

RETHINKING ONLINE DOCTORAL EDUCATION: DIGITAL INNOVATION, E-LEARNING AND AI IN THE CREA PROGRAM

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Abstract

The PhD Program in Creativity and Social and Sustainable Innovation (CREA) at the University of Vigo in Spain, seeks to strengthen the University's contribution to priority research areas and global societal challenges through an innovative, transversal and creative educational approach. The program addresses key domains such as health, environment, communication, education and culture, and governance, with a particular focus on responding to emerging developments within the digital society. CREA is delivered entirely online, aiming to attract international talent and provide flexible access to advanced doctoral training aligned with contemporary educational transformations. This paper presents the design, implementation and continuous evolution of the program's e-learning methodology, highlighting its alignment with recent developments in digital education. The CREA doctoral program is supported by a fully virtual learning ecosystem developed by the University of Vigo, which includes a remote campus for synchronous online teaching and asynchronous access to recorded sessions, a digital platform for the management and organization of course content, and a comprehensive online system for academic and administrative monitoring through a virtual doctoral office. These digital infrastructures enable effective interaction, supervision and assessment in a fully online doctoral environment.

Keywords: *Doctoral program, digital innovation, e-learning, artificial intelligence, online education.*

1. Introduction

The doctoral program in Creativity, Social and Sustainable Innovation at the CREA (Campus of the University of Vigo in Spain), promotes inter- and transdisciplinarity between all the areas of knowledge taught on this campus. Highlights the value of cross-disciplinary doctoral work by integrating two different research lines. Candidates are supported by at least two mentors who provide specialized insights to strengthen the research. 24 theses have already been read (100% with the highest grade), the professors of the Program direct and/or belong to national and international research projects and groups of high scientific impact, several hundred publications of very high impact have been generated, and even some publications and activities have received awards. It is 100% virtual, enrolment fee of less than 400 euros per year, and more than 50 applications for access in the last two years: Increase of places maximum 20 to 24. You can write your thesis as a monograph or as a compendium of scientific articles (WOS/SCOPUS). If you want, you can also take with other qualifications: a) Industrial doctorate; b) International doctorate; c) A doctorate under co-supervision (UVIGO+ Foreign University – through an agreement between the two) (a double doctoral degree is obtained). It is virtual doctoral education: 100% online (secretary's office; academic management and tutoring; teaching-through UVIGO's own (MOOVI) teletraining platform (online); and a system of offices and virtual classrooms of the UVIGO (Remote Campus). Thesis dissertations are 100% online or face-to-face; MOOCs-UVIGO: Massive Online Open Courses (to expand knowledge) and online subjects from other UVIGO Doctoral program.

Considering this massive use of online teaching and its wide and diverse application in education, teachers, public administration, and governments need to be aware of the strengths and weaknesses of AI in learning, in order to be empowered, not dominated by technology, in digital citizenship education practices. This work focuses on many complex challenges posed by the connections between AI and education, specifically referring to PhD programs, to provide a holistic view in order to ensure that future developments and practices are genuinely used for the common good, to advance knowledge of their use

in education, critically analyzing whether they can mask the production of some errors, biases, overrepresentation or underrepresentation, and investigating the challenges and ethical considerations associated with their use, employing a systematic review of the literature.

2. Artificial intelligence in CREA doctoral program

In response to the specific requirements of virtual doctoral education, the program has also developed tailored protocols, guidelines and quality assurance processes for online thesis supervision, evaluation and virtual dissertation. These procedures ensure transparency, academic rigor and consistency with institutional and international doctoral standards, while taking advantage of the opportunities offered by digital technologies. Furthermore, the paper addresses emerging challenges associated with new developments in education, particularly the increasing use of Artificial Intelligence (AI) in learning and research contexts. Some researchers in the program wanted to get involved and started by conducting a literature review on these aspects. To carry out the systematic review of the literature, the methodological guidelines of PRISMA (Page et al., 2021; PRISMA, s.f.) in the Web of Science (WOS). The results were complemented with a manual search in Google Scholar. The strengths and limitations of AI tools are critically analyzed, including their potential impact on knowledge production, the risk of masking errors, reinforcing biases, or contributing to overrepresentation or underrepresentation of information. An extensive list of researchers has shown that machine learning models exhibit errors and social and political biases (Rozado, 2023; Dwivedi et al., 2023; Aydin y Karaarslan, 2023; Patel et.al., 2023); differences in the results according to ChatGPT (Feng et al., (2023); different response each time (Borji, 2023; Guo et al. 2023); or biased (Breazu y Katson, 2024; Winkel, 2024). A previous literature review (Ricoy-Casas et. al., 2024) highlights the increasing application of AI in the classroom in various areas; the increase in interest in the subject in all areas, especially in university education; and the diversity of studies that focus mainly on four aspects: a) the description and analysis of IA tools that can generate discrimination in underrepresented students; b) tools that can mitigate these results by verifying errors, biases and others; c) examples of applications and their usefulness by teachers themselves to improve inclusion; and d) public policies and processes in relation to the implementation of AI with an impact on the learning of underrepresented students. We have been able to observe: a) Their acceptability is different and related to previous academic training: (Li et. al., 2024) (Ünlüer, 2024); Some authors recommend the introduction of AI and expert systems into higher education curricula and teaching methods (Jarrah et. al., 2023; Esfandiari et. al., 2024). Some see it as a tool for scaffolding students' understanding and promoting critical thinking (Chen & Wang, 2021). Others believe Chat GPT can support differentiation and accommodate diverse learning needs (González et al., 2023). Additionally, teachers anticipate Chat GPT as a resource for language learning, cultural exchange, and global perspectives (Da Silva & Sutil, 2024); c) There are many different AI tools and applications for theses (Kulikowski et. al., 2023; Zhang, et. al., 2024).

Most of the permitted uses focus on: 1) AI-accelerated literature review; 2) Brainstorming and clarification of research questions and interventions; 3) Data management and analysis; 4) Generation of images and/or text; 5) AI-assisted coding, data visualization. However, while there is also often a requirement to explain the measures taken to mitigate bias and ensure academic rigor, this can reinforce the idea that the results obtained may not be 100% reliable or conclusive in many cases. Most major academic journals and publishers currently have policies on the use of generative AI in publications. These policies vary considerably. There is a growing consensus that generative AI tools do not meet the criteria for authorship of academic papers, as they cannot take responsibility or be held accountable for the papers submitted. Material generated by AI tools should not replace PhD candidates' own research and learning, nor misrepresent their understanding of the knowledge, concepts, and techniques used during the PhD. Some relevant publications were critical with generative AI (Nature, 2023).

3. Other conclusions

Some researchers warn about some errors produced by these systems for the development of scientific careers (Ginther et. al., 2024). Privacy and data security concerns related to student information and interactions are often raised (García & Rodríguez, 2022). Teachers worry about the reliability of Chat GPT's responses and the potential for misinformation (Lee & Kim, 2023). We have already seen how on occasion it produces limited and biased results which can exacerbate discrimination in some groups, and these systems also face dilemmas in the field of intellectual property, industrial property and even other ethical dilemmas (Helgeson et. al., 2025; Thorp, 2023; Stokel-Walker, 2023). It already represents a challenge for teachers, and ChatGPT appears as an author in research articles which many scientists disapprove of (Stokel-Walher, 2023). The responsible, ethical, and informed use of generative AI is permitted in doctoral research at most universities. In addition to corrective tools, it is crucial that

researchers discuss with their supervisors beforehand how they plan to use AI in their research, clearly detailing this approach in their work. This can foster a responsible, ethical, and informed approach (including responsible use from a privacy and data protection perspective). Therefore, the use of generative AI tools in the research and dissertation writing process should always be conducted with complete transparency. Furthermore, if a postgraduate unit permits the use of generative AI in research, it must ensure that the discipline-specific guidelines regarding the description of the methodology and appropriate references are clearly defined.

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