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LIBRO DE ACTAS

ABSTRACTS BOOK

International Conference of Educational Innovation in Building

Congreso Internacional de Innovación Educativa en Edificación

V INTERNATIONAL CONFERENCE OF EDUCATIONAL INNOVATION IN BUILDING

CINIE 2021

ESCUELA TÉCNICA SUPERIOR DE EDIFICACIÓN
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V INTERNATIONAL CONFERENCE OF EDUCATIONAL INNOVATION IN BUILDING

(CINIE 2021)

24 al 31 de marzo de 2021

Continuamos en este año 2021 con nuestra quinta edición del Congreso Internacional de Innovación Educativa en la Edificación. Lamentablemete y por segundo año consecutivo, no podemos reunirnos y hacerlo de modo presencial como todos desearíamos. Aún así este año se ha aumentado considerablemente tanto en número de ponencias, como de participantes, por lo cual este Comité no puede sino agradecer a todos su esfuerzo y participación.

Es evidente que la situación vivida este último año ha servido para potenciar facetas y metodologías innovadoras, dentro de la labor docente en el ámbito de la edificación. A través de las diferentes ponencias del Congreso pueden comprobarse su evolución y desarrollo a nivel mundial. Como en años precedentes se ha organizado a través de diferentes áreas temáticas principales, con la finalidad de contribuir a la producción de resultados científicos de alta calidad.

Por último, dejar patente nuestro agradecimiento a la inestimable cooperación de las compañías Placo SAINT-GOBAIN, URSA Ibérica Aislantes y a la Cátedra Empresa PROIESCON. Ellos junto a todos y cada uno de los participantes en el evento lo hacen posible, y con especial relevancia, en estos momentos tan complicados.

The Organizing Committee

CINIE 2021

SUMMARY INDEX

SUMMARY INDEX

CINIE 2021
ABSTRACTS

HOW TO TEACH YOUNG ENGINEERS IN ATTRACTIVE WAY? THE IDEA AND REALISATION OF PROJECT "GLOCAL"- STATEGIC PARTNERSHIP OF ERASMUS+ PROGRAMME

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Keywords: *GLOCAL, teaching programmes, innovating teaching materials, higher education*

Abstract

Many Universities still actualise their teaching programmes to make them more attractive both for students and their future employers [1, 2]. Those aims are achieved by realisation of project GLOCAL. It responds to the current needs of the European labor market and problems of contemporary cities through changes in higher education. GLOCAL is a project that teaches future engineers to think globally and act locally.

Project *"GLOCAL – Innovative training of future engineers responding to problems of contemporary cities"* (Fig. 1) is realised as Erasmus + KA203 - Strategic Partnerships for Higher Education during period 1.09.2019-31.12.2022. Consortium consists of 3 Universities: Politechnika Białostocka (Bialystok University of Technology) - Poland, Universidad Politécnica de Madrid – Spain and Klaipedos Valstybine Kolegija (Klaipeda State University of Applied Sciences)- Lithuania.

Figure 1: *Logo of GLOCAL. (Source: Dorota Gawryluk)*

Trainings in GLOCAL are in 2 froms: short-term staf trainings for teachers (Fig. 2) and summer schools for students planned in blended form. The project will promote among summer school's participants the extension of interdisciplinary technical knowledge,

language competences and work in international teams. Form and programme of summer schools are inspired by experience of Consotium teachers [3] and knowledge shared by researchers of another Universities [4]. 2020 summer school was postponed due to Covid-19 problems. Our idea is to realise it in planed blended form with important for aim of the project “face-face” part too.

Figure 2: *Short-term staff training C1. E-learning , March 2020 Bialystok, Poland (Source: Dorota Gawryluk)*

Innovative teaching materials and handbooks are intelectual results of the project. Those outcomes are dedicated for students and additionaly for high school students, producers, engineers of various industries, local government authorities and state administration. “Small Glossary of Technical Terms for English-Polish-Spanish-Lithuanian Languages” was compiled and prepared as a multi-branch dictionary in four languages with interdisciplinary vocabulary, including technical and legal terms, on the subject of the project. The glossary contains terms related to architecture and urban planning, landscape architecture, civil engineering, environmental engineering, urban heritage and art history studies, laws and other legal publications... It is already avaliable free downolad on Glocal website [5]. There will be accessed soon monographe “Future of the City” and “Guid of good practieces of designing small archietcture objects in public space” as a result of scientific cooperation of Glocal researchers too.

References

[1] O. Kapliński, W. Bonenberg “Architecture and Engineering: The Challenges— Trends—Achievements” *Buildings*, 10, 181, 2020. doi:10.3390/buildings10100181, Buildings | Free Full-Text | Architecture and Engineering: The Challenges—Trends—Achievements (mdpi.com)

[2] M. Kosior, P. Berkowski “Impact of cooperation beetwen universities and industry on civil engineering curriculum of study – experience of Polish technical universities” *EUCEET Conference Procidings*, 2018

[3] D. Krawczyk, A. Rodero, D. Bullejos, L. Sakaluskiene “VIPSKILLS- virtual and intensive cours developing practical skills of future engineers” *ICERI Conference Procidings*, p. 6468-6475, 2018

[4] W. Bonenberg, O. Kapliński "Knowledge is the key to innovation in architectural design" *Procedia Engineering,* V.208, 2017, https://doi.org/10.1016/j.proeng.2017.11.013.

[5] "Small Glossary of Technical Terms for English-Polish-Spanish-Lithuanian Languages" D. Gawryluk and J. Kucinskiene: Editors, Klaipeda, 2020, SMALL GLOSSARY OF TECHNICAL TERMS – Glocal – innovative training of future engineers (pb.edu.pl)

OPTIMIZAR LA ENSEÑANZA DE LOS PLANES DE PROTECCIÓN DE PATRIMONIO ARQUITECTÓNICO GRACIAS A APLICACIONES WEB FULL-STACK CON JAVASCRIPT

STREAMLINING ARCHITECTURAL HERITAGE PROTECTION PLANS TEACHING THANKS TO FULL-STACK WEB APPLICATIONS USING JAVASCRIPT

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Keywords: *heritage protection plan, active learning, web development, MERN stack, holistic perspective*

Abstract

Promoting a deep and global understanding of local heritage protection plans during specific courses or a masters degree entails a great challenge: being able to synthesize and stimulate critical thinking towards the built environment. However, poor methodologies influenced by outdated beliefs of teaching focused on extremely descriptive and highly academic oral presentations have proved to be rather ineffective.

Moreover, some heritage protection plans are only downloadable as large pdf files that are not easy to handle without guidelines, therefore complicating the self-study. Even if they include index cards containing individual analysis of each protected building, it is difficult to make comparisons between them and to offer a holistic perspective of the city and its urban fabrics.

To turn this situation around, new technologies should be brought into consideration as a source of help to professors thereby facilitating them the development of instructional material focused on active methodologies. A dual-purpouse should be achieved: organizing and complementing the heritage protection plan's information in order to offer an easy and interactive search tool engaging the students in its creation.

In this regard, the present study proposes a methodology based on the step-by-step creation of a SPA (Single Page Application) as an open and flexible material. Thus, the architectural content will update dynamically according to the users interactions through filters, forms, drop-down lists, clickable maps or floorplans, only visualizing the desired information from the database on screen.

Javascript is the scripting language that will be used in this web application development process to implement aforementioned complex features, providing a full-stack solution

with open source tools: React.js for the client-side and MongoDB, Express.js and Node.js (MERN) for the server-side.

As it was mentioned before, this active learning methodology also seeks to involve students in the interface design and the coding process, bringing programming closer to architecture. [1] Thanks to the flexibility of MongoDB database (NoSQL), they will also learn to organize the information of every protected building using key-value pairs and to automate the data collection (description, geolocation, author, date, style …) from official sources via web scraping using Cheerio and Axios.

To sum up, managing heritage protection plan data through an interactive tool allows for a global vision of the city almost immediately, reducing search time and helping to draw conclusions in a very dynamic way according to the filters applied by the user. The deep knowledge of the plan will also empower him to determine whether or not a certain building may merit to be protected and added to the local heritage list.

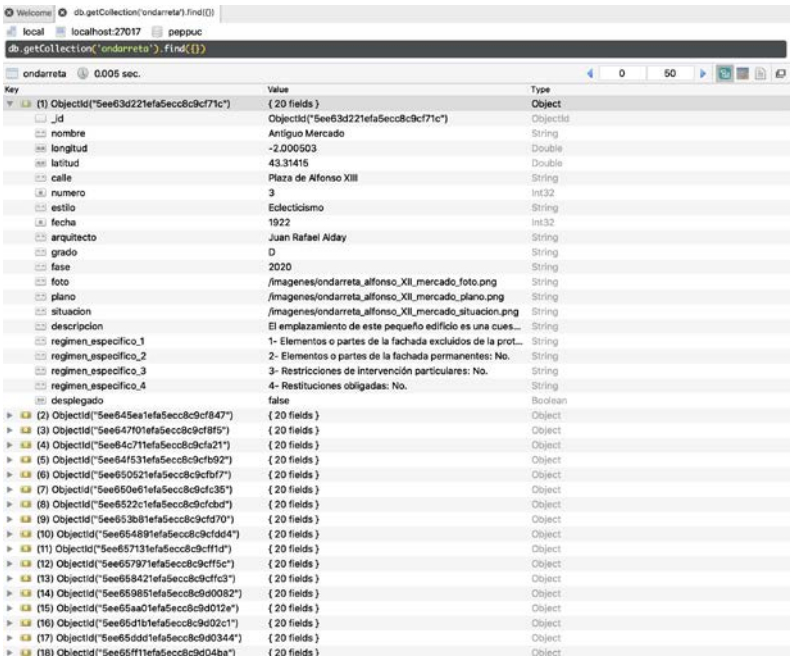

Figure 1: *MongoDB Ondarreta neighborhood collection. (Author: María Escalada)*

References

1. © MongoDB, Inc software company, MongoDB Guides - Structure your Data for MongoDB. https://docs.mongodb.com/guides/server/introduction/, 2020 (accessed 29 December 2020).

ANALYSIS OF THE APPLICATION OF ICT IN DIFFERENT EDUCATIONAL STAGES

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Keywords: *TIC, primary education, secondary education, higher education, learning*

Abstract

Had we been told a few months ago that the use of information and communication technologies (ICT) would be essential in all educational stages overnight, we would have thrown up our arms thinking that it was something impossible to happen. But, still immersed in the global health crisis of COVID-19 as we are, it can be said that "education has incorporated the use of digital tools unavoidably to follow the planned academic school calendar" [1].

The technological challenge caused by the pandemic has given visibility to both the existing technological gap between students and teachers and the difference between access to technology and its proper use [2]. Therefore, it is essential to indicate that, for the design of new curricula, objectives, and learning contents in this digital age, it is necessary to take into account both the speaker (teacher) and the listener of the message (student) without forgetting the educational stage in which both are and the limitations they present.

In the researches analyzed, it has been found that the use of an expository teaching method in primary education through ICT reinforces learning by reception. However, in the same educational stage, a constructivist teaching method through ICT facilitates discovery learning [3]. Besides, the active and autonomous role of the student who collaborates is significantly improved by a process of selection and communication of information, results and findings, which enriches their oral expression [4].

In other studies on the stage of secondary education, the use of ICT has been attributed to the enrichment of collaborative work activities and cross-curricular competencies. It is also considered a motivating element, a positive and innovative resource with numerous possibilities for improvement in learning and solving tasks [5].

Regarding higher education, research carried out in the university context concludes that, with the use of ICT, a constructive, critical and permanent dialogue is achieved between students and between students and teachers [6]. Generally, there is also a slight increase in the average grade in subjects taught with ICT, as well as greater interest and motivation towards these subjects compared to the same ones taught traditionally [7].

In short, the digital skill that students present with the use of ICT positively influences their motivation in all educational stages. This does not mean that both learning objectives and content must be adapted exclusively to this methodology, technology is not an end, but must be incorporated as an important complement to an ever-changing teaching process. Also, we must not forget to carry it out as a training strategy not only for students, but also for teachers, and focus on achieving the necessary skills for its inclusion in work and social life and promote the interest in continuing to learn.

References

[1] J. Blanco Robles; TIC y Covid-19: Reflexión sobre el cambio conceptual como recurso para la práctica educativa. Artículo de investigación. https://www.aacademica.org/julieth.blanco/2.pdf, 2020 (accessed 28 December 2020).

[2] G. Leguizamón, M. Carassai; Hiperproductividad de la enseñanza en tiempos de Covid-19. ¿Qué espacios de reflexión quedarán luego de la pandemia?. Sociales y Virtuales Vol. 7 núm. 7, 2020.

[3] M. Area; Algunos principios para el Desarrollo de "buenas prácticas" pedagógicas con las TIC en el aula. Comunicación y Pedagogía, 222, 2007, pp. 42-47.

[4] J. M. Sáez López; Valoración del impacto que tienen las TIC en educación primaria en los procesos de aprendizaje y en los resultados a través de una triangulación de datos. RELATEC Revista Latinoamericana de Tecnología Educativa, Vol. 11(2), 2012, pp. 11-24.

[5] J. M. Méndez Garrido, M. Delgado García; Las TIC en centros de Educación Primaria y Secundaria de Andalucía. Un estudio de casos a partir de buenas practices. Digital Education Review, Number 29, 2016.

[6] I. M. Gómez Trigueros, M. Ruiz Bañuls; Interdisciplinariedad y TIC: nuevas metodologías docentes aplicadas a la enseñanza superior. Píxel-Bit. Revista de Medios y Educación, Nº 52, 2018. ISSN: 1133-8482. e-ISSN: 2171-7966, doi: http://dx.doi.org/10.12795/pixelbit.2018.i52.05.

[7] R. Roig-Vila; El compromiso académico y social a través de la investigación e innovación educativas en la Enseñanza Superior. Repositorio Institucional de la Universidad de Alicante, pp. 125-136. ISBN: 978-84-17219-25-3.

DO THE CONTENTS OF UNIVERSITY TEACHING RESPOND TO WHAT SOCIETY DEMANDS?

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Keywords: *Content update; Open surveys; Didactic dimensions; Didactic coordination; Educate professionals.*

Abstract

As a result of the integration of the university system in the European Higher Education Area in 2010 [1], competences [2], methodology [3, 4] and evaluation [5] have attracted the attention of researchers in the field of university teaching, while the contents have been relegated to a background.

The present research aims to find out whether the contents that are taught respond to the changing demands of society or, otherwise, remain static and may become obsolete. The compulsory subject "Facilities Project" of the Degree in Fundamentals of Architecture at the Polytechnic University of Madrid is chosen as a case study. For this, an open survey is carried out to the students who take it in two successive years. The 29% of them respond to the survey.

As it is an open survey, students are offered a greater opportunity to express freely, both their answers and the reasons they have for giving them. It is detected that they positively value much of the content and that they also value, to a lesser extent, other content negatively with a difference of 43% between both of them.

Different evaluations are collected for each of the topics that make up the subject and also the reasons that, together with the suggestions, allow measures to be taken to improve the content offered.

Students highlight the approach of teaching facilities as an integral part of the architectural project, because when designing the building integrating its facilities, it is understood as a whole organism that works thanks to the relationship of the different systems and the facilities have just been understood, not as something abstract detached from the building where they are located, but as something concrete which helps its definition.

They also demand that sustainability take more weight in the subject. They call for further development of the contents related to renewable energies, efficient air conditioning systems, and water saving and reuse systems. A greater transversality of the sustainability contents is requested throughout the entire subject.

Air conditioning receives positive evaluations when students understand it for the first time, when students discover that it is essential to make spaces livable, not only beautiful, and when they are aware of the significant volume they occupy, which leads them to consider it essential to develop the installation of air conditioning in parallel with the development of the architectural project.

Hydraulic facilities are valued positively for their simplicity compared to the air conditioning part and for the interest that the use of renewable energy raises for the preparation of sanitary hot water.

The calculation receives negative evaluations as it is considered exhaustively exhaustive, repetitive, takes a long time and is not carried out with computer programs, as in the professional world.

It is concluded that the contact with the opinion of the students allows obtaining a valuable point of view when keeping the contents updated. Just need to implement those possible improvements and carry out the process again next year with the intention of maintaining some live content.

References

[1] Á. Rojo, E. G. Jiménez, J. G. Flores, S. R. Rodríguez, La enseñanza universitaria. Planificación y desarrollo de la docencia, EOS, Madrid, 2004.

[2] M. Reynoso Flores, A. Alonso Gatell, E. Pérez Ramírez, Las competencias profesionales ambientales en el estudiante de arquitectura, Transformación. 14(3) (2018) 371-383.

[3] P. M. Millán-Millán, Sobre la casa desde casa: nueva experiencia docente en la asignatura Taller de Arquitectura. JIDA'20. VIII Jornadas sobre Innovación Docente en Arquitectura, Málaga, eAM'-UMA, 12-13 noviembre 2020, pp. 37-45. DOI: 10.5821/jida.2020.9288

[4] J. Fontàs-Serrat, M. Estebanell-Minguell, Aprendizaje de la construcción a través del análisis de fotografías de edificios. Textos de arquitectura docencia e innovación, JIDA. 7 (2020) 83-99.

[5] L. G. Ruesgas, F. V. Gual, C. Torrecillas, A. V. Vázquez, Propuestas Tecnológicas de Autocorrección de ejercicios de modelado 3D = Technological Proposals for self-assessment of 3D modelling exercises, Advances in Building Education. 4(2) (2020) 42-59.

APPLICATION OF THE PROJECT-BASED LEARNING METHODOLOGY IN THE DESIGN OF A THERMAL COMFORT ASSESSMENT SURVEY

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Keywords: *Thermal comfort, surveys, monitoring, built environment, thermal perception*

Abstract

This research, supported by the 3rd Educational Innovation Plan of the Universidad de Sevilla, is focus on the design, critical analysis, and implementation of a thermal comfort assessment survey. To accomplish this task, students and professors of eight subjects of Degree in Building and University Master's Degree in Integral Building Management were involved in a complex of various techniques including project-based learning (PBL) [1].

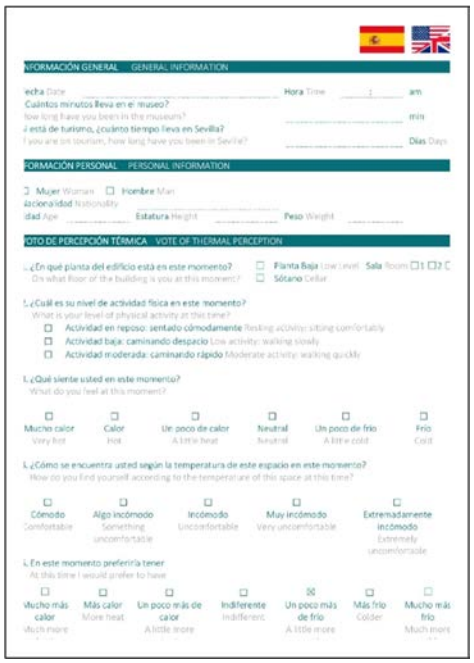

Figure 1: *Survey, final version. (Source: own production)*

The methodology was set in 4 phases. Firstly, to design the thermal comfort survey [2] European and national standards regarding energy efficiency [3] and nearly zero energy buildings (NZEB) [4] were analyzed based on PBL methodology and an extensive survey was proposed. Secondly, all the parameters considered were evaluated by means of a critical analysis with the master´s Degree students and a final version in various languages was carried out (***Figure 1***). Thirdly, a web-based tool was developed to use

the consensus survey in future cases. Finally, the implementation phase was focused on a case study, the Museum of Art and Popular Customs of Seville, in which surveys and data loggers for air temperature and relative humidity were tested (***Figure 2***).

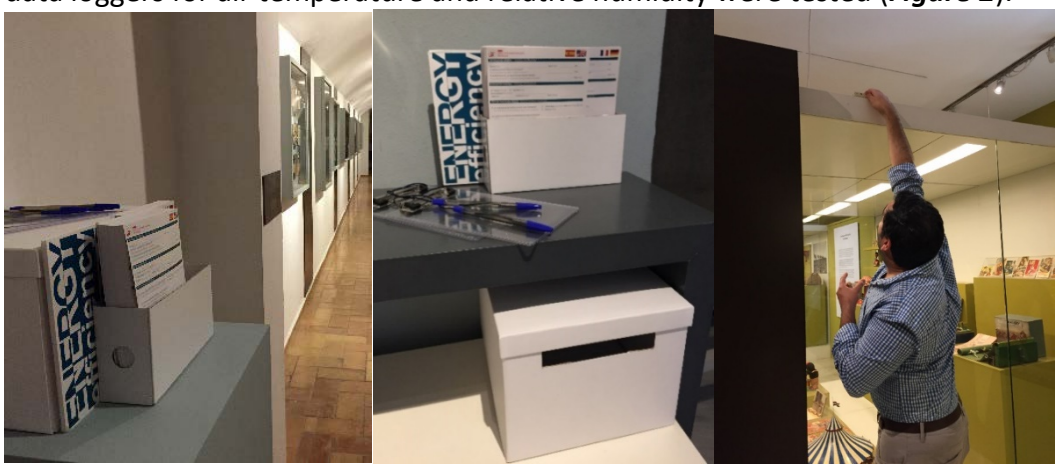

Figure 2: *Surveys and data, final version. (Source: own production)*

The results demonstrated that with collaborative work among different subjects, decisions in the sector of energy efficiency can be established. The fulfilment of the thermal comfort survey improved the extracurricular capacities and abilities of students, preparing them for recent international and national policies related with low carbon society. The results also shown that visitors as well as students completed 541 surveys until the confinement period. To sum up, the knowledge acquired by students in this specific subject matter, enhancing reflection and teamwork enriches their training and improves their future professional development.

References

[1] Ricaurte M, Viloria A. Project-based learning as a strategy for multi-level training applied to undergraduate engineering students. Educ Chem Eng 2020;33:102–11. doi:10.1016/j.ece.2020.09.001.

[2] American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE). ASHRAE Standard 55-2017 Thermal Environmental Conditions for Human Occupancy. Atlanta, GA, United States: 2017.

[3] European Union. Directive 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency. vol. 2018. 2018.

[4] European Commission. RECOMENDACIÓN (UE) 2016/ 1318 DE LA COMISIÓN - de 29 de julio de 2016 - sobre las directrices para promover los edificios de consumo de energía casi nulo y las mejores prácticas para garantizar que antes de que finalice 2020 todos los edificios nuevos sea. 2016.

EL VÍDEO COMO RECURSO PARA LA EVALUACIÓN DE PROYECTOS

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Palabras clave: *Vídeo didáctico; Herramientas digitales, Máster Universitario en Arquitectura, Construcción, Evaluación*

Resumen

La práctica educativa que se presenta se centra en el empleo de vídeos de corrección para evaluar los proyectos de los alumnos. Se contextualiza en la asignatura Construcción Aplicada del Máster Universitario en Arquitectura de la Universidad Rey Juan Carlos y se desarrolló en el curso 2019/20. La materia está diseñada para supervisar el bloque constructivo de los proyectos fin de carrera de los estudiantes. La prueba de evaluación consiste en la entrega de una sección constructiva, diez detalles con las soluciones trabajadas durante el curso y la justificación de accesibilidad y protección contra incendios. En el momento actual, el vídeo ha cobrado un gran protagonismo por ser una herramienta que transmite la información de forma directa y atractiva para los estudiantes [1]. El objetivo general de la experiencia didáctica fue emplear el vídeo como recurso para explicar las correcciones del trabajo entregado y que los estudiantes pudieran comprender qué aspectos debían mejorar y cuáles potenciar.

La metodología seguida constó de seis fases: (1) Entrega de los proyectos a través de un buzón en aula virtual; (2) Revisión inicial de la entrega por parte de los profesores; (3) Grabación del vídeo con el análisis de las soluciones empleadas y propuestas de cambio y mejora; (4) Cumplimento de la rúbrica de evaluación y aporte de comentarios de retroalimentación; (5) Envío del vídeo; (6) Solución de dudas sobre la corrección mediante tutoría.

Se emplearon como recursos tecnológicos diversas herramientas y programas. Las herramientas fueron dos ordenadores portátiles, una tableta y un lápiz capacitivo. Los programas, (-) Adobe PDF para visualizar los proyectos, (-) Samsung Notes para anotar y dibujar las correcciones, (-) AZ Screen Recorder para grabar la pantalla y el audio durante la corrección, (-) Google Drive para compartir el vídeo y (-) Microsoft Teams para las tutorías.

Se grabaron 27 vídeos, uno por cada alumno que entregó en la convocatoria de mayo. La duración de los vídeos estuvo comprendida entre los 1’52” y los 39’40” minutos, siendo la duración media de 19’01”.

Los resultados obtenidos fueron valorados como satisfactorios por parte de los profesores. En la segunda oportunidad de entrega se pudo comprobar que los estudiantes habían comprendido las correcciones, mejorando sus proyectos

considerablemente. A final de curso, se realizó una consulta a los estudiantes para conocer su opinión al respecto del desarrollo del curso. Un 59% de los estudiantes consideró que los vídeos de corrección eran útiles o muy útiles, un 25% se mostraron indiferentes, y un 16% nada útiles.

La conclusión principal es que un vídeo resulta un recurso apropiado para que los estudiantes sean capaces de comprender los errores y aciertos de sus propuestas constructivas, por lo que el objetivo general de la experiencia didáctica se ha conseguido. Por otro lado, y aunque la opción ideal es compartir la retroalimentación de los proyectos con el grupo, el vídeo individual permite profundizar en las soluciones concretas de cada proyecto, facilitando la mejora del mismo.

Reference:

[1] J. Fernández-Río, Revista Electrónica Interuniversitaria, Creación de vídeos educativos en la formación docente: un estudio de caso, 2018, 21, 115-127. Reference DOI: http://dx.doi.org/10.6018/reifop.21.1.293121

A DIDACTIC PROPOSAL DEVELOPMENT ON VIRTUAL MODALITY, FROM THE USE OF SEMANTIC WEB TOOLS IN BUSINESS ADMINISTRATION STUDENTS.

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Keywords: *Semantic Web, digital competences, didactic, autonomy, learning*

Abstract

The current research investigates the importance of digital competences, in virtual pedagogy context, considering that most of the students population in this modalty, have flaws in the good use of digital tools, that are part of semantic web, and that are part of learning virtual enviroments, generating dificulties at the time of advancing in learning processes.

Education has faced with constant changes that have led to transformation. In this way the lerning processes, teaching and evaluation, are made not just face to face, or small groups, today education tries to answer social context needs. The investigation Project since the educational context seeks to contribute to education process within virtual classroom, hand in hand by one of semantic web tools.

The structure of our proposal have the following components: Identification, charactherization and implementation of semantic web, which applies to fundamental topics of teaching and learning process.

Objective: To design a didactic proposal on virtual modaly}ity, from the use of semantic web tools, in order to strengthen, teaching and learning process for business administration students, from the Politécnico Grancolombiano.

Metodology: The design of the researching is qualitative type. The initial scope is descriptive type, based on selected categories for investigation developement: Digital competences, didactic and semantic web. These constructs were analized through a survey, and an observation diary.

The survey delimited the categories from digital and didactic competences, in order to know the perception of the students of the transversal modules of business admiistration on virtual modality, in information process, comunication and colaborative learning. Also, observation diary, described each of the enviroment characteristics of virtual learning enviroment, from Politecnico Grancolombiano.

Results showed the students interests in the use of technological tools and virtual enviroments used. There were identified their competences , for the interaction with different platforms resources, the results granted elements for developement of the didactic proposal.

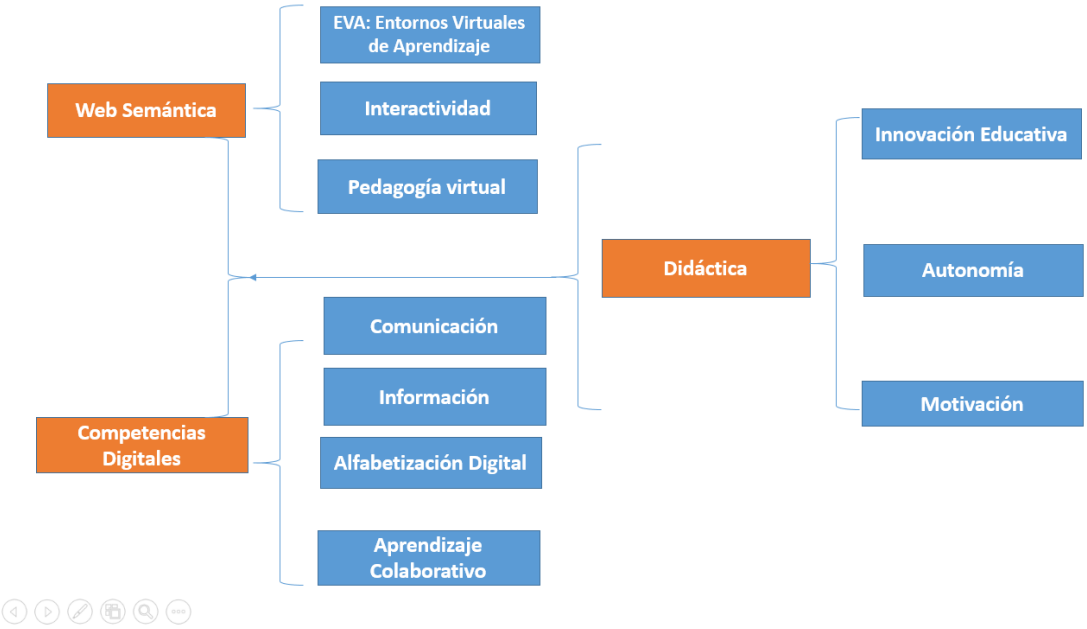

Figure 1: Constructs of the investigation.(Source: Own Authorship)

Conclusión: A didactic proposal involves strategies that promote the interest and the student motivation at virtual classroom, according to this, the investigation group implemented in the last period,

“interactive chat” proposal, that allowed tutor to synchronous accompaniment with virtual classroom tools deepening on tematic content, solving students concerns properly.

Such experience allows to conclude that the success of a virtual didactic strategy, is not based just in the use of technological tolos, it requires an active participation of the parts: the teacher based on his experience and knowledge, and the student applying his competences.

References

[1] Adarme, M. E. C., Nieto, Z., & López, H. M. P. (2018). Interpretation of teacher digital competences present at university context. Logos, science and technology magazine, 10(1), 41–51. https://dialnet.unirioja.es/servlet/articulo?codigo=6454623

[2] Jaimes, Eduard Anderson Rincón. “Evaluation of academic self regulation in undergrade students from the Corporación Universitaria Minuto de Dios – UNIMINUTO, virtual distance

mode." Academy and Virtuality magazine, vol. 10, no. 1, 2017, p. 1, https://dialnet.unirioja.es/servlet/articulo?codigo=5771285

Reference to a book:

[3] Aristega, J. E. M., Masacon, M. R. H., & Mayorga, D. C. E. (2018). The reason of self employment at higher education. Proceedings of the fourth International Congress of Pedagogical Sciencies in Ecuador: Teacher training and improvement: " challenges for education change in century XXI", 2018, ISBN 978-9942-17-033-0, pags. 339-348, 339–348. https://dialnet.unirioja.es/servlet/articulo?codigo=7220688

[4] Barreda, Silvia Valls. Teaching based on digital teaching by projects. Case of study: New Tech Odessa High School, Texas. UNED. National University of distance education (Spain), 2016, https://dialnet.unirioja.es/servlet/tesis?codigo=72152.

Reference to a chapter in an edited book:

García, Javier F. et al. The information and comunication technologies for innovation and development. Humboldt International University, 2017, https://dialnet.unirioja.es/servlet/libro?codigo=715118.

THE SOCIODRAMA AS A TECHNIQUE TO ANALYZE THE LACK OF PARTICIPATION IN THE CLASSROOM WITH THE STUDENTS

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Keywords: *participation; participatory techniques; sociodrama; university students.*

Abstract

On more than one occasion, the teaching body of universities faces the problem of lack of participation in the classroom. This fact is perceived as a problem by a large part of them since participation is considered a key element of student learning, since it increases, among other issues, motivation, cooperation and the formation of a responsible citizenship [1, 2] . Specifically, among the benefits that participation entails for the teaching body, the following stand out: 1) knowing the students, 2) recognizing the level of understanding of the subject, 3) adapting the speech or subject to recognized needs, 4) achieving a receptive environment, 5) promote creativity and a taste for knowledge. For its part, participation involves students: 1) exercising and improving oral expression skills, 2) expressing doubts, 3) knowing by example, 4) expressing opinions, 5) increasing their interest and motivation and 6) taking part active in the learning process [3].

According to the literature, the reasons for the lack of participation in the classroom can be varied. On the one hand, they can be directly related to the teacher who teaches the subject: it will depend on the importance that the teacher gives to participation, but also on the opportunities offered to their students to participate [4]. On the other hand, more practical or organizational issues such as the size of the class, the interest aroused by the subject itself or whether participation consists of a percentage in the final evaluation of the subject should also be taken into account [2]. The literature shows the importance of the shyness of students to speak in public as one of the key factors for participation [2,3,5]. Shyness that is reflected in fear or fear of speaking in public, criticism from peers or the teacher's judgment or evaluation [5]. In short, it is a fear of damaging one's social image [3].

As can be seen, the factors or causes that influence the degree of participation are varied. With the aim of facilitating the analysis of this situation and involving students in reflection –increasing participation–, this communication proposes the use of the sociodrama technique as a tool to analyze what happens in a specific classroom. This

tool consists of the representation of a fact or situation experienced by the participants themselves, a situation of which they are part; after the representation they themselves must analyze what is represented [6]. Thus, a point of catharsis is reached, one goes beyond the discourse, acquiring a deep vision of the analyzed event and developing a group diagnosis that allows to prevent similar situations in the future [7].

References

[1] Bretones Román, A. Concepciones y prácticas de participación en el aula según los estudiantes de magisterio. Facultad de Educación, Centro de Formación del Profesorado, Departamento de Didáctica y Organización Escolar, Universidad Complutense de Madrid, 1996.

[2] Moliní Fernández, F. y Sánchez-González, D. Fomentar la participación en clase de los estudiantes universitarios y evaluarla. *REDU: Revista de docencia universitaria*, 2019, 17(1): 211-227.

[3] Morell Moll, T. ¿Cómo podemos fomentar la participación en nuestras clases universitarias?. ICE/Vicerrectorat de Planificació Estratègica i Qualitat, Universitat d'Alacant, 2009.

[4] Prieto Parra, M. La participación de los estudiantes: ¿Un camino hacia su emancipación?. *Theoria*, 2005, 14(1): 27-36.

[5] Rueda, E., Mares, G., Gonzáles, L. F., Rivas, O. y Rocha, H. La participación en clase en alumnos universitarios: factores disposicionales y situacionales. *Revista Iberoamericana de Educación*, 2017, 74(1): 149-162.

[6] Torres, O. Técnicas para el trabajo en grupos. Disponible en www.sld.cu/galerias/doc/sitios/desastres/tecnicasgrupales.doc, 2003 (último acceso a 23 de febrero de 2021).

[7] García de Vicente, L. M., Diz Morales, M., Alonso González, D. y López Magán, M. (1998). El sociodrama como técnica de intervención socioeducativa. *Cuadernos de Trabajo Social*, 11: 165-160.

REVIEW THE METHODOLOGY TO IMPROVE UNIVERSITY TEACHING

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Keywords: *Methodology; University teaching; Open surveys; Performance improvement; Teacher training.*

Abstract

The selection process for hiring university professors gives greater value to the candidates' research experience and the publication of the results of said research [1]. While pedagogical training is an aspect that receives little value. So, finally, teachers who master their area of knowledge and have a good research profile, but whose training in the educational field is unknown, are hired [2].

Despite the effort promoted by Bologna [3], many subjects continue to use the traditional methodology that consists of the teacher giving lectures and examining the students about how many of the concepts transferred in class they have memorized [4].

Perhaps some additional practice or the resolution of some problems have been added, but unfortunately on many occasions the methodology is very similar to that used a century ago. Teachers who have not received pedagogical training continue to use educational methodologies that perpetuate their concept of education [5]. There is a relationship between what the teacher does in class and what he thinks about teaching and about his or her figure as an educator [6].

The present work aims to investigate which aspects of the methodology used in the subject "Facilities Project" what is taught in the 5th year of the Degree in Fundamentals of Architecture at the Polytechnic University of Madrid, which is taught with a learning methodology based on challenges, are better valued by the students and what aspects of this methodology are susceptible to improvement. For this, 29% of the students of two successive courses have answered an open survey.

The highest number of responses received, 23%, focus on closeness to reality. It is valued as a success of the methodology and the matter arouses so much interest that it receives a third of the improvement proposals collected. It is valued to show real examples of good buildings from an architectural point of view that adequately integrate their facilities, to make visits to buildings to see their facilities and also to show photographs of construction sites in class.

The next issue in terms of responses received, 18%, is the accompaniment of students. Individual and group corrections of the students' work are valued, although sometimes they demand to dedicate more time to this task. They also positively value the opportunity to participate during classes and the online communication forum used throughout the week.

Another topic that students show interest in, 16% of the responses received, is the workload. Although surprisingly half of the students consider it adequate, the other half consider it excessive.

The rest of the best valued aspects are the focus of the subject and the educational innovation. The characteristics and abilities of the teachers receive an average evaluation, and coordination with other subjects, the resources provided, the organizational issues and the excessive number of students in class are less valued.

It is concluded that the opinion of the students is an invaluable help to see what aspects of the methodology used are being well received and what other aspects need to be reviewed.

References

[1] Gorina, A., Sierra, G., Alonso, I., y Salgado, A. (2018). Profesionalización de profesores universitarios en la gestión de publicaciones en revistas científicas de las ciencias sociales. Batey: Revista cubana de antropología sociocultural, 11(11), 134-155.

[2] Carbonero, M. A., Martín-Antón, L. J., Flores, V., y Resende, A. F. (2017). Estudio comparado de los estilos de enseñanza del profesorado universitario de ciencias sociales de España y Brasil. Revista Complutense de Educación, 28(2), 631.

[3] Á. Rojo, E. G. Jiménez, J. G. Flores, S. R. Rodríguez, La enseñanza universitaria. Planificación y desarrollo de la docencia, EOS, Madrid, 2004.

[4] Prosser, M. (2010). Faculty research and teaching approaches: Exploring the relationship. In Christensen Hughes, J y Mighty, J (eds.) Taking stock: Research on teaching and learning in higher education, Montreal y Kingston, Ontario, Canada: McGill-Queen's University Press.

[5] Scott, D. E. (2015). The nebulous, essential dimensions in effective university teaching: The ethic of care and relational acumen. Journal of University Teaching y Learning Practice, 12(2), 9.

[6] Esteve, J. M. (2009). La formación de profesores: bases teóricas para el desarrollo de programas de formación inicial Teacher training. Theoretical basis for the development of pre-service training programs. Revista de educación, 350, 15-29.

EDUCATION FOR SUSTAINABLE DEVELOPMENT IN BUILDING HIGHER STUDIES

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Keywords: *Sustainable Development*, *ABP, LCA, Circular Economy*

Abstract

Education for Sustainable Development (ESD) was endorsed by UNESCO's 37th General Conference in November 2013 and was launched at the UNESCO World Conference on ESD in November 2014 [1]. The common perception was that little more than a change in teaching or curriculum was necessary; *sustainability* indicated a change of cultural paradigm. This *ecological* worldview entailed a shift of emphasis from relationships based on fragmentation, control and manipulation towards those based on participation, mutual respect and collaboration [2]. Being University a subsystem of society, oriented by its needs, values and norms, a slow and laborious process of change was foreseen. However, a virus that appears overnight, submits us to rethink many things. University is called irretrievably to interpret and transform reality creatively facing the social, economic and environmental challengers. Globalization is called to serve and globalize all its benefits, both techno-economic and socio-political, as well as cultural. In this crisis, *the raison d'être* of professions and jobs has become evident, they have been qualified and valued for what they do for others, for the integrity of their ethics, for knowing how to put the human person at the center of doing and on the horizon of commitment, beyond profit, security and success. Nothing further from success and individualistic careerism, the professions have been valued for what they really are, in order to the common good. In this context, more than ever, competences proposed by ESD are needed. It is time to change keys in method, form, instruments, perhaps it is the most propitious moment to not return to a stereotypical and routine study, market-driven without connection with the community, human being and nature. ESD prepares learners to understand and respond to the changing world and drives sustainable development [3]. It produces learning outcomes that include core competences, which can be summarized in twelve competences: systems thinking, interdisciplinary work, anticipatory thinking, justice, responsibility and ethics, critical thinking and analysis, interpersonal relations and collaboration, empathy and change of perspective, communication and use of media, strategic action, personal involvement,

assessment and evaluation, and tolerance for ambiguity and uncertainty [4]. Thus, to develop some new competences new pedagogical approaches have been incorporated, such as brainstorming, peer assessment, problem-based learning, collaborative learning, online discussion forums, games and systems simulations, among others [5], [6], [7], and [8].

The University of the Basque Country (UPV/EHU) has developed the *Campus Bizia Lab* programme as an initiative derived from the Project Erasmus University Educators for Sustainable Development (2013-2016). The aim of the initiative is to promote a collaborative process between academic staff, service and administrative staff and students, creating a transdisciplinary community, to respond to sustainability challenges within the university. It is an initiative driven by the Sustainability Directorate and the Educational Advisory Service, both belonging to the Vice-Chancellor's Office for Innovation, Social Commitment and Social Action of the UPV/EHU. Bachelor´s Degree Dissertations (TFG) and Master's Degree Dissertations (TFM) from Faculties (Engineering, Education, Science, Pharmacy, Economics and business) are developed within the framework of the program. The challenges addressed in the dissertations are designed and based on needs analysis in the Campuses; thus, they not only provide a return in terms of participants (students, faculty and staff) learning, but also contribute to a more sustainable management of the university itself. In the framework of the programme, several research projects have been developed by staff and students from the faculty of Engineering of Gipuzkoa (EIG). The departments involved have been Chemical and Environmental Engineering, Thermal Engineering and Architecture, responsible for teaching in the degree of Technical Architecture. In this context, new teaching approaches for ESD have been developed and will be presented in the conference: a Problem-Based Learning (PBL), TFG in urban planning with LCA and TFG on the recovery of cement-based waste.

a) b) c)

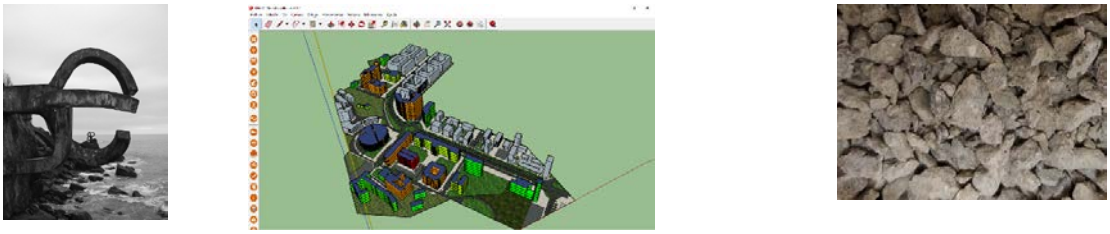

Figure 1*: a) Images of metal piece, Peine del Viento, ABP. b) Screenshots of campus, LCA. c)* Image of recycled aggregate in the laboratory.

References

[1] UNESCO (2018). Education for sustainable development (ESD) beyond 2019. 204 EX/28, Paris.

[2] S. Sterling, “Chapter 5 - Higher education, sustainability, and the role of systematic learning” in *Higher Education and the Challenge of Sustainability: Problematics, Promise and practice* (Peter Blaze Corcoran & Arjen E.J. Wals Eds.), 49-70, Netherlands, 2004.

[3] A. Leicht, J. Heiss, and W. J. Byun in *Issues and trends in Education for sustainable Development.* Published by the United Nations Educational, Scientific and Cultural Organization, Paris, 2018.

[4] R. Lozano, M. Y. Merrill, K. Sammalisto, K. Ceulemans, and F. J. Lozano, “Connecting Competences and Pedagogical Approaches for Sustainable Development in Higher Education: A Literature Review and Framework Proposal,” *Sustainability,* 9*,* 1889-1904, 2017.

[5] W. Lambrechts, I. Mulá, K. Ceulemans, I. Molderez, and V. Gaeremynnck, “The integration of competences for sustainable development in higher education: an analysis of bachelor programs in management,” *Journal of Cleaner Production,* 48*,* 65-73, 2013.

[6] D. Cotton and J. Winter, “It´s not just bits of paper and light bulbs: A review of sustainability pedagogies and their potential for use in higher education” in *Sustainability Education: Perspectives and Practice across Higher Education* (Jones, P., Selby, D., Sterling, S., Eds.), Earthscan: London, UK; New York, NY, USA, 2010.

[7] M. Murga-Menoyo, “Learning for Sustainable Economy: Teaching of Green Competencies in the University,” *Sustainability* 6, 2974-2992, 2014.

[8] J. Segalàs, D. Ferrer-Balas, and K. F. Mulder, “What do engineering students learn in sustainability courses? The effect of the pedagogical approach,” *Journal of Cleaner Production,* 18*, 27*5-284, 2010.

INNOVACIÓN EN LA FORMACIÓN DE ESTUDIANTES DE EDIFICACIÓN A PARTIR DEL ANÁLISIS DE ARTÍCULOS CIENTÍFICOS

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Palabras clave: *monografía, revistas científicas, investigación, formación complementaria*

Abstract

La actividad formativa desarrollada con carácter innovador, tiene como finalidad procurar una formación complementaria de los estudiantes del grado de Edificación mediante la familiarización con la literatura propia de las revistas científicas. El desarrollo de trabajos monográficos es un complemento utilizado habitualmente por los docentes con el objeto de que los estudiantes profundicen en algunos temas concretos, utilizando fuentes variadas que les permitan abordar la temática con un panorama de conocimiento más amplio del que, comúnmente, se utiliza en las clases de aula [1].

El uso incorrecto de la información accesible a través de internet hace que estos trabajos resulten, en muchos casos, una actividad carente de sentido, limitándose a una búsqueda acrítica de información, con escasa capacidad de análisis y de aportación reflexiva por parte del alumnado. Ello, además, implica que la evaluación se convierta para el profesorado en la lectura de textos, copiados en muchos casos, que no permiten estimar en qué medida la tarea ha contribuido a la formación del estudiante [2].

Desde la asignatura de Materiales II de la ETSIE de la Universidad de Sevilla se ha promovido la realización de monografías sustentadas en el análisis de artículos publicados en revistas científicas. Este modelo permite evitar algunos de los problemas antes señalados, al tiempo que contribuye a que los alumnos se familiaricen con unos textos que tienen una estructura y lenguaje completamente distintos a los que suelen utilizar. Asimismo, pretende que el acercamiento al tema objeto del trabajo se haga desde una óptica novedosa, innovadora, atractiva y mucho más variada que aquella a la que los estudiantes se encuentran habituados.

El planteamiento general de los trabajos parte de una propuesta amplia de temas que quedan a la libre elección del alumno. Los temas propuestos versan sobre asuntos concretos concernientes a la asignatura, evitándose en todo momento cuestiones generalistas. Cada tema o bloque de temas va acompañado de un listado de revistas y de palabras clave, que sirvan al alumno para la búsqueda de materia relacionada con la materia elegida.

En primer lugar, se debe desarrollar una introducción básica al problema; en segundo lugar, se hace una selección de un número coherente de artículos o comunicaciones, que el alumno debe analizar valorando las aportaciones fundamentales que cada

autor/autores realiza sobre el asunto en cuestión; finaliza con un apartado de conclusiones que resuma todos los resultados del análisis. Excepcionalmente, se propone que la información elaborada se acompañe de casos reales que los alumnos puedan observar en su entorno cotidiano (nuevos productos, patologías y daños, sistemas de ejecución,…), de modo que se trate de conseguir un visión lo más pragmática posible del trabajo realizado.

Podemos concluir que este modelo de trabajo monográfico, ha permitido promover una motivación extra en aquellos alumnos con verdadero interés por el aprendizaje complementario, más allá de la materia básica de un programa. También genera un atractivo importante el enfrentarse a un tipo de fuente de información desconocida, en la mayoría de los casos, como son los artículos científicos.

References

[1] V.B. Álvarez Rojo, E. García Jiménez, V. Flores-Alés, J. Correa Manfredi, Aproximación a la cultura de un centro universitario. Rev. de Educación, 346 (2008) 139-166.

[2] S. A. Alvarado Vargas, La educación superior y sus recursos en la valoración educacional formativa. Rev. Tecn. Ciencia y Educación Edwards Deming, 2 (2018) 68-84.

TIPS FOR TEACHING ONLINE AS COVID-19 TOOK HOLD

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Keywords: *Teaching online; COVID-19; Educational Innovation at the University; Educational Innovation in Technical Education; New Challenges for Higher Education; New Trends in Education; Research in Education: Educational Innovation Teaching innovation.*

Abstract

Spanish Cabinet declared on Saturday 14th of March 2020, state of alarm in Span to slow coronavirus COVID-19 spread [1]. Accordingly, universities were closing, forcing teachers, lecturers, professors, and scholars to turn to remote teaching.

At the end of March, we had about one week to draw up a plan for teaching online. For both of us, who had never taught an online class, the transition required time and patience. We had to learn the technology, i. e. Microsoft Teams, which is a collaborative workspace within Microsoft 365 & Office 365. This is a suite of tools for video chats, document sharing, workplace conversations, collaborative teamwork, and so on. Furthermore, we had to identify the best teaching tactics for our chemistry and construction materials classes of more than 70 students each. We were grappling with the implementation of the first step of the reform process in a short period of time.

With technological help from Information technology (IT) department, we drew up an approach for teaching remotely from home. Every day, using Microsoft Teams, we gave lecture with new explanations and exercises.

There is an essential tip: seek continuous feedback from students. Students need questions to know what they have learnt. In addition, we asked for feedback to improve the class and to make sure they understood the knowledge base. We should have into account that the biggest risk is that we could become a talking instrument teaching concepts that students are not following. In this case, students give up.

Conclusion

We are pleased to have met the Information technology (IT) challenges of teaching remotely. Information technology (IT) could be defined as the use of computers to transmit, store, and retrieve data or information among other uses. This new approach took a lot of time, at least twice as much work as a traditional lecture. Firstly, we had to

be familiar with the IT tools and Microsoft Teams. Then, we spent many hours preparing the online teaching content. Finally, we performed live sessions to teach them.

References

[1] Real Decreto 463/2020, de 14 de marzo, por el que se declara el estado de alarma para la gestión de la situación de crisis sanitaria ocasionada por el COVID-19. «BOE» núm. 67, de 14 de marzo de 2020, páginas 25390 a 25400 (11 págs.). Sección: I. Disposiciones generales. Departamento: Ministerio de la Presidencia, Relaciones con las Cortes y Memoria Democrática. Referencia: BOE-A-2020-3692. https://www.boe.es/eli/es/rd/2020/03/14/463

ENERGY SAVINGS AND EFFICIENCY AT SECONDARY SCHOOL BUILDINGS. (ElhZA+ENEDI PROYECT)

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Keywords: *university and secondary school student agents; energy efficiency in buildings; STEM education; girls in technical education.*

Abstract

This work describes the project submitted to the University-Society-Business 2021 call for proposals whose aim is to integrate the knowledge and university practices in the field of energy in buildings into secondary school students. The aim is to define the energy strategies to be implemented to strengthen the relationship between secondary education and university studies, by means of a "pilot project" at a secondary school, as well as to promote Science, Technology, Engineering and Maths (STEM) scientific vocations in young people, with particular emphasis on the female gender. The project will carry out an energetic study at a school developed by university research staff and secondary school students. The aim is to motivate and confirm the qualities of people in STEM teaching, in order to arouse interest and closeness as well as to promote education in the subject of energy efficiency in buildings.

References

[1] IDAE, Instituto para la Diversificación y Ahorro de la Energía. Gobierno de Epaña. Guía Práctica de la Energía. Consumo eficiente y responsable:

[2] Basque Government. Department of Education, Language Policy and Culture. Basic Education Curriculum. Guidance curriculum that completes Annex II of the Decree on Basic Education. 236/2015 (in Spanish)

[3] Government of Spain. Ministry of Science, Innovation and Universities. SCIENTIFIC WOMEN IN FIGURES 2017. Statistics and indicators of gender (in)equality in scientific training and profession.(in Spanish)

[4] ElHuyar STEM education and STEM careers, a source of inspiration for young people, Elhuyar 2020.. STEAM Hezkuntza eta STEM profesioak, gazteak inspiratzeko (in Basque)

[5] https://www.euskadi.eus/gobierno-vasco/laboratorio-control-calidad-vivienda/

[6] Martín-Garín, A., Millán-García, J. A., Hidalgo-Betanzos, J. M., Hernández-Minguillón, R. J., & Baïri, A. (2020). Airtightness Analysis of the Built Heritage–Field Measurements of Nineteenth Century Buildings through Blower Door Tests. *Energies*, *13*(24), 6727.

APLICACIÓN DE LA TÉCNICA PUZLE COMO ESTRATEGIA DE APRENDIZAJE COOPERATIVO EN INGENIERÍA SÍSMICA

APPLICATION OF THE PUZZLE TECHNIQUE AS A COOPERATIVE LEARNING STRATEGY IN EARTHQUAKE ENGINEERING

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Keywords: *Método puzle, aprendizaje cooperativo, ingeniería, habilidades sociales, innovación docente.*

Jigsaw method, cooperative learning, engineering, social skills, educational innovation.

Abstract

La técnica de puzle es un método de aprendizaje cooperativo ampliamente implementado en ámbitos académicos y que ha demostrado su eficacia en la adquisición de competencias fundamentales y transversales en la formación. La organización en grupos pequeños favorece la interacción entre alumnos y la división del trabajo en tareas separadas, fomentando la interdependencia positiva, características fundamentales en el aprendizaje cooperativo. En este trabajo se presenta la aplicación de la técnica puzle a un bloque de la asignatura "Seminarios" del Máster en Ingeniería Sísmica de la Escuela Técnica Superior de Ingenieros Industriales de la Universidad Politécnica de Madrid. Tras su aplicación se observa que el alumno adquiere de forma muy satisfactoria los contenidos de la materia, así como una mejora sustancial en la formación en competencias transversales y en el desarrollo de las habilidades sociales. Los resultados positivos de esta experiencia ponen de manifiesto la necesidad de fomentar la implantación de metodologías docentes innovadoras en las enseñanzas técnicas universitarias.

Cooperative jigsaw method is widely spread in academic environments and it has demonstrated its efficiency on the acquisition of professional and transversal competences. The organization in small groups improves the interaction between students and the work partitioning in independent tasks, promoting the positive interdependence which is crucial for cooperative learning. The present study applies the jigsaw method to the "Seminars" course from MScs in Earthquake Engineering at Universidad Politécnica de Madrid. As a result of the application of this method, it is observed that the students learn the content of the subject, and improve substantially the transversal competences and social skills. This study supports the need of implementing innovative educational methods in the technical studies.

DIGITIZATION OF TEACHING IN THE BUILDING SECTOR. VIRTUAL LABORATORY OF THERMAL INSTALLATIONS.

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Keywords: *Digitalization, VLE, Virtual Learning Environment, Virtual laboratory 4.0*

Abstract

The practical training of graduate and postgraduate students in the AEC areas, is of major concern in Higher Education. Among the different teaching modalities, laboratory practice is of paramount importance in subjects with a high technological base, such as courses of Thermal Installations, Architectural Services etc.

The emergence of Covid19 in the teaching scene has imposed great limitations on face-to-face teaching, especially in laboratories where students have to share small working spaces. Even home confinement makes it impossible to access the available equipment.

Both in this exceptional situation and for its eventual dilation over time, or in future cyclical repetitions, computer-assisted practical teaching is presented as an alternative or complement to take into account in off-site teaching.

Specific teaching material for laboratory practices has been developed in this project to support virtual platforms in order to motivate students, improve teaching activity and enhance practical work both online and offline.

This project seeks to improve activities in practical teaching by means of the design and use of specialized software, with which students can interact and research using dynamic models that represent the topic of study.

The main objective is to apply digitization to the improvement of the educational process. It's about boosting interest through practical aspects that will be useful in the

development of the profession. In order to reach these objectives, the following activities have been carried out:

a) An interactive and practical digital workspace has been created and built (Fig. 1 and 2).

b) The quality characteristics of the developed work environment have been analyzed and evaluated.

c) The enhancement actions have been proposed.

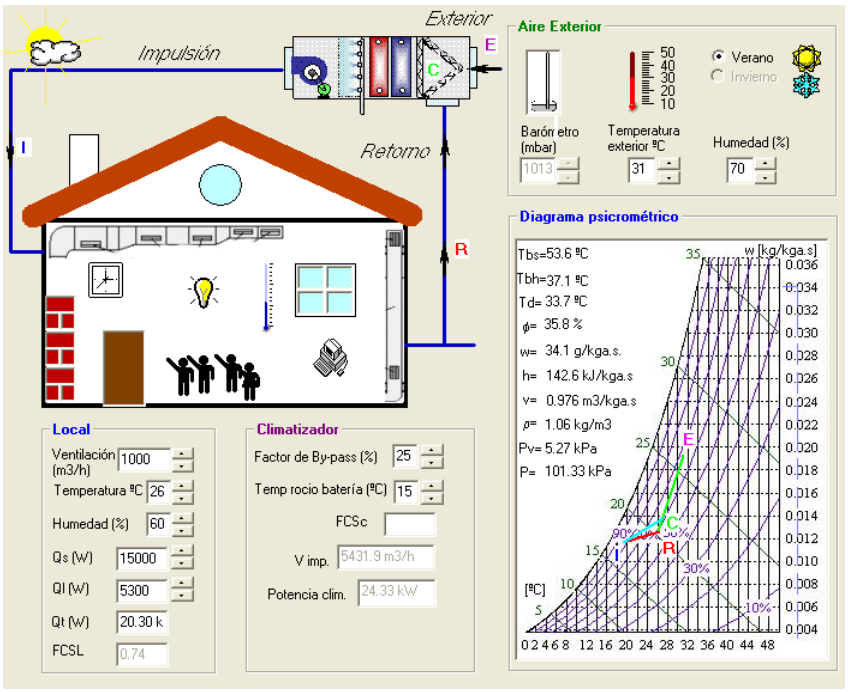

***Figure 1**: Digital work environment. Air conditioning of buildings. (Own elaboration)*

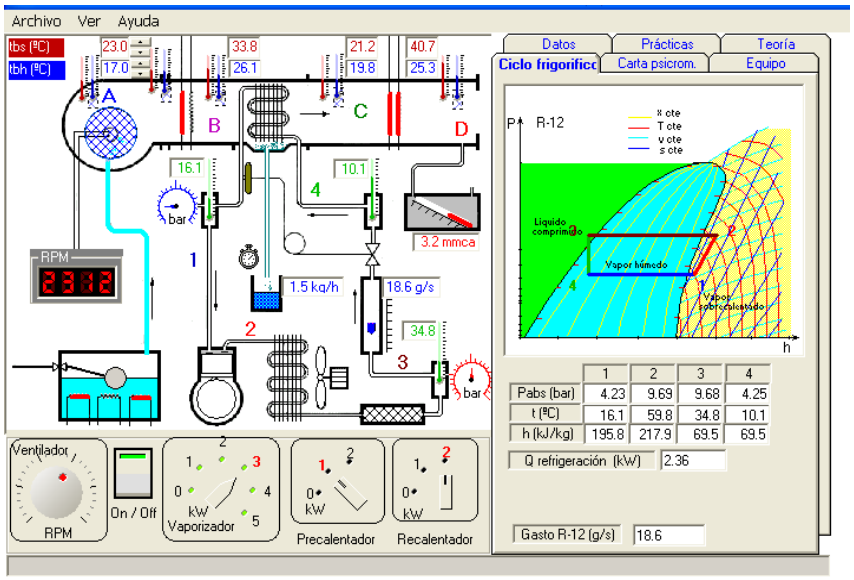

***Figure 2**: Control panel. Air conditioning installation. (Own elaboration)*

The results achieved fall within the objectives set and have been found to be successfully applicable to other Areas of Knowledge, Centres and Schools. In addition, the digital tool developed is also useful in conventional teaching. It is noted how the digitalization of content stimulates students' interest in the topics of study and facilitates the evaluation process.

This work was supported by the Department of Economic Development and Infrastructures of the Basque Government (Spain) through the TDCON4.0 project "Tecnologías y soluciones para la digitalización del sector de la construcción 4.0" ELKARTEK KK-2019/00075.

References

[1] Selwyn, N. Profesores y tecnología. Repensar la digitalización de la labor docente. Boletín de la Institución Libre de Enseñanza, 2016, 104, 27-36.

[2] Montoya, NE, González Palacio, EV. Competencias TIC en docentes de nivel técnico y tecnológico. Un estudio de caso en un centro de formación del SENA. Revista Virtual Universidad Católica del Norte, 2019, (58), 74-95. DOI: https://doi.org/10.35575/rvucn.n58a3

[3] García-Peñalvo, F, Corell, A, Abella-García, V. Grande, M. La evaluación online en la educación superior en tiempos de la COVID – 19. Education in the knowledge society (EKS), 2020, 21(4), 1-26. DOI: https://doi.org/10.14201/eks.23013

[4] Ottenbreit, A, Liao, J, Sadik, O, Ertmer, P. Evolution of Teachers' Technology Integration Knowledge, Beliefs, and Practices: How Can We Support Beginning Teachers Use of Technology? Journal of Research on Technology in Education, 2018, 50(4), 1-23. DOI: https://doi.org/10.1080/15391523.2018.1487350

[5] Gross Salvat, B. La evolución del e-learning: del Aula Virtual a la red. Rev Iberoamericana de Educación a Distancia, 2018, 21(2), 69-82. DOI: http://dx.doi.org/10.5944/ried.21.2.20577

[6] Alcántara, A. Educación superior y COVID – 19: Una perspectiva comparada. En: Girón, J, Educación y pandemia: Una visión académica. México: Instituto de Investigaciones sobre la Universidad y la Educación (IISUE); 2020. 75 – 82.

[7] García-Peñalvo, F. El sistema universitario ante la COVID – 19: corto, medio y largo plazo. Universidadsi [Entrada en blog] 2020 [acceso el 25 de junio de 2020]. Disponible en: https://www.universidadsi.es/sistema-universitario-covid-19/

[8] García-Peñalvo, FJ. Modelo de referencia para la enseñanza no presencial en universidades presenciales. Campus Virtuales, 2020, 9(1), 41-56. En http://uajournals.com/ojs/index.php/campusvirtuales/article/view/625

[9] Hodges, C, Moore, S, Lockee. B, Torrey, T, Bond, A. The difference between emergency remote teaching and online learning. Educase review [Blog] 2020 [acceso el 25 de junio de

2020]. Disponible en: https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning.1.

PROCESO DE APRENDIZAJE DE PROPAGACIÓN DE VIBRACIONES EN LA EDIFICACIÓN PARA ESTUDIANTES DE GRADO

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Keywords: *Vibraciones; Edificación; Grado*

Resumen

En este trabajo presentamos las diversas vías de investigación que los estudiantes de Grado en Edificación pueden continuar al terminar sus estudios de graduado. Para ello tratamos, entre otros, temas tan diversos como: estudios teóricos sobre la frecuencia de resonancia del mortero y el hormigón [1], formas de propagación de las vibraciones en la edificación y su relación con la normativa actual e incluso sistemas de medida y detección de vibraciones.

También se introduce a los alumnos en los diferentes métodos y materiales utilizados en el campo de la edificación para reducir dichas vibraciones hasta los límites fijados por la norma en vigor. Para ello se les propone diferentes detalles constructivos en los cuales nuestros estudiantes deben de ser capaces de elegir la solución constructiva que más se ajuste al problema planteado.

Nuestro programa educativo (proceso de enseñanza) no se limita al estudio teórico, sino que también se introduce al alumno en el manejo de los diferentes aparatos y sistemas de caracterización de los parámetros acústicos que intervienen en la transmisión de vibraciones [2]. Para esto los alumnos deben realizar un modelo informático que describa el experimento a realizar, que posteriormente llevarán a cabo en el laboratorio mediante la realización de una serie de probetas con diferentes dosificaciones de cemento, arena, grava y agua especificadas por el profesor. El objetivo de este método de enseñanza es que el alumno sea capaz de diseñar sus propios experimentos para medir la velocidad de propagación de las vibraciones, para posteriormente compararlo con el modelo realizado.

References

[1] España, Código Técnico de la Edificación. Boletín Oficial del Estado, 28 de Marzo de 2006 y siguientes.

[2] Alsina, C. Burgués, C. Fortuny, J. M. Giménez, J. Torra, M. Enseñar Matemáticas. Editorial GRAO. 6ª Edición, Octubre de 2008.

CÓMO MEJORAR LA ENSEÑANZA DE LAS MATEMÁTICAS A TRAVÉS DEL DIBUJO TÉCNICO

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Keywords: *Matemáticas, Geometría, Educación Plástica y Visual, Interdisciplinariedad, Curriculum.*

Abstract

Algunos autores indican que en los cursos de secundaria, hacer matemáticas significa soltarse con los conceptos y técnicas de cálculo aritmético y manejar con claridad las propiedades de las figuras planas y espaciales [1]. De esta forma, si se transmite a los alumnos la capacidad de observar y calcular con soltura serán capaces de reconocer los razonamientos válidamente construidos, es decir, aquellos que siguen una secuencia lógica de pasos y que indican que la persona que los efectúa ha consolidado los conocimientos que se manejan.

Si bien es cierto, que a edades tempranas existe un afán por los alumnos para interesarse por el mundo que los rodea, es labor del docente despertar ese interés y ser capaz de mantener esa plasticidad de la educación que la permite adaptarse a cada modelo de estudiante. De esta forma, se trata de generar necesidades, y apoyándonos en el origen histórico del álgebra seremos capaces de hacerles redescubrir a través de la geometría muchos conceptos que generalmente se automatizan sin que haya habido un procesamiento previo de la actividad. Es muy importante en esta etapa equivocarse y saberse corregir, además de relacionar las matemáticas con todo lo que nos rodea.

Así pues, existen puntos de vista (Como en la Educación Matemática Realista), que defienden que la mejor forma de aprender matemáticas es haciéndolas. Para ello, proponen un modelo docente en el cual, el profesor sirva como guía y los alumnos deban ir reinventando las matemáticas, entendiendo tal reinvención, como un proceso de asimilación en el cual se van descubriendo las diferentes herramientas que los matemáticos hubieron de emplear para solventar ese problema. Como se trata de ponerse en el lugar de los matemáticos, se deben de contextualizar las situaciones, ofreciendo modelos lo más reales posibles. Aun así, existen diferentes niveles de contextualización que dependerán de las capacidades del alumno y del curso de aplicación del problema. En las propuestas ofrecidas en este trabajo, veremos un ejemplo de adaptación para un curso de 3º de la E.S.O.

Lo que se pretende entonces, es dar una idea de cómo realizar un proyecto interdisciplinar entre asignaturas del mismo curso. Más concretamente proponiendo algunos ejemplos de cómo relacionar las matemáticas y el dibujo técnico que actualmente se trabajan de forma independiente en el aula, como vía para mejorar la visión global que el alumno tiene de la geometría.

Referencias

[1] I. Fernández & J.M. Pacheco, "Enseñar matemáticas es hacer democracia", Boletín Sociedad Española de Matemáticas, nº 21 (2002) 117 – 118.

WHAT DO THE STUDENTS PREFER? CHALLENGE-BASED LEARNING OR TRADITIONAL TEACHING?

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Keywords: *Challenge-based teaching; Traditional teaching; University teaching; Open surveys; Educational methodologies.*

Abstract

The objective of university education is for students to acquire the knowledge of their area and the ability to cope with what Barnett calls supercomplexity [1], which consists of knowing how to cope with the uncertainty caused by a world that is changing every day in a accelerated way [2]. The problem that university teachers face is to decide whether it makes sense, in the current context, to continue teaching as it has been done traditionally or if, on the contrary, we must delve into what Marina calls "The pedagogical forest" where the proposals pile up, overlap, flourish and wither away [3], in a quest for innovation for innovation's, sake as an ongoing race to nowhere. What for some is a sign of vitality, for others is a sign of confusion.

The present research aims to find out how students perceive traditional teaching compared to a more participatory teaching such as challenge-based teaching. Traditional teaching is based on an educational model in which the teacher transmits knowledge, explains concepts and answers questions [4]. Challenge-based teaching does not focus exclusively on the transmission of knowledge and explores other paths with greater participation and dynamism [5].

To do this, an open survey is carried out to the students of two successive courses of the subject "Facilities Project" that is taught in the 5th year of the Degree in Fundamentals of Architecture, which is developed with the challenge-based learning methodology, and the subject that they have previously taken "Technical Facilities and Services" which is taught in the 4th year of the same grade and which is developed with a more traditional methodology. 29% of the students respond to the survey.

In this survey, students are asked to assess the relationship between both subjects and to make a proposal for improvement.

31% think that both subjects have a good relationship while 21% consider that this relationship is bad. 27% state that the 5th year subject is better than the 4th year, while

1% believe the opposite. 20% of the students have obtained the validation of the 4th year subject having studied it in another country.

Regarding the improvements indicated by the students, 38% of them are aimed at improving the relationship between both subjects, while 64% propose improvements in the 4th year subject. The 5th grade subject does not receive any proposal for improvement.

It is concluded that the 5th year course in the facilities area developed with a challenge-based learning methodology receives a better evaluation than the 4th year course in the same area developed with a traditional methodology. It is detected that this methodology offers great potential for the renewal of the teaching-learning process. The research carried out highlights the need to recognize the limitations of the traditional methodology based on lectures and the poor adaptation to the training of students that today's society requires.

References

[1] Barnett, R. (2007). Will to learn: Being a student in an age of uncertainty. London, UK: McGraw-Hill Education.

[2] McCune, V., & Entwistle, N. (2011). Cultivating the disposition to understand in 21st century university education. Learning and Individual Differences, 21(3), 303-310.

[3] Marina, J. A. (2017). El bosque pedagógico. Barcelona: Ariel.

[4] Prosser, M. (2010). Faculty research and teaching approaches: Exploring the relationship. In Christensen Hughes, J & Mighty, J (eds.) Taking stock: Research on teaching and learning in higher education, Montreal & Kingston, Ontario, Canada: McGill-Queen's University Press.

[5] Knight, P. T. (2005). El profesorado de educación superior. Formación para la excelencia. Madrid: Narcea.

INNOVATION AND SUSTAINABILITY IN THE CLASSROOM [1]

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Keywords: *education, innovation, sustainability, classroom and law*

Abstract

A 21st-century education is increasingly demanding compared to previous models. The advent of a health crisis, such as Covid-19, has led teachers to reinvent traditional lectures and move towards new virtual formats. In the face of the impending global technological revolution -underpinned by what is already known as the Fourth Industrial Revolution [2]- it is more pertinent to speak of networks. Especially mention if we refer to an essential aspect of the human condition, the right to education [3].

This digital transformation process, which is also: economic, social, and cultural, lead to a considerable increase in our use of electronic media in the classroom. A clear example is we spent around 80% of our time in front of a screen [4]. It is a seemingly simple process. Proof of this is that one in three Internet users is a minor. The trend allows us to guess how more and more people are accessing: digital content, social networks, online games, and applications of all kinds. Activities convergence in teaching strategies, such as gamification, flipped classroom, blogging, BookTubers, etc.

This communication proposal offers the opportunity to learn about and discuss how the digital experience is becoming increasingly evident in an education system that is becoming volatile and changing [5]. The actors in this internet scenario are the key, as its use will depend on them: responsible, critical, respectful, and creative. The classroom demand that this progress be inclusive and sustainable. These elements constitute the pillars on which the European Commission's new public policies [6]. On a positive note, we must not forget that the best way to improve the environment is to involve all citizens, and education provides an excellent opportunity to achieve this.

References

[1] This paper has been made in the framework of the research Project “Sensibilización del alumnado y fomento de la proyección social de la sostenibilidad desde el empleo de herramienta innovadoras de internacionalización curricular: Consolidando el Grupos RISPINES de Innovación Docente”, (ref. RISPINES-LAB PIE 19-153). Main researcher: M.L. Gómez Jiménez. Universidad de Málaga; research Project “Juega y aprende: La ludoteca jurídica” (ref. UV-SFPIE_PID-1355995). Main researcher: P. Chaparro Matamoros. Universitat de València; and research Project: “Implementación del blog jurídico on-line en

el proceso de enseñanza-aprendizaje digital" (ref. UV-SFPIE_PID-1354279). Main researcher: J.C. Pedrosa López. Universitat de València.

[2] K. Schwab, The Fourth Industrial Revolution, World Economic Forum, Geneva, 2016. See https://law.unimelb.edu.au/__data/assets/pdf_file/0005/3385454/Schwab-The_Fourth_Industrial_Revolution_Klaus_S.pdf. Last visited March 9, 2021.

[3] United Nations, 4. Quality education, Sustainable Development Goals. See *https://www.un.org/sustainabledevelopment/education/*. Last visited March 8, 2021.

[4] Hootsuite and We Are Social, Digital 2021. See *https://wearesocial.com/digital-2021*. Last visited March 9, 2021.

[5] P. Rivas, Aprender a desaprender. Transformando la educación superior, LID Editorial, Madrid, 2020.

[6] European Commission, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee of the Regions, The European Green Deal, Brussels, 11.12.2019. COM (2019) 640.

EL DEBATE UNIVERISTARIO COMO HERRAMIENTA DOCENTE

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Keywords: *debate Universitario, retórica, argumentación, competencias, herramienta docente.*

Abstract

Cada vez está más implantado en nuestra Universidad el Debate Universitario, de tal manera que muchas de ellas están trabajando en la creación de un "Aula de Debate" como servicio dentro de la carta de actividades no regladas que nuestros estudiantes pueden realizar.

En esta comunicación queremos plasmar la experiencia tan innovadora que estamos desarrollando este curso llevándonos el debate a nuestras clases como herramienta de aprendizaje y adquisición de competencias. Lo innovador de la propuesta es crear un "debate docente", "inventarnos" un formato de debate donde nuestro estudiantado, de cualquier área de conocimiento, se le ofrece el aprendizaje no forzado, de manera natural. Benjamin Franklin dijo una vez "dime y lo olvido, enséñame y lo recuerdo, involúcrame y lo aprendo". Si queremos que nuestros estudiantes aprendan pensamiento crítico no basta con contarles qué es, hace falta encontrar una actividad como el debate en la que puedan ponerlo en práctica. Es una metodología activa donde también se ilusiona el docente además de poder evaluar contenidos a cada uno de los componentes. Vamos a adquirir competencias debatiendo, nuestro estudiantado deberá desarrollar todo tipo de argumentos para convencer a un jurado imparcial (estudiantes y profesor/a).

La transversalidad del proyecto es absoluta ya que se puede debatir sobre cualquier tema, señalando que lo mínimo evaluable es el contenido, la investigación que ha habido anterior al mismo. El objetivo del debate no es alcanzar la verdad absoluta. Por eso, cada grupo ha de preparar las dos posturas y se sortea la que se ha de defender.

En cuanto al pensamiento crítico, podemos decir que se entiende como el proceso mediante el cual se usa el conocimiento y la inteligencia para llegar de forma efectiva a la postura más razonable y justificada sobre un tema, sin dar por válidos razonamientos que no lo son. Eso es un debate.

Esto permite la realización, por parte de los grupos participantes, de un intenso trabajo de investigación, documentación e integración sobre un tema.

Esto estimula el trabajo en equipo, la revisión bibliográfica crítica, el análisis y la capacidad de resumen, la persuasión etc. Se fomenta el conocimiento y la posibilidad de aprender divirtiéndote bajo un formato competitivo.

En la mayoría de las ocasiones el docente establece un mismo formato para exponer trabajos o para explicar un tema. Los compañeros de aula tienden a "desconectar" cuando sus compañeros exponen. Creemos firmemente que hay que introducir fórmulas novedosas que animen a las partes intervinientes de una clase, que ilusionen, que con este tipo de metodología activa se impliquen todas las partes, los intervinientes quieren ganar, el público se involucra y el docente puede evaluar de una manera muy objetiva al apreciar la preparación y conocimiento del tema expuesto. Todo ello se realiza adquiriendo competencias que no se adquieren de otra manera. La formación en retórica y en argumentación son las dos grandes olvidadas de nuestra educación formal.

References

[1] J. Bowker. R. D'Cruz, T. Sonnereich, A. Moorghen. UoB Debating. Guide to University Debating. 2013.

[2] J. Albornoz Barrientos. Debate y Argumentación para el desarrollo de pensamiento crítico. Santiago de Chile. 2017.

[3] J. Albornoz Barrientos, J. Hermosillo Lozano. Manual básico del debatiente. Mar Adentro de México, A.C. Jalisco, México, 2013.

[4] N. Palma Peredo, J. Albornoz Barrientos. Talleres de Formación para docentes. Liga colombiana de debate. INCIDE. 2015

INTEGRAL VIRTUALIZATION OF GRAPHIC EXPRESSION SUBJETS IN ENGINEERING

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Keywords: *Virtualization, Moodle, On-line questionnaires, Interactive video tutorials.*

Abstract

The inclusion of Information and Communication Technologies in the academic and teaching fields, has led to a revolution to which we cannot remain oblivious as teachers [1-2]. The new educational paradigm requires the development of innovative teachings that allow rapid and effective adaptation to social, labor and economic situations, in such a way that various existing barriers are eliminated [3].

The main objective of this work has been the virtualization of different subjects in the area of Graphic Expression of the School of Industrial Engineering, among which are: Industrial and Commercial Installations II, Computer Applications for Engineering and Graphic Engineering. The first two are taught in all the Engineering Degrees of the Industrial Branch and the second one, in the Mechanical Engineering Degree and as an optional subject in the Electronic and Automatic Engineering Degree.

For the virtualization of the teaching material, the following have been used [4-6]:

- Interactive video tutorials. Including problem solving and case studies.

- Online questionnaires. That allow the teacher to know the student degree of learning.

- Evaluation rubrics and satisfaction questionnaires, to observe and analyze the impact that this methodology generates on student learning.

- Video tutorships. Both individual and group.

- Evaluation tests. Design of the task deliverables throughout the course and the exam at the end.

The tools used to support the designed material have been: "OBS Studio", for making video tutorials; "Zoom", to carry out the video tutorships; "Moodle", for the preparation of questionnaires, evaluation rubrics and evaluation processes, for both individual and group tasks, and the UEx Virtual Campus for the association of video tutorials and other teaching material, for the automatic assignment of tasks, forums, peer evaluation [6], etc.

The subjects Industrial and Commercial Installations II, Computer Applications for Engineering and Graphic Engineering have been ideal to apply this set of tools, due to their high degree of dynamism. The application of the teaching methodologies described, as well as the virtualization of the contents, aimed to complement and improve the learning by the students, in addition they have enabled active and dynamic learning, which has received a very good evaluation and acceptance by the students.

References

[1] E. Gómez, Calculation of the student's work volume in the new degree degrees in health sciences in Global evaluation of learning outcomes in degrees within the European Higher Education Area. Madrid Dykinson, 2011.

[2] A. Prieto, Inductive methodologies: The challenge of teaching through questioning and challenges. Barcelona: Digital Text Ed. Ocean, 2015.

[3] L. Villalustre Martínez, and M. Del Moral Pérez, “Didactic-methodological innovations in the virtual ruralnet context and satisfaction of university students”, Ibero-American Journal on Quality, Efficiency and Change in Education, Volume 8 , Number 5, 2010.

[4] A. Muñoz, et al. On adapting LMS for recommendation and personalization based on context-aware technologies. 6th International Conference on Education and New Learning Technologies, Barcelona, Spain, 2010.

[5] S. Riascos-Erazo, D. Quintero-Calvache, and G. Ávila-Fajardo. ICT in the classroom: perceptions of university professors. Education and Educators, 2009, vol. 12, no. 3.

[6] J.P. Carrasco-Amador, et al. Application of reverse learning, self-assessment and co-assessment in Graphic Engineering. 27th University Congress of Educational Innovation in Technical Teaching. Alcoy, Spain, 2019.

MOTIVATIONAL EVALUATION OF ENGINEERING STUDENTS IN TWO CENTERS OF THE UNIVERSITY OF EXTREMADURA

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Keywords: *Motivation, Industrial Engineering, Teaching, MAPE-II.*

Abstract

The student's motivational orientation is an indispensable factor for adequate learning during their formative years. The knowledge of motivational orientations allows teachers to enhance the performance of their students. The objective of this work is to compare the motivation of students from two Industrial Engineering centers of the University of Extremadura (Spain). To evaluate these factors, the MAPE-II tool was implemented. The methodology assesses student motivation by focusing on three motivational orientations: learn, results and fear of failure motivation. In addition, the tool allows to know and quantify the motivational orientations of the students through a questionnaire. The Cronbach's Alpha test was used to analyze the internal consistency of the student's responses. Center 1 presents a higher value in the learning motivation dimension, comparing the results of the dimensions obtained in the two centers analyzed. Center 2 obtained a large increase in the mean value of the second dimension related to motivation for results. Finally, it should be noted that the fear of failure dimension shows much higher values in center 2. The analysis of the student's motivational orientation makes it possible to determine negative aspects of learning and to be able to establish the necessary intervention measures to maximize their performance.

References

[1] G.F. Kuder, M.W. Richardson, The theory of the estimation of test reliability. Psychometrika 2 (1937) 151–160.

[2] M. Corrales-Serrano, Estudio de las motivaciones internas y externas para la elección de modalidad del alumnado de Bachillerato. Incidencia en la didáctica de las Ciencias Sociales, University of Extremadura, 2020.

[3] I. Montero, J. Alonso Tapia, El cuestionario MAPE-II. In Motivar en la adolescencia: Teoría, evaluación e intervención; Servicio de Publicaciones de la Universidad Autónoma de Madrid: Madrid, España, 1992.

[4] A. G. González, D. R. Salgado, J. G. Sanz-Calcedo, C. C. García, J. B. Muriel, O. L. Pérez, F. J. A. García, A teaching methodology for the real-time assessment of students' competencies related to manufacturing subjects using technology based on electronic devices. Procedia Manuf. 41 (2019) 579–586

[5] B. Lazzarini, A. Pérez-Foguet, Profiling research of the engineering academics who successfully promote education in Sustainable Human Development. J. Clean. Prod. 172 (2018) 4239–4253.

[6] K. A. Robinson, Y. Lee, E. A. Bovee, T. Perez, S. P. Walton, D. Briedis, L. Linnenbrink-Garcia, Motivation in transition: Development and roles of expectancy, task values, and costs in early college engineering. J. Educ. Psychol. (2019) 1081–1102.

INCORPORATING SCRUM FRAMEWORK TO PROJECT-BASED LEARNING APPROACH TO IMPROVE TRANSVERSAL COMPETENCIES

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Keywords: *Scrum; Project-Based Learning; Teaching Innovation; Industrial Engineering.*

Abstract

Labour market demands professionals capable of putting into practice a series of transversal competencies beyond the technical knowledge acquired during their academic training. A change opportunity about university lesson dynamics is observed in order to promote a continuous learning process to assimilate these competencies [1].

Having this in mind, a pilot experience was designed to synergistically apply Project-Based Learning (PBL) [2] and Scrum methodology [3] in an Engineering Project subject within Industrial Engineering School from University of Extremadura. Several students forming a team were tasked with a collaborative real-based project to foster interplaying among them. In learning environments, several skills such as diagnose ability, problem solving, time management, teamwork, active learning, among others, were applied, to ensure their employability [4].

An industrial construction project was commissioned to teams of four students at the beginning of the course after explaining the basics of Scrum and the work procedure to be followed. A work programme structured in three sprints of three weeks each was designed. The teams were asked to have periodic meetings to know internally the progress ("daily" meeting). What I did until today, what are the next features I will implement, and what problems I am having are the questions to answer in these "daily" meetings. At the end of each sprint, the progress of the work was demonstrated (sprint review) to the Scrum Master (Professor), who provided useful information about features to update the Product Backlog and to face the next iteration. A deep reflection on the team's work process at the end of each sprint (sprint retrospective) encourages

the development of behavioural and self-organisation competencies. Students were highly encouraged to invest time in this conversation as it allows them to move towards the goal.

At the beginning of the first sprint, doubts and difficulties to start the project arose regarding the knowledge of the Scrum framework. In addition, the teacher conducted the first retrospective meeting to show the procedure of this event and to ensure a useful discussion to improve the way each team works. The teacher did not participate in these events again in order not to interfere in the teams' conversation.

Not all students wanted to participate in this new experience and followed the previously implemented methodology [5]. Consequently, it was possible to establish differences between those who adopted the new methodology and a control group. The results show a greater interest in incorporating functionalities to the object of the project. Furthermore, an increase in attendance at tutorials was detected. There were also more consultations with the intention of accessing additional information to solve problems that arose during the implementation of the project. The success of applying PBL collaboratively was thus evidenced [6].

It was concluded that Scrum promoted the capacity for self-management and self-regulation in the face of uncertain situations in which the limits of the project are merely self-imposed. Carrying out a collaborative project encouraged students to explore their relationships, putting skills into practice and consequently developing and reinforcing transversal competencies.

References

[1] G. Sánchez-Barroso, J. González-Domínguez, J. García-Sanz-Calcedo, F. Zamora-Polo, Analysis of Learning Motivation in Industrial Engineering Teaching in University of Extremadura (Spain), Sustainability 12, 2020, p. 4987. DOI: 10.3390/su12124987.

[2] S. Román, B. Ledesma, A. Alvarez, F. Zamora, E. Sabio, Introduction to Project Based Learning on Engineering, Nova Science Publishers: New York, NY, USA, 2015; ISBN 9781634822343.

[3] K.S. Rubin, Essential Scrum: a practical guide to the most popular agile process, Addison-Wesley (seventh version), New Jersey, 2015.

[4] F. Zamora-Polo, M. Martínez Sánchez-Cortés, A.M. Reyes-Rodríguez, J. García-Sanz-Calcedo, Developing Project Managers' Transversal Competencies using Building Information Modelling, Applied Sciences 9, 2019, p. 4006. DOI: 10.3390/app9194006.

[5] G. Sánchez-Barroso, J. González-Domínguez, F. Badilla-Murillo, J. Aunión-Villa, J. García-Sanz-Calcedo, J.P. Carrasco-Amador, J.L. Canito-Lobo, Implementing Project-Based Learning through BIM technology, Advances in Building Education 4-2 (2020), 34–41. DOI: 10.20868/abe.2020.2.4462.

[6] J. González-Domínguez, G. Sánchez-Barroso, F. Zamora-Polo, J. García-Sanz-Calcedo, Application of Circular Economy Techniques for Design and Development of Products through Collaborative Project-Based Learning for Industrial Engineer Teaching, Sustainability 12, 2020, p. 4368. DOI: 10.3390/su12114368.

MODELLING AND VIRTUAL RECREATION OF AERONAUTICAL HERITAGE AS A TEACHING INNOVATION IN ENGINEERING STUDIES

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Keywords: *Educational Innovation, Aeronautical Heritage, Solid Modelling, Virtual Recreation, CATIA.*

Abstract

Historically, aeronautical heritage unlike architectural or industrial heritage has not been tackled so much. In particular, in Seville, which is the only Spanish city where aeronautical production activity has been developed without a break during the last century [1], it is surprising to check there is no museum related with this issue.

Computer-Aided Design and Computer-Aided Manufacturing have been taught for 20 years in the multiple degrees that Engineering School of Seville offers [2]. In particular, CATIA is used in aerospace engineering studies. It is a standard software in European, Canadian and American aeronautical industry [3].

In our faculty, this important capital investment is rewarded for the high level knowledge of our students which is confirmed by aeronautical sector industry and their auxiliary companies which are very satisfied with the knowledge of our students [4]. Consequently, this also involves a strong bet in educational innovation.

As a result of this learning, students acquire enough skills to perform modellings and virtual recreations [5] which help them in their professional activities and also in other activities related to rescue and cataloging of aeronautical historic heritage [6], in which engineers don´t work nowadays. The reason is this kind of activities are not remunerated professional activities and aeronautical engineers have guaranteed their professional future in aeronautical production industry.

In order to illustrate all those issues, this paper presents the Modelling and Virtual Recreation of the Ansaldo SVA 5 biplane, an aircraft which was used in reconnaissance missions during the First World War, as well as being the first of the series to be used as a bomber [7]. The main characteristic of this aircraft was its extraordinary speed, making it one of the fastest aircraft of the time. The initial documentation, provided by an international museum, consisted of hand-drawn plans and documents referring to the different verification processes of the aircraft project and the modifications that were

made during its development to solve different problems. Logically, this documentation has suffered the wear and tear of time, however, it was possible to intuit measures. This information could be complemented with the information given by observation of one of these aircrafts which is displayed in the aforementioned museum.

It is surprising to check the extraordinary similarity between virtual model and real aircraft. Results of this work, which is one of the many works carried out with similar quality, supply the results initially expected in the acquired competences.

References

[1] La industria aeronáutica en Sevilla en el siglo XX: el caso de industrias subsidiarias de aviación (1938-1966). https://idus.us.es/handle/11441/92802, 2018.

[2] D. Morales-Palma, A.J. Martínez-Donaire, G. Centeno, C. Vallecano, Teaching Experience for the Virtualization of Machine Tools and Simulation of Manufacturing Operations, J. Materials Science Forum. 853 (2016) 79-84.

[3] F. Hürlimann, R. Kelm, M. Dugas, K. Oltmann, G. Kress, Mass estimation of transport aircraft wingbox structures with a CAD/CAE-based multidisciplinary process, J. Aerospace Science and Technology. 15 (2011) 323-333. https://doi.org/10.1016/j.ast.2010.08.005.

[4] C.M. Aguilera, A. Castañeda, F. Guerrero, Past, Present and Future of the Andalusan Aeronautical Cluster, J. Network-Centric Collaboration and Supporting Frameworks. 224 (2016) 583-590.

[5] I-M. Guitescu, M. Luminita Scutaru, M. Guitescu, P. Nicolae Borza, M. Marin, New Command Mechanism of Flaps and Wings of a Light Sport Aircraft, J. Symmetry. 13 (2021) 221-235. https://doi.org/10.3390/sym13020221.

[6] P.D. Fix, From Sky to Sea: The Case for Aeronautical Archaeology, The Oxford Handbook of Maritime Archaeology, online publication, 2012. DOI: 10.1093/oxfordhb/9780199336005.013.0043.

[7] Recreación Virtual y Modelado del Avión Biplano Ansaldo SVA 5 en Catia V5 R19. http://bibing.us.es/proyectos/abreproy/92722/, 2019

VARIED TRAINING ITINERARIES IN THE INVERTED CLASSROOM FOR BETTER LEARNING

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Keywords: *inverted classroom; learning styles; teaching material; autonomous learning.*

Abstract

At the initiative of a group of teachers belonging to the Educational Innovation Group "Actitud Constructiva" of the Universidad Politécnica de Madrid [1], during the last academic year 2019-2020 we presented and developed a proposal to prepare and teach several subjects using the pedagogical model of the flipped classroom [2,3] with a micro-learning approach [4,5] aimed at creating more personalized training itineraries and more adapted to the different learning styles [6] of each student.

The main purpose of the project is to ensure that a greater number of students understand the fundamental concepts of the subjects and are able to apply them.

For this purpose, micro-videos, short videos, texts and infographics will be used to create different non-linear itineraries, based on the "Book" and "Lesson" modules offered by Moodle.

The itineraries will be designed branched whenever possible and in this way students will be offered different options to learn about a given concept but from different perspectives, paths or methods, so that through a basic trial-and-error system the student can choose the one that best suits his learning style.

As an example: When the learner studies any digital resource, a simple test (a short automatic test, for example) will be proposed at the end of the resource. This test, with no intention to evaluate, is intended to give immediate feedback to the learner on the understanding of the concept studied.

- If he/she passes the short test, it is assumed that he/she has understood the concept and can therefore choose to advance in the itinerary in a linear way towards the next digital resource that aims at acquiring understanding of another concept.

- If he/she does not pass it, the itinerary "advances" horizontally so that he/she accesses another digital resource in which the same concept is explained in a totally different way.

- If he/she passes the corresponding short test on this second occasion (which does not have to be the same), it is again assumed that he/she has understood the concept and can therefore choose to advance in the pathway in a linear way to the next digital resource that aims to acquire understanding of another concept.

- If he/she does not pass it, the itinerary "advances" horizontally again...etc.

The procedure will be repeated as many times as necessary, increasing the number of ramifications according to the needs of the students and the complexity of the concepts.

At present, several teachers of different subjects are cooperatively preparing their subjects using the inverted classroom pedagogical model. The subjects that have committed to participate in this edition have been the following:

- Undergraduate and Double Degree (ETSEM): “Mediciones y Presupuestos”; “Organización de obras”; “Construcción de estructuras de acero”; “Fundamentos de Materiales”; “Materiales 1”
- Master MITE (ETSEM): “Aislamiento y Acondicionamiento Acústico”
- Master's Degree in Acoustic Engineering (ETS Industriales): “Sistemas Constructivos”.

We look forward to presenting the results of this exciting educational innovation project.

References

[1] Información del grupo de Innovación Educativa https://innovacioneducativa.upm.es/informacion-grupo?grupo=295, 2021 (accessed 4 Marzo 2021).

[2] Reidsema, R. Kavanagh, L. Hadgraft, R. and Smith, R. (2017). Does practical work really work? The Flipped Classroom: Practice and Practices in Higher Education. Springer. ISBN: 9789811034138

[3] Santiago R. y Bergmann J. (2019) Aprender al revés: Flipped Learning 3.0 y metodologías activas en el aula. Paidós Educación (E-book) EAN: 9788449334863

[4] Rodriguez B. (2020) Docencia colaborativa universitaria: planificar, gestionar y evaluar con entornos virtuales de aprendizaje. P69. EUCM. ISBN: 9788490443996

[5] Fernadez M. Luque A. y Carrión J. (2020) Innovación docente en la universidad y realidades emergentes. P58. Octaedro. ISBN: 9788418348204

[6] Carbaugh, E. and Doubet, K. The Differentiated Flipped Classroom: A Practical Guide to Digital Learning. Corwin. Chapter 6. ISBN: 9781506302966

ON THE ADAPTATION TO REMOTE TEACHING OF CONSTRUCTION-RELATED COURSES IN ENGINEERING AS A CONSEQUENCE OF THE LOCKDOWN MOTIVATED BY COVID-19

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Keywords: *remote learning, construction in engineering, e-textbooks, digital transformation of universities, COVID-19.*

Abstract

Higher education is immersed in a continuously changing context, so the scope and results of the reflection currently being held about its future will condition the trail and mission of universities as social institutions. Due to the recent lockdown universities scrambled to accept and use new communication technologies in the teaching context, thus enhancing their digital transformation. Such an experience has the digital transformation of universities jump into the spotlight [1, 2]. Indeed, more than a few universities are boosting vice-rectorates of Strategy and Digital transformation. This passes through the modernization of equipment, facilities and digital media, but must involve a widespread set of measures to tackle with two pending tasks: the digital divide and inclusion. There is wide range of action in technology, from ethical and holistic perspectives.

The closure of classrooms in higher education during the 2020 spring semester forced the institutions to undertake a sort of decisions and transformations so that the educational agents could adapt their strategies to put together digital systems needed for remote teaching [3]. Instructors struggled to tailor creative ways to boost student engagement and encourage students to participate actively [4]. The main bottleneck for lecturers consisted of adapting their teaching methods to the instruments available and the physical and social constraints. Meanwhile students had to modify their learning strategies although their adaptation to the use of digital media worked fine in general [4, 5].

The authors developed a variety of approaches to boost student engagement and active learning to compensate for the shortcomings implied by the remote teaching: remotely oriented teamwork assignments, online classroom response systems, web-based tools for autonomous learning and more intense student follow-up [6, 7]. In this regard, Learning Management Systems, Online meeting software, e-textbooks, multimedia content and short repositories of web-based problems and exercises became valuable tools [8].

This study summarizes an analysis of the students' perspective on the use of digital technologies and e-resources to communicate with lecturers, and of the goals and tasks in which students use the technologies [9]. This study seeks to understand what their expectations are, thus collects students' perceptions and feedback with the aim of implementing further teaching measures.

The information collected comprises lecturers' perceptions, final grades as well as online questionnaires delivered to students. The indicators about perceptions feedback include the usefulness and benefits of the system employed, the agreement between expectation and system performance, satisfaction upon using the system, and the user readiness to continue using the system in future courses.

The authors concluded that the higher education has given a step forward to the education of the future, which is mainly digital, not only technologically but also in the way that students communicate with instructors, and the latter attract their attention. In view of both lecturers and students' expectations, some features and strategies have come to stay. Remote sessions have replaced in-person meetings, face-to-face tutorials have evolved to online ones. However, there is much room for improvement regarding online exams, as they have become a field of huge controversy.

References

[1] C. Coman, L.G. Țîru, L. Meseșan-Schmitz, C. Stanciu, M.C.; Bularca, Online Teaching and Learning in Higher Education during the Coronavirus Pandemic: Students' Perspective. Sustainability 12 (2020), 10367. https://doi.org/10.3390/su122410367

[2] H. Santos, J. Batista, J., R.P. Marques, Digital transformation in higher education: the use of communication technologies by students. Procedia Computer Science, 164 (2019), 123-130.

[3] M. García Alberti, F. Suárez Guerra, I. Chiyón Carrasco, J.C. Mosquera Feijoo, The sudden shift from face-to-face to online teaching: the social and educational role of lecturers during confinement, ICERI2020 Proceedings (2020), 3655-3659.

[4] J. D. Myers, A. Didwania, C. Shah, D. Jacobson, D. Norwood, M. Ehtesham, P. Aronowitz, E-learning—the new frontier: a report from the APDIM E-learning task force. The American journal of medicine, 125-12 (2012), 1234-1237.

[5] R. Yadav, A. Tiruwa, P. K. Suri, Internet Based Learning (IBL) in Higher Education: A literature Review", Journal of International Education in Business, 10-2 (2017) https://doi.org/10.1108/JIEB-10-2016-0035

[6] Cook, D. A. Web-based learning: pros, cons and controversies. Clinical Medicine, 7-1, (2007) 37.

[7] Faux D. Web-based learning: pros, cons and controversies. Education for Primary Care. 18-3 (2007) 417.

[8] G. Bell, J. Warwick, P. Galbraith (Eds.). Higher Education Management and Operational Research: Demonstrating New Practices and Metaphors (Vol. 54). Springer Science & Business Media, 2013.

[9] García-Alberti, M., Suárez, F., Chiyón, I., & Mosquera Feijoo, J. C. (2021). Challenges and Experiences of Online Evaluation in Courses of Civil Engineering during the Lockdown Learning Due to the COVID-19 Pandemic. Education Sciences, 11(2), 59.

FORCED EDUCATIONAL ADAPTATION TO ONLINE METHODOLOGY BY COVID 19

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Keywords: *covid19, digital platforms, learning for home, technical degrees, learning.*

Abstract

On 13 march 2020, the academic situation changed worldwide due to COVID 19, which observed a lack of control of cases. It was decided to move completely to an online methodology as a precautionary measure. This was a challenge for education as they had to adapt lessons, exercises and exams in a short period of time.

This situation has stretched the capacity of teachers and students to adapt. Online platforms have also been involved providing licences to facilitate the attendance to classes, such as Zoom, Moodle exams, Collaborate, Microsoft teams, Discord... [1].

For this article we will focus on the results of this method, how the teachers and student react and finally if we are going to have occupational sequelae. In previous similar and generalised studies, we have been able to observe that´s up to the speciality studied, benefits or detriments can be drawn for the student. Drawing on quantitative and qualitative findings from a survey, it´s said that results and satisfaction do not always go hand in hand [2].

It´s important to clarify sampling have been done in a technical subject (installations) in which have exercise and a taller to see how it work.

We must come to terms with the fact that we leave in a new technological generation and this situation give us the change to improve our outdated teaching methods. For this reason the government has invested in this technological progress, but not enough [3].

Online training must also pay attention to its main skills, mostly related to the absence of face-to-face interaction, both with peers and with teachers, a fact that students are aware of. Hence the numerous proposals related to the combination of distance and face-to-face actions, or blended learning, increasingly recognized for its ability to overcome the disadvantages of an online only training, adding the possibilities that distance training offers us.

Therefore, consulting the students will allow us to identify the advantages, disadvantages, barriers and opportunities related to the use of ICTs in the training of our students.

References

[1] Basilaia, G., & Kvavadze, D. (2020). Transition to Online Education in Schools during a SARS-CoV-2 Coronavirus (COVID-19) Pandemic in Georgia. Pedagogical Research, 5(4), em0060. https://doi.org/10.29333/pr/7937

[2] Castaño Calle, R., Jenaro-Río, C., & Flores Robaina, N. (2012). Análisis dafo de la utilidad de las plataformas de formación online para el entrenamiento en competencias de estudiantes universitarios. Edutec. Revista Electrónica De Tecnología Educativa, (42), a220. https://doi.org/10.21556/edutec.2012.42.346

[3] Noor, S., Isa, F. Md., & Mazhar, F. F. (2020). Online Teaching Practices During the COVID-19 Pandemic. Educational Process: International Journal, 9(3), 169-184, https://doi.org/10.22521/edupij.2020.93.4

INTRODUCING INNOVATIVE DIGITAL TOOLS TO SUSTAINABLE CONSTRUCTION UNDERGRADUATE STUDENTS: EXPERIENCES APPLYING ERASMUS+ PROJECT OUTPUTS

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Keywords: *digital tools, LCA, BIM, GIS, sustainable construction*

Abstract

Sustainable construction for undergraduate students usually focuses on providing them with theoretical and practical knowledge on energy efficiency, waste management and the life cycle of construction materials. Unfortunately, the course programming at our University (4 hours/week - one semester) does not allow to teach every related topic in the field of sustainable construction. However, our research group has found an opportunity in Erasmus+ projects that imply developing knowledge on certain innovative topics and transferring it through new teaching material and activities that are applied during the course [1]. Thus, students benefit from these projects by receiving specialized contents on cutting-edge topics from an interdisciplinary international research consortium.

In this paper, some of these experiences are presented and the specific teaching methodologies are explained. Among the topics involved are BIM-LCA integration, environmental impact GIS representation, circular economy, and innovative technologies for the sustainable refurbishment of buildings (Figure 1). According to the environmental impact assessment methodology applied by the researchers, these topics require a previous introduction to cost estimation in order to determine the resource needs (*i.e.* materials, manpower, machinery, energy, water, etc.) for the case study [2]. Resource needs will be estimated for the building's life-cycle phases on which the assessment focuses. This is a crucial stage of the analysis as these resources will be translated into environmental impacts through conversion factors [3], [4].

The general methodology described above is then integrated with innovative tools such as BIM or GIS to generate visual representations of the results obtained. BIM has been proven to be of significant help in the assessment of the environmental impact of

projects by allowing the visualization of the most contaminant building elements during early design stages based on a color palette [5]. In order to achieve that feature, the BIM model must be integrated with LCA data that make it possible to assign the corresponding environmental impact to each building element [6]. Thus, practitioners and students can gain understanding on the potential strategies to reduce a project's environmental impact by identifying those elements and analyzing the possible causes and alternatives [7]. Once this has been achieved, circular economy concepts can be easily applied to construction materials to enhance their reduction, reuse and recycling potential.

If BIM-LCA integration is useful for analyzing individual projects, GIS tools can be of invaluable help in the analysis of neighborhoods and cities. To that end, estimation methods are required for obtaining an approximation to the environmental impact of different buildings, which is usually achieved by defining a set of building typologies representative of the built environment. GIS then allows enriching maps with new information layers to generate heat maps that consider different environmental impact categories.

In our experience, undergraduate students, knowing in advance the usual contents of the sustainable construction subject, positively receive these unexpected information pills on innovative methods. The immediacy of the knowledge generation and transfer process carried out by the researchers produces more natural, unguided and spontaneous lessons with students participating with a more curious and motivated attitude.

Figure 1: *Schematic: Integration of BIM technologies + Circular economy.*

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References

[1] J. Solís-Guzmán, C. Rivero-Camacho, D. Alba-Rodríguez, A. Martínez-Rocamora, Carbon Footprint Estimation Tool for Residential Buildings for Non-Specialized Users: OERCO2 Project, Sustain. 10 (2018) 1359, doi: 10.3390/su10051359.

[2] A. Freire-Guerrero, M. D. Alba-Rodríguez, M. Marrero, A budget for the ecological footprint of buildings is possible: A case study using the dwelling construction cost database of Andalusia, Sustain. Cities Soc. 51 (2019) 101737, doi: 10.1016/j.scs.2019.101737.

[3] M. R. Ruíz-Pérez, M. D. Alba-Rodríguez, M. Marrero, The water footprint of city naturalisation. Evaluation of the water balance of city gardens, Ecol. Modell. 424 (2020) 109031, doi: 10.1016/j.ecolmodel.2020.109031.

[4] M. Marrero, C. Rivero-Camacho, M. D. Alba-Rodríguez, What are we discarding during the life cycle of a building? Case studies of social housing in Andalusia, Spain, Waste Manag. 102 (2020) 391–403, doi: 10.1016/j.wasman.2019.11.002.

[5] M. Marrero, M. Wojtasiewicz, A. Martínez-Rocamora, J. Solís-Guzmán, M. D. Alba-Rodríguez, BIM-LCA integration for the environmental impact assessment of the urbanization process, Sustain. vol. 12, no. 10, pp. 1–24, 2020, doi: 10.3390/su12104196.

[6] R. Santos, A. A. Costa, J. D. Silvestre, L. Pyl, Integration of LCA and LCC analysis within a BIM-based environment, Autom. Constr. 103 (2019) 127–149, doi: 10.1016/j.autcon.2019.02.011.

[7] M. Röck, A. Hollberg, G. Habert, A. Passer, LCA and BIM: Visualization of environmental potentials in building construction at early design stages, Build. Environ. 140, (2018) 153–161, doi: 10.1016/j.buildenv.2018.05.006.

INFLUENCE OF BIM-BASED TEACHING METHODOLOGY ON THE SPATIAL ABILITIES OF CONSTRUCTION ENGINEERING STUDENTS.

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Keywords: *spatial skills; quantitative analysis; collaborative learning; BIM; Chile.*

Abstract

Spatial visualization skills are considered essential for a variety of professional careers, especially those related with architecture, engineering, and construction (AEC). A number of studies have proven that these skills are progressively acquired by AEC students during their years in college, being necessary specific pedagogical approaches for this purpose. Other 3D native design software has been proved to exert a positive influence on the spatial abilities of students in several fields, such as fine arts or civil engineering. In the field of AEC, BIM software stands out as an appropriate tool for this purpose, as it supports 3D-native design. This study was conducted to clarify the influence that working with BIM models has on the spatial abilities of the students to visualize constructive components in 3D; it was hypothesized that the effect would be positive to some extent, as in similar disciplines. To that end, an experiment was conducted with 73 undergraduate students in construction engineering, who attended an intensive 4-week workshop where they had to work with BIM models. The improvement in their spatial abilities was measured by the Mental Rotation Test (MRT) and, besides, a satisfaction survey was conducted. The results indicate that MRT scores improved between 3.8% and 15.5% and that students felt highly satisfied with this pedagogical approach. These results aim to help in implementing BIM in the academic curricula to maximize the educational outcomes of the students while gathering their assessment of BIM-based teaching methodologies.

ANOTHER WAY OF TEACHING FOR STUDENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER

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Keywords: *ADHD, methodologies, special educational needs, dyslexia.*

Abstract

Many times, ADHD ignorance makes people to make disrespectful comments, generating delays in the educational system, when they are actually students with special educational needs. The aim of this work is to bring professionals who can generate tangible educational changes, closer to people that interact with ADHD children somehow or other [1]. This way, social conscience (about 1 of 20 children suffer from this type of disorder) in the hopes of reaching an alternative future is attempted.

There is a general tendency, especially in teachers who have been accommodated to their job, to brand ADHD students as “stupid”, “unmanageable” or “lazy”, increasing their workload, instead of taking their disorder into consideration [2]. What is more, punishments as sitting alone or keeping them in for recess are imposed, scolding them constantly and limiting their creativity. This behaviour provokes uncontrolled anxiety in students who only want to be accepted by the teacher and their schoolmates, and generally, end in school failure cases if they could not meet someone who cares about their disorder.

Actually, the problem is not as difficult as it looks, there are lots of examples, some of which we will explain in this paper. Only diagnosis improvement and medical treatment by health professionals, in addition to some better teacher training is required in order to integrate these students into classroom dynamics successfully. But this is only possible, if they can count on parent’s collaboration and daily work at home and school.

Luckily, there are a great number of education professionals who have become aware of this disorder and are investigating and innovating new techniques every day that are very useful to improve their efficiency when they are in class. Besides these professionals, we have the possibility to join forces with associations and families with ADHD children, who provide us a closer view of ADHD children´s day-to-day, helping us to understand their usual behaviour. The main aim of this work is to report and make educational community aware of the existence of this problem, providing as well. New ideas and show some leading methodologies directed towards the integration of this type of students in the general classroom dynamic.

References

[1] Polanczyk, G. et al. (2010). Implications of Extending the ADHD Age-of-Onset Criterion to Age 12: Results from a Prospectively Studied Birth Cohort. Journal of the American Academy of Child & Adolescent Psychiatry. Vol. 49, Issue 3, March, pp. 210–216.

[2] Faraone, SV. et al. (2006). The role of genetic factors in adult ADHD. Psychological Medicine. Vol. 36. Pp. 159 – 165.

NEW LABORATORY EXPERIENCES USING COMPUTER SIMULATIONS FOR BUILDING ENGINEERING STUDENTS

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Keywords: *Laboratory, computer simulations, bridge design*

Abstract

The science learning goals of laboratory experiences include enhancing mastery of science subject matter, developing scientific reasoning abilities, increasing understanding of the complexity and ambiguity of empirical work, developing practical skills, increasing understanding of the nature of science, cultivating interest in science and science learning, and improving teamwork abilities.

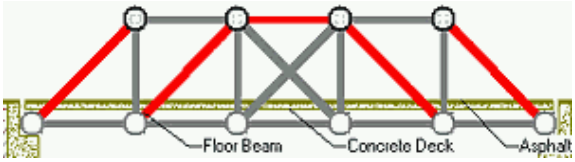
The research suggests that laboratory experiences will be more likely to achieve these goals if they are designed with clear learning outcomes in mind, are thoughtfully sequenced into the flow of classroom science instruction, integrate learning of science content and process, and incorporate ongoing student reflection and discussion.

Computer-based representations and simulations of natural phenomena and large scientific databases are more likely to be effective if they are integrated into a thoughtful sequence of classroom science instruction that also includes laboratory experiences.

In this paper we present a set of laboratory experiments that have to make our building engineering students to design appropriately different types of bridges by West Point Bridge Designer program [1-2]. It is a free program that will introduce you to students through an authentic, hands-on design experience. This software provides you with the tools to model, test, and optimize a steel highway bridge, based on realistic specifications, constraints, and performance criteria. With this program the building engineering students can to create your design with the next steps: Select a truss configuration; Draw the joints and the members; Load test your design; Modify your design as needed to pass the load test (Remember that no design is ever accomplished on the first attempt); Optimize the design to minimize the cost of the bridge. The design of the members can be changed as follows: material, cross-section and size. During the load test members in tension turn blue and members in compression turn red. The intensity of the color depends on the force to strength ratio. If the color is bright red or blue it means the internal force of that member is nearly equal to the strength.

An optimized design has the members loaded close to their strength. If time allows try a different truss configuration (Pratt Deck Truss, Warren Deck Truss, etc.) to see if the cost can be further reduced. Finally, the students present your design:

- Submit a drawing of the design with dimensions.
- Submit a material list including itemized cost and total cost for the bridge.
- Submit an evaluation of the truss you used in your design.
- Deliver a presentation to the class which describes your design, the advantages of your design, truss analysis, the cost, and a self evaluation of the process you used to arrive at the final design.



In this form, the student can analyze how the type and direction of stress applied affect the selection of the material and the cross section, how can the forces of compression and tension work together to make a stronger bridge and why it is more expensive to use many different materials and sizes rather than just a few in your design. The next step is to build a model of the bridge to measure stresses and compare the experimental results with those obtained with the program.

References

[1] https://civilengineeringbible.com/files.php?i=39.

[2] https://bridgedesigner.org/download/

CHALLENGE BASED ON PROFESSIONAL REALITY WITH A TRANSVERSAL AND MULTIDISCIPLINARY APPROACH

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Keywords: *challenge, multidisciplinary, transversality, professional reality*

Abstract

Students always ask professors to connect their teach with professional reality, in a similar way to how Bologna's Plan understands the design of University degrees [1]. Therefore, our teaching research is based on the resolution of an actual specific constructive problem, whether: it is constructive injury, incorrect adaptation to current regulations, sustainability improvement, etc. Then, the chosen problem will be treated by students on the condition it was a present issue that a client could propose to them. In order to promote teaching transversality, each of subjects contributes a student to the project who will be the expert in that area of knowledge. The experience is articulated through groups of students from different subjects, even different years, who face developing an architectural project as if they were employees in a company. The result should be the necessary documentation to implement the project, since it could be presented to the person in charge of approving it, even it could be built.

The main aim is to put students in an actual job, similar scene as it will be the development of their work, in this way motivate them, since they will have a tangible result that can be implemented. Also promote interdisciplinarity, as well as coordination transversal and vertical, not only within same grade, but also in grades that have complementary competencies: building engineering, architecture or business management. As secondaries aims, it is pretended students learn to manage and organize work both face-to-face and virtual way. The assumption of responsibilities in front of a work group, too.

During research, surveys and samplings will be carried out thus to obtain data with which to estimate the learning provided by this experience, on the other side, also to assess motivation and help student's approaches to certain difficult subjects.

References

[1] J. Olaskoaga, M. Barandiaran, M. Barrenetxea, A. Cardona, JJ. Mijangos, *Economistas*, El proceso Bolonia: Una oportunidad para adecuar las competencias de los titulados universitarios a la realidad profesional, 122 (2019) 88-95.

KAHOOT AND ITS PEDAGOGICAL USE AT UNIVERSITY

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Keywords: *Interactive Learning, Education, Apps, Innovation, Kahoot*

Abstract

Technological advancement and it has transformed how activities are performed daily. In the context of education, especially learning, educators now could introduce and integrate play-based learning activities via technology. The incorporation of play in learning has seen the emergence of a unique concept of game-based learning [1]. Actually, students become increasingly bored and engage in off-task behavior, such as doodling on their lecture notes and using social media on their mobiles and laptops [2].

The platform Kahoot is a result of the Lecture Quiz research project initiated at the Norwegian University of Science and Technology in 2006, where multiple prototypes were developed and evaluated through experiments over several years [3].

Educators need to consider elements such as motivation and whether the platform is likely to foster and reinforce learning, and the present study analyzes the possibility of the use of Kahoot in the university education.

Kahoot is a learning-based platform for all kind of ages, and one of the main advantages of Kahoot is the option to choose between the individual game or multiplayer. For this option, the students can check their previous and current knowledge. Kahoot helps to develop their curiosity on a topic, to challenge themselves and to create a sense of achievement. For professors, it is a useful tool to use as a formative assessment. In highest levels Kahoot helps the students to develop their teamwork Skills, develop their decision-making capacities as well as improving their critical thinking.

Also, Kahoot offers the possibility to create quizzes or surveys about every subject. Surveys suit better the higher levels while the quizzes work very well in all different educational levels.

It is verified that the innovation with the use of Kahoot in the classrooms implies an improvement in the communication with the students and is applicable to the highest levels of teaching. It is concluded that the main advantage is the feedback that they

report to the teacher who can immediately know if their educational task is being carried out successfully, as well as self-assessment by the students. This platform is very valid both to analyse the knowledge of the class as a whole and to identify the weaknesses of each of the students, all focused on the possibility of reinforcing the knowledge that has not been assimilated.

References

[1] Tan Ai Lin, D., Ganapathy, M., & Kaur, M. (2018). Kahoot! It: Gamification in Higher Education. Pertanika Journal of Social Sciences & Humanities, 26(1).

[2] Licorish, S. A., Owen, H. E., Daniel, B., & George, J. L. (2018). Students' perception of Kahoot!'s influence on teaching and learning. Research and Practice in Technology Enhanced Learning, 13(1), 1-23.

[3] Wang, A. I., & Tahir, R. (2020). The effect of using Kahoot! for learning–A literature review. Computers & Education, 149, 103818.

PROPUESTA DE INNOVACION APLICADA EN TÉCNICAS DE INVESTIGACIÓN. EXPERIENCIA DE FORMACIÓN MULTIDISCIPLINAR

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Keywords: *innovación educativa, recursos tecnológicos, técnicas de investigación, experiencia multidisciplinar, competencias*

Resumen

En el contexto universitario, la innovación educativa se reconoce como uno de los principales instrumentos de la transformación docente, siendo la transformación digital parte de la misma, lo que convierte a los recursos tecnológicos en herramientas útiles y cotidianas.

Actualmente ofrecer una educación de calidad, más si cabe con la experiencia que debido a la situación de COVID-19 se ha tenido que asumir en el ámbito de la docencia universitaria, destacando por ser totalmente diferente e inesperada, ha supuesto un reto y un desafío para los docentes [1], [2], [3], cuyo objetivo principal se centra en garantizar un aprendizaje efectivo que posteriormente pueda ser aplicado en el contexto profesional.

En la presente investigación, a través del proyecto de innovación docente desarrollado por el equipo de profesores firmantes, el estudiante desarrolla su propia experiencia de aprendizaje y participa activamente de ella al poder aplicarla en la realización de prácticas de distintas asignaturas y mucho más relevante, hacerlo de forma efectiva y directa durante la realización de su trabajo fin de master o grado sobre casos reales.

El objetivo de esta ponencia es, por tanto, destacar la importancia de los cambios educativos y pedagógicos que exige tanto la adaptación de la docencia a las nuevas situaciones como la posibilidad de aprovechar los recursos disponibles para ser aplicados en distintas titulaciones (máster y grado) simultáneamente.

Para ello se presenta la experiencia de innovación realizada por un grupo de docentes de la Universidad de Granada que imparten materias en el Máster Universitario en Ciencia y Tecnología en Patrimonio Arquitectónico (CiTPA), Máster Universitario en Rehabilitación Arquitectónica (MARA) y Grado en Conservación y Restauración de Bienes Culturales. En ella se aborda la elaboración de material docente inédito (vídeos, manuales para la aplicación de técnicas analíticas y uso de software especializado todo en versión bilingüe), para su integración en diferentes asignaturas en las que se precisa dar a conocer diferentes técnicas de investigación, utilización de software específico y actividades operacionales precisas que son utilizadas para la caracterización de materiales.

El aprendizaje basado en competencias a través de la enseñanza virtual incorpora nuevas formas de enseñar y aprender, permitiendo reinterpretar la docencia y hacer al estudiante el verdadero protagonista de su aprendizaje. La innovación ofrece a los estudiantes una experiencia real y aplicada que tiene una implicación práctica y profesional inmediata, aprovechando las habilidades de las nuevas generaciones.

Los resultados, esperados en las futuras evaluaciones, deben ser analizados tanto de forma individualizada como para el conjunto de asignaturas incluido el trabajo fin de grado y trabajo fin de master, siendo reconocido de antemano el buen resultado y las facilidades que en el ámbito del docente supone el trabajo en equipo, el reconocimiento de habilidades y la selección de competencias comunes entre distintas asignaturas y niveles formativos.

Agradecimientos

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References

[1] S. Carrascal Domínguez, A. María de Vicente; J. Sierra Sánchez. Transformación e innovación educativa durante la crisis del COVID-19. Estilos y modelos de enseñanza y aprendizaje. Revista Estilos de Aprendizaje / Journal of Learning Styles 13 (2020) 1-4.

[2] S.M. Moreno-Correa, La innovación educativa en los tiempos del Coronavirus. Salutem Scientia Spiritus 6(1), (2020):14-26.

[3] M.S. Ramírez-Montoya. Transformación digital e innovación educativa en Latinoamérica en el marco del CoVId-19. Campus Virtuales, 9(2), (2020), 123-139.

AN ACTIVE EDUCATIONAL APPROACH DURING THE TFM DIRECTION BASED ON ESD COMPETENCIES AND PBL METHODOLOGY THROUGH THE CAMPUS BIZIA LAB PROGRAM OF THE UPV/EHU

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Keywords: *Active Learning; Education for Sustainable Development (ESD); Internet of Things (IoT); Open Science; Problem-Based Learning (PBL).*

Abstract

The University of the Basque Country (UPV/EHU) has been developing since the 2017/2018 academic year a program called Campus Bizia Lab (CBL) in order to solve several of the challenges and problems that are generated within the framework of the university and society in general. The program promotes a collaborative structure for project development within the framework of Education for Sustainable Development (ESD) [1] using the campus as a laboratory and in which different types of personnel (students, teachers and administration and services personnel) actively participate.

On the other hand, we are currently facing a state of health alarm due to the COVID-19 pandemic that is also having a notable influence on the university community. In this sense, the ventilation of the classrooms and the rest of the spaces in the centers has become very relevant in order to reduce the risk of contagion.

Due to this, it was proposed to participate with a project in the CBL call framed within the Healthy University challenge. The project aims to generate a manual of good practices that allows an improvement in air quality in university spaces and to design a

methodology for decision-making for the renovation of spaces with insufficient air quality. The initiative tries to place the user of university spaces as an active actor in improving the health of their workplace and provoke their learning supported by a real-time monitoring system.

The main idea of an educational approach based on the Problem-Based Learning (PBL) methodology [2] is that the student addresses real current problems as a vehicle to promote learning in an active and participatory way. Due to this, it was considered appropriate to guide the theme of one of the TFMs within the project proposed in the CBL call in order to address the current problem of IAQ in university spaces.

This research focuses on the general structure that is being carried out in the CBL framework through the direction of a TFM where an approach with ESD competencies is being implemented and in which the participation of both students and university staff takes on vital importance. On the other hand, from the technological perspective, the use of ICTs is being important for the development of this project. The combined use of IoT and OSP technologies is allowing the development of a system for environmental monitoring and the monitoring of the correct ventilation of educational spaces [3,4].

The results obtained so far show a high motivation and interest of the students, the involvement of the university staff and, in general, the collaboration of the university community. This shows how the new educational and research paradigms based on open science, citizen involvement or urban laboratories can have a great place and a notable impact in terms of the transfer of knowledge to society and thus be able to address current problems.

References:

[1] United Nations Educational, Scientific and Cultural Organization (UNESCO), UNESCO roadmap for implementing the global action programme on education for sustainable development,Unesco Paris (2014).

[2] D.F. Wood, Problem based learning, BMJ (Clinical research ed.). 326 (2003) 328-330. http://dx.doi.org/10.1136/bmj.326.7384.328.

[3] A. Martín-Garín, J.A. Millán-García, J.M. Sala-Lizarraga, J.M. Hidalgo-Betanzos, A. Baïri, Internet de las cosas y plataformas de código abierto como herramientas de apoyo para la construcción 4.0.= Internet of things and open source platforms as support tools for construction 4.0. Anales de Edificación. 4 (2018) http://dx.doi.org/10.20868/ade.2018.3772.

[4] A. Martín-Garín, J.A. Millán-García, A. Baïri, M. Gabilondo, A. Rodríguez, IoT and cloud computing for building energy efficiency (Ch. 10), Start-Up Creation 2nd Edition: The Smart Eco-Efficient Built Environment. Woodhead Publishing Series in Civil and Structural Engineering (2020) 235-265. https://doi.org/10.1016/B978-0-12-819946-6.00010-2.

NEW LEARNING TECHNOLOGIES IN VOCATIONAL TRAINING

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Keywords: *Laboratory, computer simulations, bridge design*

Abstract

Plastic and Visual Education's aim is to make the students acquire the perceptive and expressive skills needed to understand reality and to interpret and appreciate, with sensibility and aesthetic sense, the pictures and plastic works surrounding them, starting with the knowledge and use of some of the traditional plastic languages (drawing, painting, sculpture and engraving) and of those related to the ICT's (photography, video, cinema and computing media), which require further skills for their use [1]. Plastic and Visual Education claims, as well, to foster the development of imagination, creativity, emotional stability and self-stem; to favor critical thinking and cooperative work; to inculcate on the students respectful and critical attitudes towards the diversity of artistic and cultural expressions; to gift the students with the needed skills in order to use the elements of visual and plastic language as expression resources and to prepare them to enjoy the natural, social and cultural environment [2].

Nowadays, with the new legislation in education, our subject is being relegated more and more to the background of the educative system. With this kind of works, it is meant to stand out the importance that, socially, being able to express properly has, not only verbally, but also through graphic representation techniques. Activities like the ones proposed in this article, manage to develop the creative capacity of our pupils and to improve their manual skills, and to speed up the connections between what is thought and what is transmitted.

One of the main functions of the Plastic and Visual Education subject is to sensitize the students with the work of artists from other ages, getting to know the different techniques used at that times, as well as the historical and sociocultural context in which they lived [3]. It suits, therefore, to start with the study and comprehension of the elements that set the plastic and visual language up to reach later on to an articulation of it in different compositions, with an expressive or descriptive intention. For this, it's proposed a first task, which requires of the exploration, analysis and appreciation of the work of a known artist, to, afterwards, carry out a manual experimentation of the same work through the use of the same techniques that were used in the epoch in which it was created.

In most of the activities that we carry out throughout our life we are accompanied by other people. Since we are born, we belong to groups naturally or moved by our interests and concerns, derived from the different activities that we perform. Is due to this fact that working cooperatively with other people means a possibility, both for the individual development and for the social development of the person, as far as the acquisition of rules and values is implied. In the second proposal of this article, the guidelines needed for the proper implementation of a group work that was carried out with Good results in the classroom are given.

References

[1] Gardner, H. (1994) Estructuras de la mente: La Teoría de las Inteligencias Múltiples. México, S.L. Fondo de cultura económica de España.

[2] Salovey, P., Woolery, A. y Mayer, J. D. (2001) Emotional intelligence: Conceptualization and measurement. G.J.O. Fletcher y M.S. Clark (Eds.), Improving academic achievement: Impact of psychological factors on education (pp. 247-266). San Diego, Academic Press.

[3] Goleman, D. (1995) Emotional Intelligence. New York, Bantam Books.

IMPLEMENTATION OF THE SUBJECT BUILDING INSTALLATIONS I DURING CONFINEMENT PERIOD: FACTS AND RESULTS

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Keywords: *Building Installations, online learning, project-based learning, building engineering, educational rates*

Abstract

Traditionally, public universities in Spain are focused on face-to-face learning. However, due to SARS-CoV-2 global pandemic, they abruptly transformed to online learning during the confinement period. In this sense, scarce subjects are prepared to that radical change, particularly those in which theoretical-practical methodology is applied.

This research comprises the subject Building Installations I of the Degree in Building Construction of the Universidad de Sevilla. A second course mandatory subject, in which all the installations concerning housing are considered. Professors used to split the contents in theorical lessons and practical applications on a specific case study by using project-based learning methodology [1].

Due to the online learning, an important transformation of the subject into information and communication technologies (ICT) was carefully prepared based on the previous experiences of the professors in previous Erasmus+ project [2]. An over-effort was carried out by all the professors to maintain constantly the contact with the students and carry out all kinds of actions which favored the follow-up of the lessons. As an example, the first video was visualized the first week 123 times by the 108 students enrolled.

Table 1: *Rates applied in the last three years*

Rate	Years			Relation	
	2018	**2019**	**2020**	**2020 - 2019**	**2019 - 2018**
Efficiency	60,61	50,89	51,16	0,27	-9,72
Performance	36,36%	43,18%	78,57%	35,39%	6,82%
Success	71,43%	68,67%	93,62%	24,95%	-2,76%
Not qualify	49,09%	37,12%	16,07%	-21,05%	-11,97%
Fail	14,55%	19,70%	5,36%	-14,34%	5,15%
Repeaters	51,52%	64,39%	62,50%	-1,89%	12,87%

Once the subject had finished, rates were extracted (Table 1). The most relevant rate is Success, being more than 93%. This rate is related to the rate of Fail (5.36%). Additionally, the rate of Performance reaches above 78%. To highlight the large number of repeaters (62.50%) at the start of the academic year, which will be reduced in future years considering the previous rates. If we compare with previous courses, rates of Performance and Success are the most significative, surpassing 35% and nearly 25%, respectively, compared to the previous course.

Considering the singular circumstances, an increase in students that continued the course in online mode was detected. Besides, the involvement of the students enrolled had increased considerably considering the rates of Performance and Success. Further education strategies must be developed in the subject learning from the coronavirus crisis to be more resilient with future challenges.

References

[1] M. Ricaurte, A. Viloria, Project-based learning as a strategy for multi-level training applied to undergraduate engineering students, Educ. Chem. Eng. 33 (2020) 102–111. doi:10.1016/j.ece.2020.09.001.

[2] A. Rotaru, Critical Thinking in the Sustainable Rehabilitation and Risk Management of the Built Environment, 2019. https://books.google.com.br/books?id=iSgGEAAAQBAJ.

A NEW APPROACH TO TEACH PROGRAMMING TO FUTURE TEACHERS THROUGH RESEARCH-BASED LEARNING

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Keywords: *Research-Based Learning; Collaborative learning; Teacher education; Experiential learning; Knowledge creation*

Abstract

Teacher training has evolved as society has done. The dynamic process of widespread change has a significant impact on people's way and quality of life, and thus, it is necessary to integrate it into society's education system and, consequently, into teacher education [1].

Continuous social changes require teachers of future generations to focus on the development of personal and professional skills, introducing new teaching and learning methodologies in the classroom. This paper analyses the application of RBL (Research-Based Learning) [2] methodology in the subject of Programming in the Master's Degree in Teacher Training.

The aim of its application is to personalize learning and bring it closer to the reality of the professional future. For its implementation, the CTMTC model (Comprehensive Training Model of the Teamwork Competence) has been followed, which allows the verification of individual work within group dynamics [3].

The aims of this study are: In one hand, to analyse the degree of personalisation of learning through RBL and, on the other hand, to assess the contribution of the RBL active methodology to student learning. In order to get these objectives, a focus group was held at the end of the course and the student evaluation surveys were analysed.

RBL methodology combined with collaborative work has been successful and has given good results. This methodology has provided an answer to a problem pointed out in previous courses, regarding the diversity of levels in terms of students' prior knowledge of the subject. The students have valued RBL very positively, allowing them to adapt their level of knowledge according to their academic background, thus getting closer to the reality of teaching and getting to know the daily challenges of the profession.

Findings show that collaborative work under a research-based learning methodology is effective to personalize learning for students. Active methodologies shown in this case study are presented as solutions to common problems in university courses. RBL combined with collaborative learning helps to increase students' involvement and engage them in their own learning. Furthermore, the obtained results will allow the creation of a knowledge network which shows possibilities to grow and be updated every year. The analysis of the effects of this network will be the motivation for further studies, but it is hoped that this study will help to improve current results.

References

[1] Javier J. Maquilón Sánchez, et al. 2011. *La formación del profesorado en el siglo XXI: Propuestas ante los cambios económicos, sociales y culturales*. Ediciones de la Universidad de Murcia, Murcia.

[2] Afdal, H. W., & Spernes, K. (2018). Designing and redesigning research-based teacher education. *Teaching and Teacher Education*, *74*(1), 215-228.

[3] Ángel Fidalgo-Blanco, Dolores Leris, María Luisa Sein-Echaluce, Francisco José García Peñalvo. 2015. Monitoring Indicators for CTMTC: Comprehensive Training Model of the Teamwork Competence in Engineering Domain. *International Journal of Engineering Education*, 31(3):829-838

LEARNING SPACES IN SUSTAINABLE BUILDINGS FACING THE CHALLENGE OF COMBINING INTERACTION AND HEALTH

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Keywords: *learning space, learning environments, EDS, covid19, sustainable design, health, well-being architecture*

Abstract

This study attempts to collect the most relevant contributions to the long list of requirements to be met in new educational spaces to adapt to the challenges of today's society. If a year ago we were talking about the search for interaction in the design of educational spaces as a means to achieve the objectives set by Education for Sustainable Development (ESD), now the debate seems focused on health due to the demands of the script. The arrival on the scene of a sinister character, covid19, has revealed several issues that have always been present and others that would be worth considering.

On one hand, the crisis has revealed the weaknesses of online education. In the three months of online education, technology has not managed to match the results of face-to-face education [1]. There is consensus in affirming that in the future we should go towards a hybrid model, part physical and part digital. But if there is one thing we have learned after confinement, it is that physical space matters because there are things that the digital environment cannot provide.

On the other hand, this pandemic crisis could allow us to turn issues already announced in the sector into reality, such as the flexibility of spaces to adapt to new methodologies and changing circumstances, the connections with the natural environment, or the improvement of environmental conditions. Some scholars go further and talk about conceiving antivirus built environments, which might provide us with security and take care of our health, both physical and emotional [2].

Finally, the pandemic is presented as the last challenge for the school building. The most important question some are asking is how do we keep distance, even temporarily, in learning environments while making sure it doesn't become the overriding principle in space design? How can we do it without sacrificing the necessary social and emotional connection right now? [3]. How can we ensure that schools continue to promote autonomy and collaboration, exploration and creativity among students?

References

[1] OECD (2020), *Education at a Glance 2020: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/69096873-en

[2] Megahed, Naglaa & Ghoneim, Ehab. (2020). Antivirus-built environment: Lessons learned from Covid-19 pandemic. Sustainable Cities and Society. 61. 102350. 10.1016/j.scs.2020.102350.

[3] Arnou, Charlotte & Cornelis, Gustaaf & Heymans, Pieter & Howard, Sarah & Leemans, Geert & Tondeur, Jo & Vaesen, Joost & Van Den Driessche, Maarten & Valcke, Martin & Elen, Jan. (2020). COVID-19 and educational spaces: Creating a powerful and social inclusive learning environment at home.

APRENDIZAJE ADAPTATIVO. UNA PROPUESTA PARA ESTUDIANTES DE GRADOS

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Keywords: *aprendizaje adaptativo, personalización, metacognición.*

Resumen

Cada vez más, se busca una personalización e individualización en el aprendizaje del estudiante, este es uno de los grandes retos del docente que busca una metodología centrada en el estudiante (1). Así mismo, se está extendiendo el uso del *big data* en múltiples sectores de la sociedad, entre ellos, la educación.

El aprendizaje adaptativo es una metodología que permite conseguir dicha personalización e individualización mediante el uso del *big data* para conseguir abarcar las necesidades de aprendizaje. (2) Este proceso sistemático busca analizar las necesidades del estudiante y los objetivos del currículo y de la proyección profesional de este para seleccionar las actividades y los recursos que le permita alcanzar dicho logro. Así mismo, se plantean procedimientos de evaluación del aprendizaje guiados y revisados por el docente. (3) Los pasos del proceso son: en primer lugar, se recopila la información interna (debilidades y fortalezas) y externa (amenazas y oportunidades) del estudiante mediante una matriz DAFO; en segundo lugar, el estudiante realiza una análisis metacognitivo de su aprendizaje; en tercer lugar, la plataforma digital de *adaptive learning* elabora un plan de trabajo al estudiante que le motive y le plantee diferentes retos adaptados a su situación personal de aprendizaje; y, finalmente, el sistema se retroalimenta constantemente del proceso elaborado por el estudiante e informa al docente para que ajuste el itinerario y resuelva las dificultades individuales y grupales de forma personal. Este proceso facilita el avance y la consolidación del estudiante que transmite al docente los resultados para que este evalúe teniendo en cuenta su evolución.

En definitiva, este aprendizaje adaptativo facilita la metacognición del estudiante y la práctica docente (1) y consigue un aprendizaje activo ya que recae en el propio estudiante, lo que le motiva y le compromete a seguir avanzando en ello (2). Este aprendizaje hace que sea autónomo y no requiera de un control constante del docente, es el estudiante el que evoluciona por sí mismo. Finalmente, se consigue un aprendizaje perdurable y facilitador en la evolución de la adquisición de los diferentes conocimientos relacionados con lo aprendido. (4)

Referencias

[1] M.P. González, et al. Aprendizaje adaptativo: un caso de evaluación personalizada. Revista Iberoamericana de Tecnología en Educación y Educación en Tecnología, 19 (2017), 65-72. https://doi.org/10.24215/18509959.0.p. 65-72

[2] A. Real Fernández, R. Molina-Carmona y F. Llorens Largo. Aprendizaje adaptativo basado en competencias y actividades. IV Congreso Internacional sobre aprendizaje, innovación y competitividad. (2017), 98-103. http://dx.doi.org/10.26754/CINAIC.2017.000001_017

[3] F. Llorens-Largo, C.J, Villagrá-Arnedo, F.J. Gallego-Durán, R. Satorre-Cuerda y R. Molina-Carmona. LudifyME. In formative assessment, learning data analytics and gamification. Elservier, (2016), 245-269. https://doi.org/10.1016/C2015-0-00087-9

[4] D. Lerís y M. L. Sein-Echaluce. La personalización del aprendizaje: Un objetivo del paradigma educativo centrado en el aprendizaje. Arbor, 187 Extra_3 (2011), 123-134. https://doi.org/10.3989/arbor.2011.Extra-3n3135

LA FIGURA DEL DIRECTOR COMO ELEMENTO CLAVE PARA LA MEJORA DE LAS PRÁCTICAS EDUCATIVAS

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Keywords: *Realimentación productiva, lideres académicos, prácticas educativas, métodos, procesos de adquisición del conocimiento.*

Resumen

Cuando hablamos de la función directora en las escuelas, lo relacionamos directamente con una figura de autoridad que pone reglas y orden en la institución que dirige. Sin embargo, esto va mucho más allá, ya que se requiere de una persona capacitada que desarrollo no solo la función de autoridad, debe gestionar, proponer proyectos, resolver problemas, pero sobre todo orientar y asesorar a los docentes a su cargo. Debe ser un elemento importante para cambiar las prácticas educativas e innovar en los métodos utilizados dentro de las escuelas.

El desarrollar técnicas de realimentación productiva para docentes, promoverá la confianza de los mismos y comprometerá a los directivos a estar al pendiente de lo que sucede en cada aula de la escuela en la que trabaja. Siendo lideres académicos que guían de forma correcta y con elementos claros a los maestros sobre los procesos de adquisición del conocimiento de los alumnos.

Referencias

[1] Educación, D. G. de C. y, Educación, S. de, & Primaria, D. de E. (2019). El liderazgo del director en la escuela.

[2] Santizo Rodall, C. A. (2016). Condiciones institucionales del trabajo colaborativo como estrategia de cambio del sistema educativo. Perfiles Educativos, 38(153), 154–167.

Sunpath3D COMO HERRAMIENTA INFORMÁTICA PARA EL CÁLCULO DE SOMBRAS Y TRAYECTORIAS SOLARES

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Palabras clave: *Sunpath3D, energía solar, Ciclo Formativo de Grado Superior (CFGS), herramientas educativas.*

Resumen

Ingenieros, arquitectos y proyectistas vinculados a proyectos de energía solar y climatización de edificios, se enfrentan diariamente a retos importantes relacionados con el dimensionamiento de instalaciones. Sus resultados son indudablemente vinculantes en lo relativo a la construcción de un completo trabajo de selección de paneles solares fotovoltaicos o colectores térmicos, equipos de climatización, aislamientos termoacústicos, tipología de cristales, etc. Y entre los factores que influyen en la generación de producción eléctrica o térmica solar o en el certificado de eficiencia energética de edificaciones, hay un factor clave que en ocasiones se olvida con frecuencia: la irradiancia solar recibida (o no) por el objeto de análisis en cuestión. La posible presencia de objetos situados en la línea norte-sur del mismo modifican muy notablemente la incidencia directa de radiación solar o las cargas térmicas experimentadas por el edificio. Es por esto que toda herramienta informática que aparezca en el mercado puede ser considerada una muy buena noticia por cuanto agiliza y clarifica nuestros cálculos.

Sunpath3D es una aplicación online gratuita, tremendamente interesante, que permite obtener el movimiento del Sol en función de la posición del edificio o vivienda cuya localización se quiera estudiar, así como la proyección de sombras que produce tras la exposición a la iluminación solar. Lo realmente interesante es que permite posicionar no solo los edificios que vienen por defecto en el programa, sino incluso nuestra propia edificación objeto de análisis diseñado en 3D, siempre y cuando el formato de archivo sea *.obj, *.stl o *.ply (los mejores resultados se obtienen hasta ahora con *.obj). Así, a modo de ejemplo, es factible diseñar una vivienda con el también programa gratuito *SketchUp Free* equipada con paneles solares fotovoltaicos, que se puede exportar en formato *.stl y con posterioridad convertir a *.obj a través de otro sitio web (meshconverter.com).

En este trabajo se presenta una herramienta gratuita, de fácil uso en línea, con prácticamente nula curva de aprendizaje y que puede revelarse como una estupenda

herramienta para una mejor comprensión y constatación del posicionamiento solar en la edificación. Esto es, el objetivo de esta aplicación es demostrar la relación entre la ubicación geográfica y la posición solar a lo largo del año. Es especialmente fácil utilizar el mapa para arrastrar la ubicación y ver de forma interactiva cómo cambia el diagrama de la trayectoria del Sol y las proyecciones de sombras. También es factible relacionar directamente la trayectoria solar 3D y la duración del día, así como un rango de diferentes proyecciones de trayectoria solar 2D.

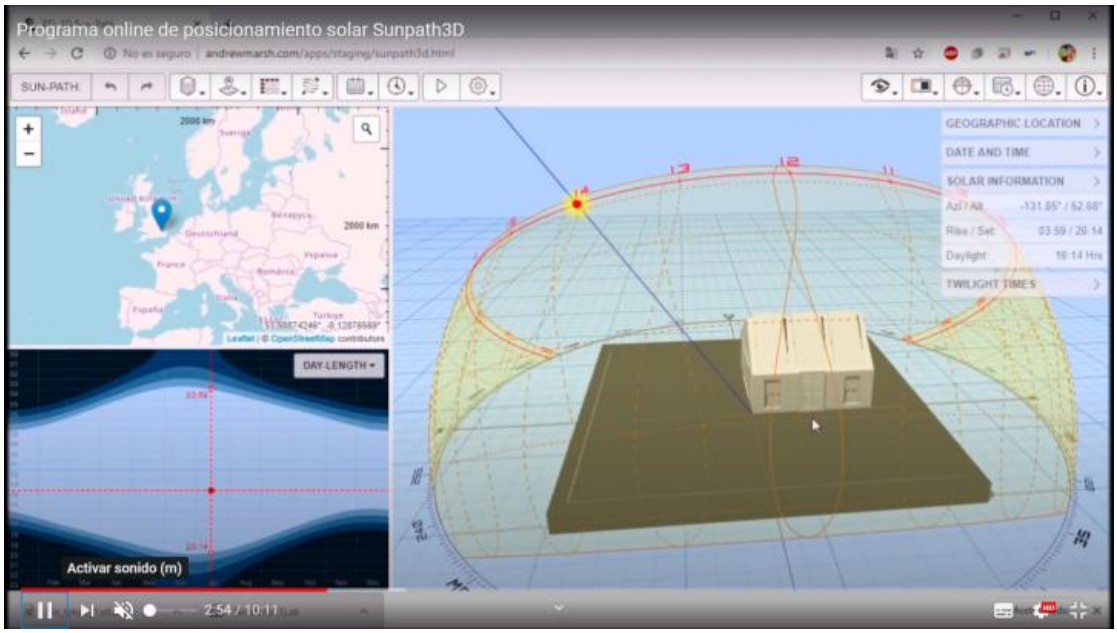

Figura 1. *Parametrización de trayectorias solares con vivienda 3D de diseño propio e interfaz del software Sunpath3D*

Referencias

[1] Llorente Pacheco, E. (2019). Programa online de posicionamiento solar Sunpath3D. https://www.youtube.com/watch?v=qV5ouSmyZAs&t=2s (Consultado 11 de marzo de 2021)

[2] Chavez Marroquin, J.L. Tutorial como hacer un Recorrido Solar 3d - 3D Sun Path. https://www.youtube.com/watch?v=b6Du28Gh0As (Consultado 11 de marzo de 2021)

[3] Bahr, W. 3D Sun Path Representation. https://www.youtube.com/watch?v=Sej_KmYES-Q (Consultado 11 de marzo de 2021)

DESARROLLO DE UN SISTEMA DE INFORMACIÓN PARA LA GESTIÓN DE PROYECTOS MEDIANTE UN ENFOQUE MULTIDISCIPLINAR

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Palabras clave: *Planificación de obras, trabajo fin de grado, multidisciplinariedad, gestión.*

Resumen

El Trabajo Fin de Grado (TFG) es el último paso que el estudiantado debe superar para culminar con éxito una titulación universitaria. A diferencia de otras materias impartidas en la titulación, el TFG permite al alumnado desarrollar en buena medida la libertad y creatividad durante su elaboración, siendo un excelente ejercicio de autonomía que acerca a los futuros egresados hacia lo que será su desempeño profesional.

En la actualidad, han surgido una gran variedad de dobles titulaciones que permiten cursar a los y las estudiantes dos grados universitarios de forma simultánea. Estas titulaciones presentan la peculiaridad de poder cursar un TFG compartido entre ambas carreras universitarias, con las consecuentes ventajas derivadas del trabajo multidisciplinar que surge al combinar dos áreas de conocimiento distintas. Tal es el caso de los dobles grados de ingeniería y administración de empresas, donde el alumnado tiene la oportunidad de elaborar herramientas de gestión, organización y/o planificación que sin duda forman parte del día a día en los proyectos de ingeniería.

Desde el Doble Grado en Administración y Dirección de Empresas e Ingeniería Informática de la E.T.S. de Ingeniería Informática, se ha querido aprovechar esta oportunidad para elaborar una herramienta de gestión que permita mejorar a tiempo real los proceso de planificación de obras y proyectos de ingeniería. En la actualidad, existe una gran variedad de herramientas disponibles que permiten construir Diagramas de Gantt y conocer el coste derivado de las distintas actividades que componen un proyecto determinado. Sin embargo, son muy pocas las herramientas de gestión que tienen en cuenta las necesidades de los usuarios que las emplean *in situ*, y quienes son realmente los que deben lidiar con proveedores, trabajadores y clientes para cumplir con los plazos y criterios de diseño establecidos.

En este trabajo se muestra como estableciendo sinergias entre distintas áreas de conocimiento se pueden desarrollar herramientas software que permitan satisfacer las necesidades finales de los usuarios. Para ello, se han puesto en común tres áreas de conocimiento bien diferencias: Organización de Empresas, Construcción Arquitectónica e Ingeniería de Software, combinando de forma equitativa los conocimientos de sendas

disciplinas para la elaboración de un Trabajo Fin de Grado multidisciplinar que permita resolver problemas reales.

Referencias

[1] Gómez, C.; Rodrigo, F. y Molines, S. (2019). Proyectos educativos multidisciplinares y ayuda a la comunidad. RIDAS, Revista Iberoamericana de Aprendizaje Servicio, 7, 131-143. DOI: 10.1344/RIDAS2019.7.9

[2] Folch, C., Capdevila, R. & Prat, M. (2019). Percepción del Profesorado sobre una Experiencia Multidisciplinar: Arte y Ciencias en un Grado de Educación. Revista Digital de Investigación en Docencia Universitaria, 13(1), 38-56. doi: https://doi.org/10.19083/ridu.2019.743

[3] Navarro Soria, Ignasi; González Gómez, Carlota; López Monsalve, Begoña; Botella Pérez, Paula Aprendizaje de contenidos académicos y desarrollo de competencias profesionales mediante prácticas didácticas centradas en el trabajo cooperativo y relaciones multidisciplinares Revista de Investigación Educativa, vol. 33, núm. 1, enero-julio, 2015, pp. 99-117 Asociación Interuniversitaria de Investigación Pedagógica Murcia, España

DISORDERS OF SOCIAL COMMUNICATION AND THEIR IMPLICATIONS IN THE STUDENT

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Keywords: *Social communication; pragmatic skills; learning difficulties.*

Abstract

Students with social communication disorders (SSD) are characterized by presenting a combined difficulty in the use of language and communication. These difficulties translate into a lack of understanding of the message sent by the sender, as well as a lack of monitoring and adaptation of the social norms of verbal and non-verbal communication on a day-to-day basis. These deficits prevent effective communication from being carried out, as well as having repercussions on the development of social relations, access to jobs, and the participation of the affected student in the classroom.

In this work, a guide is presented with the symptoms associated with the identification of this disorder in students from an early age. It should be noted the importance of this adequate identification, since it is a syndrome that has been classified both within the language disorder (SLI - Specific Language Impairment) due to the semantic-pragmatic deficit, difficulties in the use of vocabulary and language skills, and within of autism spectrum disorder (ASD) due to strong social difficulties and deficiencies in the development of interpersonal communication skills.

Thus, the TCS (Treacher Collins syndrome) can cause academic problems in engineering students related to the lack of reading comprehension, since this has repercussions generating difficulties in solving problems that require some abstraction. Also, this profile of students often has difficulties in developing social skills that allow them to empathize emotionally with other colleagues or interlocutors, and even develop conversation topics that are contextualized with the situation in which the activity takes place.

As can be seen, all these difficulties can affect the student with TCS emotionally and affect her personal life. In such a way, that any effort that makes it possible to publicize the difficulties that this disorder presents among the teachers serves as a support for the teaching activity and will have repercussions in an improvement of teaching in the university stages.

References

[1] González, M., Rivas, R. M., & López, S. (2015). Trastorno de la comunicación social (pragmático): ¿síndrome o síntoma?. Revista de Estudios e Investigación en Psicología y Educación, (09), 012-014. https://doi.org/10.17979/reipe.2015.0.09.134

[2] American Psychiatric Association. (2014). Manual Diagnóstico y estadístico de los Trastornos Mentales (DSM-5). Madrid: Editorial Médica Panamericana.

[3] Bishop, D. V. M. y Norbury, C. F. (2002). Exploring the borderlans of autistic disorder and specific language impairment: a study using standardised diagnostic instruments. J Child Psychol Psychiatry, 43, 917-29.

[4] Autismo Diario. https://autismodiario.org/2013/01/24/adios-tgd-ne-bienvenido-scd/ (consultado el 08 de marzo de 2021).

WHAT DO WE KNOW ABOUT SUSTAINABLE CONSTRUCTION? THE IMPORTANCE TO LEARN FROM THE DISRUPTIONS AND MISTAKES. THE VENEZUELAN CASE

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Keywords: *Sustainability, Construction, Covid-19, Venezuela, Education*

Abstract

The construction stakeholders usually plan all the possible variables to guarantee the success of projects, as it must be. Still, in the end, the results frequently show that they were not sufficiently prepared for what construction reality presents. The accelerated changes, challenges, and uncertainties determine that the project performance often offers unexpected circumstances that make the project's development different from initially planned in terms of quality, time, or costs.

The circumstances that disrupt the construction industry are more frequent in developing countries and affect the developed ones. The Covid-19 pandemics, the 2011 Japan earthquake, the project delays, or corruption scandals show that the problems are everywhere. Therefore, construction education needs to incorporate essential learnings to face them. Starting from the understanding of the principles that sustain the construction and the sustainability significance, the stakeholders must be aware of the risks involved in this complex industry and the fragile balance that supports the success of every project. It is also fundamental for them to react promptly to changes and minimize construction risks and increase competitiveness. This is particularly important in our global communities since construction companies perform projects in different countries with socio-political realities very different and with construction workers moving from one project to another.

The changes in the industry determine that construction today must be global, competitive, sustainable, and adapt quickly to overcome disruptions, challenges, and new realities. This demands that its stakeholders act accordingly with such new circumstances. As current challenges can no longer be addressed only with traditional strategies, it is the aim of recent research to promote innovations in construction education. The goal is to include in construction education a critical review to allow individuals to go beyond their local perspectives and enrich their decision-making with a global view based on incorporating other non-traditional learnings and the anticipation of opportunities and risks.

With this objective, in the current article, the authors explain the complexity of construction, including its history, principles of sustainable construction, opportunities,

risks, and construction challenges, with corruption and Covid-19 as new goals to overcome the difficulties to implement sustainable construction.

From the perspective of Latin America, the authors introduce the Venezuelan case, with data about the delays in some Venezuelan infrastructure projects, to show the consequences of the infrastructure problems in terms of competitiveness loss, deterioration of the quality of life, increase in poverty levels and sustainability limitations. Moreover, a summary of the proposals of different experts to improve the construction performance is presented.

The expansion of the construction perspective incorporating critical analysis and comparisons with data and cases from diverse successes, disruptions, and mistakes may become an education innovation with added value to enrich the construction industry. Having actors more aware of the reality surrounding them may support the increase in competitiveness and sustainability of this vital industry, obtaining better construction performances.

References

[1] https://www.britannica.com/technology/construction Rev 5 August 2020.

[2] CIB UNEP-IETC. The Agenda 21 for Sustainable Construction, 2002.

[3] United Nations. Transforming our world. The 2030 Agenda for Sustainable Development. Assembly on 25 September 2015 Main Committee (A / 70 / L.1. 70/1).

[4] Bingsheng Liu, Bing Xue, Junna Meng, Xingbin Chen and Ting Sun. How project management practices lead to infrastructure sustainable success: An empirical study based on goal-setting theory. Engineering construction & architectural management. June 2020.

[5] Perrotti Daniel Economic Commission for Latin America and Caribbean. Characterization of the infrastructure gap in Latin America and the Caribbean. Technical report. October 2011.

[6] Du Plessis. A strategic framework for sustainable construction in developing countries. Construction Management and Economics, 25, 67-76, 2007.

[7] McKinsey. The next normal in construction How disruption is reshaping the world largest ecosystem https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/the-next-normal-in-construction-how-disruption-is-reshaping-the-worlds-largest-ecosystem?cid=other-eml-alt-mip-

[8] Cámara Venezolana de la Construcción. Plan Nacional de Infraestructura 2021-2033, 2020.

[9] L. Pietrosemoli, C. Rodríguez-Monroy. Characterization of the infrastructure and public services in Venezuela. Diagnosis and proposals. 5to Congreso Internacional de Innovación Tecnológica en Edificación. CITE 2020. Madrid, 2020.

[10] IEA. Global status report for building and construction 2019. Towards a zero-emission, efficient, and resilient buildings and construction sector. IEA International Energy Agency.

[11] Universidad Politécnica de Madrid. Escuela Técnica Superior de Edificación. Construcción Sostenible. Guía de aprendizaje. ANXPR/CL/001-01, 2016-2017

PROBLEMS DETECTED IN COLLABORATIVE CONSTRUCTION WORK

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Keywords: *collaborative working software, technical drawing knowledge, graphical language problems, 2D, 3D.*

Abstract

Engineering is a subject that ranges from extensive collaborations to small individual projects. In our interest in the study of collaboration, we have detected a series of problems in realizing construction and engineering projects that cover different aspects. Among them, it is worth highlighting the subject of technical drawing, the different terminology used in the projects, mainly when these are carried out in different locations, the massive use of assisted design software, and the difficulty of carrying out projects collaboratively.

Computer-aided design was a catalyst that has been fully implemented in Spain since the 90s in architecture and engineering. The most widespread application worldwide is AutoCAD. Students learn to carry out small projects with software applications. The basis of any project is the drawing of the object to be made. Teachers have noticed in the teaching of technical drawing fundamental deficiencies in the correct representation of objects. Similarly, those responsible for the projects have shown the absence of this knowledge. This significantly impairs the definition of certain essential elements that, later, must be specified in the execution of the works due to the changes that occur between what is projected and what can actually be executed. On the other hand, during the construction boom and mainly due to the commercialization of homes, multiple 3D software emerged to facilitate the prospective buyer the vision of their future home. The proliferation of this type of software has posed a series of problems as students master the computer tool but not the transition from 3D to 2D and vice versa. Although AutoCAD made it easy to carry out projects with excellent efficiency, it has failed, despite its many updates, to become a collaborative tool that allows several individuals to work on the same file at the same time. However, architecture and engineering projects have always been examples of collaboration, as shown in the Collaborative Intelligence model proposed in our research articles. Specifically, this model is based on three fundamental pillars: area of knowledge, collaborative technology, and intellectual cooperation. Of these three pillars of Collaborative Intelligence, we are most affected by the area of knowledge and collaborative technology since this is where more deficiencies have been detected.

This study aims to highlight these difficulties and solve these problems that project managers have detected in their collaborators for students to acquire these skills. We

consider that the acquisition of these competencies is based on correct technical drawing learning, although the software is the main vehicle of interaction.

References

[1] J. Osnovina, «7th International Scientific Conference - Engineering for Rural Development, Proceedings,» de *Method of Calculation the Number of Dimensions*, Jelgava, LATVIA, 2008.

[2] M. Violante, S. Moos y E. Vezzetti, *A methodology for supporting the design of a learning outcomes-based formative assessment: the engineering drawing case study. European Journal of Engineering Education,* vol. 45, nº 2, pp. 305-327, 2020.

[3] S. Murad, I. Passero, R. Francese y G. Tortora, «An Empirical Evaluation of Technical Drawing Didactic in Virtual Worlds,» *International Journal of Online Engineering,* vol. 7, nº 1 (especial), pp. 23-30, 2021.

[4] N. Kirci, «The Difficulties of DESIGN TRAIN-ing.,» *Multidisciplinary Journal of Educational Research,* vol. 7, nº 2, pp. 184-215, 2017.

[5] M. Lee y Y. Lan, «From Web 2.0 to Conversational Knowledge Management: Towards Collaborative Intelligence,» *Journal of Entrepreneurship Research. (2). Nº2,* pp. 47-62, 2007.

[6] J. Castelan y D. Fritzen, «Teaching of Design and Manufacturing Tools in a Contextualized Environment,» de *Conferencia: 3rd Interdisciplinary Engineering Design Education Conference (IEDEC)*, Santa Clara, CA, 2013.

[7] P. Rowe, Design Thinking, Cambridge, MA: MIT Press, 1987.

[8] A. Daryusi y G. Köhler, «Using Eye Tracking Technology in Design-Possibilities and Limitations.,» de *New Perspectives in Science Education 8th Edition*, Florencia. Italia, 2019.

[9] V. Villa, B. Motyl, D. Paderno y G. Baronio, «TDEG based framework and tools for innovation in teaching technical drawing: the example of LaMoo project.,» *Computer Applications in Engineering Education,* vol. 26, nº 5, pp. 1293-1305, 2018.

[10] T. Megayanti, L. Widaningsih y N. I. K. Dewi, «The Mapping of Vocational School with Building Technical Drawing Concentration: Opportunities and Challenges in Construction Industry's Needs,» de *5th UPI International Conference on Technical and Vocational Education and Training (ICTVET 2018) (pp. 257-261). Atlantis Press.*, 2018.

[11] M. Makgato y S. Khoza, «Difficulties experienced by pre-service teachers and lecturers in engineering graphics and design course at a university in South Africa,» *International Journal of Educational Sciences,* vol. 14, nº 1-2, pp. 157-166, 2016.

EXPERIENCIA CON HERRAMIENTA VIRTUAL PARA LA TRANSFERENCIA DE CONOCIMIENTOS DE CONSTRUCCIÓN Y MEDIO AMBIENTE PARA ALUMNOS CON SÍNDROME DE DOWN

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Keywords: *entorno virtual de aprendizaje, discapacidad intelectual, construcción, medio ambiente, Síndrome de Down.*

Abstract

Las tecnologías de la información y comunicación (TIC) crean nuevas oportunidades en el ámbito educativo favoreciendo el acceso al conocimiento, el desarrollo de destrezas, de habilidades colaborativas o el fomento de valores, entre otros [1-3].

Este tipo de recursos son una herramienta de gran valor para las personas con discapacidad intelectual puesto que generan nuevas posibilidades de acceso al conocimiento propiciando la adaptación a sus necesidades. Siendo igualmente de gran valor para los docentes [4-6].

El presente artículo recoge la experiencia de implantación de una herramienta virtual de aprendizaje para acercar unos conocimientos básicos sobre sostenibilidad ambiental en entornos de construcción a personas con discapacidad intelectual.

En sí misma la herramienta surge dentro del Proyecto "**SUSKIDS**" 2018-ES01-KA201-050639, cuyo objetivo es la capacitación de profesionales y familiares para transmitir el conocimiento de habilidades sostenibles a personas con Síndrome de Down [7].

La plataforma de aprendizaje contiene bloques temáticos sobre sostenibilidad ambiental, de los cuales, un bloque está dedicado a la construcción y medio ambiente. Los contenidos están adaptados a diferentes habilidades (Nivel I y II, según el Marco Europeo de Cualificaciones).

La herramienta virtual se ha empleado en un grupo de alumnos con discapacidad intelectual, con edades comprendidas entre 14 y 20 años, pertenecientes al Centro Concertado de Educación Especial Estela.

Las actividades se desarrollan utilizando herramientas interactivas TICS, como soporte para las explicaciones, aportando imágenes, dibujos y pictogramas que ayudan a la compresión de los conceptos siendo el entorno virtual favorecedor y motivador para los alumnos fomentando el proceso de enseñanza – aprendizaje.

La sencillez de la herramienta ha permitido a los alumnos aprender a manejarla con rapidez además de fomentar su autonomía.

Los diferentes indicadores proporcionan incentivos los cuales han potenciado el interés y el nivel de atención de los alumnos. Éstos se han mostrado muy receptivos generándose una actitud positiva hacia el aprendizaje.

La plataforma recoge evaluaciones para alumnos y profesores cuya finalidad es dar lugar a futuras versiones mejoradas.

Actualmente gracias a las nuevas tecnologías es posible acercar y facilitar cualquier tipo de aprendizaje a diferentes colectivos haciendo accesible los contenidos permitiendo formar en actitudes y competencias sostenibles.

References

[1] M.J.S.Díaz and J.V. Berrocoso, Bordon. Revista de Pedagogía. Teacher profiles in a context of digital transformation at school. 72 (2020) 151–173. DOI: 10.13042/Bordon.2020.72965

[2] B. Hernández Sánchez, G. Vargas Morua, G. González Cedeño, J. C. Sánchez García, International Journal of Developmental and Educational Psychology, Discapacidad intelectual y el uso de las tecnologías de la información y comunicación: revisión sistemática (2020) 177–188. DOI: https://doi.org/10.17060/ijodaep.2020.n1.v2.1830

[3] T. Chalarca, D., Blanco Palencia, S. M., Diaz Cabrera, G. Mercedes, Digital Education Review, Tecnologías y metodologías aplicadas en la enseñanza de la lectoescritura a personas con Síndrome de Down, (2016), 265–283.

[4] R. Morilla, Revista internacional de educación, tecnologías de la información y comunicación aplicadas a la educación inclusiva, logopedia y multiculturalidad, Las TICs en alumnos y alumnas con síndrome de Down, 1 (2) (2012), 20–26.

[5] O. Tudela, Juana María, Nuevas tecnologías y aprendizaje matemático en niños con Síndrome de Down, FEISD, Obra Social Caja Madrid, 2005.

[6] M.A. Peña-Hita, E. Romero-Aranda, Universidad de Jaén. Pedagogía, Síndrome de Down y TIC: Análisis de recursos tecnológicos para el alumnado, 2019. https://hdl.handle.net/10953.1/8812

[7] Project “SUSKIDS Enabling Profesional and Families to Transfer Sustainable Knowledge and Skills to Down Syndrome Individuals”. ERASMUS+KA2. Strategic Associations School Education. 2018-1-ES01-KA201-050639. Available online: http://suskids.eu/ (accessed on 11 March 2021).

ANÁLISIS DE LA INTERACCIÓN DE LOS ALUMNOS DE INTERCAMBIO ERASMUS EN LOS RESULTADOS DE GRUPO. CASO DE LA ASIGNATURA DE CONSTRUCCIÓN POPULAR (II)

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Keywords: *alumno, intercambio, grupo, erasmus, magallanes / student, exchange, group, erasmus, magallanes.*

Abstract

Este trabajo presenta los resultados del análisis realizado sobre los datos obtenidos del rendimiento de los alumnos en la asignatura optativa de Construcción Popular Española. Concretamente se han tratado los aspectos relacionados con la presencia de alumnos de intercambio en la misma.

La citada asignatura se impartió por primera vez en el curso 2013-2014. En lo referente a la presencia de alumnos de intercambio, se han incorporado en los cinco últimos cursos, representando un porcentaje sustancial de los alumnos totales.

El atractivo de la asignatura para estos alumnos radica en el hecho de ser una asignatura optativa, presentando posibilidades más plásticas curricularmente; tratar un contenido propiamente dedicado al ámbito español, que resulta especialmente indicado para un alumno universitario con curiosidad por una cultura diferente a la propia y que sin embargo se refiere a una tecnología universal como es la construcción, por lo tanto, fácilmente integrable en sus propios conocimientos.

Para este trabajo se han tenido en cuenta los factores referidos a la interacción entre los alumnos que son de intercambio y los que no lo son. Tratando de obtener conclusiones que permitan orientar al alumno de intercambio en el desarrollo de la asignatura, en la forma de afrontarla y de trabajo con el resto de los alumnos [1].

Para superar la asignatura de Construcción Popular Española es necesario realizar un trabajo individual y otro en grupo (equipo) [2]. El primero versará sobre un edificio de

propio de esta clase de patrimonio, realizando un análisis pormenorizado de las características físicas del mismo y de las estrategias constructivas elegidas para enfrentarse o responder a los condicionantes del medio en el que se encuentra. En el segundo, el que deben realizar en grupo (trabajo de equipo), se les pide que elaboren un análisis de los factores ambientales, geográficos, geológicos, climáticos, históricos y económicos de una de las comarcas históricas de España y un catálogo de las soluciones constructivas que responden a estas características.

El trabajo en grupo (trabajo de equipo) es por tanto sustancial para superar esta asignatura [3], exigiendo de los alumnos una relación estrecha de trabajo, intercambio, discusión y colaboración. A priori no se exige que los grupos de trabajo sean mixtos, por lo tanto, se forman equipos en los que los componentes son todos de intercambio, equipos con ambos tipos y equipos sin alumnos de intercambio. Aunque si se efectúa la recomendación de que los grupos sean mixtos, asimétricos y cultural y lingüísticamente variados.

Esta libertad permite ahora analizar resultados de equipos con diferentes composiciones. Para el análisis de conjunto se han tenido en cuenta factores como la proporción de alumnos de intercambio total, calificación individual, calificación media del grupo, calificación media discriminada, calificación media de los equipos en relación con su composición, etc.

Se ha observado que el trabajo en grupo, por lo general, mejora las calificaciones frente a los trabajos individuales [4].

Referencias

[1] T. Moreno Olivos, “La evaluación del aprendizaje en la universidad. Tensiones, contradicciones y desafíos.,” *Rev. Mex. Investig. Educ.*, vol. 14, no. 41, pp. 563–591, 2009, [Online]. Available: https://www.redalyc.org/pdf/140/14004110.pdf.

[2] J. Bacallao, J. Parapar, and M. Roque, “La modelación jerárquica y los efectos de grupo en la predicción del rendimiento académico,” *Educ. Media Super.*, vol. 18, no. 2, pp. 25–37, 2004, Accessed: Mar. 13, 2021. [Online]. Available: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0864-21412004000200001&lng=es&nrm=iso&tlng=.

[3] R. Carballo, *Experiencias en grupo e innovación en la docencia universitaria*. Madrid: Editorial Complutense, S.A., 2002.

[4] G. García López de la Osa, S. González Rodrigo, P. C. Izquierdo Gracia, I. Martínez Pérez, R. Tendero Caballero, and M. Valiente López, “Análisis de la interacción de los alumnos de intercambio Erasmus en los resultados de grupo. Caso de la Asignatura de construcción popular.,” in *2º Congreso Internacional de Innovación Educativa en Edificación CINIE 2021*, 2021, p. 127, [Online]. Available: https://edificacion.upm.es/congresos/libros_actas/Libro_de_Abstracts_CINIE2018.pdf.

LA ENSEÑANZA DEL LEVANTAMIENTO DE CROQUIS EN LA PREPARACIÓN DE OPOSICIONES A OFICIAL DE BOMBEROS

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Keywords: *croquis, dibujo, enseñanza, oposición, bombero / sketch, drawing, teaching, fireman.*

Abstract

Un bombero, es decir, un miembro de los servicios contraincendios y de salvamento, requiere el uso del croquis en su ejercicio profesional como parte de la toma de datos para ejercer algunas de sus funciones. Entre ellas estarían la investigación de siniestros, la evaluación previa de siniestros y otros informes de naturaleza muy variable.

Por otro lado, las unidades de inspección de bomberos de los ayuntamientos realizan informes con diferentes objetos, entre los que se encuentran desde los de tipo operacional para la aprobación de una licencia de primera ocupación, hasta peritajes judiciales, para esos procedimientos judiciales en los que se vea involucrada, independientemente del papel ejercido en el asunto, alguna administración del estado.

Finalmente, para la evaluación previa de riesgos de intervenciones necesarias, con mayor o menor urgencia o las englobadas en el ámbito de la prevención operativa. En este sentido es de destacar la preparación e importancia de que dotan a los “dibujos operacionales” en los cuerpos de bomberos franceses [1].

La mayor dificultad en el cometido de la enseñanza del levantamiento de croquis en la preparación de oposiciones a oficial de bomberos estriba en la enorme diversidad de la formación de los alumnos, ya que en la actualidad se admite a la oposición a cualquier persona que posea un título de arquitecto, ingeniero o grado en la rama de conocimiento de Ingeniería y Arquitectura. Sirva como ejemplo la convocatoria para turno libre de oficiales de bombero del Excelentísimo Ayuntamiento de Madrid [2]:

"3.2.c) Estar en posesión o en condiciones de obtener el título de Arquitecto o Ingeniero o alguno de los títulos de Grado incluidos en la rama de conocimiento de Ingeniería y Arquitectura, conforme a lo previsto en el artículo 12.4 del Real Decreto 1393/2007, de 29 de octubre, por el que se establece la ordenación de las enseñanzas universitarias y normativa concordante".

Esto implica que pueden presentarse a las oposiciones (y aprobarlas), además de los arquitectos, arquitectos técnicos y graduados en edificación, ingenieros de cualquier tipo, con formaciones tan dispares y lejanas del mundo de la construcción (que es uno de los ámbitos mayoritarios de trabajo del bombero) como biotecnología, ciencias agrarias, ingeniería marítima, inteligencia artificial, informática, etc.

A ello hay que añadir la complejidad de la prueba, que consiste en introducir al opositor en un recinto a oscuras y darle entre 10 y 15 minutos para que realice un croquis con el único uso de tabla de apuntes, lápiz, metro y linterna.

En la superación de estas dificultades y el logro del objetivo por parte de los opositores, influyen, desde el punto de vista docente, la técnica de enseñanza de los distintos conceptos necesarios, la formación en materia de construcción y la práctica de simulacros de ejercicios, en las mismas condiciones que se sufren en la prueba real [3].

Referencias

[1] P. de Paris, "Découvrez les dessinateurs opérationels de la BSPP," youtube, Francia, 2017.

[2] A. de Madrid, *ANEXO BASES ESPECÍFICAS POR LAS QUE SE REGIRÁ LA CONVOCATORIA DE PRUEBAS SELECTIVAS PARA PROVEER PLAZAS DE OFICIAL DEL CUERPO DE BOMBEROS DEL AYUNTAMIENTO DE MADRID*. España: Ayuntamiento de Madrid, 2015, p. 48.

[3] G. García López de la Osa, "APUNTES PARA LA PREPARACIÓN DEL EJERCICIO DE CROQUIS DE LAS OPOSICIONES A OFICIAL DE BOMBEROS DEL AYTO. DE MADRID." Madrid, p. 37, 2015.

EXPERIENCES ON HYBRID FACE-TO-FACE AND ONLINE TEACHING FOR SMART CONSTRUCTION: BIM

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Keywords: *Building Information Modelling (BIM), civil engineering, hybrid teaching, online teaching.*

Abstract

Madrid Region decided to follow a hybrid teaching methodology for the academic year 2020/2021. The universities have combined face-to-face and online teaching simultaneously given the situation. We are aware that in the first levels the online methodology that involves les traditional classroom methodology may be detrimental.

In some cases, online methodology prevents the student from interacting, participating in class, and socializing. They may even feel uncomfortable if they need to raise any doubt. However, in higher levels this situation may alter radically. The classes are small and the communication with the student is fluid and close. In such cases, virtual learning is an added value because it enables us to convey knowledge and frees us from the need for presence in the classroom.

Furthermore, the virtual learning requires a significant initial effort of the lecturers. In order to avoid doubts about the final examinations [1], the final examen can be replaced by the presentation of a final project with reduced groups. Some of the main obstacles can be addressed, at least partially if they are reduced groups. Above 50 students would be more complicated to carry out qualitative follow up of the student performance.

In the module “Smart Construction: BIM” [2, 3] in the Master´s Degree of Civil Engineering (Máster en Ingeniería de Caminos, Canales y Puertos) at UPM, part of the runtime has been dedicated to the use of software. Effective resources make possible to work with the software remotely and in a collaborative way. Moreover, recording some of the lectures and allowing the students access at any time can help them use the main messages when they face their project. If the classes about the software are available 24 hours a day, the barriers of time and space disappear, thus, adapting the lessons to the needs of the student. This has shown to be more productive and efficient. In addition, this recorded lessons together with their effort in their own project, can be of great interest in terms of life-long learning given that they keep both the project and the video-lesson for their professional and imminent future as Civil Engineers. Figure 1

shows the achieved level by the students in the final project combining the hybrid and traditional methods.

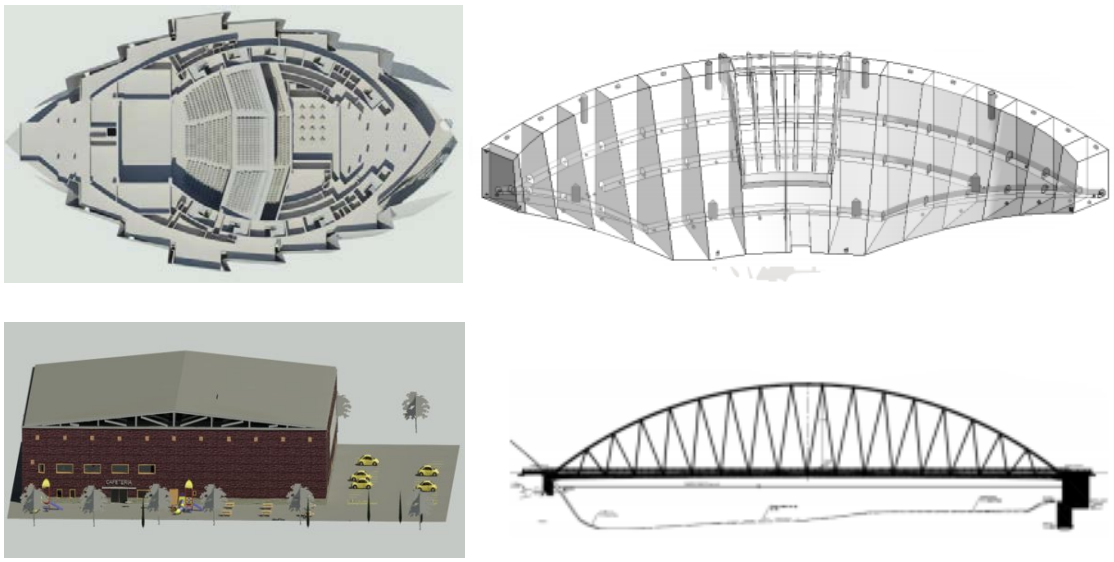

Figure 1: *Upper part: modelling in hybrid method of an auditorium and dam, Lower part: modelling in traditional method of a sports center and a bridge.*

Even though that the online and distance teaching has many supporters and opponents, some experiences have shown that some tools are remarkably effective and that they have come to stay after the COVID-19 lockdown [4, 5]. As can be seen, the results are once again satisfactory. The students have adapted to the changes, the communication with the students was fluent and the work was carried out in a new collaborative and learning environment. Therefore, virtual learning in combination with traditional theoretical lectures onsite have shown to add value to the final performance and life-long learning of the students.

References

[1] García-Alberti, M., Suárez, F., Chiyón, I., & Mosquera Feijoo, J. C. (2021). Challenges and Experiences of Online Evaluation in Courses of Civil Engineering during the Lockdown Learning Due to the COVID-19 Pandemic. Education Sciences, 11(2), 59.

[2] Moreno Bazán, Ángela, et al. "New Perspectives for BIM Usage in Transportation Infrastructure Projects." Applied Sciences 10.20 (2020): 7072.

[3] García Alberti, Marcos, et al. "Implementation of a pilot module of BIM in civil engineering school: results and conclusions after the first academic year." CINIE 2019, 6, 7 y 8 of March 2019.

[4] Pardo Iranzo, Virginia. "La docencia online: ventajas, inconvenientes y forma de organizarla." Iuris Tantum Revista Boliviana de Derecho 18 (2014): 622-635.

[5] García-Planas, María Isabel, and Judit Taberna Torres. "Transición de la docencia presencial a la no presencial en la UPC durante la pandemia del COVID-19." IJERI: International Journal of Educational Research and Innovation 15 (2021): 177-187.

STRATEGIES AND CHALLENGES FOR THE PROMOTION OF A RESPONSIBILITY MINDSET IN TECHNICAL CAREER STUDENTS DURING INTERNSHIPS

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Keywords: *responsibility, citizenship, internships, life-long learning, values*

Abstract

When referred to economic activities and innovation, the concept of responsibility summarizes a wide range of elements related to the recent shift towards other values to the ones traditionally mainly considered. While the shareholder approach, headed by M. Friedman, defends that companies should focus on shareholders' benefit, the stakeholder approach, headed by E. Freeman, defends that the impacts of organizations' actions on multiple stakeholder groups are to be considered [1]. Sustainability, triple impact, social economics, societal impact, and other related terms share the commitment to show responsible attitudes during productive or innovative processes.

However, a key question arises: how to define and promote responsibility among professionals at different organizational levels?. Identifying fundamental knowledge, skills and attitudes, as well as goals and action schemes for intervention, is a fundamental task to solve this question. In this case, personal, social and civic competences as defined by European lifelong learning frameworks, and the European common values, are useful resources for developing strategies and roadmaps [2], [3].

These resources are a valuable starting point to foster reflection on sustainability and circularity, equality, social justice, fair commerce and stakeholder engagement, among other ethical, social and environmental concerns. Competences and values, along with widely accepted social responsibility frameworks, may inspire actions that transform responsibility into accountability (formal regulations), governance (internal codes) or exemplarity (best practices).

Moreover, the development of personal, social and civic competences enhances the personal and professional brand and broadens the scope of non-technical skills, which are being increasingly demanded. The future of work is characterized by new sensibilities and concerns represented by trends like value-sensitive design (VSD), social innovation, impact investment. The development of such competences and the immersion of professionals into the responsibility frameworks should start as earliest as possible and should be reinforced and updated through life-long learning strategies.

This paper deals with the contextual factors and key strategies for promoting responsibility-related values and competences (knowledge, skills, attitudes) during internships carried out by technical career students. The aim is to explore the advantages and challenges of working on a responsibility approach at this professional career stage.

Promoting values and knowledge in the realm of responsibility requires a challenging task, which entails a strong focus on citizenship and ethics. At the same time implies finding ways to deal with the commitment, engagement, and empowerment of professionals. For the specific case of internships, the present text will propose ways to identify ideas and mechanisms that foster reflection on responsibility and citizenship competences.

References

[1] R. E. Freeman y D. L. Reed, Stockholders and Stakeholders: A New Perspective on Corporate Governance, Calif. Manage. Rev., vol. 25(3), Apr 1983, 88-106, https://doi.org/10.2307/41165018.

[2] [2] European Union (EU), Council Recommendation of 22 May 2018 on key competences for lifelong learning, Off. J. Eur. Union, May 2018, [Online]. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.C_.2018.189.01.0001.01.ENG&toc=OJ%3AC%3A2018%3A189%3ATOC.

[3] European Commission y Directorate-General for Education, Key competences for lifelong learning. 2019. https://doi.org/10.2766/569540

IMPACT OF META-LEARNING ON ACADEMIC PERFORMANCE AND MOTIVATION OF FIRST YEAR BACHELOR STUDENTS IN THE AREA OF DESCRIPTIVE GEOMETRY

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Keywords: *Meta-learning, Geometry, Peer-review, cooperative learning.*

Abstract

This document presents the results of an educational research and innovation project carried out during two consecutive academic years. Through the inclusion of tools such as the rubric, and strategies such as co-evaluation and self-evaluation, the improvement of performance and motivation in first year bachelor students has been investigated, specifically in the axonometric system syllabus, orthogonal projections, and normalization. This research has been developed in four different groups of two teaching centres. Two of the groups received traditional training in the 2018/2019 academic year and the other two were subjected to the innovation project during the 2019/2020 academic year. The initial motivation of both groups was quite similar. In the experimental group, a significant improvement in motivation was observed after teaching the syllabus. After the application of the PLE, the increase in motivation has been more remarkable than that of academic performance. Self-evaluation and co-evaluation have had a direct and positive impact on student motivation and are directly related to academic performance.

References

[1] Double, K.S., McGrane, J.A. & Hopfenbeck, T.N. (2020). The Impact of Peer Assessment on Academic Performance: A Meta-analysis of Control Group Studies. Educ Psychol Rev 32, 481–509.

[2] Kang'ethe, S.M. (2014) Peer Assessment as a Tool of Raising Students' Morale and Motivation: The Perceptions of the University of Fort Hare Social Work Students. International Journal of Educational Sciences, 6:3, 407-413.

[3] Johnston, L., & Miles, L. (2004). Assessing contributions to group assignments. Assessment and Evaluation in Higher Education, 29(6), 751–768. https://doi.org/10.1080/0260293042000227272

[4] Lavrysh, Y. (2016). PEER AND SELF-ASSESSMENT AT ESP CLASSES: CASE STUDY. Advanced Education, 0(0), 60–68. https://doi.org/10.20535/2410-8286.85351

HYDRAULIC ANALYSIS IN THE NETWORK OF WATER SUPPLY DOMICILIARY AS AN ALTERNATIVE FOR HOME EXPERIMENTS

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Keywords: *pressure, energy, Reynolds, hydraulic problems, experiments*

Abstract

The use of physical models in teaching hydrodynamics has pedagogical advantages and benefits that have not been met due to COVID meeting in-person restrictions. As a result, the Laboratory of Hydraulics (LIH) in the Civil Engineering School at the Central University of Ecuador (UCE) and the Private Technical University of Loja (UTPL) launched a methodology based on students experimenting with tools and systems they find at home.

As a part of this methodology, students measured discharge, pressure, spatial distribution, internal diameter, and roughness in their pipe domiciliary connections. These data allow calculating the head pressure changes due to friction in domiciliary connections. Because head pressure changes usually contain hydraulic design problems, these experiments have been a fundamental source for hydraulic problem-solving.

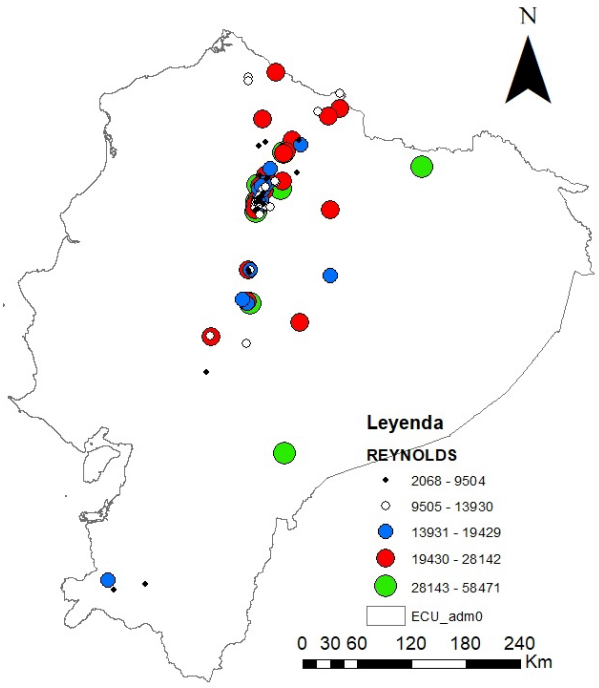

Figure 1: *Reynolds distribution in Ecuador*

Head pressure changes depend on several hydraulic characteristics such as discharge, Reynolds number [1] , pressure, location, velocity, and temperature [2]. These parameters are important for students to get familiar with prototype case studies.

The results of these experiments have provided 181 measurements and data distributed in different parts of Ecuador. These data clearly exposed that turbulent flow is predominant using the Reynolds number (Figure 1). Furthermore, design velocity is exposed in water supply systems in figure 2 with a range between 0,5 to 2 m/s while head losses in domiciliary systems are 3,8 meters (Figure 3).

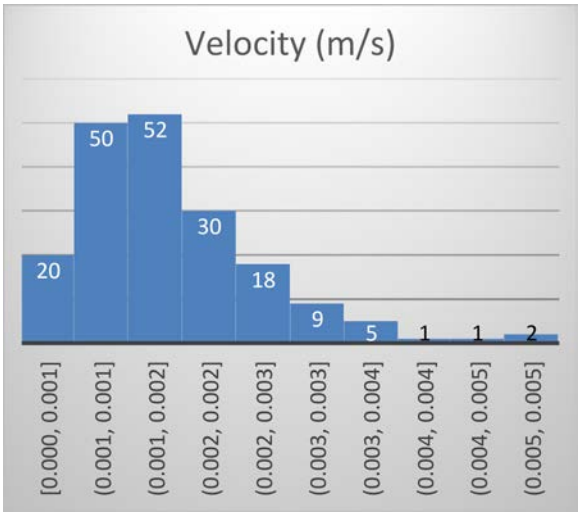

Figure 2: *Frequency of Velocity distribution*

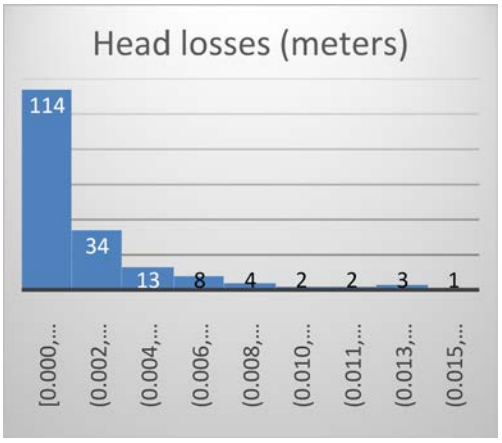

Figure 3: *Frequency of head losses*

References

[1] A. Avci and I. Karagoz, “A new explicit friction factor formula for laminar, transition and turbulent flows in smooth and rough pipes,” *Eur. J. Mech. - BFluids*, vol. 78, pp. 182–187, Nov. 2019, doi: 10.1016/j.euromechflu.2019.07.007.

[2] G. P. Das, *Hydraulic Engineering: Fundamental Concepts*. New York, UNITED STATES: Momentum Press, 2015.

SUSKIDS: MATERIALES DE APRENDIZAJE Y RECURSOS PARA LA TRANSFERENCIA DE CONOCIMIENTOS EN HABILIDADES DE RECICLAJE A PERSONAS CON SÍNDROME DE DOWN

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Keywords: *Sostenibilidad, Síndrome de Down, Reciclaje, Educación inclusiva, Discapacidad*

Abstract

Los educadores pueden influir en las oportunidades de los estudiantes en adquirir conocimientos en el ámbito de la educación ambiental, crear actitudes positivas y practicar habilidades [1]. En la actualidad, faltan materiales de aprendizaje, recursos educativos y currículos coherentes en el conjunto de la Unión Europea que estén destinados a personas con Síndrome de Down en este ámbito.

El Proyecto "SUSKIDS: Enabling professionals and families to transfer SUstainable knowledge and SKills to Down Syndrome individuals" [2] pretende conectar la educación y la formación de personas con Síndrome de Down en el campo de la sostenibilidad, el reciclaje y la educación ambiental, y para ello utiliza un enfoque centrado en la adquisición de nuevos hábitos a través de aprendizaje basado en juegos.

Así, los objetivos específicos de SUSKIDS son:

- Diseñar herramientas y guías de aprendizaje y evaluación para promover las habilidades relacionadas con la sostenibilidad y el autocuidado en personas con síndrome de Down.
- Mejorar las habilidades de los formadores y educadores, dotándolos de herramientas y recursos en reciclaje y construcción.
- Contactar a políticos del ámbito de la educación e instituciones que trabajen con personas con Síndrome de Down, para promover estos enfoques e implicar a más personas con discapacidades en la Sociedad, mejorando su integración digital.
- Desarrollar metodologías más aplicables y fáciles de implementar, como el aprendizaje personalizado, o el aprendizaje basado en investigación, juegos y proyectos, para personas con Síndrome de Down.

El proyecto ha desarrollado diversas herramientas innovadoras, para ayudar a transmitir conceptos científicos sobre el reciclaje y la sostenibilidad a personas con Síndrome de Down. SUSKIDS fija los siguientes Intelectual Outputs como resultados:

- I01 Toolkit for recycling skills knowledge transfer to Down Syndrome Individuals
- I02 Plataforma Virtual de Aprendizaje (VLE)
- I03 Curso validado y reconocido por el National Frameworks of Qualifications
- I04 Guías de evaluación validadas y reconocidas por el European Framework of Qualifications

El primero de ellos, el denominado "Toolkit for recycling skills knowledge transfer to Down Syndrome Individuals", está dirigido a profesores, técnicos terapeutas, asociaciones e investigadores en el campo de la Educación Especial. Aunque los contenidos desarrollados están dirigidos a personas con Síndrome de Down, pueden ser adaptados a otras discapacidades y a personas con necesidades especiales diferentes, en diferentes etapas y/o formaciones profesionales. En este documento también denominado de "Buenas Prácticas", se presentan las directrices metodológicas y los aspectos didácticos considerados, con el fin de proporcionar los recursos clave a los grupos destinatarios de la herramienta, en relación con el compromiso de los usuarios finales y su interacción con las herramientas de las TICs. Recoge también los temas definidos y su desarrollo, así estas "Buenas Prácticas" permiten que los profesores y alumnos adquieran vocabulario y conceptos relacionados con el tema, así como la compresión del origen y los impactos de los aspectos ambientales del mundo.

References

[1] Chawla, L., Cushing, D.F., 2007. Education for strategic environmental behavior. Environ. Educ. Res. 13, 437–452. https://doi.org/10.1080/13504620701581539

[2] http://suskids.eu/

COMBINANDO ENSEÑANZAS TÉCNICAS Y EMPRESARIALES EN LA UNIVERSIDAD POLITÉCNICA DE MADRID: ANÁLISIS DEL PERFIL DEL ALUMNADO DE DOBLE GRADO

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Keywords: *Doble Grado, Arquitecto Técnico, Administración y Dirección de Empresas, Alumnado.*

Resumen

Los dobles grados se han erigido como una alternativa atractiva para los estudiantes universitarios españoles [1]. La oferta de titulaciones complementarias que las universidades ofrecen bajo la denominación de doble grado es muy variada, habiéndose multiplicado casi por cuatro en los últimos seis años [2,3]. Recientemente, la Universidad Politécnica de Madrid ha implantado dobles grados que combinan enseñanzas técnicas con enseñanzas del campo de las ciencias sociales. Es el caso de los dobles grados en Edificación y Administración y Dirección de Empresas, en Ingeniería Civil y Territorial y en Administración y Dirección de Empresas y en Ingeniería Informática y en Administración y Dirección de Empresas [4]. La incorporación de competencias y asignaturas propias de la economía y de la empresa en los planes de estudio de la UPM ha sido frecuente, a pesar del matiz tradicional, básicamente técnico, de las Escuelas de la UPM. Los dobles grados, alargan la etapa del estudiante, pero ofrecen una formación mucho más sólida en dichas disciplinas [2]. En este contexto, resulta de interés profundizar en las características y preferencias del alumnado UPM que cursa los dobles grados con base en Administración y Dirección de Empresas. Para ello hemos realizado una encuesta a alumnos de primer, segundo, tercer y cuarto curso del Doble Grado en Edificación y Administración y Dirección de Empresas de la UPM. La encuesta consta de 17 preguntas, divididas en cuatro bloques, donde analizamos (1) los conocimientos previos; (2) el interés y los motivos para cursar el doble grado; y (3) las expectativas de futuro; (4) los resultados y conocimientos adquiridos. Los resultados del trabajo revelan que una mayoría de alumnos que acceden al doble grado lo hacen con calificaciones medias claramente superiores a la nota de corte. Sin embargo, la gran mayoría accede

sin conocimientos previos en materia de economía y empresa, lo cual podría afectar a su rendimiento en las asignaturas propias del grado en ADE. El principal motivo por el que los estudiantes deciden cursar el Doble Grado es la posible mejora en la empleabilidad que podría derivarse de tener dos titulaciones de grado, y la aportación que los conocimientos en administración de empresas pueden suponer para su futuro desempeño profesional. Aunque un 20% de los alumnos declara que querría realizar un posgrado en economía y empresa solo un 5% de los encuestados querría centrar su desarrollo profesional en esta área. Así, el Doble Grado en Edificación y ADE se concibe como un programa que permite a los futuros egresados adquirir conocimientos, destrezas y habilidades en el ámbito de la administración y dirección de empresas que se espera contribuyan al desarrollo de sus carreras profesionales en el ámbito de la Ingeniería y la Edificación con una mayor perspectiva de gestión empresarial, y a una mejor empleabilidad.

Referencias

[1] Ministerio de Industria, Energía y Turismo. Libro Blanco para el Diseño de las Titulaciones Universitarias en el Marco de la Economía Digital, 2015.

[2] Knight, J. *Doubts and Dilemmas with Double Degree Programs,* in: De Wit (Ed)., Globalisation and Internationalisation of Higher Education. Revista de Universidad y Sociedad del Conocimiento 8 (2011) 297-312.

[3] ANECA. Catálogo titulaciones universidades españolas https://srv.aneca.es/ListadoTitulos/busqueda-titulaciones, 2021 (consultado el 17 de marzo de2021)

[4] UPM. Catálogo grados en la UPM. https://www.upm.es/FuturosEstudiantes/Estudios_Titulaciones/Estudios%20Oficiales%20de%20Grado, 2021 (consultado el 17 de marzo de 2021)

THE USE OF FLIPPED CLASSROOM ACTIVE METHODOLOGY AS A DIDACTIC TOOL TEACHING STATISTICAL INFERENCE

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Keywords: *Flipped classroom, statistics, inference, collaborative work, social sciences.*

Abstract

Over the last decades, the traditional teaching model is being increasingly questioned, and the active teaching methodologies present a real alternative that can be used at different educational stages. This idea is reflected in the document “Proposals for the renovation of the educational methodologies in the university” launched by the Ministry of Education [1], where one of the main objectives is to boost the implementation of the innovative teaching methods.

There are many active methodologies that are being implemented in practice with the aim to obtain a significant learning, which means the learning based on the ability to relate previously obtained knowledge of a student with a new information given by a professor [2]. In this regard, Flipped Classroom methodology allows teachers to maximize classroom time, working directly on the application of the theoretical content seen in the videos [3].

In view of the foregoing, the main purpose of this research is to use Flipped Classroom methodology teaching statistical inference in the social sciences grades. Moreover, collaborative learning has been used in combination with this methodology, including group dynamics in the practical part of the course.

Evaluation of the results arising from this work has been performed from the motivational point of view and from the point of view of academic results. Questionnaires of the quantitative methodology have been designed for both cases, with the aim to observe significant differences between the traditional methodology and Flipped Classroom method.

Obtained results show a significant increase in the motivation of the students, with 90% of students who would repeat statistical education using the same methodology. Additionally, it has been observed that less students drop a class, with a follow up of 85% of students enrolled in practical classes.

When it comes to academic achievement, a control group and an experimental group have been created in order to evaluate the improvement of the results. Pre-test has been performed in order to confirm the equality of means and variances in both groups. The results of the post-test do not show any significant improvement in the experimental group, however, in terms of numbers, an average with a superior value has been obtained.

As a general conclusion, Flipped Classroom methodology is a good alternative in the university education, as it significantly increases the motivation and the follow up of the class by the students.

References

[1] Propuesta para la renovación de las metodologías activas en la Universidad (2006). Ministerio de educación y ciencia. Editorial: Secretaría general técnica.

[2] Ausubel, D. Teoría del aprendizaje significativo. Fascículos de EIF, (1983) 1 (1-10)

[3] Lage, M., Platt, G., Treglia,M. Inverting the Classroom: A Gateway to creating an Inclusive Learning Environment, 2010, pp.30-43.

NUEVAS TECNOLOGÍAS EN EL DESARROLLO DE LAS FUNCIONES DE TRABAJO SOCIAL, EN TIEMPOS DE PANDEMIA

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Keywords: *Covid-19, Educación superior, Trabajo social*

Resumen

Está investigación realizada en el año 2020 tras la llegada del covid-19, lo cual trajo consigo suspensión de las clases presenciales en educación superior, explora sobre el reto que para los trabajadores sociales en formación e inscritos a las prácticas profesionales constituyo el desempeñar las funciones de intervención con el apoyo de las tecnologías de la información y la comunicación. Esta investigación se inscribe en la línea de investigación de sujeto contemporáneo del programa de Trabajo Social UNIMINUTO Centro regional Soacha y metodológicamente corresponde a un estudio de carácter empírico analítico, basado en técnicas estadísticas y con un nivel exploratorio-descriptivo.

Keywords: *Covid-19, Higher education, Social work*

Abstract

This research was carried out in 2020 after the arrival of covid-19, which resulted in the suspension of classroom classes in higher education, explores the challenge for training and trainee social workers to perform the role of intervention with the support of information and communication technologies. This research is part of the research line of contemporary subject of the program of TrabajoSocial UNIMINUTO Regional Center Soacha and methodologically corresponds to an analytical empirical study, based on statistical techniques and with an exploratory level-descriptive.

References

[1] OMS (2019) pandemia por covid-19. Recuperado de: **https://www.who.int/es/emergencies/diseases/novel-coronavirus-2019**

[2] Alcaldía Mayor de Bogotá D.C. DECRETO No. 169 DE 12 DIC 2020. Recuperado de: https://secretariageneral.gov.co/sites/default/files/archivos-adjuntos/decreto-169-unificado-aislamiento-y-medidas-adicionales.pdf

[3] Cuayal, H y Palacio, J. Los alcances y procesos de la Educación Virtual en Colombia en los procesos formativos (2020). Universidad Nacional Abierta y a Distancia – UNAD.

[4] Echeverría J. (2000). Educación y tecnologías telemáticas. Revista Ibero Americana, (24), 3-8. https://rieoei.org/historico/documentos/rie24a01.htm

[5] Amuchástegui, G., Valle, M. I. D., y Renna, H. (2017). Reconstruir sin ladrillos: guías de apoyo para el sector educativo en contextos de emergencia. http://repositorio.minedu.gob.pe/handle/MINEDU/5592

[6] Almirón, M. E., y Porro, S. (2014). Los docentes en la Sociedad de la Información: reconfiguración de roles y nuevas problemáticas. IE Comunicaciones: Revista Iberoamericana de Informática Educativa, (19), 17-31. https://dialnet.unirioja.es/servlet/articulo?codigo=4794547

[7] Bonilla, L. A. G. (2016). Deliberación entorno a la Educación Virtual. Interconectando Saberes, (1), 77-89. http://is.uv.mx/index.php/IS/article/view/1112

[8] Rodríguez-Jiménez, J. M. (2009). Patrones pedagógicos en educación virtual. Revista de Educación a Distancia (RED). Monográfico X (2009), 1-16. https://revistas.um.es/red/article/view/89321

[9] Social, F (2014). Definición Global del Trabajo Social. Melbourne, Australia.

[10] Pérez, M. (2020). El Trabajo Social Sanitario en la Pandemia-Covi19: Retos y consecuencias. Transformación: Revista de Trabajo Social de Sevilla, (3), 19-22.

UNIVERSITY TEACHING MANAGEMENT IN TIMES OF PANDEMIC. IMPROVEMENTS PROPOSED BY THE ARCHITECTURE STUDENT

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Keywords: *Non-Presential Learning, Architecture, Contents, On-Line Resources, Tutoring*

Abstract

The confinement period imposed in spring 2020, as a consequence of the COVID-19 pandemic, has shaken the face-to-face teaching model that had been developed at the University of Seville (Spain). As in other European universities, professors and students were forced to adapt the learning process to a non-face-to-face model. A year has passed since then and, accepting that this situation seems to be lengthening in time, it is necessary to reflect on the dynamics adopted and those decisions that, correctly or not, have accompanied us during these months [1]. The study of the evolution that the different subjects have undergone, their adaptation, irregularities detected, and above all, the perspective with which the student has lived it, allow us to draw conclusions and some guidelines to guide similar situations. With this objective, this work aims to review the process followed by some of the subjects of the Degree in Fundaments of Architecture at the University of Seville, the casuistry in which each participating subject has been immersed, the methodological update, the usefulness of the shared contents and the coherence with the evaluation system in each case.

Now more than ever, students and teachers are immersed in a more autonomous learning model in which it is convenient to define a methodological protocol that favors tutoring in a non face-to-face context [2]. This article shows the student's vision regarding the disposition and management carried out in some of the subjects of the Degree. For this purpose, there are four basic questions that direct the perspective with which the student faces the subject: what do I have to learn? is it of interest for my future professional practice? how can I learn it? and how will I be evaluated? With the results obtained, the aim is to specify the most appropriate documentation, resources and dissemination methods, proposing to the teacher a list of the strategies most valued by the students.

References

[1] Alonso, Catalina M, Gallego, Domingo J. Money, Peter. (1997). *Los estilos de aprendizaje, procedimientos de diagnóstico y mejora.* (3ª edición). Ediciones Mensajero. Bilbao. España. ISBN: 84-271-1914-3

[2] Onrubia, J., Bustos, A., et al. (2006). Usos de una herramienta de comunicación asíncrona para la innovación docente en contextos universitarios. IV Congreso Internacional de Docencia Universitaria e Innovación. Barcelona (España).

CONTINUOUS ASSESSMENT IN THE TRANSFORMATION OF A PRESENTIAL TO ONLINE COURSE: THE CASE OF SOIL MECHANICS

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Keywords: *project-based learning, online, assessment, soil mechanics*

Abstract

The forced transformation of the courses initially designed as face-to-face in online methodology has led to numerous difficulties as well as new opportunities [1]. Throughout 2020, this process has affected practically all teaching fields, both at the university and at other educational levels. One of the most important difficulties that has arisen has been the assessment process because on the one hand it has been It is necessary to be able to guarantee the identity of the evaluated student, as well as to ensure the individualized assessment of the skills acquired.

The universities of the Community of Madrid have adopted during the academic year 20-21 a hybrid teaching system, guaranteeing a certain presence during the term period, which has resulted in a reduced attendance at the universities. However, the final assessment, through the ordinary call, has motivated numerous protests due to the health situation [2].

To reduce these difficulties, during Soil Mechanics at the School of Architecture of Madrid, during the 20-21 academic year, it has been chosen to promote continuous assessment in a much more intense way. The measures that are needed fundamentally go through two lines: on the one hand, the use of the project-based methodology (PBL) introducing the corresponding one in the teaching methodology through evaluation in a very detailed way [3] and, on the other, the increase most notably from individual tests.

For the implementation of the project-based methodology, carried out in groups between 3 and 4 students, the development of two foundation and retaining projects has been proposed. Each of them has had 2 partial deliveries and a final one, which has in turn been evaluated and returned for correction between 2 and 4 times [4]. On the other hand, the individual tests have been divided into three types, 8 asynchronous two-week questionnaires, two synchronous partial tests and the cross-review of the projects, once they are finished. All these tests have been carried out using the questionnaires tool of the Moodle online teaching platform, as well as to carry out 4 questionnaires for cross-review. The methodology implemented, initially forced by the digital

transformation of the subject, has made it possible to have a large number of individual and group grades.

The face-to-face activity has been limited to taking a final exam, at the end of January, with very small presence of students, since the continuous tracking of the course has resulted in a very high success rate. For this reason, 30 of the 252 students enrolled in the subject did not pass during the course and of them 14 took the final exam.

For this reason, continuous assessment with different evaluation approaches, allows, on the one hand, to maintain continuous activity and, on the other, to individualize the qualification, guaranteeing a more equitable evaluation and closer to the skills developed by the student during the course.

References

[1] Y. Chen, M. Roldan, M. Digital Innovation during COVID-19: Transforming Challenges to Opportunities, Communications of the Association for Information Systems. 48(1), 2021, 3.

[2] https://www.eldiario.es/sociedad/estudiantes-espana-revuelven-examenes-presenciales-universidad-plena-tercera-ola-trimestre-semipresencial_1_6749211.html, 2021 (accessed 13 February 2021).

[3] J. R. Ruiz-Gallardo, S. Castaño, J. J. Gómez-Alday, A. Valdés, Assessing student workload in Problem Based Learning: Relationships among teaching method, student workload and achievement. A case study in Natural Sciences, Teaching and Teacher Education, Volume 27, Issue 3 (2011) 619-627.

[4] M. A. Millan, D. Mencías-Carrizosa, Iterative Silent Feedback (ISF) Applied to Technical Projects Using Project-Based Learning (PBL) in Large Classes, ICERI2020 Proceedings, (2020) 8867-8872.

NEW TEACHING METHODOLOGIES IN TIME OF COVID-19

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Keywords: *teaching methodology, online teaching, questionnaire, online technology.*

Abstract

The unusual situation derived from COVID-19 crisis, has forced teachers and students to reinvent themselves, using new teaching methods [1] and applying online technologies that allow efficient distance learning.

As a consequence, a new methodology has been implemented in this academic year in the practical subject Experimentación en Ingeniería Química II, of the Chemical Engineering Degree, at the Escuela Técnica Superior de Ingeniería y Diseño Industrial (Universidad Politécnica de Madrid), in the fifth semester. The theoretical explanations necessary to carry out the experimentation by the students were performed online and synchronously. The teachers previously explained the practices to the students through the Microsoft Teams platform before assistance at the laboratory. The students were allowed to ask any questions during the online explanation or later, so that they arrived at the laboratory knowing the principles and concepts needed for the development of the practical season. In addition, the explanation was recorded to be available for the students, so that they could consult it as many times as they needed. In this way, physical contact between student and teacher and between the students who make up the group of practices was significantly minimized, since they spent less time at the laboratory. The results obtained in the satisfaction surveys that are carried out on a regular basis to students after completing the course, are in accordance with what was obtained in previous years (average rating of the course: 8.52/10), as well as with regard to the evaluation of students on the knowledge acquired in the subject (success rate around 75%). Likewise, after completing the course, a specific survey about the new teaching methodology applied was conducted by the students (37 of the 41 enrolled), obtaining an overall assessment of the applied methodology of 4.15 (out of 5). In this way, the high success of applied methodology in the opinion and learning of students is shown. However, it is important to note that many students prefer face-to-face teaching to online mode, since this allows them to better follow the explanations. This fact opens the door to the question that if this new methodology should be applied once normality is restored.

On the other hand, in the subject Regulación de Procesos Químicos, in the seventh semester, with 59 enrolled students, the way of evaluating the simulation practices of

the subject has been modified and, instead of asking students to carry out extensive reports (50-60 pages) per couples, they were asked to complete a questionnaire in Moodle (time: 2 hours). The students have been asked about their preference for one option or another and 4.62 out of 5 prefer the evaluation by questionnaires. Regarding the pass rates of the students, these have remained practically unchanged with respect to what was obtained in previous courses.

References

[1] M.d. Miguel, Metodologías de enseñanza para el desarrollo de competencias. Orientaciones para el profesorado universitario ante el Espacio Europeo de Educación Superior, Ed. Alianza, Madrid, 2006.

EXPONER Y EXPLORAR. INNOVACIÓN DOCENTE Y TRANSFERENCIA EN LA ENSEÑANZA DE ARQUITECTURA

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Keywords: *exposiciones, docencia, transferencia, sociedad, aprendizaje*

Resumen

Más allá del carácter divulgativo, las exposiciones de resultados académicos en las escuelas de arquitectura son una metodología activa para la organización docente del taller de proyectos arquitectónicos. Vistas desde una pedagogía más experimental y abierta, las exposiciones docentes se pueden presentar en adecuadas herramientas de innovación docente y de transferencia del conocimiento para el alumnado y la sociedad en general.

A diferencia de las exhibiciones habituales de resultados de un curso académico, las exposiciones docentes constituyen una experiencia que puede orientar el aprendizaje durante el curso y a posteriori, así como ayudar a reinterpretar los propios resultados docentes a través de una selección o reelaboración del material elaborado. Una metodología didáctica abierta y dinámica de confrontación, divulgación, registro e investigación, que ha retroalimentado el complejo proceso de proyectar en el transcurso de la historia. Para ello, se recurren a conceptos y herramientas de las exhibiciones e instalaciones artísticas, con una interpretación conceptual y abstracta que prevalece sobre los aspectos formales, favoreciendo una interacción activa estudiante/espectador en los lugares de intervención. La organización de los contenidos se realiza a través de materiales muy diversos: dibujos, maquetas, medios visuales o sonoros, en los que intervienen recursos utilizados en otras disciplinas como la fotografía o el videoarte que permiten indagar en la manera de mostrar (*display*) los procesos de trabajo.

El formato expositivo, dentro del ámbito de la pedagogía, se han convertido en un vehículo recurrente para la docencia de la arquitectura, con enfoques distintos según escuelas y corrientes de pensamiento. Desde el modelo anglosajón, orientado a difundir profusamente los resultados finales de sus asignaturas con exposiciones que los propios alumnos llevan a cabo con intenciones fundamentalmente divulgativas de sus actividades, hasta las que lo utilizan como medio para reivindicar ideas y posicionamientos docentes en el debate arquitectónico y el devenir de la profesión. Todas ellas forman parte de un amplio abanico de enfoques del proyecto expositivo como recurso docente en las diferentes escuelas de arquitectura del panorama actual.

Figure 1: *Exposición "Parallel of Life and Art", Alison y Peter Smithson, Institute of Contemporary Arts, Londres (1953). Los Smithson concibieron esta exposición como una secuencia de imágenes o elementos, un display,, en apariencia inconexos o desordenados, dotando al espacio de un nuevo significado. (Fuente: https://www.tate.org.uk/art/archive/items/tga-9211-5-2-89/henderson-photograph-of-installation-view-of-parallel-of-life-and-art-exhibition)*

Este texto se centra en las experiencias desarrolladas por un grupo de profesores de proyectos arquitectónicos en la E.T.S.A de Granada orientadas a convertir las exposiciones docentes en un instrumento didáctico y de investigación, una metodología que incluye los procesos de trabajo que se generan en torno a ellas y a los lugares en los que se exhiben. Estas experiencias han proporcionado resultados de gran interés para la docencia del proyecto, incentivando la formación disciplinar con implicación del alumnado que participa activamente en el diseño y montaje expositivo. En paralelo a cada exposición se organizan seminarios o conferencias con invitados externos y se publica un catálogo donde se registran estas acciones pedagógicas. Las exposiciones docentes entendidas de esta manera y el material elaborado en ellas (fragmentario, dispar, pero siempre sugerente), se convierten en puntos de partida para otros cursos académicos. El fragmento de un dibujo, una maqueta o un video, incluso un mismo hecho mostrado reiteradamente a través de herramientas de representación distintas, se convierten en desencadenantes de un proceso de trabajo en el que el aprendizaje se vincula también a la investigación.

Figure 2: *Exposición "Escuela Alhambra", Sala de exposiciones E.T.S.A. Granada, 2016. (Fotografías: Fernando Alda)*

Referencias

Libro:

[1] AA.VV., Modern Architecture (Catálogo de la exposición: "Modern Architecture: International Exhibition"), New York: Museum of Modern Art, 1932.

[2] Arredondo, D.; Collados, A.; Gor, C., Lugares al límite. El paisaje en transición de la Vega de Granada. Granada. TRN-Laboratorio artístico transfronterizo, 2014.

[3] Chaplin, S.; Stara, A., Curating Architecture and the City, London: Routledge, 2009.

[4] Domingo Santos, J., García Píriz, T., Moreno Álvarez, C., (eds.) LAB-TT//3 Laboratorio de territorios en transformación: Paisajes limítrofes entre lo agrícola y lo urbano: transferencias, Granada: Unidad de calidad, innovación y prospectiva, y Dpto. Expresión Gráfica Arquitectónica y en la Ingeniería de la Universidad de Granada, 2018.

[5] Domingo Santos, J.; Moreno Álvarez, C.; García Píriz, T., (eds,) Cuaderno Escuela Alhambra, Granada: Área de Proyectos Arquitectónicos y Área de Expresión Gráfica Arquitectónica del Departamento de Expresión Gráfica Arquitectónica y en la Ingeniería de la Universidad de Granada,2018.

[6] Pozo, J.M.; García-Diego, H.; Caballero, B., Las exposiciones de arquitectura y la arquitectura de las exposiciones. La arquitectura española y las exposiciones internacionales (1929-1975), Pamplona: T6 Ediciones, 2014.

Capítulo de un libro:

[7] JIMÉNEZ-GÓMEZ, E., LLOBET-I-RIBEIRO, X., (2017) "Els plans d'estudis d'Arquitectura. De la Bauhaus a les Noves Bauhaus. De Weimar a Ulm", en JIDA'17. V Jornadas de Innovación Docente en Arquitectura, Barcelona: Universidad Politécnica de Cataluña, pp. 430-443.

Artículo de una revista o periódico:

[8] Genís-Vinyals, M., Maroto-Sales, J., Taberna Torres, J., La influencia del espacio en el aprendizaje de la arquitectura. Bauhaus de Dessau y ENSA Nantes, en ZARCH 12 (Junio, 2009) 82-95.

[9] Ibáñez, J., Historia y evolución de las exposiciones y museos sobre Arquitectura en España, en RdM. Revista de Museología nº38 (2007) 51-71.

Referencias electrónicas (libro, revista, o artículo)

[10] Serrano Avilés, R., "As found' y la experiencia del fragmento. Debate entre imagen y preexistencia en la producción artística británica de la inmediata posguerra. Cuaderno de notas, nº12. Madrid: Dpto. Composición Arquitectónica (ETSAM), 2009.

[11] http://polired.upm.es/index.php/cuadernodenotas/article/view/863 [Consulta: 23 de mayo de 2020]

[12] Steele, B., Projects review: an exhibition that curates itself, en Curating Architecture, London: The Architectural Association (2012) 14-15.

EL CUENTO COMO ACERCAMIENTO A LA ARQUITECTURA

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Keywords: *educación; innovación; arquitectura; literatura*

Resumen

El presente estudio tenía el objetivo de conocer cómo el uso de la literatura puede acercar a los escolares a la arquitectura. Para ello, a través de literatura infantil se llevó a cabo un proyecto de innovación que permitiría ilustrar de forma visual a través de ilustraciones la historia de los álbumes ilustrados utilizados. Así, a través de las ilustraciones acompañadas de texto los escolares podrían conocer la historia de lo que se estaba narrando. Se permitía el manejo de las actividades realizadas en alumnado con necesidades educativas especiales. Se trata de una actividad que fomenta la creatividad, la motivación y sobre todo el interés del alumnado hacia las edificaciones reflejadas en las ilustraciones de una manera significativa. Por lo tanto, se hacen necesarios proyectos innovadores que fomenten el uso del cuento para acercar a los escolares el conocimiento más amplio de las edificaciones y sobre todo que se trabajen de manera inclusiva [1].

Referencias

[1] I. Rojas, I. Méndez, C. Ruiz – Esteban, Álbumes ilustrados. Una aproximación estética y visual a los textos con temática inclusiva, en C. de Pro Chereguini, A. Gómez Mármol (Eds.), I Congreso Nacional ISEN a la Vanguardia en Educación. Universidad de Murcia, ISEN Centro Universitario, Murcia, 2018, pp.55-56.

INDUSTRIAL AUTOMATICS IN BUILDING: CAD DRAWING, ELECTRICAL BOARD CONCEPTION AND MANOEUVRE SIMULATION USING CADe_SIMU and PC_SIMU SOFTWARE

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Keywords: *Hardwired logic, Industrial automation, CADe_SIMU, PC_SIMU.*

Abstract

All buildings (residential, small tertiary or large tertiary) incorporate among their installations those that are purely electrical. In fact, using electricity as an energy vector not only helps the unstoppable path towards the decarbonisation of society, but for decades it has also enabled the building to be equipped with room lighting services; activation of air conditioning systems (boilers, air conditioners, solar thermal energy installations, air treatment units, rooftops, chillers...); start/stop of water pumping systems, control of electric motors in lifts and hoists; fire safety; home automation and industrial building automation... All of them, to a greater or lesser extent, need automation solutions to implement their functionalities in a convenient and versatile way. For this purpose, there are two technologies that are interrelated but different in their execution: programmed logic and wired logic. The first of these has been growing steadily in recent years and is known as programmed logic, which is based on replacing all (or most) of the aforementioned components with lines of programming code implemented on an automaton, PLC or electronic card. This solution takes up little space and allows the integration of analogue variables (infinite intermediate values), which makes the control strategies much more advanced; however, its weaknesses are that it is difficult to understand and difficult to manipulate in the event of a breakdown or change of criteria.

The second is more "cumbersome", but at the same time more robust, reliable, easier to model and easier to maintain for low-voltage electricians. It consists of breaking down each manoeuvre or action into certain electromagnetic components, most of them working conceptually as digital variables (all/nothing or 0-1, simple to conceptualise) integrated in an electrical panel and interconnected by means of cables. And it is the transfer of electricity, together with the function that each component performs, that manages to execute the conceived manoeuvre. In parallel to both disciplines, there is a third way consisting of integrating them in a hybrid way, with the "brain" of the installation being the programmable automaton; and its extensions, the wired logic devices. It could be said that this solution is the one that has been gaining most strength in recent years, as it attempts to take advantage of the strengths of the aforementioned "schools" (although without forgetting that it continues to inherit their disadvantages).

As a result of the above, is there a legal and free tool that allows the learning of both technologies? Indeed, the duo CADe_SIMU and PC_SIMU is the best solution for this purpose: the two programs, which are intercommunicable, allow CAD drawing with standardised electrical, electromechanical and electro-pneumatic symbols; they anticipate the assembly of the real electrical panel to be implemented; they allow simulating the manoeuvres to validate their operation; as well as obtaining a dynamic animation of the behaviour of the existing moving parts as a SCADA solution (motors, lifts, conveyor belts, lights, etc.). In addition, in the latest versions available, the wired logic can be integrated with programmed logic (Siemens and Arduino PLCs) by integrating programming environments such as ladder logic, GRAFCET and C language.

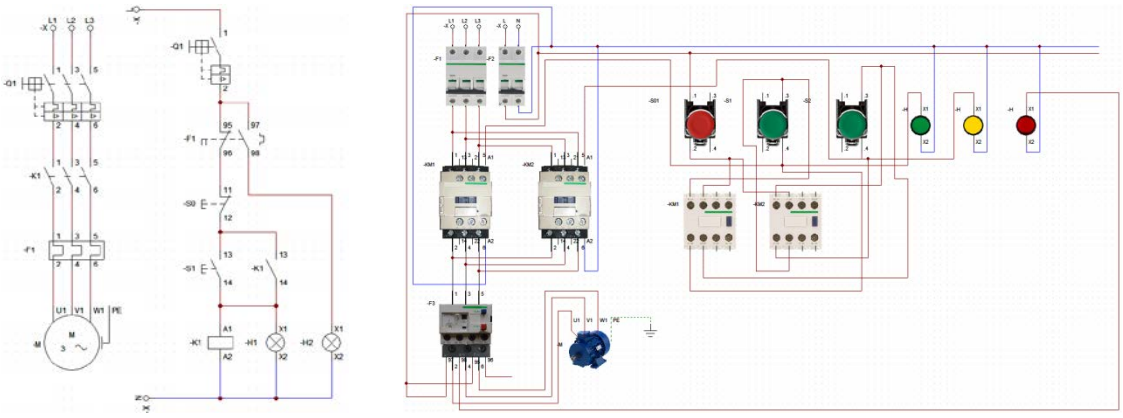

Figure 1: *CADe_SIMU and layout functionalities (own elaboration)*

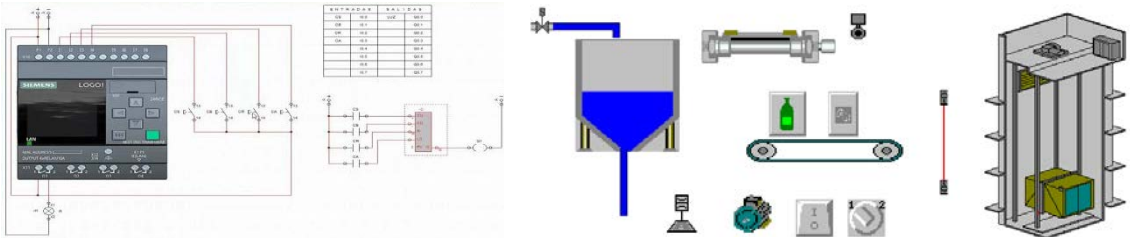

Figure 2: *Inclusion of PLCs and SCADA system (own elaboration)*

References

Reference to a journal publication:

[1] J. L. Guerrero Cárdenas, Aplicación del simulador CADe_SIMU en el aprendizaje de instalación de máquinas eléctricas en los estudiantes del tercer semestre de Electrotecnia Industrial del Instituto de Educación Superior, 2017, Lima.

Reference to a edited book:

[2] J. Rodríguez Fernández; L. Miguel Cerda; F., Bezos Sánchez-Horneros, Automatismos industriales: electricidad, electrónica, Paraninfo, 2020., Madrid.

Reference to a website:

Sitio web oficial CADe_SIMU y PC_SIMU. http://https://cade-simu.com/ . 2020.

ANALISIS DE LAS CAPACITACIONES Y NECESIDADES RESPECTO A LA INCLUSION DE LA ENSEÑANZA DE LA METODOLOGÍA BIM, EN ESTUDIOS DE GRADO Y POSTGRADO EN EL AMBITO DE LA INGENIERÍA DE LA EDIFICACION

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Keywords: *Docencia BIM, grado edificación, postgrado edificación,metodología BIM*

Resumen

La implantación de la metodología BIM como recurso de gestión de proyectos de edificación, es cada vez más demandada dentro del mundo profesional de la edificación. A través de la inicial Directiva 2014/24/UE sobre contratación pública, se establece la necesidad de emplear sistemas electrónicos (medios de comunicación y herramientas par modelar los datos del edificio) en procesos de contratación de obras, servicios y suministros a partir de septiembre de 2018. En la actualidad, diferentes entidades públicas EMT (Empresa de Transportes de Madrid), FCV (Ferrocarriles de la Generalitat Valenciana) [1] , entre otras, licitan la implantación de la metodología BIM, tanto para implantarla en su organización como para las futuras obras a realizar para su infraestructura.

Su avance y repercusión a nivel profesional es cada vez mayor, por lo que las escuelas técnicas van poco a poco adaptándolo a sus propios planes de estudios e introduciéndolo por tanto, en el contexto universitario y docente[2] .

Se han efectuado diferentes y variados estudios sobre su implantación a nivel académica en muy diversos paises y ámbitos [3], [4], [5] y su dedicación a diferentes niveles profesionales que ello implica [6].

Pero se centra la investigación desde de su punto de origen académico y docente. Comprobar las necesidades demandadas por los propios alumnos, así como la capacitación que presentan al respecto como futuros profesionales del sector de la edificación.

Igualmente se aprovecha la presencia de alumnos que corresponden a diferentes ciclos formativos universitarios. Para ello se estudian dos situaciones de alumnado, en principio diferentes. Se analiza la repercusión dentro de alumnos de grado en edificación. Son alumnos que aún no han obtenido unas competencias profesionales necesarias a través de las habilidades obtenidas en sus estudios. Por otro lado se

efectua un estudio entre alumnos de postgrado, que cursan estudios dentro de una titulación Máster en gestión de la edificación. Estos últimos se encuentran en un segundo ciclo y ya han adquirido sus habilidades y competencias para poder desarrollarse profesionalmente.

El estudio de sus concordancias y diferencias al respecto de la inclusión de las enseñanzas relativas a la metodología BIM, nos permite esbozar la demanda de los futuros profesionales al respecto. También nos permitirá determinar su aceptación o interés, en función del nivel en que se encuentran dentro de su formación técnica..

Referencias

[1] Metodología BIM. Manual BIM FGV. (2021). Recuperado 11 de marzo de 2021, de Ferrocarriles Generalitat Valenciana website: https://www.fgv.es/manual_bim/

[2] Zamora-Polo, F., Luque Sendra, A., Aguayo-González, F. y Sánchez-Martín, J. (2019). Conceptual Framework for the Use of Building Information Modeling in Engineering Education. International Journal of Engineering Education, 35 (3), 744-755. Area; Algunos principios para el Desarrollo de "buenas prácticas" pedagógicas con las TIC en el aula. Comunicación y Pedagogía, 222, 2007, pp. 42-47.

[3] Tsai, Meng-Han; Chen, Kuan-Lin; Chang, Yu-Lien (2019). Development of a project-based online course for BIM learning. Sustainability vol. 11, no 20, p. 5772.M. https://doi.org/10.3390/su11205772

[4] López-Zaldívar, O.; Verdú-Vázquez, A.; Gil-López, T.; Lozano-Diez, R.V. The implementation of building information modeling technology in university teaching: The case of the Polytechnic University of Madrid (2017). Int. J. Eng. Educ., 33, 712–722.

[5] Daoor, I. A. (2021). Introduction BIM in Engineering Curriculum: Student Perspectives from Gaza Strip's Universities. Available at SSRN 3802331.

[6] Sampaio, AZ, Lozano-Diez; R.V. BIM short course for construction industry professionals. Advances in Building Education (2020), vol. 4 (3), 23-34, doi:10.20868/abe.2020.3.4508

MODIFICATIONS IN THE TEACHING ENVIRONMENT OF THE CIVIL ENGINEERING SCHOOL OF UPM CAUSED BY THE COVID-19 SANITARY RESTRICTIONS

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Keywords: *Learning environment, Sanitary restrictions, Covid-19, hybrid teaching.*

Abstract

Due to the restrictions imposed by the current pandemic situation, the traditional teaching methodology of the Civil Engineering School of the Universidad Politécnica de Madrid in the 2020-21 course had to be modified. Considering that the school develops modules of two degrees and four master and enrols more than 2,000 students each academic year, the challenge of implementing the prescribed sanitary measures was enormous.

The main measures applied were to maintain crossed ventilation in the classrooms, avoid gatherings of students or teaching staff and reduce the capacity of the premises in order to keep at least 1.5m between students. Due to the size of the premises and the average number of students assigned to each class group notable changes had to be introduced in the teaching organisation. The study and resizing of the school included the use of Building Information Modelling (BIM) and Facility Management (FM) techniques as well as the application of origin-destiny matrixes to establish the new capacity of the rooms and reduce the risk of COVID-19 in the building [1]. Regarding the crossed ventilation, certain windows and doors of each classroom were kept opened throughout the day. In order to reduce the amount of students in the corridors and cafeteria during the resting periods between classes the daily schedules of the different syllabus were shifted a few minutes. The reduction of the capacity of the premises caused the greatest impact in the day-to-day life of students and teaching staff. In average, setting 1.5m as minimum distance between students supposed to approximately reduce the original capacity of the rooms to only its 20%. This fact, together with the decision of the Council of the School to maintain the presence-based student-teacher relationship and the synchrony of the classes equal to a normal academic year supposed introducing several changes both in the environment and technical equipment required in class.

In all the classrooms video-cameras, screens, wireless microphones and also speakers were installed and plugged into a computer with an internet connection. All the items

previously mentioned permitted to live broadcast the classes using the BlackBoard Collaborate [2] extension incorporated to Moodle [3]. The spare premises that were not used a normal course were prepared to receive and reproduce what was happening in the classrooms where the teacher was physically present. By this method all the students assigned to a certain group could attend to class in a similar manner than any other course. For those diagnosed with COVID-19, any other illness or even in quarantine the synchrony broadcast of the classes using Moodle enabled them to attend to class as they were physically present in the classroom. Therefore, they could be updated with the lessons and even to hand in the evaluation tasks.

It should be highlighted that the technical problems that teachers might have can be solved using a remote desktop application that could monitor the activity of all the classrooms simultaneously. Similarly, if the received signal is deficient students can communicate the issue by means a custom-made Discord server.

The mentioned changes introduced in the teaching environment have been suitable to successfully broadcast all classes enabling students, at home and at the school alike, to attend to class like in a normal academic year and maintaining a safe and healthy environment.

References

[1] Pavón, Rubén Muñoz, Antonio A. Arcos Alvarez, and Marcos G. Alberti. "Possibilities of BIM-FM for the Management of COVID in Public Buildings." *Sustainability* 12.23 (2020): 9974.

[2] Blackboard Collaborate, https://www.blackboard.com/es-lac/teaching-learning/collaboration-web-conferencing/blackboard-collaborate, 2021 (accessed 10 September 2020)

[3] Moodle, https://moodle.org/, 2021 (accessed 10 September 2020)

ISOVER – Placo® ACADEMY. TRAINING IN PANDEMIC TIME

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Keywords: *Training, Pandemic, Academy, Placo, ISOVER*

Abstract

With the start of the pandemic and the lockdown in March 2020, the need arises to stay connected with our customers; direct customers (distributors) and indirect (installers, specificators, constructors, promoters…), to continuous with the training work usually done by ISOVER and Placo® but also to supply the human contact made by the lockdown.

Then, on the part of Placo® and ISOVER, the idea of creating a Formative Academy arises, where, the people could find the courses and trainings more interesting for them and even personalizing it, to adapt the trainings to their necessities. Thus, people can to take advantages in the lockdown period receiving a useful course for the future.

Three classrooms are implemented within the academy where, each member of the construction process, can find the courses most adapted to their profile:

- Distributors Classroom
- Installers Classroom
- Specificators Classroom

References

[1] https://www.placo.es/academia-online

[2] https://www.isover.es/academia-online

[3] https://academiaisoverplaco.com/

PROFESSIONALIZATION OF THE CONSTRUCTION SECTOR. MINERAL WOOL AIR-CONDITION AND VENTILATION DUCTS INSTALLERS PROFFESIONAL CERTIFICATION

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Keywords: *professionalization, installers, air condition ducts, mineral wool ducts*

Abstract

The project "Aportando Profesionalidad" has a sectoral scope, since it transfer the influence of its action to the entire group of Mineral Wool Air Condition and Ventilation Ducts Installers, bases on current trends in the use of the installation systems.

This business sector located in an upward economic activity faces two difficulties:

- The majority of current workers don't have a qualification that accredits them as professionals, which limits their differentiation in the face of professional interference, generating a tendency to banal products.
- It is not possible to find qualified workers for insertion, which is limiting their capacity for business growth.

Therefore, the Project is formulated base on two main objectives and seeking to generate a series of internal and external impacts. Its main objectives are as follows:

- Professionalization of the sector. Understanding this as a professional is "a person who exercises an activity and has a degree or diploma, which guarantees the knowledge acquired and the suitability for the exercise of his trade"
- Insertion of new professionals through regulated trainings and employment trainings.

ISOVER has promoted the creation of the "Installation and Maintenance of Ducts Networks Qualification" actively participating in the development of its content, together with the INCUAL (National Institute of Qualifications), this new qualification has been made part of the current INCUAL Qualification portfolio.

References

[1] INCUAL. https://incual.mecd.es/

[2] Air Condition Ducts ISOVER. https://www.isover.es/productos-isover/productos-climatizacion

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Gil Valera, Alicia
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