples inspired by second-, third- and fourth-year engineering courses, were designed to illustrate the relevance of mathematics to engineering. Once these classes were introduced the percentage of engaged students increased by up to a third, leading to similar improvements in pass rates and median marks. © 2016 IEEE.

AUTHOR KEYWORDS: 21st century learning; Engineering; Mathematics; Problem-based learning

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Dasgupta, A., Purzer, S.

No patterns in pattern recognition: A systematic literature review

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757676, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006788281&doi=10.1109%2fFIE.2016.7757676&partnerID=40&md5=61698eae93c79072a676782c3f935a7e

DOI: 10.1109/FIE.2016.7757676

AFFILIATIONS: School of Engineering Education, Purdue University, West Lafayette, IN, United States

ABSTRACT: Pattern recognition is one of the fundamental competencies associated with computational thinking and STEM education. Although much has been written to define computational thinking (CT), we argue that CT is a multi-faceted construct and specific aspects of CT (such as pattern recognition) should be examined. The purpose of this study is to conduct a systematic review of literature on pattern recognition to define pattern recognition as an aspect of computational thinking. The synthesis included the Engineering Village database (Compendex and INSPEC). We searched peer reviewed articles and the keywords, pattern recognition, pattern generalization and education. The initial search resulted in 208 articles. The screening of abstracts more closely resulted in 17 relevant articles, which were then read in detail by two researchers. The review of this pool resulted in two relevant articles, one with a focus on mathematics education and the other one in the context of medical education. Surprisingly there were no articles that examined pattern recognition as part of engineering or computer education. Further research examining specific aspects of CT is necessary. © 2016 IEEE.

AUTHOR KEYWORDS: Computational thinking; Computer education; Computing; Pattern generalization; Pattern recognition; STEM

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Bojic, I.a , Podobnik, V.c , Arratia, J.F.c , Grgic, M.b

Supporting economically disadvantaged students from Nicaragua in STEM-C fields

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757526, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006716776&doi=10.1109%2fFIE.2016.7757526&partnerID=40&md5=fe8a1a8777d83cd717ef16f3311230f5

DOI: 10.1109/FIE.2016.7757526

AFFILIATIONS: SENSEable City Laboratory, Singapore-MIT Alliance for Research and Technology, 1 Create Way, Singapore, Singapore;

Faculty of Electrical Engineering and Computing, University of Zagreb, Unska 3, Zagreb, Croatia;

Stud. Research Development Center, Ana G. Mendez University System, 1399 Ave. Ana G Mendez, San Juan, Puerto Rico

ABSTRACT: Even students who are provided with currently best available education in Science, Technology, Engineering, Mathematics and Computer Science (STEM-C) fields are having problems coping with living in the modern world where technological advancements happen on a daily basis, let alone students coming from economically disadvantaged backgrounds. In a world where institutions offering formal education have to collaborate with individuals and groups of people interested in providing informal education, it is of a vital importance to set up good examples and share them with communities that are less experienced. In this paper we present how Student Research Development Center's (SRDC) best practices of establishing a pre-college pipeline for young economically disadvantage minority students, who are interested in STEM-C fields, from Puerto Rico are being transferred to Universidad Catolica de Nicaragua (UNICA). The goal of the paper is to show how we developed a partnership between Puerto Rico and Nicaragua, and used lessons learned in Puerto Rico to involve undergraduate and pre-college students from Nicaragua in research program using project based learning in STEM-C fields. © 2016 IEEE.

AUTHOR KEYWORDS: Informal and formal education; Project based learning; Puerto Rico

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Bigotte, M.E.a , Gomes, A.a , Branco, J.R.a , Pessoa, T.b

The influence of educational learning paths in academic success of mathematics in engineering undergraduate

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757453, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006783190&doi=10.1109%2fFIE.2016.7757453&partnerID=40&md5=7c2b5b2da5ad68ebc67823e448a24b2e

DOI: 10.1109/FIE.2016.7757453

AFFILIATIONS: Engineering Institute of Polytechnic Institute of Coimbra, Center for Informatics and Systems, University of Coimbra, Coimbra, Portugal;

Faculty of Psycholgy and Educational Sciences, University of Coimbra, Coimbra, Portugal

ABSTRACT: Issues related to the failure of mathematics in the teaching of engineering and the negative impact that these difficulties have in various courses in engineering degrees is a problem to which we have devoted our attention and investigation. Most students when entering higher education have insufficient preparation in mathematics. It is further aggravated because of the different areas of knowledge from their background when entering degrees in Engineering. The Mathematics in Engineering Support Center (CeAMatE) is a space intended to monitor students who attend the course of 'Differential and Integral Calculus'. It allows the construction of an academic course that promotes the development of students' independent study skills, with the joint responsibility of building their own educational paths. It also facilitates the construction of learning and acquisition of new knowledge through the availability of various activities and resources aimed at overcoming students' difficulties. It also incorporates an e-learning component, adapting to the learning styles and cognitive levels of students. The understanding of the educational pathways made by students who attended CeAMatE and the corresponding academic achievement in 'Differential and Integral Calculus' course is a goal of this study. This analysis will permit a better development of a set of suitable mathematical strategies/activities. © 2016 IEEE.

AUTHOR KEYWORDS: Blended learning; Engineering; Learning paths; Mathematics

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Ureel, L.C., II, Wallace, C.

Discrete mathematics for computing students: A programming oriented approach with alloy

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757641, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006821433&doi=10.1109%2fFIE.2016.7757641&partnerID=40&md5=8441876c7647c187b80b56ff5d266157

DOI: 10.1109/FIE.2016.7757641

AFFILIATIONS: Department of Computer Science, Michigan Technological University, Houghton, MI, United States

ABSTRACT: Students in computing disciplines need a strong basis in the fundamentals of discrete mathematics. Traditional "offline" approaches to teaching this material provide limited opportunities for the kind of interactive learning that students experience in their programming assignments. We have been using the Alloy language and analysis tool to teach concepts in discrete structures and logic in an exploratory, programming-intensive way. We report on our efforts to build scaffolded Alloy exercises for newcomers to discrete mathematics, and we report on some initial findings based on our experiences with students. © 2016 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Duffy, G.a , Sorby, S.b , Nozaki, S.b , Bowe, B.c

Exploring the role of spatial cognition in problem solving

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757593, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006757006&doi=10.1109%2fFIE.2016.7757593&partnerID=40&md5=f56ad96ba0f44254ca5842f94ab05c05

DOI: 10.1109/FIE.2016.7757593

AFFILIATIONS: School of Electrical and Electronic Engineering, Dublin Institute of Technology, Dublin, Ireland;

Dept of Engineering Education, Ohio State University, Columbus, OH, United States;

College of Engineering and Built Environment, Dublin Institute of Technology, Dublin, Ireland

ABSTRACT: While spatial aptitude is acknowledged as a key cognitive ability that accompanies success in STEM education, less is reported about the qualitative differences between weak and strong visualisers in how they approach and engage with assessments in STEM education. In this paper, we study one particular aspect of the STEM curriculum-solving convergent 'word' problems in mathematics-in an attempt to discern quantitative and qualitative differences between the approaches weak and strong visualisers adopt when solving these problems. The paper is a work-in-progress that started with a search for suitable convergent mathematics problems which were then presented to a small sample of engineering students using a think aloud protocol. Participants were asked to think aloud while they solved the problems and to write their answers using a LiveScribe pen to concurrently record spoken and written responses. They also completed a spatial skills test. The magnitude and significance of the correlation between the spatial and mathematics tests scores were measured to be r =.79, p <.01. © 2016 IEEE.

AUTHOR KEYWORDS: Problem solving; Spatial skills

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Golubski, C.

Using inquiry-based learning in engineering statistics courses

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757451, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006815357&doi=10.1109%2fFIE.2016.7757451&partnerID=40&md5=88cf97dac3dee416cd4473e22221758d

DOI: 10.1109/FIE.2016.7757451

AFFILIATIONS: Department of STEM Education, University of Texas at Austin, Austin, TX, United States

ABSTRACT: Many engineering students struggle with a first course in statistics. One of the reasons for this is that statistics differs from 'traditional' mathematics curriculum, such as calculus and differential equations. Merely giving students problem sets does not teach them to think in a particular fashion, as statistics problems require the assimilation of more varied information than using formulas or even applying those formulas to situational (story) problems to solve for a particular variable or variables. Data rarely conforms to contrived values, so the student's ability to critically think and make decisions is of paramount importance. Since statistics is different from a traditional mathematics discipline, we feel it is necessary to differentiate instruction from a traditional mathematics class. Because statistics and data science requires considerable decision-making processes and analytical ability, we feel that elements of inquiry-based learning will be beneficial to students. These inquiry-based lessons will be provided in the form of POGIL, or Process-Oriented Guided Inquiry Learning, activities designed to lead small groups of students through specific material within a specific subject domain. © 2016 IEEE.

AUTHOR KEYWORDS: Engineering education; Inquiry-based learning; POGIL; Statistics education

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Yaprak, E.a , Crosby, K.a , Pierrakos, O.a , Ilumoka, A.a , Weatherton, Y.P.a , Douglas, E.b , Moore, J.b

National Science Foundation programs that support engineering education research

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757339, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006836465&doi=10.1109%2fFIE.2016.7757339&partnerID=40&md5=8a3fbd457dcf0b00bad85f0491f95dbf

DOI: 10.1109/FIE.2016.7757339

AFFILIATIONS: Division Undergraduate Education, Direct. of Education and Human Resources, National Science Foundation, Arlington, VA, United States;

Division of Engineering Education and Centers, Direct. of Engineering, National Science Foundation, Arlington, VA, United States

ABSTRACT: The goal of this session is to increase the participants' knowledge of current funding opportunities at the National Science Foundation (NSF) to support projects with potential significant impacts on science, technology, engineering, and mathematics (STEM) education. In particular, the discussion will focus on new and current funding opportunities in the Division of Undergraduate Education (DUE) in the Directorate of Education and Human Resources (EHR) and the Division of Engineering Education & Centers (EEC) in the Directorate of Engineering. During the session, we will provide examples of project activities that support STEM education research opportunities. The session will use a highly interactive format (i.e., team-based activities and discussion) to engage the participants, to clarify misconceptions, and to potentially initiate and share new ideas pertinent to engineering education research and innovations in classroom implementations. This session facilitates idea sharing and interaction amongst peers. © 2016 IEEE.

AUTHOR KEYWORDS: Curriculum development; Engineering education; Faculty development; Funding opportunities; National Science Foundation; Student learning; Student learning environments

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

De Santana, S.J.a , Paiva, R.b , Bittencourt, I.I.a , Ospina, P.E.c , De Amorim Silva, R.a , Isotani, S.d

Evaluating the impact of mars and venus effect on the use of an adaptive learning technology for Portuguese and mathematics

(2016) Proceedings - IEEE 16th International Conference on Advanced Learning Technologies, ICALT 2016, art. no. 7756914, pp. 31-35.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006922960&doi=10.1109%2fICALT.2016.58&partnerID=40&md5=0ed062a1a3b05289210681b55657354f

DOI: 10.1109/ICALT.2016.58

AFFILIATIONS: Computing Institute - IC, Federal University of Alagoas - UFAL, Maceio, Brazil;

Computing and Systems Department - DSC, Federal University of Campina Grande - UFCG, Campina Grande, Brazil;

Center of Exact Sciences and Nature - CCEN, Federal University of Pernambuco - UFPE, Recife, Brazil;

Mathematics and Computer Science Institute - ICMC, University of São Paulo - USP, Sao Paulo, Brazil

ABSTRACT: Some recent studies discussed the pros and cons of gender difference in the use of intelligent educational technologies. According to these studies, there is a difference in behavior, attitude, learning and emotion. However, most of the studies were conducted for Mathematics and in a well developed ecological setting. In this work, we investigated the Mars and Venus Effect, by measuring together different variables, such as learning performance (in Portuguese and Mathematics), age, location area, and learning technology. The study was a random pre/posttest control group experimental design, on which 191 students from public schools in Brazil participated. The experimental group used an adaptive learning technology (called MeuTutor) for nine months, while the control group did not use any educational technology during the study. The most relevant results are: i) the use of the adaptive learning technology improves student's performance in Mathematics and Portuguese for both male and female students, ii) the improvement of male student's performance is more significant, against female students, iii) when we focus on technology, male students had better performance in mathematics, but no significant difference in Portuguese. © 2016 IEEE.

AUTHOR KEYWORDS: Adaptive Learning Technology; Controlled Experiment; Gender Difference; Mars and Venus Effect

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Hsiao, I.Y.T.a , Yang, S.J.H.a , Wei, Y.-H.a , Chang, T.-L.b , Lan, Y.-J.c

Creating a 3D game-based learning system in a virtual world for low-achieving students in mathematics

(2016) Proceedings - IEEE 16th International Conference on Advanced Learning Technologies, ICALT 2016, art. no. 7757039, pp. 518-519.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006857934&doi=10.1109%2fICALT.2016.37&partnerID=40&md5=63dd0816adf901aa0730d45b1033b926

DOI: 10.1109/ICALT.2016.37

AFFILIATIONS: Department of Computer Science and Information Engineering, National Central University, Taoyuan, Taiwan;

Chian Long Elementary School, Taoyuan, Taiwan;

Department of Applied Chinese Language and Culture, National Taiwan Normal University, Taipei, Taiwan

ABSTRACT: Elementary school students' mathematical ability plays an important role in the development of their future, but the proportion of low-achieving elementary students in mathematics in Taiwan is high due to their aversion to mathematics. The aim of this study is to establish a learning system to help low-achieving students' learning in mathematics. A 3D game-based learning system was developed in this study to achieve the aim and the students' learning outcomes were measured by the pre, post-test and their learning logs in the system. The participants were 6 elementary school lowachieving students studying in Northern Taiwan. The results showed that the system improved their learning outcomes. The design of the system can also be a reference for developing future virtual learning systems for mathematics. © 2016 IEEE.

AUTHOR KEYWORDS: Digital gamebased learning; Mathematic learning; Second life

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Fang, N., Lawanto, O., Goodridge, W., Villanueva, I.

Research experiences for undergraduates (REU) on self-regulated learning in engineering education

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757480, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006817294&doi=10.1109%2fFIE.2016.7757480&partnerID=40&md5=8085736dcf6caded47063fe8e4aa1e67

DOI: 10.1109/FIE.2016.7757480

AFFILIATIONS: Department of Engineering Education, Utah State University, Logan, UT, United States

ABSTRACT: Undergraduate research is one of the best practices to improve student learning and has a positive lasting impact on students' career choices and success. Extensive literature review shows that the vast majority of undergraduate research programs focus on Science, Technology, Engineering, and Mathematics (STEM) disciplinary research. This work-in-progress paper presents a new Research Experiences for Undergraduates (REU) Site program that focuses on STEM education research rather than STEM disciplinary research. This work-in-progress paper describes the overall framework of our REU Site program, student recruitment and selection in our most recent Summer 2015 program, and four REU research projects that share a common intellectual focus on self-regulated learning in engineering education. Representative comments from undergraduate student participants are provided to demonstrate the positive impact of this REU Site program. © 2016 IEEE.

AUTHOR KEYWORDS: Engineering education; Research experiences for undergraduates (REU); Self-regulated learning

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Spanias, A.a , Banavar, M.K.c , Braun, H.a , Spanias, P.b , Zhang, Y.d

Development of course modules for multidisciplinary STEM education

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757416, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006802474&doi=10.1109%2fFIE.2016.7757416&partnerID=40&md5=eed69e39ef8a8c2069bb956889572954

DOI: 10.1109/FIE.2016.7757416

AFFILIATIONS: School of ECEE, Clarkson University, United States;

MLFTC, ASU, United States;

Dept. of ECE, Clarkson University, United States;

Dept. et, Prairie View A and M University, United States

ABSTRACT: Traditional STEM education models in electrical engineering and computer science rely on structured classes, laboratories, and textbooks to transfer key concepts. Even though this process meets most of the ABET objectives, it does not respond well to current workforce needs that require widely accessible programs that will provide a large pool of graduates with STEM backgrounds, analytical and programming skills, critical thinking, and leadership abilities. In this work in progress paper, we describe our efforts to motivate students to pursue studies in STEM areas. We accomplish this by creating and disseminating modules that demonstrate how math and engineering theory enable modern applications such as those embedded in wireless devices. © 2016 IEEE.

AUTHOR KEYWORDS: Digital Signal Processing; Mobile learning; Online learning; STEM Education

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Tolbert, D., Lehman, R., Liu, G., Sadler, B., Cardella, M.

Knowledge transfer: Does more experience yield improved design quality?

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757349, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006827275&doi=10.1109%2fFIE.2016.7757349&partnerID=40&md5=c36aad5259f065ce163c675c9429cd84

DOI: 10.1109/FIE.2016.7757349

AFFILIATIONS: School of Engineering Education, Purdue University, West Lafayette, IN, United States

ABSTRACT: Engineers must be able to transfer knowledge from previous experiences in order to solve complex engineering tasks. Transfer of knowledge is described as 'the learning process involved when a person learns to use previously acquired knowledge, skills, competence, or expertise in a new situation' Therefore, we sought to explore how previous engineering, design, and mathematics experiences impact the quality of a design solution. In this study, 23 first-year engineering students, with diverse mathematics and design experiences, participated in research study. In this study, each student completed a pre-study survey, designed a playground for a fictitious neighborhood while thinking aloud, and completed an interview immediately after completing the playground task. They were asked to reflect on previous mathematics and design experiences and asked to make comparisons between those experiences and the design study they had just completed. The design session and the interview were recorded and the design artifacts were collected. Using Hailikari's model, the research team investigated the how knowledge transfer may impact design solution quality. The findings of the research have implications for approaches educators can use to help students apply knowledge from previous experiences and design high quality solutions. © 2016 IEEE.

AUTHOR KEYWORDS: Design; Engineering; First-Year Engineering; Mathematics

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Pilotte, M.a , Bairaktarova, D.b

Autism spectrum disorder and engineering education-needs and considerations

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757566, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006789313&doi=10.1109%2fFIE.2016.7757566&partnerID=40&md5=5a5565ad9504593b8a152ca1478474c7

DOI: 10.1109/FIE.2016.7757566

AFFILIATIONS: School of Engineering Education, Purdue University, West Lafayette, IN, United States;

Department of Engineering Education, Virginia Tech, Blacksburg, VA, United States

ABSTRACT: Universities are experiencing an increase in enrollment of high-functioning students with autism spectrum disorder (ASD). Even though many students with ASD do not attend college, it is reported that students with this diagnosis who do, often come from well to do families, and select STEM (Science, Technology, Engineering, Mathematics) education areas at rates above both the general population, and other differently-abled groups. While students classified with this diagnosis may hail from privileged educational exposures and demonstrate higher cognitive abilities, they often lack the ability to empathize and experience difficulty to socially connect with others. This includes an inability to decode informal social cues, which can impact the ability to communicate ideas during classroom situations. Concurrent to this notable shift in STEM student demographics, the landscape of engineering education is also changing. Greater emphasis is placed on providing an engaging and interactive student learning environment, bolstered by research demonstrating improved learning outcomes and higher retention rates. This work in process is the development of an emergent literature review, looking for the intersection between this student diagnosis, and the impact on the engineering education classroom and related stakeholders. Our work is an important first step in informing and guiding faculty and staff engagement on this unique and growing student population, especially in light of a national focus on STEM education, and dynamic changes in engineering education. © 2016 IEEE.

AUTHOR KEYWORDS: Autism spectrum disorder; Engineering classroom; Engineering education; Inclusive instruction; Practice

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Xie, Y., Qian, K., He, J.

Multi-dimensional and customizable open-source labware for promoting big data analytical skills in STEM education

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757700, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006729144&doi=10.1109%2fFIE.2016.7757700&partnerID=40&md5=4d09aff81bec0faa78e28018c2933749

DOI: 10.1109/FIE.2016.7757700

AFFILIATIONS: Department of Computer Science, Kennesaw State University, Kennesaw, GA, United States

ABSTRACT: In order to remove resource barriers and smooth the learning curve for education on big data analytics in STEM disciplines, we develop an portable open source labware that is called STEM-BD for promoting education on big data analytics. STEM-BD integrates the following four critical components, big data platform, big data sets, data analytics algorithms and hands-on lab exercises in a multi-dimensional and customizable way. In this paper, we provide a detailed description of the design goal of STEM-BD, its prototype, preliminary evaluation results, and future development. © 2016 IEEE.

AUTHOR KEYWORDS: Big data; Component; Labware; STEM education

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Hasbun, T., Araya, A., Villalon, J.

Extracurricular activities as dropout prediction factors in higher education using decision trees

(2016) Proceedings - IEEE 16th International Conference on Advanced Learning Technologies, ICALT 2016, art. no. 7756969, pp. 242-244.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006869767&doi=10.1109%2fICALT.2016.66&partnerID=40&md5=a5ad76b25276f06599297695cae0c713

DOI: 10.1109/ICALT.2016.66

AFFILIATIONS: School of Engineering and Science, Adolfo Ibáñez University, Santiago, Chile

ABSTRACT: Educational Data Mining can help predict dropout prone students and the factors institutions should observe in trying to avoid an important social problem in modern societies. However, most current predicting models use academic credit worth information from the curricula, ignoring extracurricular activities, while there is evidence from other research fields that some activities like sports can be related to academic performance. This paper studies the importance of extracurricular activities to predict dropout in students from two Bachelor of Science degrees (Engineering and Business). Data from 4.840 students was collected and two models, one including all data and another removing credits worth courses were trained and validated, showing that extracurricular activities are excellent dropout predictors. © 2016 IEEE.

AUTHOR KEYWORDS: Decision trees; Educational data mining

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Li, C.a , Said, H.a , Michael, R.a , Johnson, M.b , Meyer, H.b

Competency based IT experienes

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757572, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006784410&doi=10.1109%2fFIE.2016.7757572&partnerID=40&md5=309b7d584ce467b4170c7aa79f22f386

DOI: 10.1109/FIE.2016.7757572

AFFILIATIONS: School of Information Technology, University of Cincinnati, Cincinnati, United States;

School of Education, University of Cincinnati, Cincinnati, United States

ABSTRACT: This paper introduces an ongoing National Science Foundation funded project that prepares high school students for college readiness and fosters student interests in careers in Information Technology. The project targets a mixed student population from urban, low-income settings. Based on the project's first-year results, the paper proposes significant changes that will be implemented in the project's second year. These changes include a competency-based education curriculum in which students' IT knowledge and skills can be assessed in a way that three college course credits can be awarded to students who are still in high schools, a 12-hour graduate certificate program that prepares both in-and pre-service teachers to teach college IT courses for University of Cincinnati at their high schools through an Ohio College Credit Plus program, and a more concentrated research in computational thinking, which has been brought up for national attention and recognized as one of the essential competencies among Science, Technology, Engineering, and Mathematics disciplines. © 2016 IEEE.

AUTHOR KEYWORDS: Competency-based education; Computational thinking; Curriculum development; Information technology; K-12 STEM education; Teacher preparation

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Stansell, A., Tyler-Wod, T.

Digital fabrication for STEM projects: A middle school example

(2016) Proceedings - IEEE 16th International Conference on Advanced Learning Technologies, ICALT 2016, art. no. 7757029, pp. 483-485.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006940786&doi=10.1109%2fICALT.2016.44&partnerID=40&md5=92695b3c171527365d1509853de4461b

DOI: 10.1109/ICALT.2016.44

AFFILIATIONS: University of North Texas, Denton, United States

ABSTRACT: This paper explains the background of digital fabrication and some of the current and potential uses of that technology. A specific middle school study was conducted around STEM projects that used a 3D printer to help create an engineering project-based solution. © 2016 IEEE.

AUTHOR KEYWORDS: 3D printing; Digital fabrication; Middle school; STEM

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Benson, L.C.a , Kennedy, M.S.a , Ehlert, K.M.a , Vargas, P.M.D.a , Faber, C.J.b , Kajfez, R.L.c , McAlister, A.M.c

Understanding undergraduate engineering researchers and how they learn

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757630, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006826418&doi=10.1109%2fFIE.2016.7757630&partnerID=40&md5=17477fb9ad07dcafa6a2709291c25499

DOI: 10.1109/FIE.2016.7757630

AFFILIATIONS: Department of Engineering and Science Education, Clemson University, Clemson, SC, United States;

Department of Technological Studies, College of New Jersey, Ewing, NJ, United States;

Department of Engineering Education, Ohio State University, Columbus, OH, United States

ABSTRACT: As the need for qualified science, technology, engineering, and mathematics (STEM) graduates increases, there is an accompanying need for improved undergraduate STEM education. Undergraduate Research Experiences (UREs) have been shown to enhance an undergraduate student's academic experience; however, not all students can participate in or have access to UREs due to schedule constraints during the school year or other commitments in the summer. Our current research project seeks to determine how students develop a researcher identity and transform their epistemic beliefs through UREs. Elements identified to contribute to students' researcher identities and epistemic beliefs will then be translated into strategies that can be incorporated into traditional learning environments. This paper will overview the progress made in the first part of this multi-phase, multi-institution project and preliminary results from the initial surveys. © 2016 IEEE.

AUTHOR KEYWORDS: Epistemic beliefs; Researcher identity; Student perspectives; Undergraduate research experiences

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Nguyen, H.D., Nguyen, D., Pham, V.T.

Design an intelligent problem solver in solid geometry based on knowledge model about relations

(2016) Proceedings - 2016 8th International Conference on Knowledge and Systems Engineering, KSE 2016, art. no. 7758045, pp. 150-155.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85007012821&doi=10.1109%2fKSE.2016.7758045&partnerID=40&md5=13ea40802d17a9f6b69e5f3b838ad114

DOI: 10.1109/KSE.2016.7758045

AFFILIATIONS: University of Information Technology, VNU-HCM, Ho Chi Minh City, Viet Nam

ABSTRACT: A grand challenge in knowledge representation is building the intelligent systems for Science Technology Engineering and Math (STEM) Education. In math education, the intelligent problem solver (IPS) must have sufficient knowledge to solve problems automatically, and their solutions are natural, step-by-step and can be understand by the learners. Besides that, Solid geometry is a hardly subject of mathematics to study for the high school studens. In this paper, an IPS in solid geometry is designed. The knowledge base of this system is represented based on Rela-model which is a knowledge model about relation. The inference engine of this system has been also built based on the algorithms to solve problems on objects and model. It shorn solution clearly and step-by-step. This system has been tested on various kinds of solid geometrical exercises in high-school mathematics of Vietnam education. © 2016 IEEE.

AUTHOR KEYWORDS: intelligent problem solver; knowledge representation; solid geometry

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Poindexter, C.a , Reinhart, D.b , Swan, B.c , McNeil, V.d

The University of Central Florida STEAM program: Where engineering education and Art Meet

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757414, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006817333&doi=10.1109%2fFIE.2016.7757414&partnerID=40&md5=b7b231e3dc13df7867be4f306b76b105

DOI: 10.1109/FIE.2016.7757414

AFFILIATIONS: School of Visual Arts and Design, University of Central Florida, Orlando, United States;

Civil, Environmental and Construction Engineering Department, University of Central Florida, Orlando, United States;

Program Evaluation and Educational Research Group, University of Central Florida, Orlando, United States

ABSTRACT: ICubed is a National Science Foundation (NSF) funded project housed at the University of Central Florida aimed at increasing participation in STEM fields through coordination and institutional integration. The University of Central Florida Science, Technology, Engineering, Arts and Mathematics (UCF STEAM) is a component of ICubed. As a part of this program, UCF STEM faculty and undergraduate researchers work collaboratively with faculty and students in the College of Arts and Humanities to create science-inspired art based on the STEM researcher's explanations of scientific concepts and possibilities. Since the program's inception in 2010, over 700 University of Central Florida faculty and students have participated in the STEAM program with a large majority coming from engineering fields. An evaluation of the program over the last six years demonstrates that by encouraging strong post-secondary cross-disciplinary collaborations, the UCF STEAM program has enlightened UCF's undergraduate engineering students in a manner that not only leads to greater recognition of the interdependencies of right-and left-brain directed skills but also has helped to improve learning and communication skills. This paper highlights UCF engineering STEAM activities and lends a discussion to the educational impact of such a program. © 2016 IEEE.

AUTHOR KEYWORDS: Art education; Engineering education; STEAM; STEM

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Zintgraff, C.

STEM professional volunteers in secondary STEM education: A study proposal to better understand the practices of educators

(2016) Proceedings - IEEE 16th International Conference on Advanced Learning Technologies, ICALT 2016, art. no. 7757050, pp. 552-554.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006840032&doi=10.1109%2fICALT.2016.115&partnerID=40&md5=084f2e9b1b016fe5ec37fa4cc5b467ff

DOI: 10.1109/ICALT.2016.115

AFFILIATIONS: Department of Learning Technologies, University of North Texas, Denton, TX, United States

ABSTRACT: Recent years have seen major growth in the use of STEM professionals in U.S. secondary school formal and informal programs. Assuming the important perspective of educators in the classroom, this Ph.D. Candidate is studying how educators recruit and deploy STEM professional volunteers in technology-driven STEM competition programs, with a focus on which practices educators find most valuable, and how the use of STEM professional volunteers does or does not relate to pedagogical practices. Study results will shed additional light on how technologies, educators and school settings interact to impact STEM programs that strongly incorporate technology as a driver for learning. © 2016 IEEE.

AUTHOR KEYWORDS: Industry; Professionals; STEM; Volunteers

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Dabipi, I., Zhang, L., Brown, W.L., Jr., Hartman, C.

Integrating complex aviation science projects into undergraduate engineering education with dialectic design approach and comparative performance analysis for innovative practices

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757745, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006826391&doi=10.1109%2fFIE.2016.7757745&partnerID=40&md5=db91932843a11f0ad80258492fc85f26

DOI: 10.1109/FIE.2016.7757745

AFFILIATIONS: Department of Engineering and Aviation Sciences, University of Maryland Eastern Shore, Princess Anne, MD, United States

ABSTRACT: Engineering students are challenged with implementing and developing systems within STEM disciplines. The dialectic design approach and comparative performance analysis were created for undergraduate engineering students as a teaching method to facilitate and improve student-learning experiences in STEM disciplines. We had found in our study that both the dialectic design approach and comparative performance analysis are critical to the theoretical development and the fundamental practices for engineering education in course learning objectives. These teaching methods were created for undergraduate engineering students to support specific interdisciplinary practices such as aviation sciences and course objectives focused on emerging issues concerning the design process and performance analysis. An undergraduate engineering course must promoted student-learning experiences for innovative practices through engineering models and performance analysis. The integration design in this course supported areas that include complex aviation science projects and the requirement constraints for system development. © 2016 IEEE.

AUTHOR KEYWORDS: Aviation science projects; Comparative performance analysis; Dialectic design approach; Engineering education; Interdisciplinary education

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

He, J.a , Lo, D.C.-T.a , Xie, Y.a , Lartigue, J.b

Integrating Internet of things (IoT) into STEM undergraduate education: Case study of a modern technology infused courseware for embedded system course

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757458, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006747319&doi=10.1109%2fFIE.2016.7757458&partnerID=40&md5=1635276e8c419b83fa1b31edb3113917

DOI: 10.1109/FIE.2016.7757458

AFFILIATIONS: Department of Computer Science, Kennesaw State University, Marietta, GA, United States;

Department of Software Engineering, Kennesaw State University, Marietta, GA, United States

ABSTRACT: Internet of Things (IoT) is rapidly emerging as the next generation of communication infrastructure, where myriad of multi-scale sensors and devices are seamlessly blended for ubiquitous computing and communication. The rapid growth of IoT applications has increased the demand for experienced professionals in the area. Since few, if any, dedicated IoT courses are currently offered, most Science, Technology, Engineering, and Mathematics (STEM) students will have limited or no exposure to IoT development until after graduation and entrance into the workforce. Moreover, there is a little room for adding additional courses into existing STEM curriculum. Therefore, we propose to transform STEM core courses by integrating IoT-based learning framework into their corresponding lab projects. The design challenges of the new learning framework is summarized in the paper. Subsequently, we propose the effective learning approaches to address those challenges. Moreover, in this paper, we present a case study by incorporating IoT-based learning framework into a Software Engineering (SWE) embedded system analysis & design course. Specifically, we introduce a lab development kit composed of Raspberry Pi/Arduino boards and a set of sensors with Zigbee supporting to provide wireless communication in the class lab section. We adopt module design method to design the course labware. Well-developed modules are presented and one sample module is illustrated in the paper. The labware is evaluated through survey questions. The majority of the students provided positive feedback and enjoyed the IoT-based lab development kit. © 2016 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Leberknight, C., Adamski, J., Kufel, S.

The class connect experimental test-bed: Pedagogical and architectural design considerations for E-learning

(2016) Proceedings - IEEE 16th International Conference on Advanced Learning Technologies, ICALT 2016, art. no. 7756924, pp. 70-71.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006905571&doi=10.1109%2fICALT.2016.125&partnerID=40&md5=61a0b7fa4b1b7bfe315ab86276a35fbe

DOI: 10.1109/ICALT.2016.125

AFFILIATIONS: Department of Computer Science, Montclair State University, Montclair, NJ, United States

ABSTRACT: Existing efforts are underway to increase undergraduate enrollment in science, engineering, technology, and mathematics (STEM). The STEM workforce is crucial to the U. S. health and economy, yet retention rates in STEM fields are poor and the U. S. is faced with a looming workforce shortage. This paper describes a novel system being developed, known as Class Connect, that aims to enhance instruction for STEM disciplines and function as a test-bed to examine various phenomena associated with peer instruction and student outcomes. © 2016 IEEE.

AUTHOR KEYWORDS: Adaptive learning; Evidence-based instruction; Intelligent system; Pedagogy; Peer instruction; Personlization

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Peixoto, A.

Girls in STEM: Increasing the number of female students entering technical fields

(2016) SA 2016 - SIGGRAPH ASIA 2016 Symposium on Education: Talks, art. no. 3006042, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006823512&doi=10.1145%2f2993363.3006042&partnerID=40&md5=8dc43c13b472c5191ea9ce24a5025a7a

DOI: 10.1145/2993363.3006042

AFFILIATIONS: CEFET/RJ, University of Kansas, United States

ABSTRACT: STEM is the acronyms for Science, Technology, Engineering and Mathematic, and refers to academic disciplines of technical fields. In most places of the word the number of female students that choose to go to an undergraduate course in technical fields is considerably smaller than the total number of women in society, that is near 50%. In this panel we discuss how to improve the number of female students and the possible causes of this phenomenon. The STEM is one of the fields that contributes significantly with the number of professionals for Computer Graphics, increase the number of female students in this field can have a good impact to increase the numbers of women working in Computer Graphics.

AUTHOR KEYWORDS: Computer graphics; Education; STEM

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Guerra, R.C.C.a , Smith, K.A.b c

I-Corps™ for Learning: Sustaining and scaling STEM education innovations for impact

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757391, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006757723&doi=10.1109%2fFIE.2016.7757391&partnerID=40&md5=9ac957b5cb0807cc7cc525d285aebb54

DOI: 10.1109/FIE.2016.7757391

AFFILIATIONS: American Society for Engineering Education, United States;

School of Engineering Education, Purdue University, United States;

Civil Engineering, University of Minnesota, United States

ABSTRACT: Currently there is a lot of emphasis on engineering education research and innovation. In 2014 NSF funded a pilot implementation of the NSF Innovation Corps for Learning (I-Corps™ L) and additional cohorts have been conducted and are planned. The 7-week I-Corps™ L program uses established strategies for start-ups to scale up and move teaching and learning innovations into broad practice. Participating teams go through a hypothesis-testing, scientific method of discovery to gather important insights and identify issues associated with their projects. Unfortunately, the reach of the program is limited as a maximum of 24 teams can participate in each course offering. This special session provides an opportunity for a broad cross-section of researchers and educators to gain exposure to the Lean Start Up approach and its applicability to STEM education ecosystem. The focus of the session is to introduce the core features of the Lean Start Up process: search for a sustainable and scalable model using the Business Model Canvas, Customer Discovery, and Agile Engineering (i.e., iterate and increment towards an appropriate 'product'). © 2016 IEEE.

AUTHOR KEYWORDS: Entrepreneurship; Innovation; Research impact

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Sergis, S.a b , Sampson, D.G.b c

Towards a teaching analytics tool for supporting reflective educational (re)design in Inquiry-based STEM Education

(2016) Proceedings - IEEE 16th International Conference on Advanced Learning Technologies, ICALT 2016, art. no. 7756986, pp. 314-318.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006870592&doi=10.1109%2fICALT.2016.134&partnerID=40&md5=92d6e1277cc21c0a9919b677e61f705b

DOI: 10.1109/ICALT.2016.134

AFFILIATIONS: Department of Digital Systems University of Piraeus Piraeus, Greece;

Information Technologies Institute CERTH Thessaloniki, Greece;

School of Education Curtin University of Technology Perth, Australia

ABSTRACT: Providing appropriate tool-supported guidance to students is an essential aspect of technology-supported inquirybased STEM education, in order to facilitate them in engaging in diverse inquiry tasks. However, analyzing educational designs and evaluating the level of tool-supported guidance provided towards reflective remedying actions is not a trivial task, especially for novice STEM teachers. In this context, the paper presents the design and preliminary evaluation of an inquiry-based STEM Teaching Analytics Tool. This tool aims to visually analyze and evaluate existing educational designs in terms of the level of technology-supported guidance they offer and support teachers' reflective (re)design. The preliminary evaluation results attest to the high levels of accuracy of the proposed Teaching Analytics Tool and provide evidence of its capacity to inform future Teaching and Learning Analytics tools for facilitating STEM teachers to engage in data-driven reflective (re)design of their practice. © 2016 IEEE.

AUTHOR KEYWORDS: Guidance; Inquiry-based STEM education; Scaffolds; Teaching analytics

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Ma, S.a , West, M.b , Herman, G.L.c , Tomkin, J.d , Mestre, J.e

Studying faculty communities of practice through social network analysis

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757561, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006713731&doi=10.1109%2fFIE.2016.7757561&partnerID=40&md5=7ffad8b85b36489d164c3cb50bb65c98

DOI: 10.1109/FIE.2016.7757561

AFFILIATIONS: Department of Educational Psychology, University of Illinois at Urbana-Champaign, Urbana, IL, United States;

Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, Urbana, IL, United States;

Illinois Foundry for Innovation in Engineering Education, University of Illinois at Urbana-Champaign, Urbana, IL, United States;

Department of Geology, University of Illinois at Urbana-Champaign, Urbana, IL, United States;

Department of Physics, University of Illinois at Urbana-Champaign, Urbana, IL, United States

ABSTRACT: Creating systemic change in undergraduate engineering and STEM education is difficult to achieve and just as difficult to study. It has been proposed that organizational learning and change theories can be coupled with social network analysis to achieve both of these goals. In this paper, we describe an institutional change effort designed around principles from Communities of Practice. We then present the design of a social analysis network study that we are executing to study and analyze whether this change effort has been successful in achieving its goals. We present some preliminary data to demonstrate the promise of this approach for executing and studying institutional change in engineering education and STEM education more broadly. © 2016 IEEE.

AUTHOR KEYWORDS: Communities of practice; Evidence-based instructional practices; Institutional change; Research-based instructional strategies; Social network analysis

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

DePue, T.H.a , Robistow, B.a , Newman, R.a , Mack, K.a , Banavar, M.K.a , Yang, T.a , Barry, D.a , Curtis, P.b , Spanias, A.b , Watkins, W.c

An android app for spatial acoustic analysis as a learning tool

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https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006815377&doi=10.1109%2fFIE.2016.7757538&partnerID=40&md5=9227432b6830a5a2de5505b6291aacd4

DOI: 10.1109/FIE.2016.7757538

AFFILIATIONS: Department of Electrical and Computer Engineering, Clarkson University, Potsdam, NY, United States;

SenSIP Center, School of ECEE, Arizona State University, Tempe, AZ, United States;

Systems Librarian, United States

ABSTRACT: An Android app has been developed to assist in the education of individuals in a science, technology, engineering, and mathematics (STEM) course of study. The Android Reflection Application provides students a means to determine distances to objects while allowing them the ability to manipulate signal envelopes, signal shapes, signal types, and frequency constraints. The convenient and intuitive graphical user interface immerses the user into a richly educational environment allowing for the solidification of fundamental concepts regarding digital signal processing (DSP). In addition to the educational benefits, this application is also being applied to spatial acoustic analysis and assistance in low-visibility. This feature will allow users to determine the best use for a given space whether it is a quiet study room or a room better suited for conference meetings. The effectiveness of this application has not yet been formally tested but suggests a positive result. © 2016 IEEE.

AUTHOR KEYWORDS: Android; Autocorrelation; DSP; Mobile echolocation; Signal processing; Spatial acoustic analysis

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Griffith, H.a , Griffith, A.b

A dynamic learning model for accelerated pre-matriculation mathematics programs: A work-in-progress

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757455, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006809821&doi=10.1109%2fFIE.2016.7757455&partnerID=40&md5=71e4ac631f77a9491b050feccdc63258

DOI: 10.1109/FIE.2016.7757455

AFFILIATIONS: Michigan State University, East Lansing, MI, United States;

Wright State University, Dayton, OH, United States

ABSTRACT: Accelerated pre-matriculation mathematics remediation programs are a popular strategy for improving the placement levels of underprepared students. Although limited assessments of such programs have been reported in the literature, most work is focused either on immediate placement level improvement or longitudinal indicators of student success. While valuable, both techniques offer no insight regarding the learning progression of students while participating in the program, which is of tremendous value in optimizing program policy, such as determining the ideal number of contact hours. The research described herein proposes a first-order dynamic learning model for describing students' content acquisition process within accelerated remediation programs. Details regarding model formulation are presented within this work-in-progress paper. A brief evaluation of model efficacy is also conducted using data gathered from daily ALEKS learning assessments employed within a one-week remediation program for intending engineering students. © 2016 IEEE.

AUTHOR KEYWORDS: Computer based learning; Preparation; Time to degree

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Banks-Hunt, J.M., Adams, S., Ganter, S., Bohorquez, J.C.

K-12 STEM Education: Bringing the engineering maker space, student-centered learning, curriculum, and teacher training to middle schools

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757531, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006823476&doi=10.1109%2fFIE.2016.7757531&partnerID=40&md5=a15af751b742d0b3f55f2b11af75ae22

DOI: 10.1109/FIE.2016.7757531

AFFILIATIONS: Virginia Tech University Blacksburg, Blacksburg, United States

ABSTRACT: Encouraging our youth to pursue careers in science, technology, engineering, and mathematics (STEM) fields has become critically important to meeting needs for adequate and clean water, less pollution and an adequate food supply, along with needs for housing, communications, and sustained technology leadership. According to the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, the future of STEM fields is dependent on a steady workforce of talented and diverse individuals. Without a growing pool of STEM talent with emphasis upon the 'E', the Bureau of Statistics projects that the U.S. will have a difficult time filling the demands for STEM professionals as near as the year 2018. In response to the need to develop a STEM proficient workforce with emphasis upon the 'E', an industry leading high-tech corporation on the west coast developed a hands-on engineering maker space that exposes middle school students to an exciting one-day authentic learning experience. Announced January 2016, Virginia Tech and the high-tech corporation entered into a multi-year, multi-phase partnership agreement to develop programmatic curricula, teacher credentialing and professional development, hands-on engineering practices, activities for long-term student engagement, and ongoing research. The purpose of this work-in-progress article is to report on the first phase of the partnership agreement and its innovative practices of interest to stakeholders invested in the K-12 engineering footprint. © 2016 IEEE.

AUTHOR KEYWORDS: Hands-on engineering; Maker space; Programmatic curriculum; Teacher credentialing and professional development

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Estela-Carbonell, M.R.a , Codina, A.a , Poblet-Puig, J.a , Pardo, P.a , Puigví, M.A.a , Pujadas, E.a , Valls, S.a , Álvarez, M.D.b , Guaus, E.b , Hervada-Sala, C.b , MacAnás, J.b , Masip-Álvarez, A.b , Morillo, M.b , Nejjari, F.b

Towards the STEM knowledge homogenization of pre-university students in 21st century: MOOC: the Language for Engineering

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DOI: 10.1109/FIE.2016.7757358

AFFILIATIONS: E.T.S. d'Enginyers de Camins, Canals i Ports, Universitat Politècnica de Catalunya, BarcelonaTech, Barcelona, Spain;

Escola Superior d'Enginyeries Industria, Aeroespacial i Audiovisual de Terrassa, Universitat Politècnica de Catalunya, BarcelonaTech, Barcelona, Spain

ABSTRACT: For the past five years, Engineering students from Barcelona School of Civil Engineer in UPC BarcelonaTech have shown that educational intervention in first-year engineering programs can positively affect students' awareness of Science, Technology, Engineering and Mathematics (STEM) concepts by introducing students to basics concepts and motivating them to follow next ones. At Terrassa School of Industrial, Aerospace and Audiovisual Engineering, also belonging to UPC BarcelonaTech, STEM concepts are strengthen to high school students by means of the Mercat de Tecnologia, (a science fair among schools) and by some recommended but not compulsory propaedeutic courses of basic subjects, carried out the week prior to the official start of university studies. Still, many students entering university show some lacks on theoretical items, particularly those who do not follow the usual way to access to tertiary studies after obligatory secondary education but a parallel and more practical one. In fact, there is a large heterogeneity in terms of the average previous knowledge of every subject as well as in the individual curriculum of each student, since they might have enrolled different courses before entering the university. Due to those lacks, some professors at both aforementioned schools have developed a MOOC oriented to new university students. The designed MOOC is useful in order to improve the basic knowledge of new students regarding these sciences. © 2016 IEEE.

AUTHOR KEYWORDS: Engineering; MOOC; Self-learning; STEM

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Khanlari, A.

Long term effects of educational robots on a Grade 9 girl's perceptions of science and math

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757649, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006757190&doi=10.1109%2fFIE.2016.7757649&partnerID=40&md5=66c2a2ff329e59f557defe8e82566ae0

DOI: 10.1109/FIE.2016.7757649

AFFILIATIONS: University of Toronto, Canada

ABSTRACT: A review of literature highlighted a few important aspects of using robotics for educational purposes. However, most of the studies did not examine the long term effects of educational robots, but only considered a short period of time, when their participants were involved in robotics courses. Also, in most of the studies, the gender differences are not considered and the effects of robotics on girls are overlooked. This case study examines the effects of educational robots on Sarah, a grade 9 student who has attended in a robotics summer camp when she finished her Grade 8. The participants of this study include Sarah and her mother, who is a science teacher. This case study examines the long term effects of educational robots on Sarah, almost one year after she finished her summer camp robotics course. Based on the preliminary results of this study, the long term effects of robotics on Sarah include motivating her to learn mathematics, science, and technology. The results also show that using robotics in the education system would result in fewer gender-based stereotypes, regarding technical majors and careers. This study shows that robotics also could create an environment where Sarah, as a girl, were immersed in authentic education, and helped her improve her critical thinking and problem solving skills. © 2016 IEEE.

AUTHOR KEYWORDS: Girls' perceptions; Math education; Robotics; Science education

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Yeh, M.K.-C.a , Toshtzar, A.a , Guertin, L.b , Yan, Y.c

Using spaced repetition and gamification to enhance K-12 student science literacy with on-demand mobile short reads

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https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006833525&doi=10.1109%2fFIE.2016.7757361&partnerID=40&md5=d4f43dfab44e1d8bf661d43188deab3c

DOI: 10.1109/FIE.2016.7757361

AFFILIATIONS: Information Sciences and Technology, Penn State University, United States;

Earth Sciences, Penn State University, United States;

Learning, Design and Technology, Penn State University, United States

ABSTRACT: We present a work-in-progress project that implements spaced repetition and gamification through mobile application for STEM education as a learning system for K-12 students. Spaced repetition in the classroom has been studied and shown to be effective for foreign language and vocabulary acquisition as well as other types of training, while gamification has similarly been used to improve learners' engagement and motivation. This project combines the advantages of both instructional strategies and delivers it through a mobile learning system by using its ubiquitous nature. We believe by combining spacing and gamification with mobile learning technology, the learning system will yield fruitful results in STEM education. We discuss how existing literature affects our design and our plan of implementing such a system. © 2016 IEEE.

AUTHOR KEYWORDS: Gamification; Mobile learning; Spaced repetition; STEM education; Ubiquitous learning

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Mondisa, J.-L., Millunchick, J., Davis, C., Koch, D.

The University of Michigan's M-STEM academies program: Examining the social community of future engineers

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757747, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006827046&doi=10.1109%2fFIE.2016.7757747&partnerID=40&md5=43306bf11e8d7d1e1b74392f89419867

DOI: 10.1109/FIE.2016.7757747

AFFILIATIONS: University of Michigan, Ann Arbor, United States

ABSTRACT: A social community framework is used to examine the program elements of the University of Michigan's (UM) M-Engin Program, an undergraduate engineering mentoring program, to provide insights about its social community elements. At this initial research stage, a methodical analysis of the program data (e.g., analytics, features, elements, and artifacts) was performed to create a portfolio to begin to understand the role of social community within the M-Engin Program. From this research, we can learn how to better serve members of various program communities by identifying opportunities for improvement. Future research will include conducting informal interviews with the program's coordinators and surveying and interviewing program participants. © 2016 IEEE.

AUTHOR KEYWORDS: Mentoring; Social community; Underrepresented students

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Ghalia, M.B.a , Carlson, R.b , Estrada, V.c , Huq, H.a , Ramos, J.a

Engaging K-12 teachers in engineering through a professional development program: Implementation strategies, results and lessons learned

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757530, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006818117&doi=10.1109%2fFIE.2016.7757530&partnerID=40&md5=71f3141e6c61070ca8f5fce188f9b452

DOI: 10.1109/FIE.2016.7757530

AFFILIATIONS: Department of Electrical Engineering, University of Texas Rio Grande Valley, Edinburg, TX, United States;

Department of Human Development and School Services, University of Texas Rio Grande Valley, Edinburg, TX, United States;

Departmemt of Teaching and Learning, University of Texas Rio Grande Valley, Edinburg, TX, United States

ABSTRACT: In order for the United States to remain the global leader in engineering and technology, it must produce and retain a higher number of science, technology, engineering, and mathematics (STEM) talent. Over the past few decades, there have been a number of national initiatives that have promoted STEM education with the goal of generating student interest in science and engineering and increasing the number of students entering the STEM pipeline. Research literature confirms that teachers are the single most important factor affecting student achievement and interest in STEM subjects. Several models of teacher professional development have been reported along with the evidence of the degree of their effectiveness in promoting student interest in engineering. These professional development programs are designed to increase the engineering content knowledge of math and science teachers, thereby having a direct impact on student achievement in math and science and helping to promote a positive attitude to engineering. This paper presents the design of a teacher professional development program offered in a predominantly Hispanic region in South Texas. The professional development program provides an opportunity for teachers to participate in engineering projects, become more knowledgeable about the engineering profession, and learn new pedagogical tools that they use to develop engineering-based hands-on learning activities for their classrooms. One of the effective approaches adopted by this program is the development of creative engineering connections between the math and science concepts taught by the teacher participants and real-world engineering applications that not only can K-12 students easily understand, but also find tangible and interesting. The paper also provides evidence of the effectiveness of the program strategies that have resulted in about 89% of the developed learning activities being successfully implemented in the teachers' classrooms. The results of the program teacher surveys and discussion of lessons learned by the program management are also presented. © 2016 IEEE.

AUTHOR KEYWORDS: K-12 engineering education; Teacher professional development

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Venter, M.a , De Wet, L.b

Continuance use intention of primary school learners towards mobile mathematical applications

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757539, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006789895&doi=10.1109%2fFIE.2016.7757539&partnerID=40&md5=d7cb0233001cea2ac54f210c5516fb74

DOI: 10.1109/FIE.2016.7757539

AFFILIATIONS: Information Technology Department, Central University of Technology, Bloemfontein, South Africa;

Department of Computer Science and Informatics, University of the Free State, Bloemfontein, South Africa

ABSTRACT: Mobile educational applications include some of the most useful learning tools that have ever been developed. Games for learning are most effective when multiple sessions are involved, in other words, when users replay the games. Previous research on the use of educational games in mathematics education have focused primarily on the learning potential of these games and have not adequately addressed the continuance use intention, or the replay value, of these games. This is a serious gap in literature due to the fact that mobile mathematical applications will only be able to assist primary school learners to improve their math skills if they continue to use these apps on a regular basis. The purpose of this paper is to address this gap by investigating the continuance use intention of primary school learners towards mobile educational mathematical applications. This study adopted the Flow Theory, GameFlow and EGameFlow model, Game Based Learning model and the Technology Acceptance Model adapted to mobile gaming as theoretical base. A mixed method research methodology was employed where qualitative and quantitative data was gathered through surveys, individual observations and focus groups. Twenty-six children, aged 10 to 13, from selected schools in one of South Africa's provinces, participated in the study. The results indicate that the fun, fantasy, immersion and sensation constructs were the most influential in terms of the continuance use intention. The findings of this study could be used by educators and designers of educational mathematical applications in the evaluation of the re-use potential of these applications. © 2016 IEEE.

AUTHOR KEYWORDS: Continuance use intention; Mathematical applications; Mathematical games; Mobile games; Primary school learners

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Griggs, L.a , Stringer, J.K.b , Rankins, F.b , Hargraves, R.H.c

Investigating the impact of a hybrid summer transition program

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757527, .

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DOI: 10.1109/FIE.2016.7757527

AFFILIATIONS: Biomedical Engineering, Virginia Commonwealth University, Richmond, VA, United States;

Foundations of Education, Virginia Commonwealth University, Richmond, VA, United States;

Teaching and Learning, Electrical and Computer Engineering, Virginia Commonwealth University, Richmond, VA, United States

ABSTRACT: Pre-college summer transition programs are prevalent at colleges and universities around the country and are generally associated with positive impacts on student retention and graduation rates. At Virginia Commonwealth University, a six week hybrid on-campus/online program is offered to incoming science, technology, engineering, and mathematics majors from racial and ethnic backgrounds underrepresented in those disciplines (i.e., African American, Latino/a, Native American). This work-in-progress investigates the participants' perceptions of the program in facilitating their academic and social integration into the university. An explanatory mixed methods approach is used. Participants perceive the hybrid program to have played a vital role in their social integration and an integral role in supporting their academic integration into the university. © 2016 IEEE.

AUTHOR KEYWORDS: Academic integration; Social integration; Summer transition programs; Underrepresented students

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Serrano, M.I.a b , Groh, J.L.a

Travel grants which facilitate engineering leadership identity in female engineering students

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757642, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006789598&doi=10.1109%2fFIE.2016.7757642&partnerID=40&md5=361b71f229d29abdac74613ec85c45a2

DOI: 10.1109/FIE.2016.7757642

AFFILIATIONS: Women in Engineering Program, Purdue University, West Lafayette, IN, United States;

Polytechnic Institute, Purdue University, West Lafayette, IN, United States

ABSTRACT: In this pilot mixed methods study, we examine the impact of travel grants for female undergraduate and graduate engineering students at a large Midwestern university to attend non-technical conferences whose focus is on the development and empowerment of female leaders in science, technology, engineering and mathematics (STEM). Using a leader identity development framework, we analyzed applications, post-conference attendance surveys, required dissemination projects (i.e., sharing what was learned at the conference with the wider engineering audience at the university) and interview transcripts to examine the impact of this conference experience approach on participants' attitudes towards their anticipated degree and career paths. With an initial sample of 27 participants, preliminary results show a positive impact on professional and personal development, an increased commitment to completing current degree programs, an increase in/reinforcement of confidence in abilities, and inspiration to emulate the women leaders with whom the participants networked at the conference. © 2016 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Dele-Ajayi, O., Sanderson, J., Strachan, R., Pickard, A.

Learning mathematics through serious games: An engagement framework

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757401, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006818034&doi=10.1109%2fFIE.2016.7757401&partnerID=40&md5=1f072bf5d300bf5ba98c064768fc34a2

DOI: 10.1109/FIE.2016.7757401

AFFILIATIONS: Faculty of Engineering and Environment, Northumbria University, Newcastle-Upon-Tyne, United Kingdom

ABSTRACT: Digital games have become part of childhood and adolescence. The debate has moved from should teenagers play digital games to how to gain benefits from this gameplay. Researchers predict that technology-enhanced learning will increase with educational computer games (serious games) playing an important role. Although serious games are often built on established educational theories, they can also appear boring and struggle to engage the learner. Analyses of serious games demonstrate that many do not offer an entertainment experience comparable to or even recognizable as relatives of the entertainment games familiar to many players. However, a high level of engagement by the learner is viewed as necessary to provide a strong learning environment. The long-term aim of this study is to explore how digital games can support a more engaging and effective mathematics learning experience. This first stage has taken a qualitative grounded theory approach to explore the engagement factors of digital games among young people (aged 7-16 years). Analyses of data gathered through a combination of surveys and interviews have led to a framework of engagement factors. This provides a basis for designing serious games that are effective by being both engaging and educational. © 2016 IEEE.

AUTHOR KEYWORDS: Active learning; Game-based learning; Serious games; Technology-enhanced learning; Young people

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Carvalho, D.G., Lins, W.C.B.

LabDuino: An open source tool for science education

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757360, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006810368&doi=10.1109%2fFIE.2016.7757360&partnerID=40&md5=9a7eb2971e3a4b9e35f48b6db5f7251b

DOI: 10.1109/FIE.2016.7757360

AFFILIATIONS: Centro de Estudos Avançados Do Recife-C.E.S.A.R.edu, Recife, Brazil

ABSTRACT: Research shows that the poor quality of science education and related areas in the Brazilian basic education has been negatively affecting professionals training in research and scientific development, also contributes to high rates of evasion of STEM graduation courses. Also, scientific illiteracy are harmful to society, once it's members losses analytical judgment capability and by that are more influenceable. Therefore, it is necessary to obtain ways to reverse this situation. Inspired by Seymour Papert ideas on constructionism and the maker movement, this paper proposes an opensource embedded tool for science experimentation on K-12 classes. Created over Arduino development board and mounted on a custom circuit board, designed on an open source tool, and embedded on a laser cut box, this tool, called LabDuino, works like an experiment repository, where the student can choose the subject to be explored, then an experiment and run it following instructions, (sensors setup, initial data and so on), presented on the tool's display. The LabDuino is capable to gathering, process, show and optionally store on SD card, up to eight sensors data, promoting a hands-on experience from setting up to experiment execution in a seamless way. It was tested on a Brazilian seventh grade class, where was taught gravity force and it's effects by doing a dropping test, inspired on egg drop experiment. Was observed an increase of 14% on the experiment class grades and a more engaged students by running the experiments. © 2016 IEEE.

AUTHOR KEYWORDS: Arduino; Constructionism; Educational Technology; Embedded Software; LabDuino; Scientific Education; STEM

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Reimers, A.a , Smith, J.F.b

Enriching an informal engineering education program with social relevance and history for middle school girls

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757730, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006810832&doi=10.1109%2fFIE.2016.7757730&partnerID=40&md5=650de789e0de7e608cbaaf1097d4e5fb

DOI: 10.1109/FIE.2016.7757730

AFFILIATIONS: Department of Engineering and Society, University of Virginia, Charlottesville, VA, United States;

Philadelphia Writing Project, University of Pennsylvania, Philadelphia, PA, United States

ABSTRACT: Two educators collaborated to design and test a one-week summer course for middle school girls on sound, engineering, and invention as an exemplar integrated STEM program that draws upon rich historical and social contexts with the goal of attracting and retaining students in STEM. An engineering design project and an invention project formed the core of the course. Music and related technologies served as the unifying theme intended to tap into the interests of youth. Historical primary sources and writing about invention and innovation provided additional entry points into engineering as a human and creative endeavor. Exposure to female inventors, scientists and engineers was also planned as a way for the girls to become acquainted with positive role models. Included in this paper is a discussion of the underlying philosophies that influenced the design of the learning experiences for youth underrepresented in STEM. © 2016 IEEE.

AUTHOR KEYWORDS: Engineering; Girls; History; Informal; Integrated STEM; Middle school; Primary source; Sound

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Kenwright, B.

Holistic game development curriculum

(2016) SA 2016 - SIGGRAPH ASIA 2016 Symposium on Education, art. no. a2, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006925028&doi=10.1145%2f2993352.2993354&partnerID=40&md5=a74a7da0ab5f4e9dec13fc762d3e3e6c

DOI: 10.1145/2993352.2993354

ABSTRACT: This article discusses the design and implementation of a holistic game development curriculum. We focus on a technical degree centred around game engineering/technologies with transferable skills, problem solving, mathematics, software engineering, scalability, and industry practices. In view of the fact that there is a growing skills shortage for technically minded game engineers, we must also be aware of the rapidly changing advancements in hardware, technologies, and industry. Firstly, we want a synergistic game orientated curriculum (for a 4-year Bachelor's programme). Secondly, the organisation and teaching needs to adapt to future trends, while avoiding tunnel vision (too game orientated) and support both research and industry needs. Finally, we build upon collaborations with independent experts to support an educational programme with a diverse range of skills. The curriculum discussed in this article, connects with a wide variety of subjects (while strengthening and supporting one another), such as, programming, mathematics, computer graphics, physics-based animation, parallel systems, and artificial intelligence. All things considered, the development and incorporation of procedures into a curriculum framework to keep up with advancements in game technologies is important and valuable. Collaborative learning Computing education programs Contextual software domains Virtual worlds software. © 2016 Copyright held by the owner/author(s). SA '16 Symposium on Education, December 05-08, 2016, Macao.

AUTHOR KEYWORDS: Curriculum; Degree; Education; Game development; Holistic; Learning; Teaching; Technologies

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Naz, A.a , Lu, M.a , Hatipoglu, K.a , Rambo-Hernandez, K.b

Employing project-based learning to address the Next Generation mathematics standards in high schools

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757359, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006826129&doi=10.1109%2fFIE.2016.7757359&partnerID=40&md5=9c69450190f709dd9efa062a3b5f8dfc

DOI: 10.1109/FIE.2016.7757359

AFFILIATIONS: West Virginia University Institute of Technology, Montgomery, WV, United States;

College of Education and Human Services, West Virginia University, Morgantown, WV, United States

ABSTRACT: In the summer of 2015, a five-day professional development workshop was held at West Virginia University Institute of Technology, located in Montgomery, West Virginia, with the objective of providing systematic training of project-based learning to high school math teachers. Twenty-two teachers participated in the workshop. Instructors of the workshop were faculty members from West Virginia University Institute of Technology, West Virginia University, and West Virginia State University. The workshop's focus was project-based learning, which employs projects closely related to real-world applications to facilitate delivering abstract concepts. Specifically during the workshop, the participating high school math teachers learned designing engineering projects, mapping engineering projects to Next Generation math standards/objectives, and assessing the outcomes of project-based learning. Each participating teacher is required to implement at least one engineering project in his/her math class and the results will be collected by the superintendents of the three participating school districts. The workshop has two primary hypotheses: (i) teachers who participated in the workshop will increase their self-efficacy toward implementing project-based learning, applying engineering and technology to address content standards and objectives, and using assessments to inform instruction, and (ii) project-based learning will improve students' self-efficacy and learning effectiveness in math, and in turn, will increase their interest/intention to pursue STEM disciplines. The impact of the workshop on teachers is determined through surveys and interviews. Social Cognitive Career Theory is applied to evaluate the impact of project-based learning on the participating teachers' students. Results of the surveys, interviews, and student performance will be presented at the conference. © 2016 IEEE.

AUTHOR KEYWORDS: High school; Mathematics education; Project-based learning

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Kennedy, J.a , Lee, E.b , Fontecchio, A.c

STEAM approach by integrating the arts and STEM through origami in K-12

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https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006717869&doi=10.1109%2fFIE.2016.7757415&partnerID=40&md5=00f1f688cb507745fa93fe85ff848f0e

DOI: 10.1109/FIE.2016.7757415

AFFILIATIONS: ECE Department, Drexel University, Philadelphia, PA, United States;

GAMP High School, Philadelphia, PA, United States;

Graduate College, Drexel University, Philadelphia, PA, United States

ABSTRACT: While science, technology, engineering and math hold the fastest growing fields today, only 44% and 36% of students are math and science ready, respectively, to enter college. By integrating the arts into STEM, a four-part origami based curriculum has been developed, which combines the topics of renewable energy, architecture design, 3D CAD design and printing, and mathematic, science, and engineering principles. The modules are composed of familiar engineering education tactics to get students to think outside of the box like an engineer. Students reverse engineer origami pieces, build an origami chair using the design process, and learn the topic of renewable energies through interactive games. The final module pulls the knowledge gained from the first three together. The students design and 3D print origami structures that are energy efficient and utilizes at least one source of renewable energy. Students go through the design process with brainstorming, prototyping, and working models. The K-12 Next Generation Science Standards for science and engineering has eight practices. Origami Meets STEAM practices all eight including: (1) Asking questions and defining problems, (2) Developing and using models, (3) Planning and carrying out investigations, and (6) Instructing explanations and designing solutions. This project has been introduced to 9th and 10th grade geometry classes. Surveys were given to gauge the effectiveness of activities with the students, teachers, and participating graduate students. This is a work in progress and results of the surveys and work are still being processed. © 2016 IEEE.

AUTHOR KEYWORDS: Geometry; K-12 STEM Education; NGSS; Origami

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Sundaram, R.

Engage and educate: Engineering laboratory activities for first-year engineering students

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757662, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006823196&doi=10.1109%2fFIE.2016.7757662&partnerID=40&md5=8bb9dc848141bf484759842e76466217

DOI: 10.1109/FIE.2016.7757662

AFFILIATIONS: Gannon University, United States

ABSTRACT: This paper discusses the importance and effectiveness of structured hands-on STEM-related project-based engineering laboratory activities in the critical entry-level course, First-Year Seminar in Engineering, for undergraduate engineering majors at ABET-accredited institutions of higher education. At our institution, the First-Year Seminar in Engineering is offered once each year during the fall term. The enrollment in this course ranges from ninety to hundred first-year students who are expected to graduate with engineering degrees from the four-year ABET-accredited programs. One component of this course comprises hands-on engineering laboratory activities in sessions of short duration (fifty-five minutes apiece) in disciplines such as Biomedical Engineering (BME), Electrical and Computer Engineering (ECE), Environmental Engineering (ENV), and Mechanical Engineering (ME). In the short interval of time allotted for STEM-based laboratory experiences, the motivation, commitment, and level of engagement can range from total indifference to unbridled enthusiasm with the desire to do and learn more. The broad goal is to deliver key aspects of the engineering design process, from concept-to-product (the E in STEM), during this short interval of time. Therefore, it behooves us to develop STEM-based, project-oriented laboratory activities that focus the student on well-defined, easy-to-attain, yet insightful experimental objectives. © 2016 IEEE.

AUTHOR KEYWORDS: ECE laboratory; STEM engineering education

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Lee, K.T.

Demo: Use of tangible learning in STEM education

(2016) SA 2016 - SIGGRAPH ASIA 2016 Mobile Graphics and Interactive Applications, art. no. a23, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006925700&doi=10.1145%2f2999508.3008582&partnerID=40&md5=cf271d23474025a364c705de92082916

DOI: 10.1145/2999508.3008582

AFFILIATIONS: Studios Pte Ltd., India

ABSTRACT: Tangible Learning explores the use of tangible media integrated with mobile technology to enhance engagement and mobility for STEM education with children. Tangible Learning allows users to experience and understand thinking processes such as design thinking and computational thinking through rapid prototyping with tangible media, which is then translated into digital format on the mobile applications for direct feedback and testing of their prototype. This significantly widens the accessibility for younger age groups. The use of tangible media also encourages collaborative creation and learning of children as compared to when only the mobile application is used. Lastly, we will also take a look at one of the existing products in the market and how it has been successfully brought into the classrooms and view the creations of children who attended the session.

AUTHOR KEYWORDS: Game design; Mobile; Tangible media

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Terracina, A.a , Berta, R.b , Bordini, F.c , Damilano, R.c , Mecella, M.a

Teaching STEM through a role-playing serious game and intelligent pedagogical agents

(2016) Proceedings - IEEE 16th International Conference on Advanced Learning Technologies, ICALT 2016, art. no. 7756945, pp. 148-152.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006957588&doi=10.1109%2fICALT.2016.121&partnerID=40&md5=5f5719969b2e607a2a8234b965f4e07e

DOI: 10.1109/ICALT.2016.121

AFFILIATIONS: Sapienza Università di Roma, Italy;

Università di Genoa, Italy;

ITIS Cartesio-Luxemburg, Roma, Italy

ABSTRACT: Teaching STEM is a promising application domain for game-based instructional methods. In this paper we present a serious game organized as a role playing game: players learn how to inhabit the headspace of someone other than their primary ego identity, offering them the chance to develop a stronger sense of empathy. The same empathy is established between the player and her Intelligent Pedagogical Agent, which should guide the player into the Virtual Learning Environment and trough the game as well. We present the ongoing development of the game, and a preliminary validation of the Intelligent Pedagogical Agent to show its effectiveness with teenager students. © 2016 IEEE.

AUTHOR KEYWORDS: Game Based Learning; Intelligent Pedagogical Agent; Virtual Learning Environment

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Estela-Carbonell, M.R., Diez, P.

Internet-based tutorial providing mathematical complements for technical Master students: TIMEMathCom

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757454, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006830344&doi=10.1109%2fFIE.2016.7757454&partnerID=40&md5=8259bfda234a3955da03bf4b0a377819

DOI: 10.1109/FIE.2016.7757454

AFFILIATIONS: E.T.S. d'Enginyers de Camins Canals i Ports, Universitat Politècnica de Catalunya, BarcelonaTech, Barcelona, Spain

ABSTRACT: The mathematical background of international students in Technical Master programs is pretty heterogeneous. They often lack of a sound basis in specific topics, which are necessary to follow the Master. Filling this gap is often stressing because it requires these students to make an additional effort reviewing basic references. The goal of this initiative is to produce a tailored learning tool for these students. Previous experiences of the proposing teams suggest that using a Moodle environment is a suitable choice to develop the tool. The idea is to cover synthetically the topics and to allow getting acquainted with the knowledge in a straight-to-the point approach. T.I.M.E. is a network assembling more than 50 Higher Education Institutions (mostly in Europe) with a focus in Scientific and Technical training. T.I.M.E. provides an ideal framework for developing and testing the tool. This is because the contents are enriched by the feedback of the experience of the members involved. Moreover, T.I.M.E. community is a perfect test bench for the tool. © 2016 IEEE.

AUTHOR KEYWORDS: Mathematics; Self-assessment; Technical master students; Virtual learning tools; WIRIS

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Konert, J.a , Bohr, C.b , Bellhauser, H.b , Rensing, C.c

PeerLA - Assistant for individual learning goals and self-regulation competency improvement in online learning scenarios

(2016) Proceedings - IEEE 16th International Conference on Advanced Learning Technologies, ICALT 2016, art. no. 7756920, pp. 52-56.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006944023&doi=10.1109%2fICALT.2016.100&partnerID=40&md5=7975df9ec67b0af2cc38d236d730b88a

DOI: 10.1109/ICALT.2016.100

AFFILIATIONS: Department VI Information Technology and Media, Beuth University of Applied Sciences, Berlin, Germany;

Department of Electrical Engineering and Information, Technische Universität Darmstadt, Technology, Darmstadt, Germany;

Department of Psychology, Johannes Gutenberg-Universität Mainz, Mainz, Germany

ABSTRACT: While online learning is already a part of university education and didactics, not all students have the necessary self-regulation competency to really learn on their own efficiently and effectively. In classroom a teacher can take over a moderating part, set intermediate goals and give feedback to one's progress, but participants of online learning courses (e.g. in blended scenarios or Massive Open Online Courses (MOOCs)) face a higher demand of self-regulation competency. This paper presents a course and content independent assistant, PeerLA, which assists in improving self-regulation competency. PeerLA allows setting of long-term goals, breakdown into intermediate goals and keeps track of knowledge increase or time needed. A graphical feedback allows comparison of existing and aimed level of knowledge or time investments. PeerLA adds peer comparison to the visualization charts for social frame of reference. This comparison is course-wide or only with similar learners (close in goals and knowledge levels). PeerLA is implemented as a Learning Management System (LMS) plugin to support learning progress in mixed formal and informal learning scenarios. PeerLA was evaluated with 83 students in an online mathematics preparation course over four weeks. Results indicate the benefits of such a self-regulation assistance, especially for university freshmen. © 2016 IEEE.

AUTHOR KEYWORDS: Blended learning; Guidance; Peer learning analytics; Scaffolding; SCRUM; Self-regulation competency; Visualization

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Siegel, R.a , Saper, M.a , Tanu, E.a , Zastavker, Y.V.a , Stolk, J.D.a , Dillon, A.a , Gross, M.D.b

The promise of faculty care in undergraduate STEM courses

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757732, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006713301&doi=10.1109%2fFIE.2016.7757732&partnerID=40&md5=087279c30fe0fdedd31cf526a8a6c3de

DOI: 10.1109/FIE.2016.7757732

AFFILIATIONS: Franklin W. Olin College of Engineering, Needham, MA, United States;

Wake Forest University, Winston-Salem, NC, United States

ABSTRACT: Work in Progress. Introductory, or "weed out" chemistry courses are well-known for deterring undergraduate students from pursuing STEM (Science, Technology, Engineering, and Mathematics) fields. Specifically, students' motivations resulting from experiences in these courses can influence STEM retention. Using grounded theory, our preliminary analysis of qualitative data collected in an undergraduate chemistry course has identified "faculty care" as an emergent construct of importance to student motivations. Our emergent definition of care is students' perception that their instructors recognize and communicate actionable steps towards self-improvement or illustrate concern, encouragement, or relational interest for the students in academic and non-academic settings, or in an unexpected, personal way. We found that students hold gendered interpretations of faculty care, and these interpretations may give rise to gendered motivational attitudes. This work raises questions about the ways specific classroom activities or faculty-student interactions allow faculty to communicate a sense of care for their students and thereby affect students' motivational attitudes in their classrooms. More broadly, this work may have implications for our understanding of the ways faculty can address gendered patterns in STEM participation. © 2016 IEEE.

AUTHOR KEYWORDS: Affect; Care; Emotion; Faculty-student interaction; Gender; Motivation; Relatedness

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Toyoshima, J.a , Fujii, S.b , Tokiwa, Y.b

Development of a mobile-friendly classroom support system to improve students' presentation skills

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https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006710560&doi=10.1109%2fFIE.2016.7757542&partnerID=40&md5=0999a9ad56ff1b2c814f5f626cbe4ef5

DOI: 10.1109/FIE.2016.7757542

AFFILIATIONS: Department of Engineering and Design, Hosei University, Tokyo, Japan;

Research Center for Computing and Multimedia Studies, Hosei University, Tokyo, Japan

ABSTRACT: Work in Progress: Communication skills are indispensable for becoming successful in the global engineering community. Among various communication skills, presentation skills are regarded as one of the greatest career enhancers for engineers. Nevertheless, it is the weakest skill of most Japanese engineering students. To overcome this inadequacy, we offered a presentation skills course for sophomore Science, Technology, Engineering, and Mathematics (STEM) students by integrating video streaming and numerical peer evaluation using IT technology. This paper examines the feasibility and the students' acceptability of the newly developed IT peer evaluation system. In implementing the system, three research questions were posed: 1. Does the new system facilitate classroom management? 2. Is the new system more accepted than the existing paper-based method by the students? 3. Does the new system promote the overall improvement of students' presentation skills? The preliminary results showed that the new system facilitated classroom management, and that it was accepted by the students primarily due to its functional requirement such as utility and non-functional requirement such as promptness. Furthermore, the students' average numerical peer evaluation scores of physical messages and audience interaction mostly improved. © 2016 IEEE.

AUTHOR KEYWORDS: Classroom support system; Peer evaluation; Presentation skills

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Walters, S.a , Santana, C.a , Zastavker, Y.V.a , Dillon, A.a , Stolk, J.D.a , Gross, M.D.b

Students' motivational attitudes in introductory STEM courses: The relationship between assessment and externalization

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757629, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006830346&doi=10.1109%2fFIE.2016.7757629&partnerID=40&md5=066e5317b1a0e79c5a4912aa2e70d7cd

DOI: 10.1109/FIE.2016.7757629

AFFILIATIONS: Franklin W. Olin College of Engineering, Needham, MA, United States;

Wake Forest University, Winston-Salem, NC, United States

ABSTRACT: Work-in-Progress. Students' contextual motivation in introductory STEM (Science, Technology, Engineering, and Mathematics) courses has been a focus of many recent studies; this work provides a new lens to this work by investigating students' situational motivations. Grounded theory is used to analyze survey responses from ten students in an introductory STEM course at a small private technical school that features project-based learning environments. Analysis resulted in an emerging relationship between assessment and a behavior we call externalization. We observe a co-occurrence between externalization and problem-set-related assessment; the co-occurrence indicates that some students may not feel as though they have control over their progress and performance on problem sets and it is this lack of control that the students report to be frustrating and amotivating. Additionally, we observe that blame is presented either as externalization or non-externalization while credit is almost always non-externalized. The two presentations of blame suggest that students might externalize to cope with negative affective experiences. The results of this study may have implication for design of STEM courses with motivations as both means and ends in students' learning processes. © 2016 IEEE.

AUTHOR KEYWORDS: Autonomy; Emotion; Empowerment; Internalization; Motivation; Project-based learning; Relevance

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Padwick, A., Dele-Ajayi, O., Davenport, C., Strachan, R.

Innovative methods for evaluating the science capital of young children

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757680, .

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85006762228&doi=10.1109%2fFIE.2016.7757680&partnerID=40&md5=55cc4e1b97bbce3bbb68294c14072b4c

DOI: 10.1109/FIE.2016.7757680

AFFILIATIONS: Faculty of Engineering and Environment, Northumbria University, Newcastle-Upon-Tyne, United Kingdom

ABSTRACT: Considerable effort has been spent on interventions to increase the numbers/diversity of young people studying Science, Technology, Engineering and Mathematics (STEM) and/or entering STEM related careers with little evidence of their effectiveness. In the UK, less than 10% of professional engineers are female. Science capital is a recent concept for capturing those elements that influence children's choice of a science-related career. Children with higher science capital are more likely to choose a STEM career than those with lower science capital and therefore interventions to increase science capital are needed. Initially studies evaluating science capital have focused on secondary age children (aged 11 - 18 years). Here a research approach for evaluating science capital among primary age children (aged 7 - 11 years) is presented using a mixed methods approach. Results indicate that children share similar perceptions of scientists as 'hardworking', 'clever' and 'creative' independent of gender, age and science capital. However, children's self-identify differed by gender, age and science capital, illustrating significant gaps for some children between their self-identity and that of a scientist. Interventions focusing on narrowing this gap should increase the likelihood of them considering a science-related career. © 2016 IEEE.

AUTHOR KEYWORDS: Career advice and guidance; Diversity; Gender; Research methods; Science capital; Science education; STEM outreach; Young people

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Mihalec-Adkins, B.a , Hicks, N.b , Douglas, K.A.b , Diefes-Dux, H.b , Bermel, P.c , Madhavan, K.b

Surveying the motivations of groups of learners in highly-technical STEM MOOCs

(2016) Proceedings - Frontiers in Education Conference, FIE, 2016-November, art. no. 7757376, .

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DOI: 10.1109/FIE.2016.7757376

AFFILIATIONS: Educational Studies, Purdue University, West Lafayette, IN, United States;

School of Engineering Education, Purdue University, West Lafayette, IN, United States;

School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN, United States

ABSTRACT: Highly technical STEM MOOCs have recently become widely available, but little is known about the motivations of the various groups of learners participating. In this work, we perform a detailed survey of 1,624 learners to examine their motivations in detail. These learners exhibited overall high levels of intrinsic motivation, but varied in their extrinsic motivation, according to their current position as students, workers, or unemployed individuals. Students generally reported the highest levels of extrinsic motivation compared to other groups (p<0.001). The results from this analysis indicate that additional factors about learners in each group, such as their course participation and performance, should be examined in future work to help better understand the various needs of those enrolling in highly technical STEM MOOCs. © 2016 IEEE.

AUTHOR KEYWORDS: Learners; MOOCs; Motivation

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus