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The aim of ICAEEdu 2018 is to provide a forum where academicians and professionals from various educational fields can share their knowledge and engage in dialogues on fostering innovation and excellence in Engineering Education. The conference is open to research and practice-oriented papers in all aspects of Engineering Education, including transdisciplinary research and active methodologies.

Contents

University Refrigerator:

Learn How to Store Food Efficiently

Carlos Henrique Barbosa da Silva[*] and Marcos Afonso Lemos[♦]

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Abstract

This paper presents the process of creating the board game developed in the semester 2017/2 in the Logistics Discipline offered by the Escola de Engenharia Elétrica Mecânica e de Computação (EMC) of the Universidade Federal de Goiás (UFG). The game was named University refrigerator "GelU", inspired by famous games like Game of Life and Monopoly. The game presents as a logical element the principles of storage presented in the menu of the Discipline of Logistics allied to elements of Mathematics and Logistics. The objective of the game is to use the concepts of gamification to teach in a playful way the importance of Logistics in the food storage inside the refrigerator, using mathematical and financial calculation, through the interaction between the users and the constituent elements of the game. As a playful narrative, players (University students) share the same refrigerator to apply mathematical, strategy and logic calculations to efficiently store food, each one receives at the beginning of the game the products to be stored, all represented by game cards. The board presents houses designed for each of the four types of food, being the freezer represented by the color blue, fruits and vegetables represented by the color green, cold represented by the yellow color and the shelves represented by the color red. To win the player must store all food and have the highest efficiency in the end. The efficiency is calculated by the equation (Vgamecard/Vrefrigerator) x 100. The prototype of the game was evaluated and the research revealed that it has systemic vision for 100% of the researched ones. The developed game (GelU) used a playful language to present the Logistics to University students.

Keywords: Storage, Board Game, Logistics, Education, Gamification.

Board Games:

Evaluation of The Game Development Methodology in Engineering

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Abstract

The game methodology is used in education in various areas to stimulate creativity, concentration, reasoning, abstraction and other cognitive aspects. This work presents the results of the evaluation of the methodology of teaching - with games - used in 2017 2 in the offer of the subjects of Administration and Logistics in the Electrical Engineering course of the Federal University of Goiás. stimulated by the teacher on the first day of class, being presented the work schedule of the steps to be carried out until the final delivery of the prototype. The subjects were chosen by teams with up to 3 students regularly enrolled in the course, but all subjects should be included in the course syllabus and should be included in the training course emphasis. This research is exploratory and the data collection was performed with a questionnaire applied to the authors of the games after the end of the semester, non-probabilistic and with intentional sample. The survey revealed that 100% of respondents believe that game development provides a systemic view and encourages players to make decisions. 67% of respondents consider that the clarity of the rules allows a greater understanding of the game and that design is an instrument of innovation. The use of this methodological proposal enabled the teacher to teach in a way that arouses interest in the subject topics offered in the course and increase the learning of the contents by the students.

Keywords: Education, Engineering, Board Game, Playful, Methodology.

Formula SAE Project:

A Practical Approach to The Theoretical Concepts of Engineering

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Abstract

The Formula SAE project was born in 1981 in the USA due to the lack of engineers specialised in high performance vehicles and spread out over the world. The Formula SAE Unesp Racing Team has been in activity since 2009 and nowadays gathers around 35 active members. This project provides engineering students a hands-on opportunity to apply in practice the theoretical concepts they learn in classroom. It challenges students from several engineering courses to seek knowledge beyond their undergraduate courses and join multidisciplinary teams that must completely design and build together an open-wheeled single-seater formula race car. This article investigated the impact of Formula SAE project on the academic life of UNESP Guaratinguetá Campus and how the project allows strengthening the student's link to the Engineering course and profession. The methodology was based on exploratory research with data collection by questionnaire among the members of the Unesp Racing team, from Faculdade de Engenharia de Guaratinguetá, UNESP, in the period of 2017-2018. The survey revealed that 80% of the interviewed students declared that the project developed by the student team fully contributes to integrate into practice the multiple theoretical contents of the engineering courses. Also, 100% of the students completely agreed that Formula SAE requires students to deepen into theoretical knowledge and simulation softwares. The same amount of the population considered that teamwork is critical to the project development. This is confirmed by observing that the team is divided into hierarchically organized sectors, each one responsible for a part of the design and creation of the vehicle, that meet bi-weekly to check the progress of the project and to set deadlines for achieving the planned goals. It is worthy noting that 100% of the surveyed partially agreed that the project has conceptual topics not covered by Engineering course subjects. As a result of this study, it is possible to note that the Formula SAE motivates students to deepen their theoretical knowledge and to develop soft skills on engineering.These topics contribute to prepare a future top range engineer, since proactivity, team-working and cutting edge skills are valuable to the motorsports career.

Keywords: Designing, Engineering Education, Formula SAE, Practical Learning, Team-working.

Analysis of The Formation in Engineering by The Experience Lived in The Science without Borders Approach of Pedagogical Differences between Japan and Brazil

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Abstract

The introduction of the Science without Borders (CsF) program in Brazil has stimulated many university students, especially from the exact sciences, biological and health, in search of new experiences in countries that are referenced in their respective fields. The students' desired to experience a different culture and to have in-depth contact with a foreign language these were of the reasons that led to the international academic exchanges to several countries. Japan was one of the countries that opened its doors for Brazilian students from 2013, after overcoming the catastrophe by the Tsunami which hit on of March 11, 2011. Public higher education in Japan is characterized by the value of research and teamwork, being that all students from the third year are required to belong to a laboratory to carry out internships, and if they are interested, they may apply for a vacancy in the laboratory in the last year of their course. The practical and laboratory participation corresponds to 40% of the academic curriculum in Japan, whereas in Brazil the emphasis is on theoretical classes. Brazilian students are more prepared in theoretical concepts than the Japanese students because of the greater amount of information absorbed during the engineering course. The methodology used in this work was exploratory and the data collection by observation. The research is a case study from the years 2015 to 2016 by a student at Tohoku University in Sendai, Japan and from 2010 to 2015 and 2016 to 2017 at the Federal University of Goias, in Goiania, Brazil, with the objective of presenting the differences in the academic structure and its influences in the formation of the engineering professionals between Japan and Brazil.

Keywords: Education, Engineering, Brazil, Japan, Exchange.

Application of Problem Based Learning (PBL) to The Discipline of The Civil Engineering Course

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Abstract

This study aims to present the planning for the application of the method in undergraduate education in Civil Engineering by the Management Notions discipline for Engineering in the city of Maraba. The study was structured to be conducted in ways that are considered the perceptions of students and teachers on the use of BPA as a teaching and learning tool. Therefore, it is intended to apply the method according to the proposed in the literature. The objective of this paper is to present the planning of the implementation of the ABP. a visit to a higher education institution that uses the current method of graduation in order to observe in practice the development of ABP was held. For plans of problems cycles it uses the Canvas adapted to education as proposed by Marques (2017). The method used was qualitative in nature, which is expected to analyze the perceptions of students and teachers on the implementation of PBL. It is intended by this research contribute to the formation of the engineer, reducing the gap between theory and practice.

Keywords: ABP Education, Engineering, Civil Engineering, Education, Vocational Training.

A Qualitative Evaluation of Student Perceptions of The PBL Process

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Abstract

The education process challenged us to translate constructivism into new practices as research in science education focuses on evaluating the student perceptions of the PBL process, in instance, as working in groups and its assessment for effective construction of knowledge and development of competencies. This work aims to survey the social representation of engineering students on the PBL active methodology application on technical subjects' classes. Five subjects from Computing, Electrical and Mechanical Engineering courses of two major Universities within Brazil centre were considered. A total of 115 students evaluated the methodology. A percentage of 69,7% of the total universe answered the questionnaire, leading to a margin of error of 3% and confidence of 90%, with p = 85% estimated from the standard deviation of the calculated mean percentage of 31%. A Likert Scale were utilized in order to evaluate 10 items of 4 dimensions: team work, multidisciplinary aspect, learnability and leadership. Results show that all 10 items of four dimensions have great correlation from class to class, independent of university, course and grade. In general, students supported the assessment and suggested that some items could be merged. Overall, behavioral skills were perceived as motivators of group process, as cognitive skills were perceived as necessary for group discussion success.

Keywords: Problem Based Learning, Higher Education, Alive Engineering, Construction of Knowledge, Competencies.

The Importance of The Implantation of Sustainability in The Engineering Graduation

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Abstract

This article demonstrates the relevance of, from college education, training engineers who not only have deep practical and theoretical knowledge, but also have social, environmental and economic concerns focused on sustainability with all of its plenitude. The research is developed from the literature review of the materials present on the subject, in order to confirm the theories developed during the body of the text. The relevance of this article comes from the need, acquired in the last decades, during the exercise of the Engineering profession, to contain the advance of the devastation of the environment. Because of their great participation in the changes that take place in the environment in which they work, the engineer ends up having to adapt to the new world scenario, in which both society and the economic market request more sustainable models of action. Based on this fact, research was conducted that resulted in graphs and data related to new demand in the economic market for environmental certifications such as ISO 14001: 2015, applied in Brazil, which from 2016 to 2017 had an increase in the emission of about 544% . However, on the other hand, it was verified through research carried out at the Polytechnic School of Pernambuco that only an average of 1,94% of the workload linked to engineering training is intended for teaching sustainability, demonstrating the need for universities to adapt their program for the current economic scenario. Besides the university program, it is necessary for the training of the engineer to live the principles of sustainability, as in the concept of "living laboratory". The institutions of undergraduate education in engineering appear as the factor that will enable and provide the means for this professional to reach the labor market with the necessary requirements in relation to the pillars of sustainability, covering the social, environmental and economic spheres.

Keywords: Engineering, Sustainability, Undergraduate Education, Dow Jones Sustainability Index, CSR - Corporate Social Responsibility.

Qualitative and Numerical Analysis of Didactic Model in The Structural Mechanics Teaching

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Abstract

Based on data from MEC (Ministry of Education), the CNI (Industry National Confederation) came to the conclusion that the dropout rate of engineering students from Brazil's universities is more than 50% and that this can be associated with the low knowledge level of mathematics and science besides mismatch between the traditional teaching and the different learning styles of students. As mentioned by Felder and Silverman (1988), there are a lot of people with several different learning styles, e. g, by seeing and hearing or reflecting and acting. Therefore, the use of this traditional teaching method can be unsatisfactory for a specific group of students. Most of the teaching method is supported by verbal information (lecturing) and visual representation (sentences, formulas and symbols written in handouts or on blackboard). Thus, engineering teachers should seek out for alternatives ways of teaching that could make the learning environment more enriching. What would that be? The use of suitable methodologies for the evaluation of theoretical and computational models shown in a classroom is essential for teach engineering students and improve their quality and efficiency. Specifically, in the structural mechanics teaching, tools for developing a better understanding of the behavior of structures, like the adoption of the structural didactic models, play an important role. These models are physical models that try to simulate the real behavior of architectural structures, allowing the students to realize how different structural elements work. They consist of a set of modular pieces which are connected to each other by their joints, which can be made with low-cost materials. The main goal of this work is to show the incorporation of a set of didactic models, designed by civil engineering students enrolled in the Structural Analysis and Strength of Materials course at the UESC (Universidade Estadual de Santa Cruz), located at Ilhéus, Brazil, in the analysis of columns buckling and deflection of beams and frames with distinct boundary conditions and loads. For buckling effect, the column was simulated by an aluminum piece supported by a wood structure where its deformed shape was compared with that one found in the literature. The deformed shape result of didactic model was compatible with the literature. For beams and

frames didactic models, their deflections were measured in several points by a mechanical extensometer and the obtained results were compared with the analytical formulation (Castigliano's First Theorem) and numerical model that use the FTOOL program. Some concrete blocks were used to simulate a distributed load with their weights and dimensions measured appropriately. The results obtained for simply supported beam are similar to those obtained with FTOOL and Castigliano's Theorem (8% error percentage). For the cantilever beam the deflection obtained had a considerable discrepancy compared to numerical and analytical results. Three different Frames models had results approximately close to numerical and analytical analysis. It can be concluded that the use of the didactic model is an important tool to improve the learning level of students, by helping them to reach a better understanding of the structural behavior.

Keywords: Didactic Model, Engineering Education, FTOOL, Structural Mechanics, UESC.

Online Platform for Learning of Electrical Power Systems

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Abstract

The learning of Electric Power Systems (EPS) is related to the experience of the students with the technologies used in this area. To allow a better understanding of this subject is important to have practical classes. However, because of the cost, size and/or access to EPS it is difficulty to provide this field experience to students. This understanding can be obtained through the use of computational simulators. Tools that allow the make of several operating conditions of a real system. When these platforms are open access they do not have user-friendly interface and freedom of assembly. While private platforms have a high acquisition cost and focus on application and not teaching. In this scenario an online didactic tool was developed to allow the adequate simulation of systems. For this, the tool has online access, teaching-oriented interface and uses Optimization to find the power flow. The Optimization method demonstrates effectiveness for this use, due to the speed of resolution and the adaptation to the model. In it the objective function of minimization is given by the active power flow in the load and generation bus, while the constraints are the reactive power flux in the load bus and the active and reactive power injected by the generation and reference bus, besides the voltage limit of each bus and accuracy. While the variables are the voltage and angle of each bus, which at the end of the process will be used to calculate the power flow and then the short circuit current. The algorithm is being developed in the mathematical modeling tool AMPL, in the version for student, and uses the free solver IPOPT; the virtual interface is implemented in the Heroku platform, in Python language, with the Flask library and the database by MongoDB. The try-out of the values obtained by the platform occurs by the simulation of examples with solution present in textbooks. Such examples will have them meshes available in the tool to aid the learning in the subjects related to electrical power systems. The tool will also allow the user to construct different EPS. Inserting slack, generation and load bus. As well as transformers, with transforming ratio and/or phase shift, line impedances and capacitor banks in the bus. The use of optimization to calculate power flow is effective for accuracy and speed, as compared between systems present in textbook and platform-mounted examples. The virtual access occurs by the address https://pesep-app.herokuapp.com/#. Which does not require computational infrastructure

requirements and where the evolution of the tool can be monitored. The platform will be initially tested in the subjects related to EPS on the department of electrical engineering of the Federal University of Espírito Santo (UFES). These disciplines correspond to approximately 8,3% of the compulsory and 19,8% of the electives for undergraduate and 13,8% for the graduate. The course has 655 students in the year 2018.

Keywords: AMPL, Educational Program, Electrical Power Systems, Optimization, Power Flow.

Applications of Tools in The Development to Business Model for Gradually in Civil Engineering

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Abstract

The Projeto Integrador (PI) is a discipline offered by the Centro Universitário de Patos de Minas - UNIPAM, since the year to 2011, where all courses present in the institution were reformulated to meet this new demand. In its turn, the Projeto Integrador have with methodology to integrate the contents covered of each course, contributing to the continuous improvement of student's learning ability. In this sense, from the year 2015, the Civil Engineering students to study the Projeto Integrador discipline in seventh period, are provoked to develop the culture of entrepreneurship and innovation in the place they are inserted. Therefore, it is based on the methodology of Design Thinking, where the students must model throughout the semester a business model applied to any sector of the civil construction. In the foregoing, throughout the content, all the tools for creating the business are presented through classes taught by two professors, as well as mentoring by students which have already experienced these experiences in previous semesters. In addition, the environment for the application of classes is totally different, since they are held in Inverted Rooms, that is, a modern and relaxed place for discussions of ideas, so that students organize themselves in groups. Given the order, because of the whole process, the students must present their ideas formatted and validated in the MUITEC University Exhibition of Technological Innovation, developed by the institution. It should be noted that the business models developed by undergraduates are evaluated by external banks, composed of entrepreneurs and investors in the region, and can be a channel to encourage the creation of Startup's or even start a process of pre-acceleration. It should be noted that since the application of this Projeto Integrador model, 61 (sixty-one) new ideas were developed by the students of the course, two of which were selected for investment and today are tools applied in construction companies of region. However, the other ideas are in the process of improvement and have great potential to be applied in industry. It is concluded that the use of entrepreneurship techniques in the curriculum of the Civil Engineering course is of great relevance, since it assists students in the development of their own business, since most institutions are only concerned with technical training and do not emphasize the market need.

Keywords: Business Model, Innovative Education, Marketplace.

Academic Exchange and Outreach Projects:

Training Students to Be Conscious of Their Role as Young Participants of Current Problems of Engineering and Society

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Abstract

In the present paper, the experience of a French exchange student of the EIVP (École des Ingénieurs de la Ville de Paris) at the UFRJ (Federal University of Rio de Janeiro) is described. The student was an intern at the UFRJ's MUDA Outreach Project, for five months in 2017, where she had the opportunity to visit two occupations supported by Brazilian social movements in previously unoccupied sites in the metropolitan area of Rio de Janeiro. We discuss whether the student's participation in such an experiment was able to provide positive results in terms of engineering education. To this end, the student participated in various projects taking place in the squat, which led to the elaboration of an internship report and later to an academic paper, in order to consolidate her learning. Based on reflections about the concept of "refugee", in Brazil and France, settlements initiatives and "homelessness" in both countries were analyzed and compared. The primary conclusion is that to be successful, settlements have to be carefully planned aiming at the inclusion of the individuals involved in societal institutions. In addition, it is important to stimulate the learning of the concept of collective construction of housing, so as to assign meaning to space and their function as residents, both to alleviate possible tensions and to provide a means to consolidate their self-confidence and dignity, as individuals and citizens. In this sense, the university is no more the only holder of knowledge, but acts as a facilitator of the knowledge sharing process and at the same time training Brazilian and foreign students to be aware of their role as young participants of current issues in the interface between engineering and society. Therefore, one can consider as quite successful the exchange student experience as an intern at the MUDA Outreach Project.

Keywords: Engineering Education, Academic Exchange, Interdisciplinary Studies, Social Inclusion, University Outreach.

Navigation System for the Visually Impaired:

A Transformational Engineering Education Case

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Abstract

Society's problems are becoming more complex, broader and are multidisciplinary on their roots. In order to have market value engineers must identify and solve societal problems whose solution benefit people, specially their quality of life. This work reports about an effort to address this issue by involving engineering students on a human-centered project to promote the mobility of the visually impaired. The information about the environment and the precise guidance of visually impaired people is the basis for their safe mobility, especially in unknown spaces. Safe navigation of visually impaired people is based on cognitive maps, a mental spatial pattern of important locations or way-finding points. It involves storing the ordering or relationships between several variables that can be physical objects such as way-finding points or abstract objects such as ideas. Visually impaired and blind people need assistive technology systems to support effective navigation. One approach for assistive system placed within the physical environment is to embed a set of navigational beacons, using Bluetooth Low Energy (BLE) that can be activated to provide local cues for doorways, offices etc. behaving like a real time proximity-based locating system (BLE-RTLS). BLE beacons are small wireless devices that transmit a nearly continuous radio signal, usually a few times every second. This signal tells the smart devices the beacon's ID number which is sent to a cloud server to find and retrieve the related information. This information triggers a customized event in the visually impaired app that is related to a specific location he/she is next to at that very moment, giving information about rooms, doors and stairs in front of the user, upcoming changes of the walking surface etc. The project deals with a successful hardware/software android system which enables communication of relevant location-aware information to a blind person carrying a Bluetooth enabled cell phone. It is focused on the case of navigating on an unknown indoor/outdoor environment of Centro Braille in Campinas (CCLBC). Information provided to the user, as he/she approaches the unit, includes a description of the institution, unit's topology and services available in three different floors. Care was taken to not overflow the user with information and to minimize the multiple beacons interference when the receiving signal strength is used as a single decision parameter. The experiment was carried out between June and November of 2017 with 100% success. Solution development required the integration of knowledge, processes, techniques, and tools both hardware and software. The applied methodology promoted critical thinking and the development of student's responsibility for their own learning. Students participating on the project experienced the opportunity to work with people who had different cognitive and intellectual capitals, a challenge found most of the time only outside school limits. The collaborative applied method nurtured initiative and

risk taking to the process of solving a real-world problem, therefore contributing for a better student education. This work was carried out under the extension project "Promoção da Inclusão Social/Digital de Deficientes Visuais através de Soluções de Engenharia Elétrica".

Keywords: Bluetooth Low Energy, Navigation System, Real Time Proximity, Transformational Engineering Education, Visually Impaired.

Interdisciplinary Projects Involving Engineering and Veterinary Courses:

Expanding Borders of Engineering Education

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Abstract

This work reports an experience involving Interdisciplinary Projects between Engineering and Veterinary students. As part of a live-stock replacement policy, students from both courses working together built a representation of a dog circulatory system. The model consists in a representation of a heart and veins made with LEDs controlled by an Arduino, programmed to show the heart pumping the blood to cells and lungs, where the blood oxygenation occurs. This project seeks insert the student as an active subject of the teaching-learning process and promote the engagement of teachers from different

disciplines and areas of knowledge. In the process of learning, for the establishment of new mental connections, it is important to consider two aspects: continuity - process in which the student relates the previous knowledge with the new ones, that is, the teaching is supported in already existing cognitive structures; and the rupture - a process that is installed in the presence of new challenges proposed by the teacher and that surpass their experience. Knowing that these processes are essential, the need for interdisciplinarity, which will make it easier for the student and the teacher, to understand and practice certain subjects and the role of each one of them in this scenario. For the students of Veterinary Medicine the understanding of the physiological processes and the fact of explaining their needs to the students of Engineering, constituted a significant pedagogical gain. From the elaboration of visual mockups, the understanding about the functioning of the organs grows. In formulating explanations of the phenomena to colleagues from another area, the elaboration of reasoning reaches the levels of deep learning. For Engineering students, we can say that there was an engagement to seek more knowledge of the area of physiology and anatomy, showing a proactive attitude to solve problems that extrapolate their area of training. In addition, there was an interaction between the students of both courses, which is very important in the training of professional integrators who need to communicate and act in several areas. Stimulate creative power, autonomy, integration and group work among students and teachers, promoting interdisciplinarity. Promote the discussion of innovative topics for the undergraduate course, with a critical and reflective basis.

Keywords: Active Learning, Interdisciplinarity, CDIO, PBL, Project-approach Education.

Education for Sustainability at The Polytechnic School of Pernambuco

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Abstract

Increasing concern about negative environmental impacts demands sustainable practices, and, therefore, professionals able to collaborate with the Sustainable Development (SD). Sustainability requires engineers not only training to establish problem-solving techniques but also the ability to identify problems, and, thus, propose appropriate and effective solutions. During the university years, students are able to actively experience, build, and practice knowledge, skills, and principles of sustainability as part of their professional identity and formal education. For this reason, principles of sustainability must be incorporated into engineering undergraduate programs, and High Education Institutions (HEI) need to revise and change their educational models. The purpose of this paper is to identify courses related to sustainability in the Civil Engineering (CE) undergraduate program of the Polytechnic School of the State University of Pernambuco (POLI/UPE) and compare them with the related courses of the best CE undergraduate programs in the Northeast of Brazil. Initially, a bibliographic research was carried out to identify aspects related to the importance of sustainability teaching in the scope of engineering undergraduate programs, at national and international levels. Then, a documentary analysis, carried out in May 2017, allowed obtaining and detailing information regarding the 17 programs considered in this study. From the results, we noticed that 29.4% of the 17 programs do not offer courses related to the teaching of sustainability concepts and applications. Undergraduate programs with content related to the study of sustainability totaled 10 courses. Regarding POLI's CE curriculum, we observed that only two required and one elective courses address issues related to sustainable development, concepts of sustainability, and social responsibility of the engineer. It can be concluded that there has been a shortage of courses focused on teaching sustainability. For further research, we suggest a continuous work with other Brazilian HEI, contacting engineering departments or undergraduate program coordinators. For meaningful learning outcomes, these topics should be incorporated into various undergraduate courses in order to guide the students on how to integrate sustainable concepts and practices into their professional life.

Keywords: Curriculum Assessment, Civil Engineering, Undergraduate Programs, Syllabus, Sustainability.

Strategic Board:

Test The Level of Knowledge About Other Countries

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Abstract

This article presents the process of creating a board game called "Strategic Board - (TE)" held in the second semester of 2017 in the discipline of Logistics in the Electrical Engineering Course of the Federal University of Goiás (UFG). Creative process management, Design Thinking, such as brainstorming and prototyping. Supported by the concept of gamification to create a game to support teaching and training in a playful way. The inspiration for the game was board like Profile, Academy, Master, War and the animated film Operation Present. The theme of the game is Geography / Curiosity. In order to win the player must conquer as many "territories" as possible, represented by the houses available on the board, answering questions related to world geography and curiosities, and using strategy to block the advancement of opponents. The board design was developed to enable different sequences of moves, allowing movements for all directions; the player is free to choose the best move. Another differential is the possibility of customization of the questions, allowing the used game to be used with other questions and or used for company training. Applied research using the game's prototype revealed that the design is innovative for 80% of respondents, 20% partially and 0% considered without any innovation.

Keywords: Strategy, Game, Logistics, Gamification, Design Thinking.

Common Engineering Students' Difficulties with DC Electric Circuits in An Inquiry-based Laboratory

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Abstract

It is well known in Physics Education literature that some difficulties of the students with direct current electric circuits concepts remain even after attending to Introductory Physics. The National Curricular Guidelines for Engineering Teaching (DCN) defines the principles and proceedings about curriculum in all Engineering courses in Brazil. In DCN, is said that all courses must discuss about 15 topics that should take, at least, 30% of all the time spent in undergraduate. Some topics are: Scientific and Technologic Method, Physics, Math and Applied Electricity, which relate directly with the Electricity and Magnetism laboratory course. It is offered to third period undergraduate students attending to the theoretical electricity and magnetism classes in the University of São Paulo. Our group have been researching this laboratory for more than 10 years, looking to students' difficulties and proposing an active learning instructional material. In 2006, we adapted a question developed by McDermott and employed it to investigate students' conceptual understanding of electric circuits in three states of Brazil. The research involved students from STEM (Science, Technology, Engineering, and Mathematics) areas and the question was applied after students attended to theoretical and laboratory courses. To answer the question, students had to order light bulbs according to brightness in three different electric circuits. The fact that only 13% of students answered correctly agree to result in other countries and inspired us to restructure the laboratory guide from a course in our institution. The new guide was inquiry-based with some activities adapted from Tutorials in Introductory Physics and others developed in a prediction-observation-explanation form. We used the same question as pre and post-test and the average percentage of students who got the maximum score was 47%. We also have been using the Determining and Interpreting Resistive Electric Circuit Concepts Test (DIRECT) as assessment. The DIRECT is a 29-multiple choice test whose the questions can be grouped in conceptual objectives, in a way that allow us identifying specific conceptual difficulties in students. After analyzing the questions, we proposed many modifications in the students' guide and some of them we managed to improve like those related to resistance and current. On the other hand, less than 50% of students could answer correctly some questions related to the concepts of power and voltage in the post-test, even after our efforts to improve learning in this aspect. Along the years, we were able to help students overcome

known conceptual difficulties with the proposal of new activities, but some difficulties still a challenge to be outgrown. In this work, we analyze the data collected from 2013 to 2017. Our experience have shown us that research for improving practice is fundamental to overcome persisting difficulties and is a long-term and constant action. Also, using different resources such as homework activities on the internet, videos and computer simulations have shown to be useful tools as supplement materials.

Keywords: Electric Circuits, Inquiry, Laboratory, Engineering Teaching, Undergraduate.

Flipping the Classroom:

The Application of The Circuit as An Objective Evaluation Action in Foundation Design

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Abstract

The evaluation process is one the most challenging tasks in education because, for many times, the process is subjective, lacks clarity and goals or has a deficient comprehension of its purpose. The circuit is a form of assessment based on the interaction and cooperation between students that aims to verify the results of the learning process through entertaining activities. This paper presents the results of applying the circuit in Foundation Design, an undergraduate course of the 5th-year of Civil Engineering at the Universidade Estadual de Santa Cruz, UESC, in Ilhéus, Brazil, in 2017. The motivation for applying the circuit in this course was to permit the students to work together and share what they have learned with their classmates. By doing so, the professor considered the idea of the Zone of Proximal Development, assessing the students' ability to solve problems with the help of their peers. The method, although containing many rules, was easy to apply. The students, divided into groups of three, were expected to create two reports based on data for one Standard Penetration Test – SPT - and one Cone Penetration Test – CPT. Each member of the group had a different attribution, the first one, the engineer, producing the report, the second one, the technician, completing the missing data of the tests, and the third one, the manager, correcting the final report. After completing the activity, each student pointed out its negative and positive aspects and this information was used to compose the results. From the results, the method showed to be effective because it developed the students' sense of responsibility (73% of the answers), it allowed the students to experience the dynamics of the labor market and was innovative (60% of the answers each). Conversely, it may have failed with respect to the distribution of time (40% of the answers), what may have compromised the results of the groups. Therefore, the method proved to be effective but, for further applications, it still needs some improvements.

Keywords: Circuit, Foundation Design, Zone of Proximal Development.

The Acting of The Higher Education Institution in The Accompanying of The Supervised Internship:

A Contribution for The Engineering Courses

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Abstract

Brazil's public policies of professionalization recognize the internship as an educational-professional link, supervised and developed as part of the pedagogical project and the trajectory of the student's education. In Brazil there is a law that regulates the student internship on their undergraduate courses. The internship needs to be understood as a powerful source of learning, as it is a propitious environment of great importance for the exchange of technical and transversal competencies between companies offering internships, higher education institutions and students. However, it is necessary to promote a consistent dialogue between the three parties involved and it depends to a large extent on initiatives of Higher Education Institutions. This work presents a proposal of action focused on the relationship between the following agents: the supervising professional, the trainee student and the tutor teacher. It is being applied to the Course of Electrical Engineering of the Federal University of the State of Espírito Santo, in order to collaborate in leading the student in his trajectory, having as one of the most important pillars supporting the actions of acquisition and transfer of the competencies proper to the professional practice. The intention is to operate in the interfaces between the three agents, promoting a dialogue between the parties and a reflection on the performance of each one of them to establish and stimulate the joint participation of all the agents in the educational-professional process of the student. Therefore, it was decided to develop interfaces in the form of a website to provide efficient ways of communication, containing very objective and easy-to-answer surveys as well. With this methodology, the trainee can receive information about technical contents necessary for the good performance of his activities, as well as a more effective guidance of his supervisor. The supervisor will have the opportunity to know how the University is preparing their students, besides being able to propose programmatic contents and exchange information about the existing limitations and skills that need to be developed by the trainee. There will be a standard routine for completing the surveys by the student and the supervisor. Moreover, there will be a report from the teacher after analysis of the questionnaires, which, if deemed

necessary, will promote a conversation between the parties. It is hoped this pedagogical strategy will be able to reveal, for the business part, that it is worth investing in the offer of good internships; to show the student that he should make every effort and seize every opportunity of acquiring skills to become a competitive professional in the current job market and; to show the University that a closer relationship with the business sector can contribute to update the pedagogical resources for the professionalization of students and to establish more research and development partnerships.

Keywords: Education, Internship Law, Supervised Internship, Technical Skills, Transversal Competencies.

Business Model for Photovoltaic Systems through Shared Generation:

Approach with Design Thinking

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Abstract

The National Electric Energy Agency (ANEEL) regulated the shared generation model by means of Normative Resolution n^o 482/2012, where individuals or legal entities can unite for installing a generating plant that uses renewable sources for the production of energy power. In this way, the collective

engagement of cooperatives and consortium has adopted the installation of photovoltaic systems as an alternative for the reduction of electric energy costs and the diversification of the energy matrix in Brazil. From the interest of maximize the margins of business through shared generation, it is possible to find in the market today proposals for rent or purchase of lots that use solar energy as a renewable source to generate energy credits, being an alternative for consumers who have some kind of economic or physical roofing limitations. As attractive, the surplus in kilowatt-hour of energy generated by the photovoltaic system used it to reduce the costs from the electric energy consumption of the participants that mighty be linked to the system of shared generation through the registration of a natural person or a national registry of a legal entity. From this, the work aims to evaluate the different forms of entrepreneurship in the photovoltaic solar energy market, and how these types of businesses can generate a capacity of technical efficiency compatible with an economic viability that meets the common interests of a consortium or cooperative that uses the generation shared by means of photovoltaic system. The methodology for analyzing this shared distributed generation business model will be through Design Thinking, which has tools such as map of empathy and the algorithm proposed by Minkowski. The purpose of this analysis is to meet the need of Brazilian society in an innovative way to promote solutions that bring well-being in the lives of the people involved in the process.

Keywords: Business, Cooperative, Consortium, Design Thinking, Solar Energy.

Evaluation and Implementation Proposal for A Methane Gas Generator Using Solid Waste

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Abstract

A waste or garbage is any material considered to be useless, superfluous or worthless, generated by human activity, unwanted and discarded in the environment, where once collected, the waste can be disposed of in landfills or destined for composting, incineration and recycling. Reducing the impact of economic activities on the environment is a reality today and is no longer just an issue for ecologists. It is necessary to avoid that such a large volume of waste continue to be released into the environment, polluting sources, soil, air, as they not only affect the quality of life of rural and urban populations, but also the survival of flora and fauna in the regions where the creators are inserted. In recent years there has been a resurgence of interest in biogas capture due to growing concern about global warming. The use of biogas to generate electricity causes a reduction in the potential for environmental pollution, since the mixture composed of a marked concentration of methane gas (CH4) is burned, about twenty (20) times more polluting than the dioxide of carbon (CO2), with regard to the greenhouse effect. The use of biodigesters has deserved important importance due to the aspects of sanitation and energy, besides stimulating the recycling of nutrients. Since the entry into force of the Kyoto Protocol there has been renewed interest in biodigester technology. The biodigester is an equipment where organic matter fermentation takes place in a controlled manner, providing the reduction of environmental impact and the generation of fuel of low cost. The fermentation of the residues occurs through the action of microscopic organisms (bacteria). Thus, considering the environmental problems and the possibility of saving natural gas prices, this work has as general objective the evaluation and suggestion of the implementation of a methane gas generator using solid waste, in addition to a review of the biogas production study reuse of methane gas. At the end of the work is intended to verify the possibility of implementing the project in an industrial kitchen

Keywords: Waste, Garbage, Environmental Problems, Kyoto Protocol, Biodigester.

Operations Management Implementation in A Small Food Company

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Abstract

The concept of production management has a wide scope, thus comprising a series of subjects that should not be analyzed individually. In our daily life, production management activities happen at all times, which makes us seek to know the operation of productive activities in order to manage them in the best possible way. Organizations are essential to society, since all the time people have contact with the products and services they provide, from the mattress they are sleeping to, the food they consume, the transport used for commuting, water that they would consume, none of this would be possible without productive organizations. These organizations are divided into three fundamental sectors: primary, which includes the extractive, fishing and farming areas; represented by the manufacturing industries; and tertiary organizations that are the service area organizations. This work presents the application of the concepts of production and operations management, stock and demand management, and material resource planning in a small food business, which did not have any type of productive or financial control, and it was possible to observe the results and the opportunities that can be provided in the long term, through the optimum use of material resources, machinery and manpower, as well as enabling the company to new markets for action. In addition to presenting the application of the concepts of production and operations management, the general goal is to promote the financial recovery of a small food business, in a situation of near bankruptcy, through the implementation of the concepts of production planning and control, control of stock levels of raw material and finished product and financial management. And finally, to reach the goals were implemented an MRP system to manage of raw material storage levels and finished goods also; production standardization using news operational requirements and defining the costs of raw material, production operation and sales.

Keywords: Production Management, Operations Management, Storage, Demand, Costs.

Homemade Beer:

Academic Enterprise

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Abstract

A Beer is a non-distilled alcoholic beverage obtained from the alcoholic fermentation of malted cereal wort, usually barley malt. The origin of the first alcoholic beverages is uncertain, but probably have been made from barley, dates, grapes or honey. Beer was already known by many ancient civilizations and was popular in climates where it was not possible to grow grapes. Most cereal drinks in the last 8,000 years are considered beer. The invention has been attributed to the Sumerians and Egyptians, both civilizations having produced an alcoholic beverage for more than 5,000 years. The people of northern Europe discovered the technique of brewery not long before the Christian era. To date, some beers in this region have a slightly acid taste, indicating the development of lactic fermentations. The monks have perfected brewing technology and served, in a way, as wholesale sellers. The homemade beer market in Brazil has presented annual growth between 30% and 40%. Home brewing today represents 1% of the national brewing sector, but according to the Brazilian Beverage Association (Abrabe), the trend in growth should lead the country to reach 2% of the beer market share in ten years. In the second quarter of 2016, the number of breweries registered in the Ministry of Agriculture increased from 320 to 397. The current craft beer market in Brazil is seeking local, organic, differentiated products that have a history, there is a need for new tastes and new experience, and do not just want what comes from large, large scale, low quality companies. The practice of homemade brewing not only opens the door to the emergence of new breweries, but also creates business opportunities for the supply of raw materials and equipment. This research project aims at the idealization, planning and execution of a business plan for the complete artisan brewing process, seeking alternatives to raw materials, processes and manufacturing and equipment, in order to make its implementation simple and with low cost making it possible to enter the beverage market.

Keywords: Industrial Engineering, Craft Beer, Teaching Methodologies and Methods, Process Control.

Extracurricular Activities:

Analysis of Its Influence and Relevance

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Abstract

In Brazil, the academic curriculum offered in undergraduate Engineering courses is focused on teaching primarily the theories and techniques necessaries to meet the basic needs of professional Engineering practices. However, the professional market requires skills from the new engineers which are not presented in their regular curriculum. Among the requirements, it can be pointed out the following skills: communication, teamwork and mastery in problem solving techniques. In contrast of that trend, the Polytechnic Association (PoliUFG) was created at Federal University of Goiás, Goiânia, Brazil, in 2015, formed by students from several Engineering courses from the University itself. The Association aims to carry out initiatives complementary to those offered at the academic institution and it is legally characterized as a Non-Profit Civil Association, with its own statute and independent management. In order to fulfill one of its objectives to establish an approximation between the professional market and the University, PoliUFG created the Market Week. This event, which lasted four days, is formed by lectures given by local big companies owners and CEOs, workshops, technical visits besides bringing to the University internationally renowned companies such as AmBev, Cargill, Kraft Heinz, Monsanto and P&G. This experience provides to the students not only a professional experience preview but also a perception of the skills that the job market requires. In the 2017 edition of the Market Week, the Net Promoter Score (NPS) methodology was used to evaluate the importance of this type of event in three different categories: University, students and the professional market. This evaluation showed, with satisfaction, the achievements of the event, as desired by the organization, among them, the development of soft skills and the contact with the practical area of Engineering through the participating

companies. It was also possible to observe how much the students are interested in this type of event, since a significant number of participants assessed it with high importance and recommended to friends, besides saying they would return to attend the event in the next year. The results also allowed to infer the high impact of promotive initiatives, such as the Polytechnic Association, in undergraduate courses. A conclusion of this study points out that students who participate in institutions such as PoliUFG or attend to their events are more likely to be attuned to what is happening in the professional market than a regular student who goes to the University just to attend classes. This fact is shown by numerical analysis extracted from the NPS, a survey answered by the students and the companies at the end of event.

Keywords: Education, Engineering, Extra Curricular Activities, Job Market, Soft Skills.

Development of A New Portable Guitar:

Linking Innovation and Undergraduate Teamwork

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Abstract

The constructivist spiral approach conceived by LIMA (2017) consists in constructing knowledge from simple tasks with general applications before facing a complex and specific assignments. Knowledge can thus be seen as a spiral staircase, in which a person is always at the same spot but moving up towards a more complex level. Based on this approach, the Laboratory of Innovation, Prototyping and Simulation (LIPS), located at Federal University of Minas Gerais (UFMG), teamed up undergraduate ENGINEERING students coordinated by a professor to solve contemporary problems focusing on innovative education having the spiral approach as a guideline. Travelling with a stringed instrument can be very cumbersome to musicians due to its volume and weight. This study evaluates the possibilities of making a totally functional electric guitar with enhanced portability and earphone compatibility to eliminate the need of an amplifier, which adds more volume and weight to carry. In the process, the ENGINEERING team applied the educational constructivist approach together with concepts of physics and mathematics to evaluate the problem. Afterwards, the development of their own functional and lighter guitar prototype, named Minitar, was conceived relying on ENGINEERING softwares for 3D modelling and programming languages, such as C#. In this process, the team developed new abilities and insights by accomplishing the goals of the project. The idea for the project, its evaluation and an early prototype started mid 2017 by the first author of this paper, and the remaining work was completed a year later by the team. A functional prototype was therefore built from scratch relying on different sources of knowledge by our multidisciplinary team, hence validating the constructivist spiral approach as an organizational and educational framework. This particular result can be used as an example to further improve the ENGINEERING education in Brazil and also be used as inspiration for

educational researches elsewhere.

Keywords: Constructivist Spiral Approach, Engineering, Innovation, Multidisciplinary, Music.

CDIO as Project Management in Engineering Courses:

Conceiving, Designing, Implementing and Operating Educational Projects

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Abstract

The CDIO (Conceive, Design, Implement and Operate) framework has a great adherence within Engineering education, mainly when acting with project-based approach activities and practices. In Universidade São Judas Tadeu, every semester, Engineering students must develop interdisciplinary projects in which they are able to work applying the knowledge and skills are being taught in order to solve problems that resemble and/or are inspired in real world situations. These projects get more complex each semester once students acquire more competences and experience. Aiming to keep a consistent and structured approach in all these projects, students apply the CDIO framework as a tool for project management, where they should understand the problems presented in some given situation (conceiving solutions), and then designing e evaluating possible solutions (developing and analyzing strategies) that should be implemented (prototyped) and tested, keeping register of each step and being analytical through the process. Every semester, students learn new tools and techniques that are added to their work in these projects, and their role changes from a more passive posture (in first semesters where most of the work is led by teachers) to a more inquisitive and autonomous posture while the course develops through time. In this process CDIO poses as one of the main conductors where these new tools and techniques are aligned and get means to achieve project goals. CDIO, as a pedagogical approach for project management, has propitiate a good understanding of other professional project management methodologies, making an easy transposition to PMI (Project Management Institute) with its matrix of process groups and knowledge areas or Scrum (Agile Methodology) with its backlogs, artifacts and phases. An important aspect of using CDIO is that students have been satisfactorily achieving the proposed project goals, being able to construct solutions, facing difficulties and solving them, demonstrating understanding and confidence during the process, and more than technical skills, students have also demonstrated development in soft skills, needed in solving the problems and constructing solutions.

Keywords: Active Learning, CDIO, Interdisciplinary Teaching, Project-led Education, Project Management.

Soft Skills Teaching for Contemporary Engineering Careers:

A Experience Report

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Abstract

Engineering career demands solid technical skills and, usually, courses in this area provide a necessary scientific and mathematical background that support deep understanding and development for specific contents and skills in Engineering fields. Despite all the efforts for a needed technical formation the contemporary professional scenario asks for more. Several educational institutions have realized that some soft skills are central part of engineers' formation. Since 2017 all Engineering courses of Universidade São Judas Tadeu have been redesign in order to add disciplines that address these competences by present, apply, discuss and develop contents, skills and attitudes towards a socio emotional perspective. There was created a specific course called Integrated Learning Laboratory (ILL) focused in soft skills and life project, but aiming professional development. This course occurs in the first two semesters of Engineering courses with presential encounters supported by online materials and activities in a gamified platform. In the next semesters students are supported by this online platform: Virtual Integrated Learning Laboratory (VILL) which provides deepening understanding in some major areas. At the lasts semester's students will have access to a coaching attendance. Six main axes were defined in order to develop students' soft skills: Identity (in perspectives of personal, social and professional identity), Problem solving, Creativity, Communication, Critical thinking and Diversity. In each semester three of these axes are approached by means of workshops with active learning methodologies where students learn about them and their application, practicing and discussing the impacts in the specific Engineering career. In the first semester (Identity, Problem solving and Creativity axes are developed) the main focus is in the understanding what means to be an engineer and what kind of activities are developed in daily basis by this professional. In the second semester (Communication, Critical thinking and Diversity) the focus is in the understanding of professional contemporary scenario. Besides ILL courses there are also some project-approach and institutional disciplines through Engineering courses where students expand their understanding and skills, providing a rich environment where technical skills are developed alongside with soft skills as group work, collaboration, inclusion, ethics, self-knowledge, communication and more.

Keywords: Active Learning, Blended Learning, Engineer Education, Interdisciplinary Teaching, Soft Skills.

Competency Development:

An Innovative Course in Physics for Engineering

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Abstract

This paper aims to introduce to the scientific community a novel Physics I (Mechanics) course design developed by the Laboratory of Pedagogical Innovation in Physics - LIDF - (acronymous in portuguese) research team, associated to the UFPA Institute of Technology. LIDF staff is a multidisciplinary group of professors, physicists, engineers, undergraduate and postgraduate students, intended in studying, designing and developing new educational tools, as well as innovative ways of teaching and learning Physics for engineering courses. The room where the laboratory takes place has multifunctional and multi-user features, focusing on an education that meets the innovation requirements of our contemporary society. With regards to the teaching product discussed in this text, it was built and implemented in an undergraduate freshman class of the Civil Engineering course of UFPA, in the year of 2017. Its basis is the Philippe Perrenoud's competence development paradigm. Therefore, the performed proposal sought to provide a more substantial integration between technical knowledge, acquired in the Professional Cycle of undergraduate engineering courses, and basic knowledge, corresponding here to the Physics I course, by means of bringing theory and practices together, whenever possible, in a contextualized and interdisciplinary way. During the classes, it was striven to encourage the student to face problem situations, such as those a civil engineer faces in his routine, leading students to internalize the script: inquire the problem; examine the situation; mentally choose an action scheme, in parallel with the acquired knowledge; and, together with the classmates, take action in a strategic and flexible manner. Additionally, the learner needs to adopt the same strategy in another practice, more complex, inspired by the Bifocal Modeling, introduced by Stanford researcher Paulo Blikstein. It was proposed a methodology here named Integrative Project, consisting in the physical construction, and the mathematical and

computational modeling of a popsicle stick bridge prototype. Then, activities reports, class diary, and internal (students) and external (other professors) evaluations were analyzed, seeming to confirm the proposal potential. As a consequence of the good results, the suggestion was refined and, in the year of 2018, expanded to three engineering undergraduate classes (civil, electrical and biomedical), and to an integrated high school and buildings technician course class. It must be remarked that the inquiries on the results of high school application of this practice will support a master's thesis in Physics Teaching.

Keywords: Instructional Design, Competences Developing, Pedagogical Laboratory, Physics Teaching to Engineering, Theory and Practice Integration.

Integrating Practice and Theory into Basic Graduation Courses in Physics:

The Current Stage of Implementation of The Laboratory of Didactic Innovation in Physics (LIDF)

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Abstract

This article is exposed as a continuity of a proposal of a applied research focused on the basic physics disciplines for the undergraduate engineering courses of the Institute of Technology in the Federal University of Pará (UFPA). The Laboratory of Didactic Innovation in Physics - LIDF - (acronym in Portuguese), is composed by a multidisciplinary group of professors: physicists, engineers, undergraduate and graduate students. Its main goal is to design and present new educational products and innovative ways of teaching and learning physics for the courses of the natural sciences and engineering. LIDF is a multifunctional and multiuser laboratory that seeks to produce innovation with the focus on student training that meets the multiple demands of contemporary society. In this article we proceed with the steps of clarifying the characteristics of the LIDF, which includes: delimitation of lines; underlines; educational products resulting from it, taking into account educational-pedagogical demands as well as managerial demands. The group of researchers and students connected to the laboratory deal with the following research branch: Development, adaptation and validation of educational products for physics teaching. It encompasses the development of experimental activities for various approaches and levels of complexity. It also includes development and adaptation of didactic sequences, including evaluation practices, as well as appropriation, application and discussion of results in the investigation of active learning methodologies. An important action field is the support for projects in a similar way

to FabLearn Labs, proposed by Paulo Blikstein at Stanford University, which are places that provide diversified tools for the students which can design technological apparatus from the use of these elements. The LIDF works not only to produce instructional resources, but also to contribute to the formation of an educational paradigm aimed at the development of competences by means of educational proposals that unite theory and practice in an indivisible way. In this sense, the laboratory team works with different formats of educational events both for the internal public and for the community outside the LIDF, acting as both initial and continuing training such as workshops; minicourses, etc. As a result of these actions, we highlight the development and successful application of an instructional design proposal for Physics 1 (Mechanics) for two engineering (Electrical and Civil). The course is a strategic concatenation of elements of other teaching methods in order to enhance the development of competencies. We promote a sequence of interconnected stages, called Cycles, that articulate elements of the Inverse Classroom and Hands on Activities. At the same time we challenge the student with an activity of greater complexity, a integrative project where the student constructs and compares a physical with a mathematical-computational model. In 2018 the course was refined and applied in four classes: three engineering (Civil, Electrical and Biomedical) and a Technical Education in Buildings. Also worthy of mention is the institutionalization of a research group for the LIDF's own lines. The Laboratory clearly is going forward in its mission of creating didactic-pedagogical innovation in the teaching-learning for basic sciences for the engineering.

Keywords: Active Learning Methodologies, Investigative and Demonstration Practices, Lab Proposal, Physics Teaching for Enginnering, Theory and Practice Integration.

The Engineer Teacher and The Art of Teaching:

The Challenge of The Teacher Engineer in Academic Training Good Professionals and Teachers

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Abstract

The Engineering courses in Brazil are increasing substantially over the years, in 1973 they were only 100 Engineering courses and in 2018 there are already 5924 courses registered in the Ministry of Education. This increasing collaborates with the economic growth of Brazil and confirms the increased demand for engineers, masters and doctors, in the teaching career, to act in order to match the expectations of the country, working in the structuring of projects of courses and classes, for academic training of future Engineers is of utmost importance to the country, since they will be the human resources offered to the job market, hence the concern of the institutions should be what competencies they should have to meet the country's needs. The consequence of this concern in responding to these expectations of the society by a differentiated formation, made that the discussion about the education in Engineering had an emphasis in the didactic-pedagogical formation of the professor Engineer, demonstrating the proposition that differentiated activities in the classroom can interest in the study at the beginning of the course, and facilitate learning. There are several recent studies that address new teaching situations using available technologies, which can be used to support instruction while motivating and engaging students. The study of several bibliographies indicates three competences necessary to the professor Engineer, the technical and scientific competence, the didactic-pedagogical competence and the knowledge of the social context that the course, the students and the job offers are inserted. This paper proposes, through a bibliographical review, the discussion of these competences, analyzing researches with professors who expressed their wishes in relation to each competency, as well as verifying suggestions from authors/researchers working with new teaching methods such as PBL (Problem Based Learning), and that incorporate the Multiple Intelligence Theory into teaching strategies as a way of assisting the learning process and the development of personal and technical characteristics necessary for the professional in formation. It is concluded that the competencies to make teaching effective and to work with the different types of methodologies, such as the active one, are basically identical, that is, the technical competence, the willingness to learn continuously as the students learn (didactic pedagogical competence) , the way of communicating the results obtained and the search for the knowledge of the

context of the insertion of the academic community in order to enhance the desired results. Professors who believe in efficacy and are willing to advance in the work with active methodology will converge to an educational academic training action specifically aimed at the implementation of active methodologies. However, the ongoing process of sharing knowledge requires readiness and research in Engineering education.

Keywords: Academic Training, Higher Education, Multiple Intelligence Theory, Problem Based Learning, Professor Engineer.

Multidisciplinary Project for The Development of A Social Innovative Technology for Water Desalination in Northeast Semiarid

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Abstract

This paper describes the activities developed in an extension project entitled Development of Innovative Social Technology for Water Desalination in the Brazilian Northeast in 2016. It is about building a solar water desalinator, to be used by production units, making use of and optimizing the evaporation/condensation. It is an equipment built with low cost materials and easy local procurement. They are being built and tested five prototypes of the desalinator in cities of the state of Paraíba for tests and improvements: Campina Grande, Dona Inês, Monteiro, Picuí and João Pessoa, the latter being in the final stage of construction and that of Campina started in the INSA (National Institute of Semi-Arid) unit. The equipment has the following features: a solar collector for preheating water, masonry (made of bricks, ferrocement and lined with burnt cement), a system of evaporation and condensation of the brackish water in its interior, It will also contain condensed water storage drum. In addition, it will have a 200 liters drum for storing and distributing the water to the manifold through a second drum, with capacity of 75 liters equipped with float. The project had, as main objective, the development of an innovative social technology for water desalination, optimizing the principle of evaporation/condensation from equipment built with inexpensive materials, easily purchasable in rural communities, characterized by robustness, low cost operation and maintenance. For the development of the prototype, a multidisciplinary team of students was selected from technical courses in Electronics, Mechanics, Buildings, and 1 undergraduate degrees in Electrical Engineering and Interior Design (one student of each of these five courses). The construction of the desalinator was only realized because of the multidisciplinary team, since each one shared the knowledge of its area. The teams were separated into two groups: Electronic Team and Construction Team, where weekly meetings were held to project the project. Electronic team responsible for monitoring and efficiency in different parts of the desalinator. In the monthly meetings, all members of the multidisciplinary team presented the activities carried out, explaining the theoretical concepts used and the results obtained. The objective is to promulgate knowledge in order to obtain

better efficiency in the desalination process, for society in general to have access to a technology that is low-cost, easily assembled and maintained, and the possibility of each one autonomously replicating it in his/her own properties.

Keywords: Extension Multidisciplinary, Social Technology, Desalinator.

Adapted and Automated Bathroom for Seniors and Wheelchair Users

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Abstract

At a time when the Internet of Things (IoT) market, home automation and domotics are no longer luxury goods, and with more affordable prices, they become a reality in people's lives. In this context, automation technologies are coupled with assistive technologies (technologies that provide accessibility, integration and independence for people with special needs), and give rise to a new branch of technology called Assistive Automation. The project in question deals with the adaptation of a bathroom in a residence, which can also be adapted for public buildings, as long as they comply with the standards of NBR 9050, which deals with Brazilian standards of accessibility. This building uses assistive technologies, which allow a better quality of life for people with motor needs such as: seniors and wheelchair users, facilitating everyday tasks such as turning lights on and off, or opening doors (motor drive, moving the door, for means of sensors) that, for non-carriers, seem rather simple, but for the target audience of this project represents a great discomfort. In addition to the comfort functions, the project aims to provide users with security by means of buttons and timers that monitor the user's status and, in case of emergency, sound alarms and unlock doors for immediate assistance. This work uses Arduino microcontroller, sensors and actuators that have a low cost of acquisition when compared to equivalent projects using PLCs (Programmable Logic Controllers) or Residential Automation Centers. In addition to its assistive functions, this project intends to disseminate the idea of assistive automation in order to arouse the interest of new studies in this area, which has not yet been researched, which could in the future make it cheaper and make this technology popular and accessible to people of lower purchasing power. The project was developed in prototype and is undergoing refinement to be installed in APAE (Association of Parents and Friends of Exceptional) of Sobral-CE.

Keywords: Accessibility, Computer Engineering, Embedded Systems, Home Automation, Microcontrollers.

Use of Flipped Classroom Elements:

A Case Study in Teaching Physics for Engineering at The Federal University of Pará

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Abstract

The Laboratory of Didactic Innovation in Physics-LIDF proposes for the discipline of Theoretical Physics I offered in the Civil Engineering course of the Federal University of Pará the implementation of a Didactic Sequence based on the methodology "Flipped Classroom". Our purpose in proposing SD actions based on the inversion of the traditional teaching model was to provide less expositive classes that are capable of engaging students in content, increasing participation, student-teacher interaction, and improving the use of time. The teaching method described here suggests "doing" in the classroom, enabling the student to cope with situations similar to situations in the professional life of the civil engineer, demanding that the student: intervene and question the problem; analyze the situation; select in your mind a scheme of action and together with other learners act in a flexible and strategic. However, in order to achieve this there is a need for the student to study before class. For this purpose we have developed what we call Reading Tests-RT's, where the student receives the instructional material containing, among others, videos, links to digital resources and text and / or image files. In addition, you receive an online response form that meets the following functions: a) Encourage and evaluate the study of the material using essay questions that investigate the "reading" of the content. b) Provide a less superficial study proposing an issue that requires application of some knowledge contained in the material. c) To provoke a reflexive posture proposing an unstructured question allowing the student to make inferences and estimates in order to answer the question. d) To provoke the link between the instructional material and the face-to-face meeting with a multiple-choice question whose discussion can begin the work in the classroom. As a way of analyzing whether the RT's complied their objective, an

opinion questionnaire with discursive and multiple choice questions was applied, which was answered in an online platform at the end of the course and had membership of just over 35% of the class. In general, there was a significant recognition of the importance of the proposed method as it helped to assimilate the contents and made the students able to question and inquire the teacher in the classroom. It was also proven that RT's encouraged students to determine a regular study schedule for the proposed activities in the discipline. It is also worth mentioning the participation of the students. Of the total of 42 enrolled, 25 maintained its frequency equal to or greater than 75%. This number increases when we speak of students who had a frequency of 50% or more, totaling just over 34 students (81%). This fact is relevant since in the courses of Engineering the evasion of the students is a recurrent phenomenon. As a consequence of these data and others still under analysis this method of teaching continues to be applied in the discipline of Fundamental Physics I offered in the Civil Engineering course and also now for the Electrical Engineering course of the same university.

Keywords: Physics Teaching, Flipped Classroom, Reading Tests.

Simulation Laboratory for Learning in Electronic Digital Improvements of Learning Electrical Engineering

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Abstract

In recent years, the use of technological resources has been changing the way which practical teaching is carried out in undergraduate and technical education. In Brazil, this approach is further studied because of the number of technical and engineering courses that are offered in the distance format. In several cases where the student only has access to a theoretical information, making this connection between theory and practice becomes even more challenging. In this case the student have any access to laboratories and equipments for conducting experiments. Electrical, electronic or computer courses use laboratories in order to test the theories and practices, being great importance and aid the use of simulators that allow the student to carry out practical experiments. The contribution of this work is presenting the results obtained from the application of computational simulators in classes of digital electronic circuits and computer networks over two different courses. The students were challenged to perform experiments on computer simulators using desktop, web or mobile applications, and then compare the results from the practical experiments. The realization of simulations allowed students to start initial tests on the use of different equipments and circuits. At the end, them were asked to answer a questionnaire (Quiz) regarding their perception of the use of simulators before and after practical experiments. Most students reported that the use of simulators allowed relating theory to practice. From the collected results it was possible to identify a positive on the use of simulators during the learning of electronic digital circuits and computer networks. These simulators not only improved the academic performance of students but also allowed them to initially relate theory to practice with more confidence and security, considering that for most students this has been the first contact with electronic equipments and circuits.

Keywords: Engineering Education, Environments Teaching, Simulation Learning, Theoretical, Practice Learning.

Improvements and Advantages of Using Moodle to Support Out Classes Case Study in Engineering and Technical Courses

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Abstract

Technology resources have become an important tool to support teaching learning within educational environments. These resources allows not only the recording and monitoring of the performance of students history, but also has been used as a tool to support the out classroom. In presence courses, students have accompaniment of teachers and tutors to the academic and knowledge information within a content or specific area of studies. However, the autonomy outside classroom not only allow the student in order to show independent cognitive abilities, but also allows teachers to follow the interaction and learning of the student. Among technological resources widely used by the institutions, we may mention the Moodle. Moodle is an open source educational support tool used in distance learning and academic training courses. Moodle allows students to access content available, create and participate discussion forums, perform activities and exercises, submit proposed and mandatory homeworks, send messages to teachers and colleagues, perform exercises or tests with real-time resolution, consult feedback of activities, among other activities. The access of these resources allows students and teachers to manage academic activities further enhancing the academic achievement and achievement of presence lessons. This article presents the behavior and interaction about 70 students in two different disciplines of an undergraduate course. The profile of each student was analyzed in relation to the number of accesses to the Moodle platform. Results show that the grading score is directly related to how the student interacts in Moodle. It is concluded that technological tools such as Moodle, when used as a resource to support the classroom, helps in teaching learning by stimulating students in accessing information and thus improving their academic performance.

Keywords: E-learning, Distance and Flexible Education, Moodle, Learning Management Systems, Tool Education.

The Impact of Knowledge Management on The Quality of Learning in a Higher Education Institution

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Abstract

It is important to know the perceptions of the students, since the attributes that make up the satisfaction of the service are subjective and diversified, because when the higher school knows what the student thinks important then there is the opportunity to reorient the service offering, seeking to meet with quality the customers and thus create competitive advantages. In view of this context, the following question is asked as a research question: What are the expectations and perceptions of students about the quality of teaching? The present research project had the purpose to identify the critical factors for the improvement of quality teaching in a higher education institute by using of an organizational excellence tool the knowledge management. This research was carried out on the campus of the Salesian University Center of Sao Paulo, locates in Lorena, more specifically in the 1st and 5th year of the industrial engineering course. The empirical study on a Knowledge Management was done seeking its performance as a tool of organizational excellence. The completed project allowed us to understand how the interaction between market, society, students and institution is realized so that all ideas converge in the ideology of solving problems of society and satisfy the needs of the students, always seeking a teaching of quality. The criteria used for the development of this research were found in the bibliographic review, the ideas of their respective references converged partially in the same sense and objective of this research. The PPP (Educational Policy Project), PE (Teaching Plan) and pre-determined criteria were analyzed in which, through content analysis, it was possible to identify possible gaps and thus possible opportunities for improvement without teaching quality. Two research questionnaires were elaborated in 2017, which were evaluated by the University Center's ethics committee, validated and later applied in the already referenced classes, whose objective was to understand the expectations of the students' incomes and perceptions regarding the quality of teaching of the course. The analysis of the results collected, from the forms and the PPP and PE documents made it possible to verify if the criteria found in the literature really corresponded to the realities of the University Center under study and to identify

among them the critical factors for improvement in the quality of teaching.

Keywords: Class Plan, Industrial Engineering, Knowledge Management, Political Project Pedagogical, Teaching Plan.

Critical Factors in The Participation of The Institutional Evaluation in A Higher Education Institution

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Abstract

With the growth of higher education in recent years, universities are seeking improvements in the service offer, reaching a greater demand and more recognition by society. Through internal evaluation, it is possible to monitor quality teaching, as they analyze what students need, in order to interconnect what institutions have to do in order for both to succeed. The institutional evaluation is a constant process that helps the university to identify the positives and negatives to improve the quality of the same. However, the low participation of the students in the institutional evaluation hinders the university to create improvement actions. As a research question has: Why the low adherence of the students in the evaluation? How to increase the participation rate with qualified answers? The objective of this work is to present an analysis of the factors associated with low participation and quality of the institutional evaluation. The method applied was a case study at the Salesian University Center of São Paulo, where interviews were conducted with students of the Production Engineering course during the year 2017. The interview took place in two forms, a qualitative approach at first for identify the influential variables and, later on, a quantitative approach with the purpose of ordering them by importance and grouping them into common factors. The tabulated answers allowed to identify the influential variables in the low adherence of students in the institutional evaluation. After the identification, it adopted the techniques of ordering variables, together with statistical techniques in order to prioritize the variables found and group them into factors. The research pointed out new variables through the fieldwork that can contribute to improve the institutional evaluation. In addition to the validation of the influential variables in the studied process, the research pointed out that the communication of results is the major contributor to the low adherence, since it does not occur in a systematic and transparent way, thus leading to other variables such as demotivation of the students. Lack of management also contributes to flawed communication where research benefits are not evident leaving students without understanding the real reason for it. The work still points as a suggestion of future research, the understanding of what communication would be for students and institutions.

Keywords: Critical Factors, Factor Analysis, Higher Education, Institutional Evaluation, Ordering the Variables.

Short Film:

"A Troca"

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Abstract

The Festival Internacional de Cinema e Vídeo Ambiental (FICA) is a consolidated and prestigious film festival in Latin America that exhibits and awards the best productions of each year. Aiming to participate and obtain awards in the next edition of the festival, the group "PET - Engenharias (Conexões de Saberes)" wrote a script and produced an environmental film that presents the problems related to

non-ionizing radiation. The purpose of the production of the film "A Troca"' ("The Barter" in English language) is to inform viewers the main harmful effects related to such radiations, present in radio sets, cell phones, microwave apparatus and others. In addition, it aims to make the public aware of new practices and habits that minimize the use of devices that emit such radiations. The film's producers also propose to disseminate such information not only in the academic field, but also to the public of regional festivals, such as FICA and others national and international festivals. The film was produced with low budget and few actors where it was used technology of 4K filming besides the use of a drone to make aerial images. The main concern of the production was with the scenarios and the costumes used by the actors. All the scenes of the film were recorded in three intense days of filming, and although the objective of the film is to inform about non-ionizing radiations. In addition, the film is devoid of speech and the message is passed through the interpretation of the actors and a text that appears at the end of the last scene. The footage taken was edited and compiled, just as the soundtrack was selected and added to the film by the editing team, composed of a member of the group "PET - Engenharias (Conexões de Saberes)" and an intern of the Laboratório de Engenharia Multimeios (Engemulti). The goal of the film to be broadcast in 2019 at FICA will be fulfilled and the main message, informing about non-ionizing radiation, will be taken to various segments of the public, increasing knowledge about the dangers and effects that technological devices can bring and raising awareness the general public.

Keywords: Exchange, FICA, Environmental Film, Non-ionizing Radiation, PET.

The Course of Introduction to Engineering from The CDIO Initiative at UNISAL (Brazil)

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Abstract

The introductory course provides a framework for Engineering practice as a broad outline of the tasks and responsibilities of an engineer and the use of disciplinary knowledge in performing those tasks. Students should engage in engineering practice through problem solving and simple design exercises, individually and in teams. The course should also include the knowledge, skills and attitudes of personal and interpersonal skills, developing those that are essential at the beginning of a program to prepare students for more advanced experiences of producing products, processes, and systems. Introductory courses aim to stimulate students' interest in, and strengthen their motivation for, the field of engineering by focusing on the application of relevant core engineering disciplines. Students usually elect engineering programs because they want to build things, and introductory courses can capitalize on this interest. Among the various logical disciplines, components of the basic core of Engineering courses involving Calculus, Physics and Linear Algebra, among others that characterize the initial learning of the engineer, the Introduction to Engineering, commonly established in the first semester, highlights the summary of what will be the learning process in the development of any engineer preparing for the professional market. Personal and interpersonal characteristics besides all the technical and professional knowledge involved must understand the direction of any specialty of the engineering establishing activities of teaching both theoretical and practical including its process of evaluation. In view of this scenario, the Salesian University Center of Sao Paulo (UNISAL) at its Lorena Unit, created its engineering courses thinking precisely on the purpose of developing students through active learning. Due to the Country Curriculum Guidelines, the Industrial Engineering course has in its basic matrix this introductory course. With the inclusion of the discipline in the other specialties offered by the institution from 2017, a content was proposed in which project management concepts and elements established by the CDIO INITIATIVE as well as presenting how was the historical development of Engineering and

its teaching process directed to each specialty including its subareas. Thus, this paper presents the improvement of the teaching-learning process of the course in the Industrial Engineering course, including contents and assessments in order to establish a direction to the other specialties in Engineering offered by the institution, thus strengthening the model proposed by the CDIO Initiative in order to develop the necessary skills to the engineer from the beginning.

Keywords: Introduction to Engineering, Projects, Content, Assessment, Standards 4.

Responsible Research and Innovation-RRI:

A Reflective Study on Its Application by The European Union

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Abstract

The study refers to an analysis of Responsible Research and Innovation – RRI and its application in the European Union - EU and its relation with Brazilian research, since little is known on the subject. Objectives: to know the policies of RRI and its contributions to researchers and policy makers public manager to use it as innovative in scientific research, with a view to possible solutions to social problems, since RRI promotes change and contributes to scientific development. Method: This is a documentary research, of qualitative analysis based on the collection of information, spreadsheets and statistical graphs, opinions, agreements, reports, websites, edicts, news and official documents. The approach is divided into two stages, the first of a literature review on RRI, and the second, the analysis of information and data collected in institutional departments. Results: the six major Agendas created and instituted by the Commission of the European Union have thematic strategies of organization of the integrated work of development of scientific researches such as: Ethics, Gender Equality, Governance, Free Access, Public Engagement and Scientific Education. The survey data revealed that in 2013, Brazil invested only 1.3% of its GDP in research and development, about US $ 31 billion and ranks 10th in the absolute investment ranking. In the years 2014 to 2015 Brazil did not invest much in research, and in 2016, the figures were even lower than the previous year. In the member countries of the European Union, this reality is different. Of the twenty-eight countries, Finland, although ranked 26th, increased its percentage of GDP from research investment to 3.6%, about $ 7 billion in 2013, highlighting how the country who invested more in research. In Portugal the support for scientific research has an organization of management and investments through an institution to support the scientific community, through different financing instruments, destined to scientists, research teams and R & D centers. Conclusions: it was clear from the findings that it is possible to develop research using the themes proposed by the indicated EU agendas as a tool for innovative scientific research to find solutions to major social problems. And that, in doing so, be open and transparent, engaging society and making the results of

public domain research available to the public. It was found that the RRI as a strategic and innovative resource, supports and allows the alignment of responsible research, with transparent results and reach for all, besides being a reflexive practice of innovative research that benefits the whole society. However, the information provided in this study will serve the initiatives of scientific investigations and strategies of search of new ways to solve the great world problems.

Keywords: Science, Education, Innovation, Strategies, Responsible Research.

Environmental Education as A Strategy to Reduce Electric Energy Consumption:

An Approach at A Municipal School in Goiânia, Goiás, Brazil

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Abstract

Environmental Education is an important tool for raising awareness about water waste, energy consumption, emission of pollutants, among other aspects. It is generally verified that users of public buildings have a lack of concern regarding the consumption of natural resources arising from the use of the building, among them electric energy, since the financial costs of maintenance are the direct responsibility of the public coffers, still that indirectly the entire population contributes to the payment, through taxes. In the municipality of Goiânia, Goiás, Brazil, for example, municipal public educational buildings correspond to approximately 30% of the electricity consumption. The main objective of this study was to develop environmental education strategies and implement energy efficiency actions to reduce the consumption of electricity in a public school in Goiânia. The methodology used was based on research-participant, environmental education together with replacement of lamps by LED system (Light Emitting Diode) at strategic locations in the building and monitoring of results. The actions

carried out included the lamp replacement, and educational lectures offered to students of different age groups in three school shifts with a partnership of employees and teachers of the municipal school selected on energy efficiency and strategies to reduce the consumption of electricity. The project mobilized directly about 200 people belonging to the target audience and indirectly 800 students who were part of the teaching unit. It was collected a data base among 2012 to 2016. The methods of data collection and analysis were based on documentary research, analyzing the electric energy bills of the building, as well as documents and legislation of the municipality itself on the consumption of electric power and the architecture model applied to school environments in Goiânia. The results obtained, after a monitoring period of six months (November to April) during the years 2016 and 2017, indicated an analyze to reduction of 16% of the consumption of electric energy in the building, compared to the same period in the previous year. Therefore, this result regard to the possibility of investments in energy efficiency projects for public buildings in the city of Goiânia.

Keywords: Electricity Consumption, Energy Efficiency, Environmental Education, Light Emitting Diode, Public Buildings.

Developing Student Leadership through Experiential Learning

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Abstract

In a world where technology is changing every single detail of our societies, schools, and organizations in a skyrocketing speed, it is worrying that the way we develop our leaders is improving so slowly. With numerous studies showing that leadership is one of the factors that impact the most on software projects' success, it is worrying that more than $14B are spent yearly with leadership development and, still, most organizations believe they are not being effective. One of the most efficient methodologies for leadership development inside companies is the Experiential Learning from David Kolb, but it still has some problems in gaining traction inside universities due to their difficulty of simulating practical experiences. Contrary to most of MBA students that usually work during their programs, already occupying management positions technology students frequently struggle to implement what they learn on leadership courses in their professional or personal lives. Because graduate students are mostly full-time and have zero or little leadership experience and have limited occasions to apply the leadership concepts they learn, they were the main focus of this study. From the literature review, it was evident that many different approaches for teaching leadership have been tried inside universities with various results and little standardization is perceived on the way they were used. For this reason, this study proposes a framework based on Experiential Learning for using group activities as a means to help technology students practice leadership skills. A first pilot was executed with pleasant results and feedback from students: 91% of them enjoyed the group activity and most of them felt they practiced important leadership skills and that this could improve their effectiveness as future leaders. Nonetheless, because this pilot was run with a small group, with limited time and resources, it must be replicated in other contexts, with other group activities and larger groups to gather more data for a concrete basis for the suggested framework. Exploring these other scenarios could be strongly considered as a future work, to increase its validity and enable it to be used among other universities.

Keywords: Leadership Development, Experiential Learning, Group Activities, Technology Leaders, Software Management.

Reception of The Fledglings of The School of Engineering:

Challenges and Perspectives

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Abstract

The Nucleus of Educational Engineering - NEED together with the School of Engineering of the Federal University of Rio Grande do Sul - UFRGS develops at the beginning of each semester the project entitled "Reception of the Fledglings of the School of Engineering: Challenges and Perspectives" with the intention of presenting the School of Engineering, Courses, Projects in progress and / or realized. In this sense, the project aims to encourage the continuous improvement and innovation of engineering education through the development of innovative teaching practices. As a proposal, the project "Welcoming the Freshmen - Challenge UFRGS" - 2017/1. The project houses a set of projects and activities of various modalities related to current needs, technological changes and career challenges. In addition, challenges are proposed based on the 17 UN Sustainable Development Goals. The formation of the groups was made up of interdisciplinary groups so as to enable the academic to interact in other areas of knowledge, seeking alternatives, interventions, continuous improvement, sustainability solutions, use of existing resources or the improvement of them. For the presentation of the projects a workshop on PITCH was held, which consists of a brief presentation of three to five minutes where it should present the justification of the project. The evaluation consisted of presentation, team competencies, problem, solution, market size, revenue potential and business model. The general objective is to promote the discussion about the need to improve the training and professionalism of professionals, and the absorption of new technologies through the exchange with other centers of knowledge and research.

Keywords: NEED, Engineering Education, Sustainability, Environmental Education.

Rational Use of Water:

Booklets Used in Education Campaign

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Abstract

Water is an essential liquid both for the preservation of life and for development. Thus, measures that contribute to its rational use are very important, because the supply of drinking water is decreasing while demand is growing. In recent years this issue has been of concern to many researchers and others. In this sense, eight editions of the World Water Forum have already been held. The first was held in Marrakesh, Morocco in 1997, where the role of drinking water in sustainable development was discussed. The eighth edition of the World Water Forum, the largest among them, was held for the first time in the Southern Hemisphere and was held in Brasília, the capital of Brazil, between March 17 and 23, 2018 with the theme "Sharing Water". In 2015 a project for the control and rational use of water and electricity was implemented at the headquarters of the Regional Council of Engineering and Agronomy of Goiás. In this project the use of the water released from the air conditioning units was carried out, together with an educational campaign focused on the rational use of water. Thus, this work aims to report on the preparation and dissemination of booklets used in the educational campaign. The booklets contain a clear and objective set of information that can be applied in commercial and industrial residential buildings. One primer deals with the "rational use of water in cleaning services" and the other guides how to install "system for collecting and storing water from the air-conditioning unit". In the elaboration, three pillars were considered: transcription of information in a reliable way and to reach a target public with any level of education, including student body of educational institutions; use of clear and objective language; creation of illustrations produced with light and attractive visual. These booklets are digitally available on portals of three official institutions, and hundreds of printed copies have been distributed. A survey was conducted with people directly involved in the educational campaign, and with others who had access to the booklets. The results obtained were highly positive, demonstrating satisfaction and commitment to disseminate the instructions contained in the booklets, including demonstration of stimulus to adopt procedures in other situations that result in effective combat to waste of water. From the work can be related the following conclusions: The positive evaluation of the content and form of the instructions contained in the booklet shows that this material was produced technically correct, reaching the proposed objective; The good understanding and commitment to practice the messages made available indicate an important contribution to the appropriate ways of using water; The booklets were the means for educational actions related to the rational use of water and, consequently, are helping to reduce rationing actions.

Keywords: Booklet, Combating Waste, Educational Campaign, Rational Use, Water.

Semi-Attending Robotics Course Through an On-line Platform Using Lego Mindstorms Ev3

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Abstract

The absence of participatory methodologies in the educational formation of individuals is still a reality in the current teaching methods used in most schools. The traditional method of schooling, where a teacher is responsible for transmitting knowledge and the students merely receive information, is how students of all schooling levels are taught; this manner of schooling is outdated and must be changed. Robotics is an device that has been increasingly raising the interest of young people and adults. It can be used as an interactive schooling tool, thus modernizing the way of teaching. The present work briefly describes the application of a teaching-learning technique which enables Educational Robotics as a facilitator in the teaching of courses as Mathematics, Physics and Computer Programming. Such courses are seen as too abstract by some students, which may lead them to feel discouraged to further and develop skills in the area of Exact Sciences. Robotics is then used with a goal of awakening the interest of theses courses' students, posteriorly, for the Engineering courses, Engenharia Elétrica and Engenharia de Computação, of the Universidade Federal do Ceará - Campus Sobral. This project was carried out through a partnership between the Instituto UFC Virtual, Secretaria da Educação de Sobral and the Universidade Federal do Ceará, enhancing the schooling methodologies and also motivating the students from the north region of Ceará, particularly from the municipality of Sobral. This work aims to introduce Robotics' general notions through use of the Lego Mindstorms Ev3 Kit, with aid of the programming interface, which is part of the kit (Mindstorms software), and the SOLAR Virtual Learning Environment, where the students watch on-line classes e participate in discussion forums about topics presented by the tutors. The students are challenged to create programs to solve daily-life problems, thus working on their reasoning, teamwork, and the usage of previous knowledge acquired in classroom. Towards the end of the course, when all the students already know how to program the Lego Mindstorms Ev3, it is held a robotics competition as a way of gathering the results obtained through the course. This competition is composed of challenges of different difficulty levels, in which the teams must program the

robots to achieve goals set by the organization of the course, being evaluated by guest judges, who have previous experience with Robotics and programming. The teams with best performance are awarded trophies and medals as form of recognition for their effort. All participants are encouraged to continue studying and further the knowledge attained through the course.

Keywords: E-Learning, Logic, Programming, Robotics, Teaching-learning.

Virtual Environment Tool for NonIonizing Radiation Evaluation

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Abstract

In recent years in Brazil, due to technological advancement and the constant increase in user demand searching a better quality of service (voice, video, data transfer), there is an increase in the radio base station number (RBS) installed by the service providers in urban areas of the cities, thus increasing human exposure to electromagnetic fields emitted by the antennas installed in these stations. The possible health problems caused by this exposure are one of the biggest concerns for regulatory agencies of the services that use radio frequency technology. Studies around this subject have been developed since 1974 based on the guidelines of the International Commission for Protection against Non-ionizing radiation (ICNIRP) that are ratified by the World Health Organization (WHO). In Brazil the institution responsible for regulating the radio spectrum and defining the radiation limits emitted by radio stations is the National Telecommunications Agency (ANATEL) and based on Resolution No. 303 of 2 July 2002, which adhered to the ICNIRP standards announced in 1994, this work proposes an evaluation module of non-ionizing radiation levels through the protection zone in a three-dimensional simulator of antennas signal propagation. The module allows the display of the power received by the actors in configurable scenery and provides analysis of distant electrical field intensity for identification of exposure levels to NIR. This way through this module it will be possible to analyze which areas around the antenna are considered, in accordance with the regulation, safe and livable, as well as it will be possible to know whether the stations are respecting the limits imposed to ensure the Safety of the general and occupational population.

Keywords: Non-ionizing Radiation, Three-dimensional Simulator, Virtual Reality, Exposure Levels, Distant Electric Field.

The Extensionist Actions and The Impacts on The Process of Professional Formation and The Transformation of Society:

The Practical Case of the Nucleus of Social Attention of the Faculty of Engineering (NASFE/UFJF)

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Abstract

Since colonial times, social inequality is the reality that insists on persisting in the country, even with the great economic advances obtained over the centuries. Faced with these problems, there are several responsible for acting on their resolutions and / or mitigations. The important role of government (federal, state, and municipal), justice, NGOs, and even religious institutions are the most popular forms of

action outside the scientific community, but universities in extension actions to be an important vector for generating ideas and solutions so that we have a more egalitarian society. It was with this in mind that, in 2008 at the Federal University of Juiz de Fora (UFJF), the Nucleus of Social Attendance of the Faculty of Engineering (NASFE) was created to allow the generation of social projects of engineering and architecture, but also to enable the students to live practical experiences, acting in real cases and developing skills and competences essential for their academic formation. NASFE is currently an extension project that aims at good engineering practice in order to improve the quality of life of poor communities through the provision of free advisory services to engineering projects. With the guidance of teachers, students from the 2nd to 10th period of Engineering, Architecture, Arts and Design, and Social Service of the UFJF it is made possible to offer such services. Since November 2016 actions have been developing in partnership with the Center of Legal Practices of the Faculty of Law of the UFJF providing experience in multiprofessional and multidisciplinary activities. In addition to these services, students are organized into sectors to advance the practice of developing leadership skills so that they are able to assume leadership roles in the labor market and in public power. In this sense, NASFE is divided into three sectors: CIA (Communication, Infrastructure, and Service), Human Resources, and Quality and Projects, each of which is overseen by an academic member. Organization and opening of the requests, training, and management of the members and, finally, development, monitoring, and delivery of projects are the main activities of each sector, respectively. In 2016 and 2017, 71 consultations were carried out, divided into usucapian projects, proletarian projects, regularizations and architectural projects, mapping of risk areas, and technical surveys. Thus, even with the reduced number of students and professors facing the high demand of society for public engineering, a satisfactory productivity was obtained, as well as allowing members a practical vision of the social responsibility of their future professions. In addition, in view of the great problem of cities with natural disasters, the NASFE-EDUCATION sector was implemented in March 2018 with the aim of promoting prevention through the learning of elementary school children and the school community, regarding social and environmental risks, and to bring up the discussion on the subject and necessary care. The development of educational actions in public schools has partners such as the Fire Department and City Hall of Juiz de Fora.

Keywords: Extension Actions, Public Engineering, Professional Training, Social Responsibility.

Leadership Skills Development in Undergraduate Students at Out-of- classes' Engineering Projects

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Abstract

Leadership consists of a set of skills and involves a broad behavioral issue, once that it is required many skills of a good leader to present a satisfactory result in relation to the team and to the activities proposed to the group. It is necessary to understand that all the attitudes of a leader are resignified and interpreted in different ways by all the people involved in the group, since what is spoken can be misunderstood or partially understood, embarking on a matter of communication. Therefore, there is a great need for a leader to have a well-grounded speech and to follow a line of logical reasoning or to stay in line with the firm's or work group's convictions. Also, it is required a good knowledge of the process that the group deals with, beyond management strategies and methods. In this paper, will be discussed the experience of some undergraduate engineering students that are leaders of extracurricular projects at the Pontifícia Universidade Católica de Minas Gerais - Campus Coração Eucarístico in Belo Horizonte, Minas Gerais. Each project has its own peculiarity and so, it requires the experiences of different leaders. It is significant to realize that, currently, those who do not seek this type of experience do not live the full experience of what the University has to offer as a teaching, research and extension space. In this way, the students profile are not fully developed when they only experience the traditional education, in the classroom, especially when it is considered the possibility of improving leadership skills. There

are few topics in the curricula of Engineering courses that really deal with entrepreneurship, business and people management, so it is interesting to realize the space of extracurricular projects for the development of these skills and the promotion of a contact space between University - Market - Society. To evaluate the experience of the leaders were developed questionnaires, applied to the leaders themselves, the group members and the counselors responsible for those students. In addition, in meetings, relevant guidelines are taken with the meaning of discuss and share problems and results, promoting an exchange of information between different groups. With each experience it is possible to realize that there is a profitable knowledge, so, for common problems solutions are proposed. Another point is the success that each group presents in their own proposals, revealing that each leader does a successful job. With this study, it is possible to perceive the University's effectiveness in developing leaders and promoting opportunities to work on extra-class projects where these skills and competencies are improved. This is of extreme benefit to society and the labor market, since these people have acted alongside these segments, which demand people with different skills. For the students, the possibility to develop themselves as leaders, still during their graduation courses is very pertinent because it allows the experience in professional, scientific and technological projects, besides improving their personal and professional spheres.

Keywords: Competences, Engineering Education, Leadership, Out-of-classes' Projects, University.

The Importance and Application of Calculus as A Basis for Engineering Knowledge

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Abstract

Working meaningful learning is to create concepts that are perceived by the student in practice. The question guiding this work is how to accomplish this intent with disciplines involve mathematical tools? To answer the question were created techniques of anticipation of knowledge presenting applications of these tools in systems, circuits or applied calculations of Engineering. For the study presented here, a basic sinusoidal rectification circuit of the Electrical Engineering was used to apply the definite integral concept, calculating the effective voltage obtained from this half wave rectifier. The specific discipline adopted was the Power Electronics and, with this, it was possible to make plausible to the student the practical use of the mathematical tool worked in the discipline of Calculus II.

Keywords: Electrical Engineering, Interdisciplinarity, Learning, Mathematics, Rectifier Circuit.

Analysis of The Characteristics About The Face-to-face and Distance Education that Contribute to Technical Graduation in Electronics Science

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Abstract

In Brazil, according to Law n.9394 from 1996 the formal education is offered in two modalities: one is the Face-to-face Teaching and the other is the Distance Teaching. The first modality is conventional teaching and learning, that is, one that happens through direct communication between teacher and student within a classroom. According to current legislation and institutional norms, the Face-to-face Teaching requires a minimum percentage of 75% attendance to teaching activities and mandatory presence at the assessments. On the other hand, the second modality began to gain more attention in proportion to the evolution of communication technologies. Formally inserted in the educational context since the last century, the Distance Teaching is characterized by the physical separation between teacher and student. One of the great challenges is to replace Face-to-face Teaching with Distance Teaching without losing quality. In Human Sciences areas, for example, the Distance Teaching courses may adapt easily due to the focus of academic education. However, in technological courses such as Electronics, the student needs a more effective interaction with the practice conducting experiments and tests. Thus, it is necessary methods and procedures that students need to keep the level of quality between these two modalities. The objective of this work is to analyze the positive and negative aspects of technical courses in the area of Electronics in Face-to-face Teaching and Distance Teaching in different educational institutions and to identify what leads students to adopt one or another modality. The research results show that the Face-to-face Teaching courses have a great advantage in relation to the Distance Teaching courses, being this the possibility of the student to do practical classes with the presence of a teacher. The main advantage of Distance Teaching is that the student has more flexibility in scheduling. Also, it was verified that of the five institutions researched two offer face-to-face courses and four offer distance courses. We propose a discussion about the challenges and initiatives for keep the quality of education for both modalities.

Keywords: E-learning, Distance and Flexible Education, Face-to-face Teaching, Distance Teaching, Tool Education.

Development of An Educational Application to Aid in The Learning of Photovoltaic Systems

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Abstract

Education, over the last few years, has undergone several changes due to the evolution of technologies and communication. The continuous growth of technology has contributed to improving the lives of people and especially access to information, and it is possible to expand tools favorable to the progress of education. Currently, one of the main topics has been an education for sustainable development with the aim of highlighting the importance of sustainability for environmental preservation. With the increasing consumption of electric power in the world, the incentive to sustainable energy sources has grown considerably in the last years and the demand of alternative energy sources that integrate to the network presents an accelerated growth in both urban areas and in rural areas. Solar energy, in particular, has practicality, versatility, and modularity of installation, being a simple or complex system. In addition, even if project design is an important step, there is still a lack of access to information and its installation. In the educational analysis, there are disciplines that require the student's dedication and practice for their understanding, and there is a need for alternative methods that help in the understanding of practical and theoretical knowledge acquired in the classroom applied to the labor market, integrating them with an easy access, making this learning more effective. In this way, the proposed article presents an application that dynamically aims to teach the theory and the design of photovoltaic projects (solar panels, batteries, inverters) of on-grid and off-grid systems. Expanding knowledge and access to information for field professionals, students, and even consumers through the Solaris application, which integrates solar radiation database and equipment information, capable of providing quick references, tips and also project size. Developed for the Android mobile device system, the application is accessible to engineering students by providing theoretical introductions, calculation methods and guides for system installation from the user's location by reporting the average local irradiance, optimal installation angle, estimation the production of energy, the number of photovoltaic modules,

the capacity of the bank of batteries and the design of inverters, collaborating in the process of teaching and learning the main factors that determine the generation and efficiency of the photovoltaic system.

Keywords: Educational Applications, Mobile Learning, Sustainability, Photovoltaic System.

Photovoltaic Solar Cooperative:

Solidary Economy as A Basis for Social Development

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Abstract

The advent of photovoltaic energy, Brazil's geo-climatic favoring of solar radiation levels and adequate temperature, social inequality followed by high levels of unemployment and the regulation of distributed generation with compensation system, motivated the elaboration of a business model based on a platform focused on the social development of communities through access to electricity. The project

is essentially based on the composition of cooperatives, stakeholder grouping, creation and assembly of photovoltaic plants, distributed generation of energy and compensation of credits for the members. The agents involved, their desires, needs, discomforts, functions in the process and the connections with other agents are described. Primarily, the model is composed of investors, beneficiaries, volunteer professionals, benefactors, the cooperative and the energy utility. Investors will receive shares that qualify their participation. The beneficiaries' packages will be distributed by the cooperative, so that they fit the reality of these participants. With the implementation of the cooperative, the focus will be the assembly of the photovoltaic plant, to accomplish the schedule and the defined proposals. It is also proposed an online platform for the integration between the agents, with relevant information, a communication channel to solve doubts or requests and questionnaires that will be used in the continuous improvement of the model. Finally, the gains for all involved and the social impact of this action were evaluated. The degree of satisfaction can be measured through questionnaires available on the integration platform. This work was developed through the realization of workshops and the application of the methodology of Design Thinking. The workshops have counted with the participation of the designers of the project. There were divergences of thought, discussion, and shifting of opinions at each meeting. Thus the project was gradually built. The method used in the process is a disruptive learning tool, which escapes the traditional teaching model, encourages graphic thinking, requires group dynamics, creativity with active participation, exercises visual memory and organizes thinking for visualization of solutions. The success of the tool was expressive, including naming the business model as "Islands of Light".

Keywords: Active Learning, Photovoltaic Cooperatives, Social Development, Solidarity Economy, Thinking Design.

A Course of Leveling Exact Sciences:

A Way of Reducing Rates of Evasion and Improvement of Higher Education Analysis of The Performance of A Calculus Class Between Leveling-course Students and Non-leveling Course Students

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Abstract

Several studies on the performance of engineering students in Brazilian higher education indicate that one of the major problems faced by these and by educational institutions is the high levels of evasion and failure in the first two years of the student at University. There is an extensive literature that points out the relationship between the phenomenon described above and the high deficiencies that the new entrants have in their formation of exact sciences when entering higher education. This scenario is reflected at Universidade Federal do Pará (UFPA), since the indicators of disapproval in the basic disciplines of the undergraduate courses in Engineering of the Instituto de Tecnologia (ITEC) overcome 50%. In order to mitigate this problem at UFPA, the Program of Learning Leveling Courses (PCNA, acronym in portuguese) was implemented in 2011, which is one of the main pedagogical strategies to teach Elementary Physics, Chemistry and Mathematics during three weeks, for ITEC engineering freshmen (their priority public), as well as for students from other UFPA courses and campuses, before the actual start of the universitary term. Other publications by PCNA, had already indicated improvements in the approval of PCNA Cursists (students who completed the Leveling Course about Elementary Mathematics before the discipline of calculus) in the initial discipline of Calculus. This work, however, counts on the standardization of the form of evaluation of the same students, both in Calculus and in the PCNA, to determine the direct impact of the PCNA as a mechanism to combat against evasion, evaluating not only the approval, but also the academic performance of the Cursists in relation to the Non-Cursists

(students who did not participate or did not complete the referred Leveling Course). When comparing the data of 553 engineering students, were found that: among the 39% approved in the subject, about 70% were Cursists. About 20% of these obtained the maximum concept, against only 3% for the Non-Cursists. The evasion rate was 6% for the Cursists, against 63% of the Non-Cursists. Change in approval for the Cursists was greater than 95%. In this way, it is worth highlighting the positive impact that The PCNA had on the academic performance of its students, contributing to reduce the rates of evasion of the engineering courses and leveling the knowledge among the engineering classes entering the UFPA. The relation between the students participation in the PCNA, their concepts and their approval in the discipline becomes evident.

Keywords: Calculus Teaching, Engineering Education, Evasion, Higher Education, Leveling Course.

Group of Studies in Energy Efficiency:

An Action to Raise Awareness about The Use of Energy

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Abstract

The Energy Efficiency Studies Group of Universidade Regional do Noroeste do Estado do Rio Grande do Sul (Unijuí), made by Professors and students of the Electrical Engineering Course, aims to present concepts and knowledge that can easily be converted into Energy Efficiency actions, reinforcing sustainable awareness of subjects who are increasingly capable of being conscious multipliers in the community. The methodology adopted by the study group will be based on statistical surveys, being carried out bibliographical researches, calculations necessary for the study, simulations in computational environment to anticipate and prove results, aiming the elaboration of an interactive model to present concepts of Energy Efficiency. The entire process of data collection is documented and is discussed among group members. The group uses the Energy Efficiency as a study object to introduce the concepts in speeches and other types of actions with the local community, aiming to bring knowledge inside the student's homes so that they can be applied, contributing to the reduction of the use of electric energy and consequently to preserve the environment.

Keywords: Awareness, Electrical Engineering, Engineering Education, Energy Efficiency, Studies Group.

Electrostatic Precipitator:

A Project to Improve Physics Education for Undergraduate Students in Engineering

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Abstract

The focus traditional freshman-level study in the first semesters of Engineering undergraduate is on fundaments of the Electrostatics by Physics Course. This moment becomes a contrast between studying of Visible or Palpable Topics (or Particle Dynamics) and not Visible to the Naked Eye (or Electronic Interaction). In this paper, we present an experience in teaching Electrostatics by understanding its concepts through the construction of a Didactic Electrostatic Precipitator. This example may inspire teaching activities of the Physics of Engineering undergraduate. The Electrostatic Precipitator is a device used to remove solid particles in a gaseous medium using Electrostatic forces, those precipitators are used in thermoelectric power plants, hospitals and industries to decrease the concentration of solid particles released into the atmosphere. The operating principle of the precipitator: in his input region, the particles are charged electrically by ions generated in the regions of electric discharge, these particles are attracted by the collector plates through electric forces where they settle, creating a layer. From the physical point of view, the Electrostatic Precipitation process is composed of three basic parts: electrification of the particles, transport of the electrified particles to the collector plates and removal of the particle layer from the collector plates. Therefore, the undergraduate students made an Electrostatic Precipitator using an Aluminum tube with a coiled Copper wire in his body and a thicker Copper wire is placed in the middle of the tube, parallel with the inner walls. The coiled Copper wire in the body is connected on the positive power supply pole and the thicker one in the negative pole, the smoke particles are negative charged, then they are attracted to the positive charged walls, this encounter is due to the attraction between opposite charges. This experiment made the undergraduate students have a practical interaction with the Electrostatic content, making them learn more easily the Physics content.

Keywords: Electrostatic Precipitator, Engineering Education, Practical Interaction, Physics.

Analysis of The Knowledge in Basic Disciplines of New Entrants in Electrical Engineering of Universidade Federal do Pará and Their Evolution After A Course of Leveling in Elementary Mathematics and Chemistry:

A Case Study in The Years 2016 to 2018

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Abstract

Currently, more than half (55%) of Brazilian engineering students leave the course, according to the National Confederation of Industry (CNI). At Universidade Federal do Pará (UFPA), this reflex can be seen in the course of Electrical Engineering, which has a very low ratio of graduates and among the factors contributing to this is the precarious teaching that leads the students to successive disapprovals and, consequently, their withdrawal. On the other hand, the Program of Learning Leveling Courses (PCNA) aims to reduce the rate of evasion and retention of this and the other engineering students of the Institute of Technology (ITEC) of UFPA. The Electrical Engineering classes have shown higher adhesion rates to the basic science leveling courses offered by the program. Thus, this paper proposes to study the contribution of these courses to the students of these classes in the last three years. The methodology adopted consisted in classifying the level of knowledge of students in six categories: critical, insufficient, bad, regular, good and excellent. For this, the initial and final grades of each student

were used in the final and initial exams in the subjects of Mathematics and Elementary Chemistry, from 2016 to 2018, however the performance in Chemistry can not be analyzed in 2016 due to differences in methodology adopted. After this categorization, the distribution of these levels and their evolution in each discipline was analyzed. The results showed that in all the years, there was evolution in all the precarious levels of knowledge, being some extraordinary, where the student ascended more than two levels of knowledge after the program. With all these data, it is evident that the classes and methodologies applied in the leveling courses in these classes helped the students to absorb and to know contents that it is considered necessary for the first semesters of the graduation course.

Keywords: Course of Leveling, Electrical Engineering, Evolution, PCNA, Performance.

Green Roofs:

Software Development at The University

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Abstract

Proactivity, group work and time management are essential skills for every professional who wishes to excel in the market. Developing these skill on the students is a great challenge for university. This article aims to demonstrate a way, in a university environment, to overcome this challenge with a software development methodology. Is also intended to generate a return of value to society, thus fulfilling two of the purposes of higher education established by the Laws of National Education and Guidelines (PRESIDÊNCIA DA REPÚBLICA, 1996): "to train graduates in different areas of knowledge, suitable for insertion in professional sectors "and" to provide specialized services to the community and establish a relationship of reciprocity with it ". The methodology was created contemplating all the processes that involve it, from the conception of the idea to the availability of the product for use. Were generated documents that describe the purpose, requirements, simulations and validations of the software,

as well as the schedule to be fulfilled and the way to manage the team. As object of the methodology was developed the Green Roofs application that contribute to solar energy development and usage. A team of 3 and one former intern from Engemulti (Laboratory of Multimedia Engineering) and a fellow from PET-EMC was composed, all from the Federal University of Goiás. Based on the principles of cooperation, diligence and independence, we had the guidance of a professor at the School of Electrical Engineering, Mechanics and Computing at UFG and the assistance of two professors at the Institute of Informatics at UFG to accomplish this task. The results showed a well developed software and a good growth of the students.

Keywords: Software, University, Mobile, Solar, Energy.

Ciclo Camp Project:

Bicycles Loan as An Alternative Method of Internal Mobility for The Campus Do Vale on UFRGS

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Abstract

The Núcleo de Engenharia Educacional (NEED) of the Universidade Federal do Rio Grande do Sul aims to encourage the continuous improvement and innovation of engineering education through the development of innovative teaching practices. As a proposal, the project "Acolhimento dos Calouros – Desafio UFRGS " - 2017/1. The aim of the reception is based on the need to improve the training of the academics of the Escola de Engenharia da UFRGS and its professionalization, facing the challenges and opportunities that are opening in all fields of knowledge. The project houses a set of projects and activities of diverse modalities related to the current needs, that is, the future engineer has to be attentive to the technological changes and ready for challenges. In this sense, the NEED, together with the concepts of active learning, proposed to the freshmen a challenge of how to make the UFRGS more sustainable, thus making it possible to associate theoretical knowledge with practice. And, through the challenge proposed came the Ciclo Camp Project, proposed by a group of freshmen of the Escola de Engenharia that aims to propose an alternative form of internal mobility in the UFRGS, which provides a faster and more effective movement to the community based on this concept of transport. The project concerns the loan of bicycles, through a mobile application, to the active students and employees of UFRGS, for internal use of the service between the dependencies of the Campus do Vale. From this concept, the present article analyzes the acceptance of loan and internal sharing of bicycles in UFRGS, besides proposing improvement actions for the aspects of greater relevance. For the implementation and possible realization of the project, the questionnaire method was used to validate the acceptance of the use of bicycles. It was defined by the elaboration and application of an instrument (questionnaire) evaluated by specialists of the area, in the sense of identifying categories of applicability and economic-applicability. The questionnaire was applied to 155 students with active enrollment in UFRGS.

Keywords: Environmental Education, Sustainable Development, Ciclo Camp Project.

ENACTUS UFRGS:

Promoting The Social Entrepreneurship of Socially Vulnerable Communities in Porto Alegre City and Metropolitan Region

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Abstract

ENACTUS is an international organization that mobilizes students and academics committed to using the power of entrepreneurial action in order to advance progress in the world. In this context, the ENACTUS Team of the Federal University of Rio Grande do Sul was created, which currently has a staff of 36 students from 19 different courses of the university, with the support of faculty and external counselors. The team follows the guidelines of the ENACTUS^{TM} NGO, present in 36 countries, which involves more than 1,730 universities, 72,000 students, and 550 corporate organizations and individual partners. In addition to following the guidance of the UN Sustainable Development Goals (SDGs), it consists of detecting opportunities for action, elaborating strategic planning and developing entrepreneurial, sustainable and self replicating projects in the community, focused on issues of social entrepreneurship which, according to Drucker (1986), is related to transforming ideas into business opportunities by combining individuals and processes, as well as to a collective action involving people from the community seeking the integration and development of these people. Therefore, the main focus is to discover solutions to social problems through community needs, measuring success through the performance and the social impact of actions, attitudes and behaviors, in other words, the number of people in the social entrepreneurship program or project (MELO NETO; FRÓES, 2001, p. 81). Following these concepts, ENACTUS UFRGS presents two projects in progress: "We are UBUNTU" and "Flores de Antônia", which deal, respectively, with immigration and refugee issues, and gender equity; and two finalized projects: "Semeia Sonho" and "Pandorga", which provide, respectively, autonomy for recyclable waste pickers and sports education. Will be approached the projects that are in progress and that finished. The immigration scenario according to data from the Research Center of the Italo-Brazilian Center for Migration Assistance and Instruction (CIBAI, 2015),Rio Grande do Sul state has more than 13,000 refugees, divided by more than 100 municipalities, most of which are in mountainous, as Caxias do Sul (with 2,000 refugees) and Bento Gonçalves (1.3 thousand), Lajeado and Porto Alegre, where the estimate indicates a thousand refugees each. As a support for refugees, the team is developing a free virtual platform was called UBUNTU, which aims to unite opportunities from a wide range of backgrounds, ranging from the personal development of those impacted to their reintegration into the labor market. The website will be accessible by any immigrant from any country, as it is easy to use and contemplates multiple languages. The launch of the UBUNTU platform is scheduled for December

2017. After the project acceleration, the website administration is planned to be transferred to the impacted immigrants. Also, a profitability plan based on advertisements on the platform is studied. Through its network, the team Enactus UFRGS wants to consolidate, improve and expand its projects, as well as strengthen ties with the community of students, teachers and the external community, as well as provide experiences on social entrepreneurship, equity, recognize opportunities and promote progress following the UN SDGs. The projects completed and in progress are contributing to the emergence of others aiming to strengthening this organization, as well as providing recognition and seriousness of the team.

Keywords: ENACTUS, Entrepreneurship, Vulnerable, Ubuntu, Refugees.

Project Based Learning:

The Integration of Knowledge, Skills and Attitudes through The 4x4 In Schools Challenge

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Abstract

The present work describes an exchange of experiences among students of the State School CIEP 291 - Dom Martinho Schlude in Pinheiral, RJ, with the students of Advertising and Propaganda, Information Systems and, mainly, students of the Engineering courses of the University Center of Volta Redonda (UniFOA) for a period of six months. The main motivation for the university students in the project was the social entrepreneurship because the school is located in a peripheral municipality with a high illiteracy rate, with the lowest rate of Development of Basic Education (IDEB) in the South Fluminense region (RJ). The 4x4 In Schools Challenge is a Jaguar Land Rover competition for high school students who may have as tutors, Higher Education students and / or Research Center professionals. To participate each High School team must promote several technological changes in a prototype of a 4x4 vehicle approximately 20 cm long, 10 cm wide and 10 cm high. It is also necessary for the teams the structure of a microenterprise, with logo and marketing actions, approaching an entrepreneurial vision. All actions taken were exposed through verbal presentations and evidence of car performance on obstacle courses. Therefore, CIEP 291 created a partnership with UniFOA to assist in the development of an electric / mechanical prototype design, as well as advertising and marketing support. After defining the support, three teachers and twenty five students participated in the course of Information Systems, Electrical Engineering, Mechanical Engineering, Advertising and Propaganda, two professors from CIEP 291 and six students who would compete. For university students, an Academic Extension and Scientific Initiation Project was created with two hours of weekly work during the competition period. At university, teachers decided to use Project-Based Learning as a teaching methodology, with students separated into small work groups according to the needs of each area. Subsequently, the university students played the role of tutors and facilitators in the teaching-learning process with the team of CIEP 291. The school teachers were guiding the proposed tasks by monitoring a work plan so that all the requirements

were fulfilled in the established term. As an outcome, the CIEP291 team managed to develop all the necessary requirements, therefore became the national champion in the Beginner Mode and received three individual prizes in the competition. As a result, it was qualified for the World Competition Stage competing with twenty-four teams from sixteen countries, ranking first in marketing and among the top three in terms of technological innovation. We believe that the methodology used in the project was very enriching, strengthening and stimulating the main skills, abilities and attitudes of the students, in both segments, due to the relevance of meaningful learning, offered by the needs in solving the real problems proposed by the competition.

Keywords: 4x4 Challenge, Higher Education, High School, Project-based Learning, Technology.

Web Lab Platform:

An Approach to The Study of Mobile Robotics

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Abstract

Nowadays the robotics systems has been broadly used in college education as a very important learning tool to lure and rise the teaching-learning process inside to the engineering courses. The students achieve higher motivation in performing laboratory aimed to the formative contents development. Another practice utilized by educational institutions consists in the Web Lab concept, that corresponds to the remote experimentation laboratories. The incorporation of this process in the systematic teachinglearning in engineering education, makes possible carrying out real-time experiments through the internet, fact that helps the development of the student during the training process. Furthermore, one of leading training content of mechatronics engineering and automation consists on robotic mobile systems programming. However, some educational platforms to remotely control robots have been present some difficulties on their final objective. Mainly because the methods shows problems as a complicated integrated development environment (IDE), special and expensive hardware and software to control the robots, non-free platforms and still lack of compatibility at networks and industrial protocols. The approach used in this work employs an embedded system in a mobile robotic platform with Wi-Fi connectivity, which allows its parameterization, control and programming remotely. The solution also enables video supervision and real-time access to the remote environmental information. This method provides a browser-based editor that makes easy to wire together flows using the wide range of nodes, using block oriented programming that can be deployed to its runtime in a single-click working on the cloud. The greatest advantages of the developed system are to be open-source, modular, inexpensive, and simple enough to be assembled by most researchers, professors and students. Thus, with the platform in question, teachers can develop experiments aimed at problematizing the formative contents that make up the practice of programming robotic mobile systems, making the student to learn in a practical way the characteristic aspects of mobile robotic systems.

Keywords: Engineering Education, Mobile Robots, Modular System, Open-source, Web Lab.

Clown Group:

Humanistic Training for Engineering Students

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Abstract

The Clown Group – Engineers without Borders (Knowledge Connections) is a group of clowns formed by Engineers and Engineering students. The theoretical basis of the Clown Group goes back to the origins of Jerzy Grotowski's "poor theater" (1933–1999). Concerning the use of music, theater and dance to present and promote the pleasure of art, the Group values the interaction with the public and does not worry about the structural elements commonly characterized by the theater as stage and lighting. In this way, the Clown Group promotes a Humanistic Formation of its members by providing a development in the capacity of communication, contact with the external community and also the satisfaction, by allowing the art to be spread in a simple and effective way. The objective of this work is to analyze the importance of Humanistic Training in the professional and personal development of Engineers and Engineering students, treating as a special case the Humanistic Training linked to the actions of the Clown Group – Engineers without Borders (Knowledge Connections). As a hypothesis, it is expected that the experience of members and ex–members of the Clown Group can be proven through their training and presentations over the years. In order to evaluate the personal and professional development of members and ex–members of the Clown Group during the training process, a qualitative research was carried out, via an applied questionnaire, in addition to a documentary research by observation, in which data were collected through analysis and observation of photos and documents of the Clown Group. In addition, Artificial Neural Networks were used to correlate the members and ex–members based on the two applied researches. The members and ex–members of the Clown Group have experienced a major break in introspection, significantly improving their way of communicating with society. The members and

ex–members presented an improvement in the way they relate to each other in a team, a fundamental aspect of an Engineer's professional life. The Clown Group presents itself as a very important action for Humanistic Training and the professional and personal development of Engineers and Engineering students. The diffusion of art in the academic and external community promoted by the Clown Group also allows the deconstruction of the stereotype that the areas of Engineering and the Arts cannot coexist.

Keywords: Art, Communication, Humanistic Training, Clown, Tutorial Education Program.

Teaching and Design of Fuzzy Controllers Made Easy with The Crookes Radiometer

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Abstract

The Crookes radiometer, also known as the light mill, was invented in 1873 by the British chemist and physicist Sir William Crookes, it consists of a sealed glass bulb containing partial vacuum and four vanes forming a propeller supported on a low-friction spindle allowing free rotation. The vanes start to rotate when exposed to light. The explanation of this movement has been debated by the scientific community for a long time and today the accepted reason is related to an infra-red light induced thermal effect that produces torque. It is a fact that the radiometer can be used as an instrument to detect and even measure the infra-red energy by measuring the rotational speed of the vanes when exposed to such radiation. By having a low-cost, being easy to find and awake strong curiosity, the instrument can be considered a viable alternative for the development of an enhanced educational platform including a digital control system for the vanes' rotational speed. The developed platform consists of open software and hardware allowing to interface with the radiometer, the speed sensor (optical detector) and the actuator (infra-red emitter) by handling all the controller design in a user-friendly interface in a computer. The platform aims to facilitate the design of digital controllers, giving students the possibility to implement what they just learned in theory in a practical application, resulting in a better teaching quality, as the students understand better the theory and increase their confidence in the effectiveness of the designed controller. Previous work, presented an educational platform as an alternative for the teaching of classical PID controllers design, but the system was initially developed with analog components and a microcontroller kit hard to find and quite expensive, also requiring a higher complex level of programming. Here we demonstrated an enhanced platform using the Arduino Integrated Development Environment and the implementation of a Fuzzy controller for the speed rotational control logic, reducing hardware cost by more than 70%, facilitating the system set up and the programming trough a friendly environment. This new control algorithm allows the study of techniques frequently presented in elective control courses in engineering schools. Design of digital control systems are often based on theoretical case studies, with the new proposed platform, a Fuzzy control system implementation in a real plant can be presented to the students, facilitating and complementing the understanding of the theory classes.

Keywords: Arduino, Crookes' Radiometer, Digital Controller Design, Fuzzy Controller, Teaching Tools.

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