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INTERNATIONAL INSTRUCTIONAL TECHNOLOGIES IN ENGINEERING EDUCATION SYMPOSIUM

ABSTRACT PROCEEDINGS

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Semposym Program

Time	
9.00-9.30	Registration
9.30-10.00	Opening Ceremony

Session 1

Time	Face to face Presentation
	Chair: Özge Andiç-Çakır
10.00-10.15	**TICON Pilot Test: Functionality and Efficiency of TICON E-Learning Platform for Teaching Creativity Online in HE Engineering Programs** *Özge Andiç-Çakır, Fırat Sarsar, Hüseyin Ekrem Ulus,* **Dilara Deniz Alagöz***, Patricia Wolf, Marianne Harbo Frederiksen, Christoph Kunz, Kathryn Cormican, Manon Van Leeuwen, Henry Mangold*
10.15-10.30	**Blended Learning in Engineering Education: Current Situation and a Roadmap** *İbrahim Halil Özdemir, Fırat Sarsar, Stephen Harmon*
10.30-11.00	Coffee Break

Session 2

Time	Face to face Presentation
	Chair: Fırat Sarsar
11.00-11.15	**Another Brick in the Code** *Nuno Pombo,* **Mehran Pourvahab**
11.15-11.30	**First Step Into The Virtual Engineering Education Platform** *Erol Yaprak, Erkan Ayder*
11.30-12.15	**Keynote** **Mühendislik Eğitimine İlişkin Yaygın Problemler ve Potansiyel Çözüm Önerileri** *Prof. Dr. Yüksel Göktaş - Erzurum Atatürk University*
12.15-13.00	

Lunch

Session 3

Time	Face to face Presentation Chair: Bahadır Namdar	Virtual Presentation Chair: Fırat Sarsar
13.00-13.15	**Engaging Preservice Science Teachers' Online Argumentation to Foster Climate Change Awareness** **Bahadır Namdar***, Lokman Topbaş*	**Using Leaderboards to Gamify Computer Programming Course** *Harun Çiğdem, Mehmet Emin Korkusuz, Caner Karaçaltı*
13.15-13.30	**Higher Education STEM Faculties' Experiences and Perceptions Implementing Long Term Future Scenarios** *Fırat Sarsar, Bahadır Namdar,* **Özge Andiç-Çakır***, Dilara Deniz Alagöz, Patricia Wolf, Christoph Kunz, Nuno Pombo, Manon Van Leeuwen*	**Development of Hardware and Software Tools for Digital Engineering Education** *Tsvetelina GEORGIEVA, Seher KADIROVA, Stanislav PENCHEV*

13.30-13.45	**Digital Tools: Unlocking the potential of digital co-creation between HEIs, NGOs, and citizens.** *Elif Tunalı Çalışkan, Marie Schirrmacher, Carla Droste, Katrin Uude, Tuğçe Doğan*	**The Model of Support for Social Entrepreneurship - Experiences of The Sehubs Project** *Renata Lisowska, Jarosław Ropęga*
13.45-14:15	Coffee Break	

Session 4

Time	**Face to face Presentation** Chair: Esra Telli	**Virtual Presentation** Chair: Özge Andiç Çakır
14.15-14:30	**A Study for Higher Education Teachers and Institutions Instructional Technology Curriculum and Syllabus: HIIT** *Esra Telli, Pınar Emre-Arslan, Fırat Sarsar, Alper Başbay, Hakan Atılgan, Kathryn Cormican, Suzana Sampaio, Manon Van Leeuwen, Tsvetelina Gergieva, Seher Kadirova*	**Agro Tourism as an Example of Agricultural Entrepreneurship** *Farrukh Rahimli*
14.30- 14.45	**Blockchain Technologies for VET Education: Determination of Teaching Objectives** *Abdullah Kalay, Özge Andiç-Çakır, Fırat Sarsar, Mustafa Takaoğlu, Taner Dursun, Francisco José Rosa Encinas, Manon Van Leeuwen, Luis Manuel Gómez*	**Distance Learning with the Use of Information Technologies in Higher Education** *Olcay Çetiner Özdemir*
14.45-15.00	**The reflections from flipped learning studies in engineering education in post-Covid times.** *Alev Ateş-Çobanoğlu, Ezgi Türk*	**He Hardiness as A Factor of Psychological Health of Future It Specialists** *Kateryna Binytska, Dmytro Kostenko*
15.00-15.15	**TICON Evaluation Panel** *Hüseyin Ekrem Ulus*	**Socially and environmentally consacious entrepreneurship - tools for hybrid business models** *Pawel Glodek, Daria Zawalska*
15:15 - 15:30	Coffee Break	
15:30-16:15	**Keynote** **Creatively Teaching Far-Future Technology Scenario Development** *Prof. Dr. Patricia Wolf - Southern Denmark University*	
16:15-16:30	**Closing Ceremony**	

Agro Tourism as An Example of Agricultural Entrepreneurship
Farrukh Rahimli[1]

Abstract

Entrepreneurship, as the term that expresses the capacity to take various risks to earn income, to develop, organize and manage a new business line, has been used frequently for many different sectors in recent years. In this sense, entrepreneurship is not only bringing together production factors such as natural resources, capital and labor in order to meet human needs and organizing this business by undertaking possible risks. In Azerbaijan, the concept of "entrepreneurship", which is referred to as "Entrepreneurship" in international terminology, and the concepts of business owner, which is also used as "Business Owner" in English, are both translated with the word "sahibkarlıq", which naturally creates confusion. In this study, we will use the concept of agricultural entrepreneurship not only in terms of the production of various agricultural products and marketing of agricultural inputs and products, but also to express the enterprises established by making relatively new and rather technical-technological innovations in addition to all these steps. Although agriculture is considered to be the oldest type of business ownership and entrepreneurship in the history of humanity in many aspects, the agricultural sector is generally not among the first sectors that come to mind, especially when it comes to novelty and innovation. In the field of agriculture, although the unmanned aerial vehicle, which was invented for different purposes, especially in sectors such as industry and defense, is used more widely by adapting various innovations such as internet of things, remote sensing, big data and so on, vertical agriculture, vermicompost production, aquaponics, non-traditional agricultural and animal husbandry initiatives such as the production of products (various types of mushrooms, aloe Vera, stevia, oysters and etc.) are also becoming widespread. In addition to these, new business lines and entrepreneurship examples can be formed in cooperation with various sectors of agriculture and animal husbandry. To give an example, agriculture and space sectors together "Space Agriculture", agriculture and alternative energy sectors together, vegetable production under solar blades- Agrivoltaik Agriculture, use of thermal water in greenhouses and Geothermal Greenhouse and etc. We can also add Agro Tourism (agricultural tourism), which is formed by the cooperation of agriculture and tourism sectors, to the applications. Agro Tourism, which has a very wide scope from production to trade, from accommodation to food and beverage, from cultural activities to education, has started to become widespread in Azerbaijan as well as in Turkey in recent years. Especially during the COVID-19 pandemic and the period following it, the most preferred form of tourism for people who are bored of urban life and longing to be in touch with nature is observed as turning to rural areas. Agro tourism, which has various advantages such as creating new job opportunities in the agricultural sector, which is specially supported by the state within the framework of the development of non-oil sectors in Azerbaijan, and providing additional income and recognition, is also increasing in importance.

Keywords: Entrepreneurship, Tourism, Agro Tourism, Agriculture and livestock,

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First Step Into The Virtual Engineering Education Platform

Erol Yaprak[1], Erkan Ayder[2]

Abstract

It appears as a necessity that the computer games are included in the curriculum of engineering education, for generation z students. Especially for mechanical engineering students, softwares such as "Flight Simulator", "Kerbal Space Program", "Car Mechanics" and "Cities Skylines" seem to be quite interesting. Based on these, a product based engineering engine, therefore an engineering education platform can be made and included in the curriculum. Going through the learning process, the students can step by step accomplish the design of a selected product (airplane engine, internal combustion engine, pump, etc.) within these design steps, control algorithyms (constructional, hydrodynamic, aerodynamic, vibration, material, etc.) can evaluate and advise the system performance to the designer. A primary simple application of this virtual engineering education platform, based on airplane engines, is shown in this study. A simulation environment is prepared where the components of an airplane engine can be used in a design area. The necessary elements to design (compressor, combustion chamber, turbine, etc.) and the thermodynamic specifications of these elements are determined. The specifications of the elements included in the design and environmental factors are defined as the data provided by the designer. These data and specifications are collected in a matrix system, defined as "information cell", which is specific to each element. Information cells interact with other information cells that they are connected during the design. The simulation provides the designer the necessary mathematical solution by collecting the output data within itself, thanks to the interaction of these information cells. So, the designer can directly get the results and by evaluating these, can make the necessary changes on the design. The neat and user friendly design of the simulation, along with the addition of signs and indicators, enables the designer to evaluate the simulation output easily, avoiding the necessity of dealing with complex processes.

Keywords: Engineering, Education, Virtual

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Distance Learning with the Use of Information Technologies in Higher Education

Olcay Çetin Özdemir[1]

Abstract

In the twentieth century and twenty-first century, the use of information technologies opens new horizons in the field of education, as in many areas of our daily life. Information technologies have become widespread in all levels of the education sector. In the field of higher education, courses have started with online distance education. In addition to online distance education, hybrid and face-to-face education continues. On the Internet, "remote access courses" have started to be implemented as a new dimension in education. In the education that included theory and practice, there were different perspectives in practice due to the framework (rules) of the courses, the content and the rules of the distance access course. Information technologies are used in theoretical knowledge sharing and applied course studies, including field work in higher education. With the use of information technologies, it is observed that the learning skills of the students change, the interest in visual subjects increase and their attention span is shortened. Due to these changes, the renewal of education programs has come to the fore. While planning the course contents for distance education, it is necessary to create a holistic system and create the right instructional design. Learning outcomes for designing synchronous or asynchronous virtual lessons will contribute positively to the learning process. Distance education processes are handled in five categories in terms of student experience and effectiveness as passive participation, supportive participation, increased participation, interactive participation and immersive participation systems. The aim of the study is to convey the information obtained as a result of the examination of online distance education applications in the field of higher education, which is carried out using information technologies today. In the study, the Case Studies model of Descriptive Studies, which is included in the classification of Scientific Researches according to its Methods (Gurbetoğlu, 2018), is used as a method. It has been the duty of universities to provide education with computers to the professionals of the future within the scope of university education and to carry out the effective and efficient use of computers in the field of profession. In addition to being remotely accessible and enableing examples and calculations to be easily followed and course being associated with information technologies, increased the interest in the subject and facilitated learning. Practice in Education will continue to be used by universities to prepare future courses.

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The Reflections from Flipped Learning Studies in Engineering Education in Post-Covid Time

Alev Ateş Çobanoğlu[1], Ezgi Türk[2]

Abstract

One of the blended learning models, the flipped learning model gains increasing popularity especially in post-Covid times. Flipped learning is a learner-centered pedagogical approach which enables continuance of learning not only inside the class but also outside the class free from time and space. In a flipped classroom, learners involve pre-training activities outside class and engage in individual or small-group collaborative learning activities inside class with the guidance of the teacher. Flipped learning involves replacement of indoor and outdoor classroom activities by facilitating digital course materials such as teacher's video and digital documents to the learners before lessons and freeing instructors from theoretical knowledge transmission during class time. Present study reviews the results of flipped learning practices in engineering education which were published between 2018 and 2022. In this review, a set of exclusion criteria was considered for data collection. 33 articles which were examined in the current study were full text, written in English, open access educational research articles and SSCI, SCI-E and ESCI indexed. The data set included 12 experimental studies,6 Design based research 3 case studies, 3 mixed research, 3 surveys, 1 pedagogical experiment, expert assessment and cluster analysis, 1 action inquiry method, 2 qualitative and quantitative methods,1 qualitative method 1 quasi-experimental in engineering education. The findings indicated that flipped learning practices have significant positive effects on learner achievement, motivation, engagement, course satisfaction, collaborative learning and encourages autonomous work, problem solving skills, self-regulated time management, and communication between classmates and teachers. It is considered that the results encourage both practitioners and researchers for applying flipped learning model in several engineering courses.

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Using Leaderboards to Gamify Computer Programming Course

Harun Çiğdem[1], Mehmet Emin Korkusuz[2], Caner Karaçaltı[3]

Abstract

Gamification attracts attention from faculty members in the field of engineering education, as in all other fields. The aim here may be to increase students' participation in the course and to increase their success by increasing their interest in the activities offered by the instructors. Leaderboards, one of the gamification items, are one of the most used items as a ranking activity among the participants according to the scores they get from a certain application or the whole course. In this study, the effect of the leaderboards created with the scores obtained by the students from the weekly formative online quizzes in the Computer Programming Language course, which is a compulsory course in the Department of Electronics and Communication Technology and Mechatronics Technology, was examined. The research was carried out in a quasi-experimental study model with a control group and experimental group. During the six-week study, online quizzes consisting of ten questions were made available to both the experimental group and the control group by the instructors for each week. Leaderboards application was created only for students in the experimental group. MOODLE was used as the learning management system and logs of MOODLE were analyzed as data. In the results obtained, formative online quizzes lose their interest after a certain period of time (after the third week), whether they are gamified or not. In the last application, the number of participants increased as the exam week was approaching. When the effect of formative online quizzes on student achievement was examined, a significant positive correlation was found between the number of students completing formative quizzes and their theoretical exam scores, regardless of the experimental or control group.

Keywords: Gamification, Leaderboards, Formative online quiz, Computer programming course

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Engaging Preservice Science Teachers' Online Argumentation to Foster Climate Change Awareness

Bahadır Namdar[1], Lokman Topbaş[2]

Abstract

The aim of this study was to investigate the effect of online argumentation activities on preservice science teachers' climate change awareness. Four day long program was prepared to teach the subdimensions of climate change awareness by incorporating online tools for preservice teachers' to engage in online argumentation. The participants were 32 preservice science teachers studying in science teacher education programs across 22 different universities in Turkey. All participants completed 11 online activities prepared by the researchers in the scope of a research project funded by Ege University Office of Scientific Research Projects. The data sources were a questionnaire consisting of open-ended questions to identify climate change awareness in five domains namely climate change content knowledge, reasons and impacts of climate change, awareness of individual initiatives, awareness towards industrial initiatives. We also collected participants' written arguments that they created during 6 out of 11 activities. To analyze changes in participants' content knowledge we created rubrics and scored the participants' answers. Then we conducted a paired samples t-test. For the rest of the open-ended questions, we conducted a content analysis and created codes and then categories for the participants' answers. The data analysis revealed that after the program the participants' climate change content knowledge domain has significantly increased and they used more justifications in their arguments reflecting their climate change awareness. The results also indicated that the ways preservice science teachers engage in online argumentation differed for the one preservice teacher who developed an awareness and the one who did not. We provide implications for preservice teacher training programs to increase climate change awareness and scaffolds to engage preservice science teachers in argumentation more effectively.

Keywords: Climate change awareness, Climate change education, Online argumentation, Preservice science teachers

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The Hardiness as a Factor of Psychological Health of Future It Specialists

Kateryna Binytska[1], Dmytro Kostenko[2]

Abstract

The rhythm of life in modern society is stressful, extreme and critical. This is due to many factors, among which we single out socio-economic transformations, the political situation in the state, the threat of a pandemic, international military conflicts, the ecological state of the environment, and the substantial, growing informational influence. All this affects an individual's psychological and mental health and emotional well-being. The ability of an individual to overcome adverse life conditions and detect a high stress resistance is interpreted as life resistance, which is essential for life. Modern psychological and pedagogical science shows an increased interest in studying the phenomenon of hardiness and its role in maintaining the psychological health of an individual. Therefore, hardiness today is not only a factor in the health of future IT specialists, but its formation is an essential task for universities and a significant social problem. Therefore, future specialists in the IT industry need to develop hardiness competencies, which they will use in their professional activities and personal life. In our opinion, promising directions for studying the problem of hardiness as a factor in the psychological health of future IT specialists are: – mastering technologies that contribute to the formation of competence of hardiness to preserve the mental health of future IT specialists in universities; - implementation of pedagogical diagnostics of the levels of the formation of hardiness to preserve the mental health of future IT specialists in a higher education institution and the development of a program for this work; - studying the experience of life hardiness to preserve the mental health of future IT specialists in foreign countries. In particular, we consider it expedient to exchange knowledge: at the universities of Ukraine and Turkey.

Keywords: Hardiness, Psychological health, Future IT specialist

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Higher Education STEM Faculties' Experiences and Perceptions Implementing Long Term Future Scenarios

Fırat Sarsar[1], Özge Andiç Çakır[2], Bahadır Namdar[3], Dilara Deniz Alagöz[4], Patricia Wolf[5], Christoph Kunz[6], Nuno Pompo[7], Manon van Leeuwen[8]

Abstract

The purpose of this research was to investigate higher education STEM faculty members' experiences and perceptions of implementing long-term future scenarios methods (LTFS) in their courses. This research was conducted during the curriculum development phase of the FIT4FUTURE Project aimed at developing the creation of a comprehensive curriculum that incorporated various elements of STEM education, including LTFS methods and cutting-edge technologies. As part of the research process, desk research was conducted and examples of long-term future scenarios were collected from both industry and education. As a result of this study, it has been concluded that various sectors and universities around the world use LTFS. To collect qualitative and quantitative data on the effectiveness of the curriculum, a mixed-methods research design was employed, combining both qualitative and quantitative data collection techniques. A total of 125 faculty members from Turkey, Denmark, Germany, and Portugal completed a survey including questions to determine the LTFS methods employed. Then, we conducted in-depth interviews with 22 number of faculty members in each country. Surveys and interviews provided insights into the experiences and perceptions of the faculty members regarding LTFS methods. In line with the collected data, it was concluded that STEM instructors in Higher Education do not have sufficient experience and knowledge about the LTFS methods. However, the participants stated that they wanted to learn more about the long-term future scenarios. To sum up, the data which are collecten within the FIT4FUTURE Project provided valuable insides into the curriculum for STEM fields in higher education to develop LTFS methods and future strategies.

Keywords: LTFS, Future strategies, STEM education, FIT4FUTURE Project

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Digital Tools: Unlocking the Potential of Digital Co-creation between HEIs, NGOs, and Citizens

Elif Tunalı Çalışkan[1], Marie Schirrmacher[2], Carla Droste[3], Katrin Uude[4], Tuğçe Doğan[5]

Abstract

Higher education institutions (HEIs) play a growing role in regional development (Klein&Pereira, 2021). Therefore, literature calls for more comprehensive knowledge on co-creation between HEIs, non-governmental organizations (NGOs), and citizens to improve its practical realization (Mooney et al., 2022). Nowadays, co-creation increasingly takes place in digital environments (De Silva et al., 2021). However, to date, the collaboration between HEIs and NGOs in the digital sphere has been neglected (Polese et al., 2021). As the pace of digitalization increases, the variety of digital tools are also increasing. While there is so much information about how to use these tools, it is important to analyse them for interaction and collaboration for specific areas. To meet this need, social scientists and engineers work together to analyse data from the field, transform this into algorithms and design powerful digital tools. One of the examples of these efforts is our project that is called CoCreAid Kit 4.0 which is specifically focused on the tools to facilitate collaboration between HEIs and NGOs. Research contributes to closing the knowledge gap by analysing current success factors and barriers to digital co-creation and identifying appropriate platforms and methods for collaboration. The following research question is set to be answered: How can higher education institutions successfully co-create digitally with NGOs? To contribute to this question, 80 interviews were conducted with digital co-creation experts from HEIs and NGOs. The interviews confirmed that there are high barriers to digital co-creation. Frequently mentioned were a lack of digital competence and a loss of interpersonal relationships. The lack of the social component in many cases leads to a decreased attention span and less engagement. Many respondents indicate that their own digital skills as in need of improvement. In terms of platforms and methods, NGOs and HEIs only work with tools they are already familiar with. By identifying the success factors, barriers, and requirements, this research provides a starting point for enhancing digital co-creation between HEIs and NGOs. It has been shown that there are variety of digital platforms, and the problem is how to use this variety efficiently. Therefore, it is recommended to provide more guidance, advice, and training material to stakeholders for successful digital collaboration. From HEIs viewpoint, the perceptions of trainers involved in such projects regarding the use of digital tools are changing. Teachers/Professors are beginning to look for different and more efficient tools that they can transfer their tacit knowledge and experience to their students. By the help of their experience, learning outcomes of students can be improved, learning methods can become more sustainable and cost-effective. Such projects enable social scientists to reshape the planning of research and analysis methods, while enabling engineers to redesign their product development process. Probably the most adequate teaching/learning methodology for training students "to real life problems" is project-based learning. In this way, more powerful, user friendly and economical digital tools can be planned, designed, and managed from the beginning for stakeholders and even future users.

Keywords: Digital tools, Engineering education, Digital co-creation, entrepreneurial digital colloboration, Transdisciplinary projects

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TICON Pilot Test: Functionality and Efficiency of TICON E-Learning Platform for Teaching Creativity Online in HE Engineering Programs

Özge Andiç Çakır[1], Fırat Sarsar[2], Hüseyin Ekrem Ulus[3], Dilara Deniz Alagöz[4], Patrica Wolf[5], Marianne Harbo Frederiksen[6], Christoph Kunz[7], Henry Mangold[8], Kathryn Cormican[9], Manon van Leeuwen[10]

Abstract

The TICON Project addresses an important but unsolved need in teaching creativity online for 21st-century engineering programs. TICON's main goal is to equip higher education engineering teachers with essential online tools, relevant pedagogical know-how, as well as with relevant technical and practical skills while teaching creativity in online and hybrid settings. TICON Project Consortium has thus designed the platform to deliver a range of educational materials, including lessons, assessments, and feedback. In this context, the pilot testing conducting within TICON Project has been completed. The pilot test included both student feedback (n = 360) and engineering teachers' views on the platform and its performance (n=60). The students and engineering teachers participating the pilot test were from universities of Germany, Denmark, Turkey and Ireland. In TICON pilot test, engineering teachers and students tested the TICON platform's functionality and efficiency in teaching creativity skills online. The extent to which the TICON e-learning platform is user-friendly can be inferred from the results, which indicate that its interface is both adaptable and well-designed. The educational materials, which encompass both the lessons and assessments, have been unequivocally praised for their exceptional quality, remarkable relevance, and unparalleled ability to keep students fully engaged. The results of pilot test indicate that the platform has the potential to make a significant impact in the field of higher education engineering and online teaching of creative skills. The educational resources, comprising both lessons and assessments, have been widely acknowledged for their compelling quality, remarkable relevance, and exceptional capacity to captivate and inspire learners.

Keywords: Teaching creativity online, Higher education, Engineering, TICON Project

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Blockchain Technologies for VET Education: Determination of Teaching Objectives

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Abstract

Blockchain technology is a rapidly developing technology in recent years and is used in many industries. Therefore, vocational education and training (VET) related to blockchain technology is also becoming more and more important. Blockchain technology is multidisciplinary based on topics such as programming, mathematics, and cryptography. Therefore, education programs on blockchain technology should provide students with a strong foundation in different subjects. Blockchain technology training in VET should teach students the concepts related to those topics and help them develop their skills in designing and developing blockchain applications. Not every VET educator has sufficient knowledge of blockchain technology, a technology that will enable the recruitment of VET students today and in the future. Within the scope of this study, it is aimed to develop an electronic book that will improve VET educators' knowledge about blockchain technology and help them develop innovative and effective solutions using this technology. For this purpose, a survey was prepared by project researchers and field experts to conduct a needs analysis. With this survey, it is aimed to determine the demographic information of the participants, their thoughts on the level of blockchain knowledge and related field knowledge, teaching approaches to be used in blockchain education and the subjects that could be included in the blockchain education content. The survey was examined by the experts in the field and edited in line with their feedback. A total of 101 VET educators, 51 from Spain and 50 from Turkey, participated in the survey. The data collected from the survey were analyzed with descriptive statistics. As a result of the survey, it was determined that the knowledge level of the participants about blockchain technologies needs to be improved. In the continuation of this study, it was found that it is necessary to create a teaching framework that includes blockchain technologies and technologies related to blockchain. As a result of the survey analysis, learning objectives were determined and the teaching outline was developed.

Keywords: Blockchain education, Blockchain technology, Blockchain in VET

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A Study for Higher Education Teachers and Institutions Instructional Technology Curriculum and Syllabus: HIIT Project

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Abstract

This study aims to equip HE STEM teachers with the self-efficacy, competencies and skills needed to understand the principles and constructs of Instructional Technology and rapidly leverage these in their environments. The first step is to analyze the extant literature (state of the art) in the domain. The second step is to identify the needs and requirements of the target group i.e. HE STEM teachers. The aim here is to uncover problems and challenges to enable us to design a user focused curriculum. Next, we develop a syllabus and curriculum and e-learning space. A central goal of the project is to develop a curriculum, syllabus and learning approach for STEM teachers that align with their requirements. Developing a curriculum and syllabus in the scope of instructional technology requires gaining insight into the specific needs of the STEM teachers, uncovering the challenges for practical implementation, and identifying the sources for knowledge on the topic. The scientific method in this study comprised a comprehensive analysis of the extant literature. 36 relevant academic papers were identified, and a detailed content analysis was performed to uncover relevant themes. From this analysis, specific questions were defined. These informed focus group interview schedules to capture user experiences and insights. 41 STEM teachers in higher education participated focus groups in Turkey, Ireland, Bulgaria, Portugal, Spain. A quantitative survey was then designed to capture empirical data relating to (a) the challenges regarding digital tools and technology (b) the challenges of adapting pedagogical approaches and course content, and (c) the challenges experienced by students with learning barriers. 143 HE STEM teachers participated in this analysis. According to the analysis, HE STEM teachers are self-confident in using digital tools and technology, adapting pedagogical approaches and course content, and were aware of the problems associated with students with learning disabilities. On the other hand, we found that teachers experience a lack of knowledge about integrating students' needs with technology. Furthermore, they lack practical relevant materials, and they require more training on how to use tools.

Keywords: Higher Education Teachers, Instructional Technology, STEM

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Blended Learning in Engineering Education: Current Situation and a Roadmap

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Abstract

Emerging technology and digital transformation have increased the demand for contemporary learning methods that fulfill the requirements of students. In particular, because of the COVID-19 pandemic, the acceptance of current learning methods that include technology is on the increase. Blended learning is one of the learning approaches that is gaining popularity. blended learning is the blending of learning processes and learning contents face-to-face and online in line with a certain plan and within a certain systematic scope. The fact that traditional learning and online learning are both used in the blended learning method gives colleges and universities many benefits. This benefit also shows its impact on engineering education. The framework of engineering education in higher education is suitable for the implementation of blended learning since it includes both theoretical and practical training activities. It is important to know that a systematic and planned process design is essential for an effective and efficient blended learning in higher education engineering education. This paper aims to examine the current state of blended learning in higher education with a focus on engineering education and to provide higher education institutions and engineering instructors with recommendations and a road map for their teaching processes. According to research findings blended learning increases the effectiveness of engineering education, and engineering learners' engagement. Moreover, blended learning allows for reducing costs and increasing safety in engineering education. Based on the research findings recommendations will be provided for engineering instructors and higher education institutions, and a roadmap for effective blended learning in engineering education will be presented.

Keywords: Blended learning, Engineering education, Higher education, Effective blended learning

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Socially and environmentally conscious entrepreneurship - tools for hybrid business models

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Abstract

Business models need tools to describe them in a visual way that is easy to digest and presents the most important elements of the business. This is all the more important as business models in the modern economy are becoming increasingly complex, also taking into account non-business elements such as social and environmental activities. This has contributed to the concept of hybrid models (Santos et al., 2015; Davies & Doherty, 2019). They are relevant not only for social enterprises or non-profit organisations but also for modern companies combining business with non-business objectives. The development of hybrid models is accompanied by the evolution of tools for describing and creating business models. New concepts are being created using different assumptions. However, although many new concepts for new tools are being developed, there is a lack of a structured description of the processes involved and an indication of the main trends. Hence, the purpose of this presentation is to propose a typology of business modelling tools relating to how non-business dimensions are taken into account. The article provides a literature review relating to business models in the context of an action for social and environmental goals. In addition, an analysis of tools for describing business models was carried out, resulting in a proposed method for their typology. As a starting point, the widely used concept of the Business Model Canvas (Osterwalder & Pigneur, 2010) was used. It has been modified by various authors to include social and environmental objectives. Three main types of tools are identified based on their design characteristics. They are discussed and their primary areas of application are indicated.

Keywords: Entrepreneurship, Hybrid business model

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The Model of Support for Socılar Entreprenurshıp – Experıences of The Sehubs Project

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Abstract

Social enterprises (SEs) are regarded as an important tool for social inclusion because of the support they offer for social inclusion. The activity of a social enterprise can bring various benefits to individuals and institutions that are directly or indirectly involved in, supporț or benefiț from its effects. The most important challenges facing current social enterprises can be identified as: (i) improving the competence of social entrepreneurs in running a social enterprise and managing human resources, (ii) improving communication between social enterprises and support institutions serving both social entrepreneurs and people at risk of exclusion, (iii) Creating cooperation networks between public administration and third sector organisations, (iv) Creating support centers for social economy entities, (v) Creating a system of financial and non-financial support for social entrepreneurs.

The aim of the presentation is to describe the innovative model of co-creating hubs for social enterprises (SE), working with various disadvantaged groups or toward overcoming social issues in various fields (culture, sport, employment, etc.), and to test its practical application in different local contexts. SE hubs operate as institutions for non-formal education and training that provide various types of support to management and operational staff of social enterprises with different social backgrounds. The model of the SE co-creation hub combines components that address: 1) the capacity-building needs of SEs in the area of applying inclusive training approaches for their staff; 2) the needs for exchange of experience and knowledge on integrating innovative non-formal inclusive and skill-based training programs that are applied by SEs for their target groups; 3) the needs for gaining public acknowledgement and community trust in SE activities.

Keywords: Social enterprises, Model of support, Social inclusion, Support center, Social entrepreneurship.

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Development of Hardware and Software Tools for Digital Engineering Education

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Abstract

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The digital engineering education needs to be enlarged with hardware and software tools for computer control systems with different purpose. In modern industry, types of mobile transport trolley platforms are often used, performing various types of operations, set programmatically or with the help of an operator who monitors and is responsible for the given process. The widest application of mobile transport trolley platforms is found in manufacturing. Mobile transport trolley platforms, or more often referred to by the term "robots", are used to transport raw materials, materials or finished products along a predetermined route on the territory of the factory or the workshop where they are located.

In the paper is present a tool for digital engineering education in the field of computer control system for mobile transport trolley platform with selection of components for the platform management development; assembling; development of executable code for microcontrollers and development of the structure of a graphical interface in the MATLAB software. The graphical user interface will be used for control the platform through the Internet using Internet of things. The Internet of things will improve the students' knowledge in algorithms; programming skills; collaboration and creative design. Hardware components are based on Arduino platform. The executable code for microcontroller is written in Arduino specialized language. The mobile transport trolley platform, executable code and graphical interface in the MATLAB are experimental tested for the functional possibilities. The developed tool is module based and have a possibility to enlarge the structure and functionality. This tool will be used in the digital engineering education in course "Computer control systems".

Keywords: Digital engineering education; MATLAB; Arduino; Internet of things

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Another Brick in the Code

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Abstract

Lego has been used in education as a tool for teaching and learning which fundamental principles behind its use include: 1) Hands-on learning, which means that Lego allows students to engage in hands-on, experiential learning by building and manipulating physical models which can help students to better understand and retain information. 2) Collaboration, in the sense that Lego can be used as a tool for promoting collaboration and teamwork among students. Working in groups to build and problem-solve can foster communication and teamwork skills. 3) Creativity, since Lego provides a flexible and open-ended platform for students to express their creativity and design solutions to problems. 4) Problem-solving, due to the fact that building with Lego requires students to think critically and solve problems in order to complete a task or achieve a desired outcome. 5) Engagement, because Lego can be a fun and engaging activity for students, which can increase motivation and participation. Lego is broadly adopted in a multitude of scientific domains such as, engineering, to teach principles of design and prototyping, computer science, to teach programming concepts such as loops and conditional statements, or business, to teach concepts such as supply chain management and operations. This study presents a programming crash-course for year-11 and 12 students, using Lego principle. Programming is a problem-solving approach that involves breaking down complex problems into smaller, more manageable parts, and then using logic and algorithms to solve those parts. Learning about algorithms and programming can help individuals develop problem-solving skills, logical thinking, and an understanding of how technology works. In addition, it can be a fun and engaging experience that provides an opportunity for participants to create and build new things. Twenty four students were enrolled in a 2-hour session designed to introduce them to programming concepts. The session was divided into five challenges: 1) sequential instructions, 2) loops, 3) loops and decisions, 4) variables, and 5) an in-class competition using the game of police and eggs thief. Firstly, participants learned the basics of algorithms and programming by setting the movements of a Lego panda figure through a maze built with Lego bricks in order to reach a food portion. Secondly, participants were asked to optimize their sequential instructions using loops. Thirdly, a new scenario was created in which participants had to program the decision-making of a Lego cat figure to drink milk when it found the corresponding piece. If the piece represented strawberry jam, the cat had to ignore it. Fourthly, Lego bricks with numbers were added to the scenario and participants had to define variables and perform arithmetic operations with those values. Finally, the participants were divided into two groups. One group controlled a thief who could reach the egg pieces, while the other group controlled a police officer who tried to catch the thief by reaching its location. Each group took turns and had one movement of the figure in each direction, as long as allowed by the scenario.

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