

16TH INTERNATIONAL CONFERENCE OF EDUCATION, RESEARCH AND INNOVATION

# CONFERENCE PROCEEDINGS

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16TH INTERNATIONAL CONFERENCE OF EDUCATION, RESEARCH AND INNOVATION

## CONFERENCE PROCEEDINGS

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Luis Gómez Chova, *University of Valencia*, *Spain* Chelo González Martínez, *Polytechnic University of Valencia*, *Spain* Joanna Lees, *CEU Cardinal Herrera University*, *Spain* 

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#### **Preface**

The ICERI2023 Conference Proceedings contain the papers presented at the 16th annual International Conference of Education, Research and Innovation, which took place in Seville from the 13th to 15th of November 2023.

ICERI is an annual event whose aim is to provide a platform for lecturers and to share valuable research and information about education, pedagogical technologies, and educational innovations. This year, participants from over 80 countries took part in networking activities, plenary sessions, parallel thematic sessions and workshops. Keynote speeches were delivered by global educational experts. You can see their talks at IATED Talks (iated.org/talks/).

ICERI2023's focus included the following topics: Pedagogical Methods and Innovations, Technology in Teaching and Learning, Inclusive Learning, Special Education, Emerging Technologies in Education, International Cooperation, Teacher Training and Educational Management, Curriculum Design, Accreditation and Quality in Education, University-Industry Cooperation and Open Educational Resources.

The ICERI2023 International Program Committee is composed of lecturers and researchers from all around the world. A blind peer review process was followed to guarantee the quality of the final publication. During this process, the following points were evaluated: the content, relevance to the field, general structure, clarity of contents, originality, relation to the conference topics and disciplines.

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Lastly, we wish to extend our most sincere thanks and best wishes to all members and delegates who have contributed to the ICERI2023 Proceedings.

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#### **ICERI2023 Keynote Speakers**

#### **Cristobal Cobo – Senior Education Specialist (Chile)**



Keynote speech: Unlocking the Potential: How Can Higher Education Lead the Way in a Changing World?

In the post-pandemic world, higher education institutions have a new, crucial role to play in addressing the global "poly-crisis," which includes climate change, demographic transformations, and the automation and datification of education, among other challenges. These challenges raise important questions about the future of higher education. During this presentation, we will

explore a series of institutional and interpersonal capacities that need to be developed and consolidated in the context of higher education. These capacities include:

- Addressing sustainability and climate change literacies as cross-cutting and multidisciplinary capacities embedded in the institutional agenda and future professional development.
- b) Reinventing andragogy and hybrid learning for lifelong learners, creating opportunities for individuals of any age or background in a world of increased mobility and expanding life expectancy.
- c) Addressing the datification of education and cognitive automation by developing "algorithmic awareness" to navigate a world increasingly filled with smart technologies, which brings both opportunities and challenges.

Thriving in future-proof higher education institutions will be the result of proactively responding to the global poly-crisis and facing major disruptions. Universities are more crucial than ever, and reflecting on these challenges will be instrumental in shaping their future.

Biography:

Cristobal Cobo (PhD) is a Senior Education Specialist (Technology). He served as the founding Director of the Center for Research - Ceibal Foundation in Uruguay from 2014 to 2019. He is also an associated researcher at the Oxford Internet Institute, University of Oxford, from 2009 to 2019. Cobo works at the intersection of the future of learning, a culture of innovation, and human-centered technologies. Cristobal has been distinguished by the British Council of Economic and Social Research (ESRC) and is an associate research fellow at the Centre on Skills, Knowledge, and Organizational Performance, University of Oxford. He was a professor and director of Communication and New Technologies at the Latin American Faculty of Social Sciences, Mexico.

He has served as an external evaluator for the Inter-American Development Bank, the National Science Foundation, and MIT Press (US), the International Labour Organization (UN), and the International Development Research Centre (Canada). He holds a PhD in Communication Sciences from Universitat Autònoma de Barcelona, awarded "cum laude". His latest book, edited with Axel Rivas, is "The New Digital Education Policy Landscape: From Education Systems to Platforms" (Routledge, 2023). Previously, he wrote "I accept the terms and conditions: Uses and abuses of digital technologies" (in Spanish, Portuguese, and English) published by Santillana in 2019, "Innovación Pendiente" (Penguin Random House, 2016), and "Invisible Learning" with John Moravec (Universitat de Barcelona, 2011). He has been a speaker in more than 30 countries, including 4 TEDx events.

Currently, Cristóbal Cobo is a Senior Fellow for The Inter-American Dialogue. He has been featured in CNN, Deutsche Welle, El Pais, Le Monde Diplomatique, the Wall Street Journal, and the World Economic Forum.

#### Pooja K. Agarwal – Berklee College of Music in Boston, Massachusetts (USA)



Keynote speech: Teaching might be an art, but learning is a science!

Dr. Pooja K. Agarwal shares practical teaching strategies—based on 100 years of research—that dramatically improve student learning. Equipped with scientific knowledge and evidence-based tools, turn your teaching into POWERFUL teaching and unleash the science of learning in your classroom.

#### Biography:

Pooja K. Agarwal, Ph.D., is a cognitive scientist, conducting research on how students learn since 2005. She is the author of the book Powerful Teaching: Unleash the Science of Learning and an Assistant Professor of Psychology at the Berklee College of Music in Boston, teaching psychological science to exceptional undergraduate musicians. Dr. Agarwal is also the Founder of RetrievalPractice.org, a source of research-based teaching strategies for more than 15,000 teachers around the world.

Dr. Agarwal's research has been published in leading peer-reviewed academic journals; featured in The New York Times, NPR, Scientific American, and Education Week; recognized by the National Science Foundation; and highlighted in numerous books, podcasts, and videos.

Dr. Agarwal received her Ph.D. from Washington University in St. Louis. Her love of learning formed at the outset of her career as a 4th and 5th grade teacher in St. Louis, Missouri.

Website: retrievalpractice.org Twitter: @RetrieveLearn

#### **Conference Tracks & Sessions**

The ICERI2023 conference program is available online at https://iated.org/iceri2023

#### ORAL SESSIONS MONDAY

**Immersive Experiences** 

Internships and Work-integrated Learning

Curriculum Design Experiences

Access (and Barriers) to Education

Hybrid & Blended Learning

Workplace & Vocational Training

Student Engagement and Motivation

Multilingualism and Language Learning

Architecture and Design Education (1)

Research on Virtual & Augmented Reality in Education

Virtual & Augmented Reality in Vocational and Workplace Learning

Pedagogical Innovation and Research

Educating Individuals with Intellectual Disabilities

Personalized Learning Environments

Continuous & Life-Long Learning

Student Support

Language Learning Experiences

Architecture and Design Education (2)

Virtual & Augmented Reality Educational Best Practices

University-Industry Cooperation

Educational Leadership and Management

Inclusion of Learners with Disabilities

Learning Analytics

Life-Long Learning

Student Health and Wellbeing

**Education for Sustainability** 

New Technologies in Architecture & Design Education

Virtual & Augmented Reality in Health Sciences Education

Game-Based Learning

Professional Development of Teachers (1)

Inclusive Education

MOOCs & Open Educational Resources

Lifelong Learning, Work-integrated Learning, and Higher Education in a Digital Era

Students and Teachers Wellbeing

English as a Foreign Language

Arts & Humanities Education

#### POSTER SESSIONS MONDAY

Pedagogical Innovations and Trends in Education Emerging Technologies in Education

#### **ORAL SESSIONS TUESDAY**

AI in Education (1)

Assessment and Evaluation Strategies (1)

Quality in Education

Diversity and Equity in Education

Mobile and Multimedia Learning Experiences

Gamification

Service Learning

**Robotics Education** 

Computational Thinking & Coding Skills

Generative AI Experiences in Education (1)

Assessment and Evaluation Strategies (2)

Professional Development of Teachers (2)

Inclusion of Refugees and at-Risk Students

Online Learning Experiences (1)

Developing Soft Skills

Project and Problem Based Learning

**Emerging Technologies in Engineering Education** 

Programming in Higher Education

AI in Education (2)

e-Assessment

Pre-service Teachers

**International Cooperation** 

Digital Literacy

Creativity & Design Thinking

Active Learning in Engineering Education

Mathematics Education

Computer Science Education

Generative AI Experiences in Education (2)

Mentoring & Tutoring

ICT Skills among Teachers

Lessons learned from the COVID-19 pandemic

Innovative Tools for Learning

**Pedagogical Innovations** 

Active & Experiential Learning

**Teaching Mathematics** 

Active Learning in STEM

AI in Education (3)

Student Selection and Admission

Professional Development of Teachers (3)

University and Society

Online Learning Experiences (2)

Exchange and Mobility Programmes

Early Childhood Education

Flipped Learning

Teaching STEM

#### POSTER SESSIONS TUESDAY

**Experiences in Education** 

New Challenges in Education and Research

#### VIRTUAL SESSIONS

#### DIGITAL TRANSFORMATION OF EDUCATION

Data Science & AI in Education

Learning Analytics & Educational Data Mining

Digital Technologies and Resources for Learning under Lockdown

Digital Transformation

21st Century Skills

Educational Programming & Robotics

#### **DIGITAL & DISTANCE LEARNING**

Distance Education in COVID-19 Times

Blended & Mobile Learning

e-Learning Experiences

Learning Management Systems & Virtual Learning Environments

Post-Pandemic Scenarios in Education

#### INNOVATIVE EDUCATIONAL TECHNOLOGIES

AI, Chatbots & Robots Virtual & Augmented Reality Social Media in Education Technology Enhanced Learning

#### **TEACHER TRAINING & ED. MANAGEMENT**

ICT & Digital Skills Pre-service Teachers Professional Development of Teachers Educational Management

#### **ACTIVE & STUDENT-CENTERED LEARNING**

Gamification & Game-based Learning Problem & Project-Based Learning Flipped Learning Collaborative & Team-based Learning Active & Experiential Learning Pedagogical Innovations

#### **QUALITY & IMPACT OF EDUCATION**

Quality in Education
Experiences and Challenges in Curriculum Design
Sustainability & Environmental Awareness
University-Industry Collaboration
Social Impact of Education
Education and Research

#### **EDUCATIONAL STAGES & LIFE-LONG LEARNING**

From Pre-school to Secondary Education Transition to the Job Market Developing Entrepreneurship in Education Life-Long & Workplace Learning

#### **MULTICULTURALITY & INCLUSION**

Multicultural Education Diversity Issues Special Educational Needs Inclusive Education

#### ASSESSMENT, MENTORING & STUDENT SUPPORT

Assessment & Evaluation Mentoring & Tutoring Developing Soft and Transversal Skills Student Support & Motivation Student Wellbeing

#### STEM EDUCATION

Mathematics & Statistics Engineering Education Computer Science Education STEM Experiences

#### LANGUAGE LEARNING AND TEACHING

Foreign Languages New Technologies in Language Learning Language Learning & Translation Studies

#### **DISCIPLINE-ORIENTED SESSIONS**

Architecture & Interior Design Health Sciences Education Business and Marketing Education

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# THE "BEING A PART OF IT" METHODOLOGY: VET STUDENTS PARTICIPATING IN RESEARCH PROJECTS FROM THE CLASSROOM

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# **Abstract**

In this communication, we present the methodology Being a Part of It (BPI), in which students in a VET classroom, led by their teacher, are going to carry out an engineering project proposed and supervised by a technology company, as if they were a development department of the company, developing important parts of the company's research projects,

The methodology BPI, as other teaching methods based on projects or case analysis, such as Case-based learning, is expected to promote in students a special motivation for learning. It is also expected the development of transversal skills such as digital tools, autonomous learning techniques, group work, oral and written expression, critical thinking and others that will be important in their vocational studies and in their later professional career. The objective is to train students with obstacles in the processes and transversal skills that favour their recruitment. That is why we propose the application of BPI methodology at the beginning of vocational training studies. We intend that students, from the beginning of their studies, have a practical training at the classroom, acquire team-working skills, assume responsibilities and learn about the work processes of technology companies.

At the beginning of the 2023-2024 academic year, three-week pilot tests will be carried out in three VET centers in France, Greece and Spain. These tests are carried out in the framework of the Erasmus + 2021-1-ES01-KA220-VET-000029545 project TECHVETLAB: A solution for postcovid-19 laboral market through a technical training of VET students with obstacles.

This is an opportunity to evaluate how being for a period of time (certainly short in the case of these pilot tests) immersed in this project generates in the students an additional motivation towards VET studies and in general towards technological innovation. The study will follow the ACRS (Attention, Confidence, Relevance, Satisfaction) model proposed by Keller in 2010 which provides a structure for assessment based on his conception of the motivational design of learning. In our case it will be based on a survey of 34 questions, adapting the language of the questions posed to the level of studies corresponding to the beginning of vocational training studies.

Keywords: Vocational training, technology, critical thinking, methodology, research, students, evaluation.

### 1 INTRODUCTION

Within the framework of the Erasmus Plus 2021-1-ES01-KA220-VET-000029545 project TECHVETLAB: A solution for postcovid-19 labour market through a technical training of VET students with obstacles, a teaching methodology was developed for VET students with the aim of motivating them towards the world of innovation, initiating them in the acquisition of creativity and critical thinking tools. The method we have developed for this, which we call *Being a Part of It*, BPI, consists of making the classroom of the educational centre function for a period of time as a development department of a technology-based company. The students in the classroom carry out a project proposed by the company and supervised by one of its technicians, using digital communication platforms, and by the teacher in

the classroom. One of the pillars of the success of this methodology is the programming of the project by the company, both in terms of its objectives and its work plan, which must be adapted to the time available and the characteristics of the students group. The other pilar is the organization of the work in the classroom following company strategies and with the guidance of the teacher.

The TECHVETLAB project working group has been aware that in order to put the BPI methodology into practice it is necessary to give support to teachers and interested companies so that tackling the project is not seen as a too costly task and to highlight its advantages, mainly for the training of future professionals, but also for the company itself. To this end, a guide for teachers and company technicians has been written containing the principles of the methodology and detailed templates to assist in the programming of the project [1,2].

The next step was to design a proof of concept with three pilot projects. At the beginning of the 2023-2024 academic year, three-week pilot tests are beeing carry out in three VET centres in France, Greece and Spain. In this article we briefly summarize the approach of these projects.

Moreover, an evaluation method has been designed and will be used to analyse the influence of our methodology on the motivation of VET students towards their studies and future career.

# 2 METHODOLOGY

The methodology Being a part of it, BPI, as other teaching methods based on projects or case analysis, such as Case-Based Learning, CBL, is expected to promote in students a special motivation for learning. It is also expected the development of transversal skills such as autonomous learning techniques, group work, oral and written expression, critical thinking and others that will be important in their vocational studies and in their later professional career.

That is why we propose the application of BPI methodology at the beginning of vocational training studies. Students in a VET classroom, led by their teacher, are going to carry out an engineering project proposed and supervised by a technology company, as if they were a development department of the company.

The project starts with an agreement between the school and the technology company, which includes information about the number of students involved, their previous studies, the amount of work time to be devoted to the project and other baseline data. The company will prepare a project appropriate to these conditions. To do that it can use the guidelines and templates provided in the references [1,2]. In essence, the schedule contains a brief description of the project, the approach of the technological problem to be solved; the basic objectives of the project and the possibilities to go further in these objectives, so that the project can be easily adapted to the reality of classroom work; the necessary equipment provided by the company and/or the school; the schedule of meetings with the company tutor, and the format of the oral presentations of the working groups; the format of the final report to be presented by the group at the end of the project. It will also contain a detailed work plan with activities and time schedule. On the other hand, the teacher will prepare a classroom work plan, defining the working groups into which the classroom will be subdivided, distributing the tasks among them, and setting the assessment criteria.

These proof of concept is an opportunity to evaluate how being for a period of time (certainly short in the case of these pilot tests) immersed in this project generates in the students an additional motivation towards VET studies and in general towards technological innovation.

The study and evaluation of motivation in students at any level of education is a basic aspect of the educational process since much of the success in the teaching-learning process depends on factors related to motivation [3]. The analysis of motivation in students to be conclusive regarding the effectiveness of a particular methodology needs a model that articulates the evaluation. In this sense the ACRS (Attention, Confidence, Relevance, Satisfaction) model proposed by Keller in 2010 [4] provides a structure for assessment based on his conception of the motivational design of learning. This procedure allows the teacher to analyze student motivation in response to the introduction of a given teaching material. The procedure is applicable to students from different educational systems, from high school to university [4,5]. The model proposes four fundamental elements in motivation: attention, confidence, relevance and satisfaction. The attention element refers to how the methodology or teaching materials are able to capture the curiosity, enthusiasm and interest of the students, making the student have an active attitude towards learning due to the novelty it implies for him/her. Relevance has to do with how the student connects the teaching materials and methods with his learning needs, his/her goals and previous experiences and also

with his/her preferences in relation to the study. Confidence has to do with the feeling of personal control and the expected success at the end of the learning process with the methodology used. Satisfaction refers to the positivity with which the student faces the learning process.

These four fields of analysis are evaluated by means of a survey in which the student is asked a series of statements with which he/she agrees or disagrees with a numerical value from 1 to 5. Part of these questions refer to each of the fields in such a way that finally a numerical value and an uncertainty for each of the fields can be obtained to compare the results of an analysis group with a control group.

#### 3 RESULTS

#### 3.1 Pilot tests

The pilot tests are being carried out at the beginning of the academic year 2023-2024 in three schools: École de la Deuxième Chance Haute-Loire E2C (France); 1st Epalgematiko Lykeio Kato Achaias (Greece); and IES Enrique Tierno Galván, Moncada (Spain). The projects have been carried out by Somatica, Materials & Solutions (Portugal) and by Ikasia Technologies SL, Valencia (Spain) Very briefly they consist of the following:

#### 3.1.1 Construction game.

The project asks the students to design a construction game aimed at children of around 5 years of age, in the style of the classic Meccano but with plastic pieces with joints between them adapted to the age of the children. The group will have to make decisions about the basic model to be built. The design of the pieces is done with a free 3D design programme and the pieces are manufactured with a 3D printer provided by the company.

#### 3.1.2 Bioreactor

The aim is to build a prototype of a bioreactor used for cell culture in a three-dimensional medium. Essentially, it involves adapting a commercial polystyrene well to allow a continuous flow of a fluid that is driven by a syringe pump. For this purpose, a plug is designed which has an inlet and an outlet to which silicone tubing is fitted. The syringe pump is driven by a commercial stepper motor. All parts are designed with a 3D design program and manufactured by 3D printing.

# 3.1.3 Simulation and design of an electronic circuit

An electronic system is usually constructed by the assembly of many circuits, which each represents a small component of the whole device. Thus, in this case, we'll be simulating, constructing, probing and designing a possible PCB for filtering circuits, which receive a sinusoidal input signal, and outputs the filtered signal in the other end of the circuit. The project to be performed will follow three main events: Filtering circuit selection and simulation, Breadboard circuit construction and probing with amplifier DC powering, signal generation and oscilloscope measurement, and PCB design of the circuits employed.

# 3.2 Motivation assessment

The hypothesis of the study is that the fact of starting vocational training studies by participating in a development project proposed by a company will be an important motivating factor for students in their future studies in the vocational training center and their future career.

The study will be carried out in three vocational schools: The study will include in each of the centres a group in which the pilot test will have been carried out with the BPI methodology and a control group of the same educational level. The responses will be anonymized and will be collected in two sealed envelopes corresponding to the analysis group and the control group.

The study seeks to answer the question: Does the fact of having carried out the internship following the BPI methodology have a positive influence on the student's motivation for their vocational training studies?

It is based on a survey of 34 questions, following the ACRS model of the "Course Interest Survey" [4], adapting the language of the questions posed to the level of studies corresponding to the beginning of vocational training studies. Responses are rated with a score: 1: Not true, 2: Slightly true, 3: Moderately true, 4: Mostly true, 5: Very true.

Table 1. Motivation Survey

		1	2	3	4	5
1.	The instructor knows how to make us feel enthusiastic about the subject matter of this course.					
2.	The things I am learning in this VET course will be useful to me.					
3.	I feel confident that I will do well in this VET course.					
4.	This class has very little in it that captures my attention.					
5.	The teachers make the subject matter of this VET course seem important.					
6.	You have to be lucky to get good grades in this course.					
7.	I have to work too hard to succeed in this course.					
8.	I do NOT see how the content of this VET course relates to anything I already know.					
9.	Whether or not I succeed in this VET course is up to me.					
10.	The teachers create suspense when building up to a point.					
11.	The subject matter of this VET course is just too difficult for me.					
12.	I feel that this course gives me a lot of satisfaction.					
13.	In this class, I try to set and achieve high standards of excellence.					
14.	I feel that the grades or other recognition I receive are fair compared to other students					
15.	The students in this class seem curious about the subject matter.					
16.	I enjoy working for this course.					
17.	It is difficult to predict what grade the teachers will give my assignments.					
18.	I am pleased with the instructor's evaluations of my work compared to how well I think I have done.					
19.	I feel satisfied with what I am getting from this course.					
20.	The content of this course relates to my expectations and goals.					
21.	The teachers does unusual or surprising things that are interesting.					
22.	The students actively participate in this class.					
23.	To accomplish my goals, it is important that I do well in this course.					
24.	The teachers use an interesting variety of teaching techniques.					
25.	I do NOT think I will benefit much from this course.					
26.	I often daydream while in this class.					
27.	As I am taking this class, I believe that I can succeed if I try hard enough.					
28.	The personal benefits of VET studies are clear to me.					
29.	My curiosity is often stimulated by the questions asked or the problems given on the subject matter in this class.					
30.	I find the challenge level in this course to be about right: neither too easy not too hard.					
31.	I feel rather disappointed with this VET course.					
32.	I feel that I get enough recognition of my work in this course by means of grades, comments, or other feedback.					
33.	The amount of work I have to do is appropriate for this type of course.					
34.	I get enough feedback to know how well I am doing.					

Table 2 Scoring guide for the Course Interest Survey

Attention	Relevance	Confidence	Satisfaction
1	2	3	7(reverse)
2 (reverse)	5	6 (reverse)	12
10	8 (reverse)	9	14
15	13	11 (reverse)	16
21	20	17 (reverse)	18
24	22	27	19
26 (reverse)	23	30	31 (reverse)
29	25 (reverse)	34	32
	28		33

<sup>\*</sup> There are questions posed in negative form, the assigned values should be taken in reverse order, i.e. 1 is 5, 2 is 4 3 is 3, 4 is 2 and 5 is 1.

Data analysis: The mean values of the scores assigned by the students will be used, obtaining an evaluation for each of the fields and the sum of the four will be considered the final evaluation of motivation.

# 4 CONCLUSIONS

Through the Erasmus Plus Programme project "TECHVETLAB: A SOLUTION FOR POSTCOVID-19 LABORAL MARKET THROUGH A TECHNICAL TRAINING OF VET STUDENTS WITH OBSTACLES", technology-based companies and VET educational centres from Spain, Portugal, Italy, France and Greece have developed an innovative learning methodology that allows VET students to acquire key knowledge and competences for their access to the labour market in the technology sector. In this communication we have presented the main features of the methodology, as well as a model work plan that facilitates the work of technology companies and educational centres to implement this methodology.

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