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Digital Futures Challenge-Based Learning in Higher Education in Europe: The DIFUCH Erasmus+ Project

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Abstract: Within DIFUCH, we are developing innovative challenge-based pedagogies, tools and platforms for the virtual delivery of a joint programme within a groundbreaking-breaking and flexible academic structure in Europe. This Erasmus+ project is focused on delivering new multi-disciplinary, transnational, cross-sectional future skills-orientated modules and learning pathways that address societal challenges. In this paper, we present the current work of DIFUCH to develop an innovative programme underpinned by Challenge Based Learning (CBL) that addresses local and global societal challenges and strengthens interactions between education, research, and external stakeholders for a positive effect on our communities. This project facilitates the improvement of learning outcomes vis-à-vis university learners' perception of social responsibility, their ability to deal with complex societal challenges from social and economic stability to global warming, their ability to put knowledge into practice, team building and communications skills.

Keywords: Knowledge networks, developing regions, multi-cultural interaction, knowledge society, education

1. INTRODUCTION

Higher education is seen as the last phase of the academic pathway where it is intended to empower students to acquire practical skills, critical sense, creativity, and adaptability. Thus, students are converted into professionals working in a given area (Carvalho et al. 2021).

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To this end, learning methods, currently referred to as traditional, have always been used. In these, the teacher is the lecturer of the subject, as he or she holds all the information, thus occupying a prominent place. The student, on the other hand, is the receiver and reproducer of passively received and memorised knowledge (Ariès 1981; C. V. de Carvalho et al. 2019; Dickinson et al. 2018; Ilkiw et al. 2017; Korhonen and Törmä 2016; Nagai and Izeki 2013; Park and Choi 2014).

These methods have some limitations, such as increased demotivation, loss of interest in the content taught, and lack of critical thinking which translates into less teaching effectiveness than other teaching methods (Dickinson et al. 2018; Hincapié Parra, Ramos Monobe, and Chrino-Barceló 2018; Ilkiw et al. 2017; Park and Choi 2014; Santos and Soares 2011).

Studies previously conducted indicate that students must be involved in learning, cooperatively, from the conception to the evaluation and implementation of knowledge for better results, that is, they must do something rather than just listen (Lockwood et al. 2020; Meyers and Jones 1993). Currently, society needs individuals who are able to adapt quickly and critically analyse their contexts (OECD, 2008).

To combat these shortcomings, some higher education institutions have innovated teaching-learning strategies through active learning methods (Carvalho et al. 2021; Park and Choi 2014). In these, teachers become facilitators of learning experiences and students become responsible for acquiring knowledge, playing an active role in developing their own skills (Carvalho et al. 2021; C. V. de Carvalho et al. 2019; Dufresne et al. 1996; Oliveira, Sanches, and Martins 2022)

One of the active learning methods that show better results is challenge-based learning (CBL) or problem-based learning (PBL) since it is centred on students, who take responsibility for solving real challenges (Oliveira, Sanches, and Martins 2022; Prince 2004), promoting theoretical and practical training and also the acquisition of soft-skills such as critical thinking and proactivity (Cuevas-Ortuno and Huegel 2020; Grabinger and Dunlap 2002; Oliveira, Sanches, and Martins 2022).

This value co-creation process focuses on the deconstruction of the traditional producer-consumer exchange, in which the producer creates value, and the consumer consumes or destroys it (Vargo & Lusch, 2008). On the other hand, in adopting a co-creation process, the organisation forms a reciprocal and balanced relationship with its consumers, allowing a wide range of consumer opinions and preferences to shape all aspects of the service, product and/or delivery (Prahalad & Ramaswamy, 2004). Value co-creation also adopts the perspective that it is not necessary to distinguish products from services or vice versa, as all products contain service elements, and within all services, there are product elements (also known as 'goods') (Goi et al. 2022; Gummesson, 2007). The bibliography on co-creation models in other areas has expanded rapidly when compared to the context of higher education services. However, co-creation studies in HEIs are still in the exploratory phase (Goi et al. 2022; Smorvik & Vespestad, 2020; Dollinger et al., 2018). Only a small number of studies have empirically examined co-creation activities in HEIs.

Contemporary society has an increasing tendency to change, sometimes instigated by changes in technology. As soon as they are placed in the economy, they are desired by everyone (A. Carvalho et al. 2021). Professions are becoming more dynamic where it is possible to put a machine in a job, and some jobs are disappearing despite once being considered crucial and areas that once seemed futuristic are being increasingly studied due to their current impact (A. Carvalho et al. 2021). With the development of technology, the internet has come to play a key role in distance learning (online or blended learning). All these changes are also related to higher education (Carvalho et al. 2021; Hannay 2006; Vanslambrouck et al. 2018).

In an increasingly networked and technology-dependent society, opportunities for creativity and innovation abound (Henderikx and Jansen, 2018). However, our global interconnected world also presents challenges for all organisations; global competition, shorter product and service life cycles and diminishing barriers to new industry entrants increase the difficulties for many organisations and represent existential threats for some (Guardia et al, 2021). Exponential growth and disruptive innovation precipitated by technological developments underpin many of the challenges and opportunities (Damewood, 2016). In the HEI sector, universities are facing increasing pressure to excel in innovation, transformation and accessibility (Guardia et al., 2021). Also, the challenges faced by HEIs globally are mirrored in the public and private sectors (Henderikx and Jansen, 2018).

With the COVID-19 pandemic, society's life went from the real world to a virtual world. At that time, all colleges were closed, and higher education was forced to go digital and change the approach of the whole educational process from classes to assessments so that it never left aside its mission, that is, the training of young adults who will become professionals (Stevanović, Božić, and Radović, 2021).

In a digital learning environment, there are positive aspects in the students' perceptions, such as: better time management, reduction of associated costs and increased motivation. However, there are negative aspects noted by teachers, such as the difficulty to perceive differences in the individual needs of each student (Vanslambrouck et al. 2018), difficulties in constructing the evaluation system, the possibility of accessing documents at the time of the assessment, increased anxiety, technical problems, and insufficient digital literacy. Significantly, a study conducted by Kutluk and Gulmez (2012) further argued that students feel dissatisfied with communication with the teacher.

Despite the factors presented above, it is found that there is still a preference for physical media over a virtual field as well as for traditional learning methods overactive learning methods (Carvalho et al. 2021; Park and Choi 2014). In this sense, the DIFUCH project intends to innovate in higher education, through the online world, and improve the

learning-teaching process using tools and strategies based on the challenge-based learning typology.

2. DIFUCH PROJECT

DIFUCH is a two-year project funded by Erasmus+ Programme, European Commission as a cooperation partnership in Higher Education involving three partners from Portugal, The Netherlands and Ireland. This consortium comprises a group of higher education institutions that have been working together on many projects in education and research. The Higher Education Institutions (HEI) partners in the consortium are:

1. Instituto Politécnico de Bragança, Portugal
2. South East Technological University, Ireland
2. Hanze University of Applied Sciences, The Netherlands

The project requires the cooperation of Higher Education professionals in various institutions and is relevant to all types of learners from eighteen to eighty-one including students, researchers, employees and civil servants as well as other stakeholders who are interested in developing digital skills appropriate for the 21st century. Each partner will nominate experienced teachers to constitute an expert consultant group that will design the learning methodology for piloting and testing the outputs of the project. Stakeholders will be represented by diverse economic actors in the region of all the partner institutions. Those stakeholders will be asked to identify challenges in their businesses or industries and become involved in the innovation and co-creation process. Students will be recruited using interviews and an application process with specific emphasis on those from socio-economically disadvantaged groups. The researchers and staff of the HEIs will act as consultants and mentors for the methodologies and tools developed.

The DIFUCH project will develop a new model for challenge-based learning, where the physical campus is complemented with an online, open collaborative and inclusive platform. Digital learning will enhance the regional impact of existing partner institutions and support the development of future-orientated, innovative, flexible and socially aware HEI communities capable of addressing society's grand challenges at local, regional, national and at European levels through an engaged, collaboratively developed and delivered curriculum.

The DIFUCH project has identified the lack of close relationships between European HEIs and regional stakeholders in the development of new challenge-based learning. This means that, in general, European regions' expectations in terms of training, innovation and upskilling are not being met by the Higher Education Institutions' curriculum of the regions they serve.

3. PROJECT MANAGEMENT METHODS AND KEY EVENTS

3.1 Intellectual Outputs

IPB (Instituto Politécnico de Bragança, Portugal), is the project coordinator for the DIFUCH project. The activities of the DIFUCH project were divided into four Intellectual Outputs (IO) see Figure 1, each managed by a particular academic partner and membership of the consortium based on their interests and skills. The steering committee is responsible for the administrative and financial management of the project. The project also deployed an International Advisory Board which included academic and research members that weren't partners in the project. This board provides guidance on evaluation reports, quality checks on the project's outputs, quality management and feedback to funding agencies. The project started in February 2022, with a kick-off meeting at Hanze University of Applied Sciences.

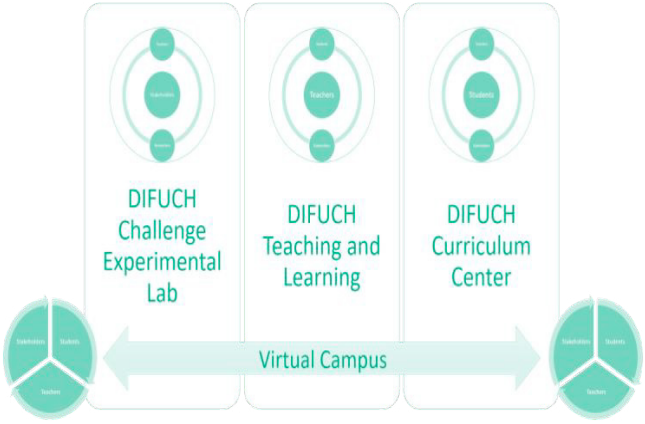

Figure 1 DIFUCH project structure

3.2 IO1 DIFUCH Teaching and Learning

In IO1 new learnings and skills development for students within the partner institutions will be explored. By using the digital future challenge-based approach developed in this project stakeholders will be able to contribute to regional and European development. Flexible learning pathways will be central to the DIFUCH project. Young learners will participate in blended intensive programmes, and adult learners will have the opportunity to select modules (micro-credentials) more relevant to their learning objectives and career development. Prior knowledge and skills will be recognised and certified by the consortium HEIs with knowledge gaps filled with flexible modules which lead to micro-credentials. In June 2022 each partner HEI nominated five experienced educationalists to travel to Bragança to form an expert consultant group that began the design of a new learning methodology for challenge-based learning. This methodology was organised around United Nations Sustainable Development Goals fostering an entrepreneurial mindset and civic engagement. This will be further developed and implemented with local and regional stakeholders. In DIFUCH learners will become experts by choosing the most appropriate course for them from all available curricula.

Learners can think globally through digital mobility and join transnational teams adopting challenges that provide solutions for their respective regions. For individuals with physical limitations technology will be adopted to guarantee that they are able to participate in every activity, to learn and develop the necessary competencies and skills. Technology and digitisation of the learning process can indeed be a solution to make participation more equal and guarantee mobility, in a virtual way.

The Future of Jobs Report 2020, by The World Economic Forum, clearly states that near future jobs will undoubtedly need people with expertise in skills such as critical thinking and analysis, creativity, originality and initiative, analytical thinking and innovation, reasoning, problem-solving and ideation, among others. The learning process underpinning the DIFUCH project is conceived under a framework of active learning methodologies. In a nutshell, this learning process is based on multidisciplinary, multicultural, and transdisciplinary teams from all HEIs of the consortium working around real problems with future scope, in a co-creation and digital framework. These team works will be managed by teachers from a consortium who will act mostly as facilitators in the learning process, promoting discussions and active learning activities designed to produce layers of knowledge around the stated problems and underlying phenomena.

To this purpose, while addressing all stages of the process, an integrated set of resources based on both design thinking and speculative design methodologies is being elaborated. The goal of this toolkit is to help students and facilitators in promoting discussions and awareness during the learning process, helping them to make decisions and choose their own learning path towards innovative solutions to the proposed problems in current and future scenarios.

Incorporating micro-credentials into existing Higher Education Frameworks has been undertaken by the EU Erasmus+ programme *The European Consortium of Innovative Universities* (ECIU), which consists of an alliance of 12 universities from several countries within the EU. The ECIU White Paper (Brown et al., 2020) outlines fundamental requirements that should exist in micro-credentials to initiate creativity, collaboration and social change: Definitions and Standards, Quality Assurance, Credit and Recognition, Storage, Portability and Platforms and Successful Uptake. This new framework is dependent on open and inclusive collaboration between all stakeholders seeking to act as a partnership between learners, employers and European universities to meet the demands of the labour market and introduce societal changes. DIFUCH contains all the elements of a cross-border collaborative initiative which underpins the fundamental challenge to society to cultivate talents and ensure the quality and portability of educational credentials. The European Credit Transfer System (ECTS) provides validation, value and recognition of educational standards by learners, employers and society at large. The system is used by 48 countries within the European Higher Education Area and is based on national and internationally agreed values for workloads involved in formal HE programmes arising from the Bologna Process of 2019.

3.3 IO2 DIFUCH Digital Challenge Lab

The DIFUCH Digital Challenge Lab (IO2) will bring multidisciplinary, cross-sectoral, and inter-institutional teams together to co-design a knowledge creation model that is connected to regional challenges with a future perspective. To meet this goal, DIFUCH partners were asked to research the regional needs of their respective institutions to identify a set of challenges which correspond to United Nations Sustainable Development Goals (industrial transition, sustainable cities, economic growth, quality education, health etc.) that DIFUCH can tackle through the development of appropriate curricula. The development of the DIFUCH challenge lab includes 1) networking with the public, business and social stakeholders of each of the DIFUCH partner's respective regions to research and identify their needs; 2) designing and create content: an initial set of digital future challenges will be investigated and collected via a systematized approach; 3) following the networking and research phase and, as a consequence of the field work, a set of final digital future challenges will be developed by all partners through their local stakeholders; and 4) the challenges will be tested in a pilot phase and finally launched through the virtual ecosystem (O4)

Digital learning spaces will be integrated into a common digital ecosystem, inclusive, open, social, and agile which are not not segregated from the world wide web, other virtual platforms, social media, and streaming services. The teams will transfer research results back to their HEIs and their respective regions. Thus, contributing to regional development with innovative solutions that are adaptable to different regions in Europe.

3.4 IO3 DIFUCH Curriculum Centre

In this IO, new challenge-based blended intensive programmes and micro-credentials will be codesigned and tested in an iterative process in collaboration with HEIs, stakeholders and students. Central to this task is networking and identifying the needs of regional stakeholders. Collaborating with stakeholders and students ensures that the curriculum and micro-credentials address the real needs of students and stakeholders. For this step different focus groups, one per country will be organised. Each partner will engage with stakeholders from their region to identify digital future challenges that face these organisations and in turn offer the opportunity for students to learn how to address real and future challenges. This process will ultimately benefit local communities and wider society, it will generate a positive economic impact and ensure better readiness for the future economy among educators, students and stakeholder organisations. An important step in this process is the multiplier event organised by the South East Technological University (SETU), Ireland. This event will facilitate

regional stakeholders (i.e. SMEs, CSEs, HEIs and student communities) to engage with DIFUCH partners to help identify regional challenges to develop a set of digital future challenges communicated through teacher-facilitators to researchers and students. Challenge-based modules will be piloted, including the selection of participants and feedback.

3.5 IO4 DIFUCH Virtual Campus

This IO focuses on embracing digital technology to facilitate an innovative virtual campus, with students in the lead in a way that increases their digital literacy skills and makes them aware of their role in adopting digital technologies for the whole learning community of CBL. Having students design their own digital learning ecosystem, combining digital platforms from partners HEIs and also, preferably, ones they use themselves, makes it attractive to younger generations and creates a unique learning experience. By formulating their own digital learning manifesto that expresses the values and rules of the digital learning ecosystem, students will be in the lead and 'train' and engage facilitators and external parties throughout the CBL courses and onboard them into their digital ecosystem. The DIFUCH partnership expects long-term benefits with a sustainable joint digital and blended study programme to be implemented with a digital future challenge learning methodology. This sustainability will be guaranteed by the virtual campus platform after the end of the project. The digital learning ecosystem designed in this way contributes to the pedagogical challenge-based learning methodology of DIFUCH and will support collaborative projects, and international knowledge creation teams.

4. DIFUCH PROJECT OBJECTIVES AND ONGOING OUTCOMES

The transnational nature of the project is key to achieving the project outcomes. The DIFUCH project supports international cooperation and benchmarking in terms of practices, solutions, and approaches to the implementation of innovative strategies for future-orientated challenge-based learning in higher education. The participation of partners representing different European regions provides complementary skills and experiences but with a common scientific and regional context and potential impact. The implementation of an international digital community of practice to enhance the sharing of innovative teaching resources, tools and strategies enriched with different countries' perspectives building tools, methods and modules and joining courses that support international collaboration of students with different cultural backgrounds. The aim of this project is to design, test and implement digital future challenge-based learning methodologies, platforms and tools within a group of three HEIs in an innovative, future-orientated, trans-institutional cooperation and regional engagement that enhances collaboration and co-creation at all levels including university, trans-university, regional and inter-regionally.

5. CONCLUSIONS

Technology is driving change across all sectors at an ever-increasing rate; the opportunities posed by technological innovation and disruption are immeasurable, however, central to success is the transformation of knowledge achieved through strong collaboration between universities and stakeholders. By acknowledging and addressing these challenges and opportunities, the DIFUCH project will provide a new and creative programme for identifying, predicting, and helping to resolve social, environmental and economic challenges. The DIFUCH joint programme will be implemented in all partner HEIs at an international level, contributing to regional economic and social impact in participating HEIs, partnering companies and organisations contributing to a transformational educational paradigm.

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