GREEN AND DIGITAL COMPETENCES FOR ENGINEERING PHD CANDIDATES

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GREEN AND DIGITAL COMPETENCES FOR ENGINEERING PHD CANDIDATES

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1. INTRODUCTION

This document constitutes the "Competency Deliverable" of the TECSKILL project. It comprehensively addresses the digital and green skills to be developed within the framework of this innovative project. Additionally, it details the functioning of competency sheets, fundamental tools for evaluating and documenting participants' progress.

The TECSKILL project emerges in response to the growing need for training in digital and environmental sustainability competences in the European context. In an increasingly digitized world and one concerned about environmental preservation, acquiring these skills becomes indispensable for both young people entering the job market and active professionals seeking to update their knowledge. To ensure coherence with European standards, the competences defined within TECSKILL have been adapted from the DigComp 2.2 and GreenComp frameworks, which provide comprehensive references for the development of digital and sustainability-related skills.

To address this need, the TECSKILL project aims to develop digital and green competences in engineering doctoral students across Europe. Through transnational cooperation among higher education institutions, the project aims to refine learning programs, promote innovation and entrepreneurship, enhance research skills, and produce high-quality common outcomes. All of this is aimed at contributing to the digital transformation of society and combating climate change.

This document provides a comprehensive overview of the digital and green competences developed in the TECSKILL project, along with a detailed explanation of the use of competency sheets.

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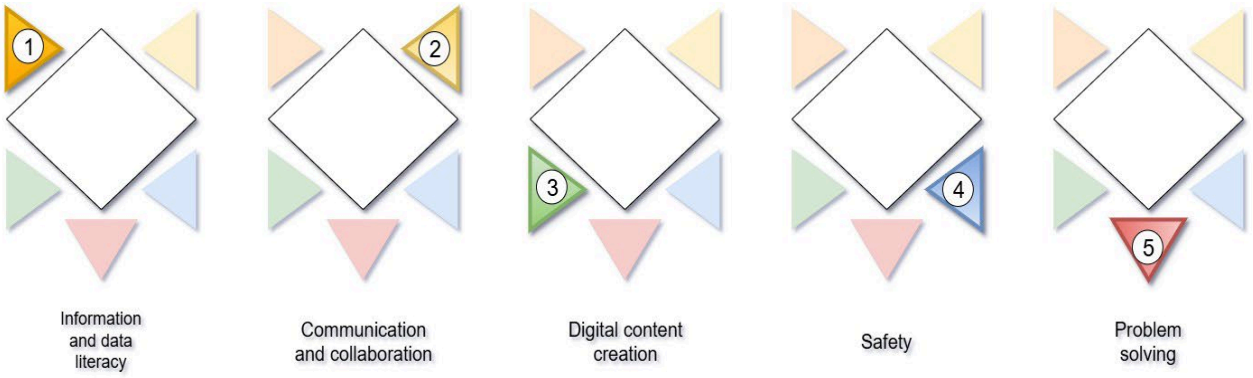
2. COMPETENCES

2.1. COMPETENCES SUMMARY

2.1.1. INTRODUCTION TO DIGITAL COMPETENCES



Information and data literacy	Communication and collaboration	Digital content creation	Safety	Problem solving
This area focuses on fundamental skills for searching, evaluating, and managing digital information and data. Participants will develop the ability to navigate and filter data, assess its quality and relevance, and manage it effectively.	Competences in this area centre on interaction and collaboration through digital technologies. Participants will learn to communicate effectively, share information, and collaborate in virtual environments, maintaining netiquette and managing their digital identity.	In this area, participants will acquire skills to develop and manipulate digital content creatively. This includes creating, integrating, and revising digital content while also respecting copyright and licenses.	Digital security competences focus on protecting devices, personal data, and privacy online. Participants will learn to defend themselves, others, and the environment in the digital environment, identifying and resolving technical issues.	This area focuses on critical thinking and problem-solving using digital technologies. Participants will develop the ability to identify technological needs and solutions, as well as to use creativity to address digital challenges.

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In the current environment of rapid technological evolution, digital competences have become a fundamental requirement in practically every professional field. From searching and evaluating information online to collaborating in virtual environments and creating digital content, these skills are essential for success in today's digital world.

Chart 1. Digital Competences

Nº	Competence area	Code	Competence
1	Information and Data Literacy	DC1	Searching and Filtering Data, Information and Digital Content
		DC2	Evaluating Data, Information and Digital Content
		DC3	Data, Information and Digital Content Management
2	Communication and Collaboration	DC4	Interacting through Digital Technologies
		DC5	Sharing through Digital Technologies
		DC6	Engaging Citizenship Through Digital Technologies
		DC7	Collaborating Through Digital Technologies
		DC8	Netiquette
		DC9	Managing Digital Identity
3	Digital Content Creation	DC10	Development of digital multimedia content for research purposes.
		DC11	Digital Content Integration and Reelaboration
		DC12	Copyright and Intellectual Property Licensing
		DC13	Programming
4	Safety	DC14	Protecting Devices
		DC15	Protecting Personal Data and Privacy
		DC16	Protecting Health and Well-Being
		DC17	Protecting the Environment
5	Problem Solving	DC18	Troubleshooting technical problems
		DC19	Identification of technological needs and responses
		DC20	Creative use of digital technology
		DC21	Identifying gaps in digital skills

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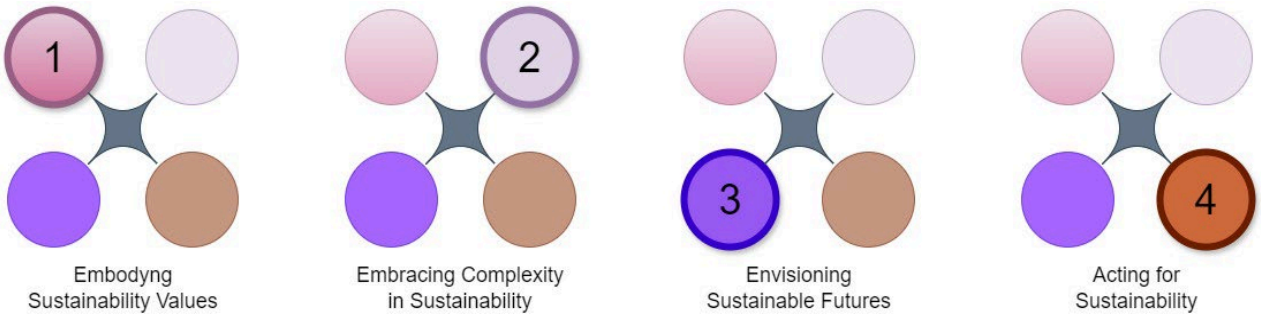
2.1.2. INTRODUCTION TO GREEN COMPETENCES



Competences in this area focus on assessing and promoting sustainability in all its dimensions. Participants will learn to appreciate the importance of sustainability, favor equity, and promote environmental conservation.	In this area, participants will develop skills to understand and address the complexity of environmental issues. This includes systemic and critical thinking, as well as the ability to frame problems effectively.	Competences in this area focus on the ability to imagine and work towards a sustainable future. Participants will develop future literacy skills, adaptability, and exploratory thinking.	This area focuses on empowering individual and collective action to promote sustainability. Participants will learn to exercise their political agency, collaborate on collective actions, and take individual initiatives to promote sustainability.

The urgent need to address global environmental challenges has underscored the importance of green competences in education and the workplace. These competences not only involve understanding the principles of sustainability and environmental conservation but also adopting a critical and proactive mindset towards environmental action.

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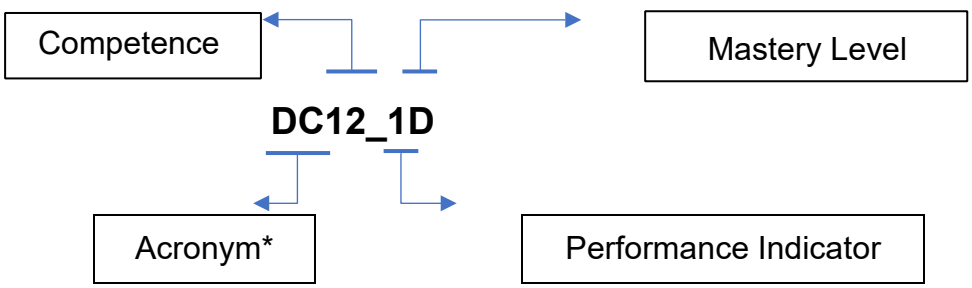
Chart 2. Green Competences

Nº	Competence Area	Code	Competence
1	Embodying Sustainability Values	DC1	Valuing sustainability
		DC2	Supporting fairness
		DC3	Promoting nature
2	Embracing Complexity in Sustainability	DC4	Systems thinking
		DC5	Critical thinking
		DC6	Problem framing
3	Envisioning Sustainable Futures	DC7	Futures literacy
		DC8	Adaptability
		DC9	Exploratory thinking
4	Acting for Sustainability	DC10	Political agency
		DC11	Collective action
		DC12	Individual initiative

2.2.CHART DESCRIPTION

Competency sheets are tools used to assess and document participants' progress in developing competences. Each competency sheet contains the definition and objective of a specific competency, along with performance indicators and mastery levels.

Performance indicators are the parameters that will be evaluated to determine the level of development of the doctoral candidates. Mastery levels for each performance indicator range from A (lowest) to D (highest). All competences are assigned a code for identification in other project deliverables.



*Acronym: DC stands for Digital Competences and GC stands for Green Competences.

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Chart 3. Example of a Competence Sheet Structure

Code and Competence Name

DC19	Identification of technological needs and responses		
Definition	Identify technological needs and assess and implement technological responses during research projects		
Goal	Be able to identify technological needs at different stages of a research project and evaluate and implement appropriate responses to promote consistent results		
Knowledge Metrics			
Description		**Progression levels**	
1	**Identifying technology needs in the preparatory phase of a research project**	A	Defines the high-level technology needs for the achievement of the goals of a research project
		B	Identifies the technological responses needed to carry out the work envisaged in the project
		C	Adequately chooses the technological response (technical equipment and materials) to take on the research work
		D	Assists peers in identifying the technological need and making the appropriate choice of the necessary technological response
2	**Recognise technological needs during the execution of a research project**	A	Defines the specific technological needs (equipment and material) for a given experiment
		B	Identifies the appropriate configuration of the technological response for a given experiment (technological need)
		C	Successfully implements the configuration of the technological need for a particular experiment
		D	Supports peers in defining the technological need and its configuration for a particular experiment
3	**Exploring technological needs for managing the implementation of a research project**	A	Sets out the technological requirements for managing a research project (budget, schedule, communications)
		B	Maps the technological responses needed to ensure the success of the project (communications, responsibilities, etc.)
		C	Successfully deploys technology solutions ensuring stakeholder involvement
		D	Assists peers in identifying research project management technology needs and supports them in the choice of the technological response

Performance Indicator

Mastery Level

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DIGITAL COMPETENCES

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DC1	Searching and Filtering Data, Information and Digital Content
Definition	Ability to adapt, customize search strategies and effectively select information, ensuring that relevant and high-quality information is obtained in line with research needs
Goal	Develop and implement an efficient and customized search strategy, incorporating information filtering, to comprehensively identify and compile the scientific literature

Knowledge Metrics

Description		Progression levels	
1	**Adjust search strategies according to the specific needs of the research**	**A**	Can adjust search strategies according to the specific needs of the research
		B	Can perform independent searches in advanced databases, distinguishing between Open Access and Non-Open Access
		C	Can perform advanced database searching, using DOI and authors' names as an efficient method to locate and access publications
		D	Expert in autonomous searches in databases such as WOS and ScienceDirect. Shows ability to teach these skills
2	**Modify and adapt data filtering methods according to the specific requirements of the research**	**A**	Ability to apply data filtering strategies, although it shows shortcomings in executing them efficiently
		B	Displays solid knowledge of keyword usage to optimize information filtering
		C	Has a proven ability in data filtering by applying expert Boolean search with "AND", "OR" and "NOT" operators to refine queries with precision
		D	Expert in data flow analysis with the ability to efficiently apply advanced Boolean search and keyword usage
3	**To make the doctoral student aware of the complexities of information searches**	**A**	Recognizes limitations in content accessibility
		B	Recognizes the importance of minimizing information overload and shows the ability to avoid distractions in searches
		C	Performs a detailed analysis of the advantages and disadvantages of using artificial intelligence-based search engines
		D	Fully understands the complexity of information search and develops advanced strategies to overcome limitations in content accessibility

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4	**Establish strategies to search for research-related project calls for proposals**	A	Identifies projects carried out in their area of study
		B	Filters projects using criteria such as method, field of application or location
		C	Uses more complex filters, such as date of realization, novelty or economic impact
		D	Expert in the pursuit of projects related to the area of research, with the ability to teach such skills
5	**Conduct effective searches for research calls for proposals**	A	Uses conventional search engines to find research calls
		B	Uses specialized search engines such as Pivot-RP to search for specific calls
		C	Uses specialized databases and customizable alerts to receive notifications of new calls, such as Horizon 2020 or Research Professional
		D	Applies advanced trend analysis techniques to identify emerging calls, using tools such as Dimensions or Grant Forward.

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DC2	Evaluating Data, Information and Digital Content		
Definition	Critical and systematic analysis of digital datasets, information and relevant content to determine the quality, relevance and reliability of the research information collected		
Goal	Improve the ability to discern the validity and usefulness of digital resources in relation to research objectives		
Knowledge Metrics			
Description		**Progression levels**	
1	**To discern the quality of digital resources, identifying aspects such as accuracy, reliability and timeliness of the data and information evaluated**	A	The PhD student possesses the ability to perform basic assessments of the reliability of digital information sources
		B	Recognizes specific limitations in the information assessed, indicating an intermediate understanding of factors affecting quality
		C	Has an advanced understanding of the validity of the data collection methods used
		D	Autonomously and expertly evaluates the quality and reliability of the information
2	**Understand the different means of recognizing malicious information**	A	Basic understanding of the potential sources of malicious information
		B	Identifies the various software typically employed in plagiarism detection research
		C	Specifically familiar with copyright legislation and knows methods such as cross-validation of data or peer review
		D	Effectively applies advanced strategies and techniques to recognize malicious information, demonstrating an expert level of critical content evaluation
3	**Understand the information presented in digital engineering research content**	A	Identifies basic elements in flowcharts and graphs, recognizing symbols commonly used in their area of research
		B	Analyses complex graphs and flowcharts in scientific articles, identifying causal relationships and dependencies between variables
		C	Synthesizes information from graphs and diagrams to gain an overall understanding and evaluates the effectiveness of Graphical Abstracts in conveying key concepts
		D	Critically evaluates the effectiveness of visual presentation in digital content, providing advanced insights on how to improve clarity and visual communication

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4	**Identify the adequacy of the representation of digital content**	A	Identifies the need for visual representations through graphics or images
		B	Evaluates consistency between visual representations and textual content
		C	Evaluates the appropriateness of the type of graphic chosen with the content it represents
		D	Perfectly assesses whether the type and number of graphical representations are optimal for conveying information
5	**Evaluate the suitability of databases used in scientific publications**	A	Recognizes the source of data used in a paper
		B	Understands the relationship of the database to the research objective
		C	Evaluates the adequacy of the data used in an article in relation to its scope, quality and relevance to the purpose of the research
		D	Critically examines the limitations of the database, identifying potential biases or shortcomings that could influence the research findings

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DC3	Data, Information and Digital Content Management		
Definition	Efficiently organize, store and manage data and digital information generated during research projects		
Goal	To advance the efficiency of information management through innovative solutions that optimise the handling of digital data in research projects		
Knowledge Metrics			
Description		**Progression levels**	
1	**Acquire skills to design and implement systems that optimize the organization and retrieval of bibliographic information in research projects**	A	Basic knowledge of academic systems such as Mendeley and Zotero to organize bibliographic references in research projects
		B	Sets up a customized database integrated with tools such as Zotero and Mendeley for efficient management of bibliographic information and associated documents
		C	Optimizes a data management system with advanced Mendeley features and EndNote tools, enabling online collaboration and document synchronization in research projects
		D	Leads the development of a data management environment integrating analytical tools to extract key information from references and documents in research projects
2	**Manage standards that promote interoperability and quality in digital data management**	A	Possesses basic knowledge of existing bibliographic standards, such as APA, IEEE or ISO, used in engineering research
		B	Rigorously applies recognized bibliographic standards to ensure correct citation and referencing in research projects
		C	Applies FAIR principles to ensure transparency and accessibility of data in research projects
		D	Expert in the implementation of specialized regulations for data management in engineering research, promoting the integrity and reproducibility of results
3	**Organize the information presented by other authors related to the same research topic**	A	Identifies and summarizes key information from previous studies on a research topic
		B	Organizes state-of-the-art information into a document, highlighting trends, methods, and gaps in research
		C	Effectively manages information overload by applying advanced organization techniques such as concept maps or comparison matrices
		D	Develops innovative strategies to organize and manage large amounts of information, applying data mining and automated analysis techniques

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4	**Create a digital information management system for research projects**	A	Uses basic digital tools to organize and store information related to a research project, such as Google Drive
		B	Implements more advanced digital information management systems, such as Trello or Asana, to coordinate tasks and documentation in a project
		C	Designs and customizes an information management system using more complex platforms such as SharePoint, customizing workflows
		D	Adapts customized digital information management systems for complex research projects
5	**Optimal organization of information**	A	Creates simple folders to organize documents related to a research project, using descriptive file names
		B	Applies a more elaborate folder structure and uses consistent naming conventions to facilitate document identification
		C	Designs a folder structure adapted to the specific needs of the project, considering the interrelation of documents and facilitating quick searches
		D	Develops a customized information organization system that incorporates knowledge management principles, with workflow automation and advanced metadata approaches
6	**Manage databases of the research projects**	A	Uses basic tools such as spreadsheets to record and organize manually collected data, keeping a simple structure
		B	Implements simple relational databases using software such as Microsoft Access or MySQL to organize data from a variety of sources
		C	Uses more advanced database management systems, such as PostgreSQL or MongoDB, to handle large datasets and ensure integrity and security
		D	Designs and implements a customized data management system, considering performance optimization, scalability and interoperability with other analytics tools

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DC4	Interacting through Digital Technologies		
Definition	Develop knowledge, skills and interaction attitude in research projects through various digital technologies		
Goal	Use and critically integrate digital technologies in the communication of engineering research projects		
Knowledge Metrics			
Description		**Progression levels**	
1	**Manage various digital technologies to facilitate the interaction of the doctoral student in digital environments**	A	Demonstrates familiarity with various digital technologies to facilitate the doctoral student's interaction with digital media, but does not have a deep understanding of their maximum performance
		B	Develops knowledge and skills that enable them to interact with new digital technologies
		C	Dominates digital technologies to facilitate the interaction of the doctoral student in digital environments
		D	Leads the implementation of new innovative ways to facilitate doctoral student interaction in digital environments
2	**Use digital internal communication technologies for the management of research projects**	A	Is fluent in identifying different internal communication tools for research project management, but their knowledge of the different applications is limited
		B	Is proficient in the advanced functions of digital technologies for the management of internal communications (moderating online sessions, internal communication flow, etc.)
		C	Integrates digital tools into cross-cutting aspects of research project management to optimise internal communication
		D	Can improve and optimise the application of digital tools, making innovations, and applying emerging digital technologies to improve internal communication for research project management
3	**Understand the platforms for communicating scientific and technical results obtained during research**	A	Compares the purpose and prestige of different digital platforms for disseminating scientific results of research conducted
		B	Ability to develop strategies for selecting digital platforms to disseminate research results
		C	Identifies new innovative ways of disseminating scientific research results
		D	Adapts the results presented to digital platforms for the communication of the results

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4	**Interacting through social networks used by the scientific community**	A	Uses social media to increase the dissemination of research project milestones
		B	Regularly contributes to discussions in social networks related to the thematic area of your research project
		C	Attracts followers through their interaction with digital content
		D	Attracts researcher interest through social networking groups in their own research social networks (ResearchGate)

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DC5	Sharing through Digital Technologies		
Definition	Encourage advanced information sharing and state-of-the-art digital content to establish effective sharing during engineering research projects		
Goal	Develop skills and capacities to share digital content effectively through advanced technology. Promote transparency of research results		
Knowledge Metrics			
Description		**Progression levels**	
1	**Implement the project's corporate identity in scientific communications during research through digital tools**	A	Uses digital technologies to adhere colours, logos and other visual elements in accordance with the corporate identity of the research project
		B	Use of digital technologies to coherently implement the corporate identity of the research project in various digital tools, such as presentations and social networks
		C	Identifies digital tools with which to innovate in the creative implementation of visual elements that enhance the corporate identity of the project
		D	Investigates how to incorporate the project's corporate identity into the dissemination of project results
2	**Know the digital technologies for sharing information within research projects through their corporate identity**	A	Understands the essential elements of corporate identity and how they are applied in digital tools
		B	Rational use of common digital tools for sharing information in research projects, incorporating corporate identity
		C	Explores and uses emerging digital technologies (such as AI) to share information, while maintaining a strong integration with the project's corporate identity
		D	Participates in the development of new digital technologies to convey the corporate identity of a research project
3	**Implement digital technologies to share scientific-technical information generated during research**	A	Demonstrates basic understanding of the functions and features of these platforms in terms of information sharing
		B	Customises the presentation of scientific and technical information for different contexts using digital technologies (text editors, Draw.io...)
		C	Integrates cutting-edge digital technologies to share scientific and technical information
		D	Increases knowledge by disseminating their experience in scientific and technical research work (LinkedIn)

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4	**Organise meetings within a research project to share scientific information through digital technologies.**	A	Ensures the effective participation of partners and the clear transmission of scientific information through the application of digital technologies
		B	Efficiently manages advanced functions of digital platforms to enhance the participants' experience
		C	Tailors digital meetings according to the specific needs of the research
		D	Investigates new digital tools to improve the efficiency/organisation of meetings within a research project

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DC6	Engaging Citizenship Through Digital Technologies		
Definition	Employ digital technologies appropriately in the context of research projects to enhance community interaction, address societal challenges and contribute to sustainable development		
Goal	Effectively apply digital technologies in research projects to strengthen community interaction, address social challenges and contribute to sustainable development through research in engineering projects		
Knowledge Metrics			
Description		**Progression levels**	
1	**Apply digital technologies to assess the needs of citizens and strengthen the research object of the projects**	A	Adequately identifies relevant digital platforms and tools to capture the needs of society
		B	Applies digital technologies in a proficient way to collect data and strengthen the management of research projects
		C	Introduces innovative practices in the application of digital technologies to assess citizens' needs
		D	Researches new digital technologies to improve data collection and address public needs
2	**Understand various public and private platforms for managing and soliciting engineering research projects**	A	Identifies and understands the functioning of digital platforms for the management and application of research projects
		B	Learns about the advanced functions of various digital platforms, optimising the research project management and application process
		C	Customises the use of project management platforms according to the specific needs of the research projects (Jira)
		D	Leads initiatives for the incorporation of new platforms or the development of customised solutions to optimise the management of engineering research projects
3	**Use digital tools to involve citizens in research projects, either in the development of the database or to ensure the applicability of research results**	A	Identifies and uses digital tools to communicate research project information to the public
		B	Develops more advanced strategies to engage citizens through digital tools
		C	Establishes feedback biases using digital technologies to strengthen the applicability of results
		D	Collaborates with other institutions to share experiences and promote continuous improvement in citizen participation in research projects

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4	**To adequately represent, through digital technologies, the scientific information generated so that it is accessible to the public**	A	Uses digital technologies to represent scientific information (Excel, GraphPad...)
		B	Adapts complex visual representations to make them understandable for citizens (Power BI)
		C	Uses digital technologies to represent visual information in an attractive way through code development (Python, MATLAB...)
		D	Investigates visual data compression strategies through the application of digital technologies

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DC7	Collaborating Through Digital Technologies		
Definition	Advanced management of digital technologies in collaborative processes of integrated data and/or resource creation in research projects		
Goal	Dominate the strategic selection of digital technologies for knowledge cocreation and collaboration within engineering research		
Knowledge Metrics			
Description		**Progression levels**	
1	**Know digital technologies that optimise collaboration between stakeholders and/or research project team members**	A	Knows the functionality of various technologies and how it could be adapted to research projects (SharePoint, Microsoft Teams)
		B	Efficient use of collaborative digital technologies
		C	Innovates in the use of digital technologies with new functionalities useful for collaboration (Miro)
		D	Continuously integrates new digital technologies to optimise collaboration between stakeholders and/or project team members
2	**Develop effective strategies to facilitate smooth collaboration of scientific information during a project using digital tools**	A	Learns about different strategies that facilitate effective collaboration through the application of digital technologies
		B	Implements more advanced digital tools to optimise research project communication and collaboration
		C	Designs strategies to suit different contexts and types of projects
		D	Introduces specific innovative features of digital technologies to enhance collaboration during research projects
3	**Use digital tools in a collaborative context to assign responsibilities within an engineering research project**	A	Knows different ways of establishing accountability (RACI matrix) through digital tools (e.g. JIRA)
		B	Can integrate the particular scenario of their research project into the functionalities offered by digital responsibility management tools
		C	Develops personalised strategies within the team to allocate responsibilities in innovative ways
		D	Introduces innovations in accountability practices to maximise efficiency

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4	**Using specific digital tools to plan and share tasks effectively in the framework of an engineering research project**	A	Efficiently uses digital tools for planning and task allocation in a research project, such as Kanban or Miro
		B	Effectively integrates digital tools (Kanban, Miro...) for particular scenarios specific to research projects
		C	Evaluates the effectiveness of strategies used to share tasks with digital tools in engineering research projects
		D	Critically assesses and provides recommendations for improving task-sharing strategies using digital tools in research projects
5	**Co-create, through digital technologies, digital resources that enhance collaboration within an engineering research project**	A	Participates in co-creation activities using digital technologies
		B	Designs digital resources with advanced functionalities that enhance collaboration, such as real-time collaborative editing tools
		C	Customises digital resources to suit the specific needs of the research project
		D	Introduces significant innovations in digital co-creation that transform project collaboration
6	**Know and implement digital technologies that enable the co-creation of digital resources within engineering research projects**	A	Demonstrates familiarity with at least two digital platforms designed for the co-creation of resources in research projects
		B	Uses advanced tools to manage and organise the process of co-creation of digital resources
		C	Facilitates the equitable and meaningful participation of all collaborators during co-creation sessions
		D	Leads the implementation of innovative practices in digital cocreation, contributing to the development of new approaches and technologies

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DC8	Netiquette		
Definition	To increase researchers' knowledge related to the way they behave in the use of digital technologies and their interaction to meet the needs of specific audiences		
Goal	To develop skills in understanding norms of behaviour in the use of technologies, as well as specific knowledge in the use of technologies and interaction in digital environments		
Knowledge Metrics			
Description		**Progression levels**	
1	**Understand and apply the rules of behaviour in scientific digital environments, communicating effectively in a manner tailored to the target audience**	A	Identifies variables that relate to the well-being of the working group and the use of digital technology in the research project
		B	Uses digital platforms in an ethical and respectful manner in accordance with established standards
		C	Leads innovative problem-solving strategies in the use of digital technologies
		D	Contributes to the establishment of ethical standards and practices in the digital communication of research projects
2	**Manage conflicts between members of the working group through the application of digital technologies**	A	Ability to identify digital technologies that manage conflicts in the context of research projects (ODR systems)
		B	Demonstrates understanding in the application of these digital conflict management technologies in the framework of research projects
		C	Customises certain functions in the application of digital technologies for research working groups
		D	Controls the resolution of conflicts through the creation of forums on digital platforms, thus helping to share risk management plans
3	**Create digital resources adapted to different contexts, cultures or generations for the dissemination of the results or knowledge generated during the PhD student's research**	A	Understands how these characteristics can influence the dissemination of the digital resource created
		B	Develops digital resources tailored to the specific needs of the target population
		C	Identifies areas for improvement through the addition of elements that provide feedback from specific audiences
		D	Demonstrates ability to anticipate potential conflicts in managing the creation of digital content

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4	**Be able to interact/adapt the rules of conduct in the use of digital information and communication technologies**	A	Understands the importance of these standards in the context of digital conduct
		B	Demonstrates the ability to interpret and adapt standards to specific research contexts
		C	Develops norms adapted to the use of digital technologies in research projects
		D	Has experience in developing norms of conduct for using digital technologies efficiently

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DC9	Managing Digital Identity		
Definition	Manage digital contents of your doctoral thesis to disseminate via social networks the information generated in Project Engineering of your doctoral thesis		
Goal	Achieve a wider dissemination of the achievements and knowledge gained in your doctoral thesis through social networks		
Knowledge Metrics			
Description		**Progression levels**	
1	**Understand the importance of effectively managing digital identity in digital environments, embracing its specific relevance within the field of research**	A	Demonstrates basic understanding of how digital identity management affects online presence in the field of research
		B	Uses various digital platforms to manage basic aspects, such as connecting profiles
		C	Uses their digital identity to disseminate a digital personality
		D	Protects their digital identity through personal identifiers, and enforces regulations
2	**Establish a digital identity, such as the use of identifiers like ORCiD, for the management of scientific and technical documentation**	A	Correctly links scientific output to identifiers such as ORCiD
		B	Customises ORCiD profile to highlight scientific contributions and achievements
		C	Ability to manage digital identity with identifiers other than ORCiD
		D	Seamlessly uses all types of identifiers typical of scientific databases (Scopus, Publons, WOS...)
3	**Integrate the digital identity in a way that allows the researcher to establish connections with the various scientific profiles related to the research.**	A	Connects their digital identity with relevant scientific profiles
		B	Shapes their digital identity into relevant scientific profiles in ways that connect with experts in their research area
		C	Uses their own digital identity to connect with other researchers, contributing to knowledge generation
		D	Their digital identity is recognised as a reference in the field, generating an impact on global collaboration

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4	**To manage effectively the digital identity and digital environments, ensuring they are kept up to date**	A	Regularly updates information on their digital profiles (e.g., ORCID, ResearchGate)
		B	Participates in training courses or events to keep up to date with the latest digital trends in their field
		C	Uses digital tools to identify trends in research and digital change
		D	Leads initiatives to improve digital identity management at the institutional level

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DC10	Development of digital multimedia content for research purposes		
Definition	Creation of scientific digital content to improve communication, dissemination and transfer of engineering research information		
Goal	Effective use of digital tools to achieve efficient communication of information generated during doctoral student research		
Knowledge Metrics			
Description		**Progression levels**	
1	**Create synthetic graphical resources of the research results**	A	Summarizes your research adequately, although some relevant information is lost
		B	Creates graphs that accurately represent your research, making it more understandable
		C	Improves the quality of their scientific article thanks to the quality of their multimedia content
		D	Develops highly innovative multimedia resources that significantly enhance the presentation and understanding of the research findings
2	**Employ digital tools for the creation of scientific posters for an engineering research conference**	A	Generates digital content independently and inefficiently
		B	Is fluent in a wide range of software
		C	Creates complex multimedia content seamlessly and semi-automatically
		D	Knows the advanced options of all the software used at work
3	**Identify and create diagrams to effectively represent research findings**	A	Generates digital diagrams with a formal aesthetic that correctly communicates their ideas
		B	Designs diagrams using the latest software on the market and effectively convey their ideas
		C	Effortlessly represents research data using the software tools needed
		D	Researches new software for creating diagrams and updates its skills on existing ones

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4	**Use information technologies to create digital content to improve the management of research projects**	A	Creates digital content when it is completely necessary according to project requirements
		B	Creates digital content comfortably and is aware that it enriches their work
		C	Finds the most effective way to communicate, regardless of the type of digital format
		D	Is an expert in digital communication and helps other colleagues to improve their multimedia content

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DC11	Digital Content Integration and Reelaboration		
Definition		Modify, refine, improve and integrate information and content into an existing body of knowledge to create new, original and relevant content	
Goal		To develop the ability to rework scientific digital content for the creation of new scientific	
Knowledge Metrics			
Description		**Progression levels**	
1	**Re-elaboration of Proprietary Scientific Multimedia Contents**	A	Makes superficial adjustments to existing multimedia content, with a basic understanding of the subject matter
		B	Modifies specific elements of digital content, improving clarity
		C	Effectively combines and rearranges existing multimedia content to create an original product
		D	Fuses advanced design skills and scientific knowledge to create completely new and meaningful multimedia content
2	**Re-elaborate Scientific Multimedia Content from other Authors**	A	Examines, interprets and reworks content from other authors to suit their research
		B	Can create original content from other authors' publications
		C	Provides new scientific information and knowledge from the research of other scientists
		D	Integrates multimedia content from diverse authors to create comprehensive, innovative resources that advance the field and promote interdisciplinary collaboration
3	**Tailoring Digital Content for Specific Audiences**	A	Customizes digital content to specific audiences, significantly improving relevance and understanding
		B	Tailors advanced digital content for diverse audiences, ensuring optimal comprehension and meaningful relevance
		C	Develops highly personalized content and uses innovative strategies and advanced resources to achieve effective communication
		D	Demonstrates a deep understanding of the specific needs of diverse audiences. Implements advanced and creative strategies that elevate the user experience

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4	**Modify scientific digital resources with AI digital technologies**	A	Shows a basic understanding of how these tools can contribute to content enhancement
		B	Uses artificial intelligence tools to make simple modifications to scientific digital assets
		C	Demonstrates advanced skills in the strategic application of artificial intelligence for the reworking of scientific content
		D	Carries out comprehensive digital content management, generating innovative material that contributes significantly to the advancement of the field

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DC12	Copyright and Intellectual Property Licensing		
Definition	Request and manage data, information, and digital content with copyrights and intellectual property licenses		
Goal	Develop the skills and knowledge necessary to understand, manage and ethically and effectively apply copyright and intellectual property licenses in the context of research projects		
Knowledge Metrics			
Description		**Progression levels**	
1	**Identify databases and scientific information that can be legally viewed and downloaded**	A	Knows databases of legal scientific articles and recognizes the importance of legality in the access to scientific information
		B	Demonstrates superior knowledge of license types and their application in research projects
		C	Applies advanced strategies for the legal protection of copyrights in research projects
		D	Offers comprehensive legal advice on copyright and intellectual property rights
2	**Know how to use and share the research results of other researchers in a legal manner**	A	Understands the ethical implications of sharing results from other researchers
		B	Shares research results of others while respecting licenses and copyrights
		C	Demonstrates a thorough understanding of contractual and legal implications, tailored to the academic environment
		D	Demonstrates expertise in regulations and licensing, promoting legal practices in the scientific field
3	**Can check the novelty of their patents or intellectual property through the appropriate databases**	A	Understands basic concepts related to novelty in the context of intellectual property
		B	Uses databases to verify the novelty of patents and intellectual property in a basic way
		C	Performs complete and accurate novelty verification, demonstrating advanced skills
		D	Provides leadership in the implementation of advanced standards to ensure novelty in patents and intellectual property

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4	**Develop, with support, the necessary documentation to register the rights to the results of an engineering research project**	A	Understands basic concepts related to patent registration documentation
		B	Develops documentation for the registration of intellectual property rights with the support of
		C	Creates complete and accurate documentation for the registration of intellectual property rights
		D	Advises peers on intellectual property registration and documentation development

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DC13	Programming		
Definition	Solve problems that arise during engineering research projects, through models, algorithms, or programming with digital technologies		
Goal	Develop programming skills for effective process automation, analysis of experimental data and creation of customized computational tools		
Knowledge Metrics			
Description		**Progression levels**	
1	**To know different digital programming tools to improve the creation of databases**	A	Uses simple spreadsheet scripts to automate repetitive tasks in data analysis
		B	Develops simple scripts to process and clean data sets in common formats such as CSV or Excel
		C	Creates basic programs in Python or R to perform more complex data analysis, such as visualizations or descriptive statistics
		D	Uses artificial intelligence to automate specific processes in research projects
2	**Use digital technologies for the development of codes that personalize the processing and filtering of scientific data**	A	Uses scripts to perform basic analysis of experimental data
		B	Develops scripts that implement more advanced statistical techniques, such as regression methods
		C	Applies machine learning algorithms to perform predictive or classificatory analysis
		D	Leads the implementation of new data analysis techniques that contribute to research innovation
3	**Simulate or model complex problems within the PhD student's research using digital tools**	A	Recognizes the usefulness of simulation in research and identifies some digital tools for this purpose
		B	Shows basic understanding of how simulations/models inform research
		C	Applies advanced digital tools for simulation with a strategic approach
		D	Uses Artificial Intelligence as a tool to speed up the development of simulations

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4	**Solve problems through algorithm development or programming with digital tools**	A	Identifies basic programming concepts and recognizes the importance of programming in research
		B	Develops basic algorithms and programs to solve specific problems
		C	Uses advanced programming to solve complex research problems
		D	Contributes innovative approaches to problem-solving through programming

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DC 14	Protecting Devices		
Definition	Know, design and execute security and privacy measures/protocols for the protection of information and digital devices, understanding the risks and potential threats in the field of engineering research		
Goal	Critical evaluation in terms of security and adoption of risk prevention, eradication and/or mitigation measures in digital research environments		
Knowledge Metrics			
Description		**Progression levels**	
1	**Identify malicious scientific emails/messages in digital research environments**	A	Knows the severity of malicious scientific emails/messages in digital research environments
		B	Explains to other researchers the severity of malicious emails/messages in digital research environments
		C	Identifies malicious emails/messages in digital research environments
		D	Explains to other researchers how to properly identify malicious emails/messages
2	**Managing passwords for scientific digital environments**	A	Is aware that proper password management in scientific environments is critical
		B	Establishes secure passwords in scientific digital environments
		C	Develops security protocols/codes for setting passwords in different digital environments
		D	Researches new digital tools for password management of digital environments used in research
3	**Establish security measures in digital environments for accessing and editing engineering research project information**	A	Knows the importance of setting access and editing measures in the digital environments used to share research information
		B	Implements standard security measures for accessing and editing research project information in digital environments
		C	Establishes protocols for proper access and editing of information in research project digital environments
		D	Coordinates with the university ICT service to manage access and editing in digital research environments

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4	**Evaluate the massive request for malicious information and collaboration in digital research environments**	A	Manages information requests and collaboration emails in digital research environments
		B	Knows the origins or main sources of suspicious information requests and collaboration in digital research environments
		C	Evaluates requests for information and collaboration coming through digital research environments
		D	Can implement automatic information filtering in digital environments to eliminate malicious information request emails
5	**Protect research results through patents or intellectual property**	A	Knows the difference between patent and intellectual property
		B	Identifies through digital platforms whether your potential research result has been patented or protected
		C	Identifies and uses the platforms for the protection of research results
		D	Uses digital tools for the protection of research results generated during the PhD student's research career

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DC 15	Protecting Personal Data and Privacy		
Definition	Understand how to implement protocols for the protection of personal information and privacy from potential risks in digital research environments		
Goal	Effective protection of privacy and personal data and privacy within research projects against potential digital risks and threats		
Knowledge Metrics			
Description		**Progression levels**	
1	**Information privacy management within research projects through digital tools**	A	Identifies critical information that must be properly privacy-managed through digital tools
		B	Classifies documents and information generated in research projects according to their level of privacy
		C	Implements privacy protocols for documents/information generated in research projects through digital technologies
		D	Explains the privacy protocols to the members of the research team of the project
2	**Protect the personal information and privacy of research project stakeholders through digital technologies**	A	Knows the importance of properly managing the privacy of stakeholders in research projects
		B	Identifies the stakeholders with the most sensitive and critical information
		C	Protects the personal information and privacy of stakeholders in the digital environment used in the project
		D	Researches new digital tools to securely protect stakeholders' personal information and privacy
3	**Establish access and editing of personal information in digital environments used in research projects**	A	Gives access to the digital environment to the members of the research project
		B	Defines personal information that cannot be shared through digital tools
		C	Controls access to personal information within digital environments in research projects
		D	Controls editing of personal information within digital environments in research projects

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4	**Develop confidentiality agreements with the different public and private partners of research projects for the protection of information shared in digital environments**	A	Understands the need for data protection and intuits the levels of confidentiality of data processed in digital environments
		B	Establishes oral agreements with partners and/or entities in the treatment of information generated and shared in digital environments
		C	Develops, with digital tools, confidentiality agreements with partners and/or entities in the treatment of information generated and shared in digital environments
		D	Researches new digital tools for the generation of confidentiality agreements for the privacy of research projects

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DC 16	Protecting Health and Well-Being		
Definition	Ability to identify and mitigate health risks, both physical and mental, derived from the use of digital technologies in research		
Goal	Development of skills and/or technical abilities in identifying and evaluating problems in the use of digital technologies and designing and implementing solutions that protect personal integrity and support the inherent dangers of digital environments		
Knowledge Metrics			
Description		**Progression levels**	
1	**Identify what are the main issues within a research project on the impact of digital technologies on health and wellbeing**	A	Identifies research activities that, using digital technologies, have the greatest potential to affect health and well-being
		B	Identifies the management activities that, using digital technologies, have the greatest potential to affect health and well-being
		C	Determines the people who will be affected by using digital technologies in research projects
		D	Explains to other project members the problems generated in health and well-being due to activities that employ digital technologies in research projects
2	**To propose strategies to improve health and well-being and reduce the impact of digital technologies**	A	Knows the importance of mitigating the problems generated in health and well-being by the use of digital technologies in research
		B	Knows strategies to improve health and well-being and reduce the impact of the use of digital technologies in research
		C	Implements strategies to improve health and well-being and reduce the impact of the use of digital technologies in research
		D	Researches new strategies with digital tools to improve health and wellness and reduce the impact of the use of digital technologies in research

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3	**Employ digital technologies to manage workload among research team members, minimizing the impact of the use of digital technologies on health and well-being**	A	Knows the importance of properly managing the workload of research team members to improve health and well-being
		B	Knows digital tools to improve the workload of team members and, consequently, improve health and well-being during research
		C	Applies digital technologies to manage the workload of team members, mitigating issues related to health and well-being
		D	Researches new digital technologies to manage the workload within a research team, mitigating issues related to health and well-being
4	**Use digital technologies to organize the daily work of research through digital technologies**	A	Knowledge of how digital technologies affect the doctoral student's own health and well-being
		B	Ability to balance working with and without digital technologies to improve the health and well-being of the doctoral student
		C	Implements digital technologies to organize daily research work
		D	Researches new digital tools to organize daily research work

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DC 17	Protecting the Environment		
Definition	Understand the influence of the use of digital technologies on the impact of the environment during research projects on the impact of the environment		
Goal	Ability to analyse how digital technologies used in research projects affect the environmental impact of the project and establish methods to mitigate it		
Knowledge Metrics			
Description		**Progression levels**	
1	**Understand the environmental impact of digital technologies used in research projects**	A	Understands the basic concepts of environmental impact due to the use of digital technologies
		B	Knows that the use of digital technologies in research affects the environment
		C	Identifies the research project activities that most affect sustainability due to the use of digital technologies
		D	Explains to other researchers the criticality of the activities of a research project related to the contamination of digital technologies
2	**Assess the environmental impact of digital technologies used in research projects**	A	Compares, with assistance, the activities of the research project that most affect sustainability using digital technologies
		B	Independently compares the activities of the research project that most affect sustainability using digital technologies
		C	Evaluates the environmental impact, with support, of the digital technologies used in the activities of a research project
		D	Evaluates the environmental impact, autonomously, of the digital technologies used in the activities of a research project
3	**Design research projects to mitigate the impact of digital technologies**	A	Identifies sustainable research projects using digital technologies
		B	Compares research projects and determine the one that pollutes the least using digital technologies
		C	Designs research projects, with support, where the environmental impact of the digital technologies used is mitigated
		D	Designs research projects, in an autonomous way, where the environmental impact of the digital technologies used is mitigated

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4	**Establish sustainable strategies for the environmental impact generated by the technologies used in research projects**	A	Knows the importance of optimizing the use of digital technologies to minimize the environmental impact in research
		B	Knows good practices to mitigate the environmental impact of digital technologies used in research projects
		C	Designs sustainable strategies to reduce the environmental impact of digital technologies used in research projects
		D	Implements sustainable strategies to reduce the environmental impact of digital technologies used in research projects

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DC18	Troubleshooting technical problems		
Definition	Identify and solve technical problems when carrying out research work		
Goal	Be able to solve technical problems at different stages of the research project: preparation, simulation, experimentation and results		
Knowledge Metrics			
Description		**Progression levels**	
1	**Solve technical problems during the elaboration of a research project with digital tools**	A	Recognises technical issues arising from state-of-the-art analysis and the knowledge gap
		B	Evaluates possible solutions to the identified technical problem
		C	Appropriately implements the most suitable solution to the identified technical problem
		D	Helps colleagues to identify and solve technical problems
2	**Solve technical problems during the simulation phase of a research project with digital tools**	A	Recognises technical problems during the simulation run that prevent consistent results
		B	Evaluates the boundary conditions implemented in the simulation that will prevent consistent results
		C	Implements relevant boundary conditions to lead to simulations consistent with actual experience
		D	Helps peers to develop simulations that are consistent with the real system and lead to robust results
3	**Solve technical problems in the management and analysis of research data with digital technologies**	A	Recognises technical problems in the analysis of research results that prevent robust conclusions
		B	Assesses possible biases and errors during data acquisition that did not lead to robust conclusions
		C	Implements solutions to avoid technical problems in data analysis that prevent robust conclusions
		D	Assists colleagues in acquiring research data that leads to robust results

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4	**Solve technical problems during the experimentation phase of a research project with digital tools**	A	Identifies technical problems for the commissioning of the equipment used
		B	Examines possible technical problems that arise during experimentation that did not lead to robust conclusions
		C	Develops preventive measures to avoid technical problems during experimentation
		D	Supports peers to carry out robust experimentation leading to consistent results

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DC19	Identification of technological needs and responses		
Definition	Identify technological needs and assess and implement technological responses during research projects		
Goal	Be able to identify technological needs at different stages of a research project and evaluate and implement appropriate responses to promote consistent results		
Knowledge Metrics			
Description		**Progression levels**	
1	**Identifying technology needs in the preparatory phase of a research project**	A	Defines the high-level technology needs for the achievement of the goals of a research project
		B	Identifies the technological responses needed to carry out the work envisaged in the project
		C	Adequately chooses the technological response (technical equipment and materials) to take on the research work
		D	Assists peers in identifying the technological need and making the appropriate choice of the necessary technological response
2	**Recognise technological needs during the execution of a research project**	A	Defines the specific technological needs (equipment and material) for a given experiment
		B	Identifies the appropriate configuration of the technological response for a given experiment (technological need)
		C	Successfully implements the configuration of the technological need for a particular experiment
		D	Supports peers in defining the technological need and its configuration for a particular experiment
3	**Exploring technological needs for managing the implementation of a research project**	A	Sets out the technological requirements for managing a research project (budget, schedule, communications)
		B	Maps the technological responses needed to ensure the success of the project (communications, responsibilities, etc.)
		C	Successfully deploys technology solutions ensuring stakeholder involvement
		D	Assists peers in identifying research project management technology needs and supports them in the choice of the technological response

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DC20	Creative use of digital technology		
Definition	Employing digital technologies to create and manage processes for understanding and solving problems in complex research situations		
Goal	Be able to use digital technologies to support research work (individual and collective) by improving processes and creating knowledge to understand and solve research problems		
Knowledge Metrics			
Description		**Progression levels**	
1	**Employing digital technologies to improve my productivity in research tasks**	A	Identifies tools and technologies to standardise and automate research processes
		B	Finds and discusses the digital technology needs to standardise and automate research processes
		C	Adapts and implements innovative processes for standardisation and automation of research processes
		D	Creates content on how to implement the research process standardisation and automation needs
2	**Applying digital technologies to produce content on the use of laboratory equipment**	A	Understands digital technologies that will help create content to improve the use of scientific equipment
		B	Modifies and enhances the appearance of existing content using digital technologies
		C	Creates content based on digital technologies that helps to understand the basic operation of laboratory equipment
		D	Produces highly innovative content based on digital technologies to get the most out of lab equipment
3	**Making use of digital technologies to improve the performance of research software**	A	Is interested in complementary digital technologies (plug-ins and/or add-ins) to dedicated research software
		B	Is familiar with the operating algorithms of dedicated software to detect complementarity needs
		C	Masters the application of complementary digital technologies that enhance the basic performance of the software
		D	Develops tailor-made applications based on digital technologies to improve the performance of dedicated software

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4	**Engaging AI tools to improve technological responses within a research project**	A	Is familiar with and discusses the AI tools available to understand and solve research problems
		B	Assesses and identifies AI requirements needed to meet research problem-solving needs
		C	Adopts and deploys AI tools to improve performance in solving research problems
		D	Builds knowledge on how to use AI tools to support research problem-solving

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DC21	Identifying gaps in digital skills		
Definition	Encouraging self-learning through continuous improvement of digital skills to enhance competence		
Goal	Identify gaps in the development of digital skills relevant to research work to improve them		
Knowledge Metrics			
Description		**Progression levels**	
1	**Be aware of the needs of digital technologies for research work**	A	Identifies gaps in competency level that could improve their performance in research tasks
		B	Recognises useful resources to improve the level of competence in digital technologies applied to research
		C	Consumes content related to the development of digital competences for research work
		D	Implements and evaluates their competence performance to further improve their performance in the use of digital technologies
2	**Boosting the competence level of digital technologies applied to research**	A	Identifies useful knowledge and skills to improve their level of competence in applied digital technologies
		B	Assimilates new skills and practical knowledge useful for their competence improvement through structured knowledge
		C	Capitalises on tacit (unstructured) knowledge to improve their competence level
		D	Demonstrates an increase in competence performance due to the practical application of newly acquired knowledge
3	**Contributing to the development of the digital technology skills of others**	A	Helps peers to broaden their knowledge about digital competence development
		B	Assists peers in their digital competence development through mentoring
		C	Coaches peers in their competence development and provides them with useful resources to do so
		D	Supports peers in identifying digital skills gaps to foster their continuous improvement

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GREEN COMPETENCES

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GC1	Valuing sustainability		
Definition	Reflect on how different actions affect the sustainability of research and align the values of project/research with the values of sustainability		
Goal	Critical evaluation in terms of sustainability of values and actions during the engineering doctoral student's research career		
Knowledge Metrics			
Description		**Progression levels**	
1	**Understand the concepts and values of sustainability in engineering research**	A	Identifies the main regional, national and European sustainability values and strategies
		B	Knows how the main regional, national and European sustainability values and strategies affect the scientific community (SDGs/European Green Pact)
		C	Knows how the main values and strategies of sustainability affect the doctoral student's own line of research
		D	Researches and elaborates on changes in society's sustainability values and strategies and can present them to other doctoral students
2	**Know how to align the values and objectives of a project with sustainability values**	A	Identifies sustainable values within a research project
		B	Analyses the sustainable values of a research project
		C	Aligns the values and objectives of a research project with sustainability values (e.g., with the SDGs)
		D	Can explain to other researchers how they should adapt the objectives or goals of their project to align with sustainable values
3	**Evaluate the sustainability of engineering research projects**	A	Is aware of how research projects affect sustainability
		B	Identifies research projects that affect the environment
		C	Can compare different research projects and determine which is more sustainable in a reasoned manner
		D	Investigates new ways to evaluate the criticality of research projects

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4	**Analyse and select the best strategy or course of action to improve research sustainability**	A	Compares different sustainability strategies within a project and can rank them in order of effectiveness
		B	Can develop, with the help of their mentor or senior researcher, sustainable strategies to reduce the environmental impact of critical project activities
		C	Can autonomously develop strategies to reduce the environmental impact of research projects
		D	Investigates new sustainability reduction strategies in research projects and implements environmentally friendly work plans

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GC2	Supporting fairness		
Definition		Support equity so that current and future generations can live in a sustainable society. Learn from the experiences of researchers in terms of sustainability	
Goal		Be able to understand and extract all the scientific knowledge that improves the sustainability of society and implement it in current and future projects	
Knowledge Metrics			
Description		**Progression levels**	
1	**Understand successful sustainable practices in engineering research projects**	A	Identifies good sustainable practices in the field of engineering research projects
		B	Compares good sustainable practices observed in engineering research projects in different communities
		C	Has an in-depth understanding of the potential for new sustainable best practices in the field of engineering research projects
		D	Researches on new sustainable best practices and determine their impact on current and future research projects
2	**Implement good sustainable practices in current and future research projects**	A	Evaluates, with the help of the tutor or a senior researcher, the potential for implementing the experiences and results obtained by other authors in the student's own line of research
		B	Analyses autonomously the potential of implementing the experiences and results obtained by other authors in the doctoral student's own line of research
		C	Implements good sustainable practices in the research projects in which the doctoral student participates
		D	Actively participates in the organization of seminars, conferences and congresses aimed at implementing good sustainable practices in research projects

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3	**Develop a methodology based on scientific knowledge to improve the sustainability of research**	A	Can relate the knowledge of sustainability developed by other authors and group them by lines of research
		B	Designs, with the help of their tutor or a senior researcher, develop a work methodology that allows the application of sustainable knowledge in the student's own line of research
		C	Autonomously creates a work methodology that allows the application of sustainable knowledge in the doctoral student's own line of research
		D	Develops a general methodology that can be implemented in various fields of study and that is easily reproducible, promoting the sustainability of the research
4	**Design new research projects that focus on today's major sustainability challenges to improve sustainability in the future**	A	Identifies the main research challenges in terms of sustainability in the field of engineering
		B	In-depth knowledge of the main sustainability challenges in the doctoral student's own line of research
		C	Proposes a new project that encompasses some of the current sustainability research challenges
		D	Clearly establishes the objectives and scope of the project, and develops an appropriate work plan for the achievement of the sustainability challenge

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GC3	Promoting nature		
Definition	To know the impact of research on the different nature and restore/regenerate it to create a resilient nature		
Goal	Evaluate the impact on the ecosystem of the different actions taken during the PhD student's research career and make decisions that are sustainable for nature		
Knowledge Metrics			
Description		**Progression levels**	
1	**Understand the influence of actions and activities of research projects on the environment**	A	Identifies the activities that have the greatest influence on nature
		B	Can compare two activities from a sustainable point of view with environmental results
		C	Can compare two activities from a sustainable point of view without environmental results
		D	Explains to other researchers new ways of understanding the environmental impact of research activities
2	**Assess the environmental impact of research activities on nature**	A	Knows about methodologies to quantify the environmental impact of research on nature
		B	Selects the best and most efficient methodology to quantify the environmental impact of research projects
		C	Implements methodologies to quantify the sustainability of tasks within research projects
		D	Investigates new ways to assess the environmental impact of research activities on nature
3	**Establish actions within the research to restore nature**	A	Learns about different strategies to restore nature
		B	Can identify the best strategy to regenerate nature within a research project
		C	Is aware of the latest strategies to improve the environment in research projects
		D	Implements strategies such as the circular economy within its research projects

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4	**Design research projects in such a way as to maximize their sustainability**	A	Identifies the weaknesses of research projects from the point of view of sustainability
		B	Designs, with tutor assistance, research projects with more sustainable activities
		C	Designs research projects with more sustainable activities
		D	Investigates new strategies to increase the sustainability of the research group's new projects

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GC4	Systems thinking		
Definition	Approach sustainability in research from all angles, considering time and context and understanding how it interacts with other elements		
Goal	To understand the relationship between sustainability and the main variables of research projects and the interrelation of environmental variables during their phases		
Knowledge Metrics			
Description		**Progression levels**	
1	**Understand the different ways of quantifying environmental impact and their interrelationship**	A	Knows that there are different ways to quantify environmental impact and its importance
		B	Determines the environmental impact in all its categories
		C	Can analyse the interrelationship of the different environmental impact categories
		D	Draws conclusions from the interrelationship of environmental impact categories within a research project
2	**To know the interrelation between environmental impact and other important variables in research projects**	A	Identifies other variables that have a bearing on the environmental impact of research projects
		B	Knows, with results, the variable that has the greatest interrelation with the sustainability of research projects
		C	Knows, without results, the variable that has the greatest interrelation with the sustainability of research projects
		D	Can obtain correlations between the environmental variable and other research variables
3	**To understand the impact on the nature of research projects throughout their life cycle**	A	Identifies the phase of the research project with the greatest impact on the environment
		B	Quantifies the environmental impact of a research project throughout its life cycle
		C	Evaluates the environmental impact of a research project throughout its life cycle
		D	Explains to other researchers the environmental impact of a research project throughout its life cycle

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4	**Manage research projects in a sustainable manner**	A	Can understand the need for sustainable management of projects and research
		B	Learns ways to manage projects in a sustainable way
		C	Implements sustainability in the management of research projects
		D	Designs, with the tutor's help, new actions to manage projects in a sustainable way

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GC5	Critical thinking		
Definition	Have the necessary skills to evaluate and understand information related to sustainability issues, broadening their vision for sustainability		
Goal	To have a critical perspective that improves the capacity of doctoral students, increasing their understanding of sustainability concepts and better assessing sustainability issues		
Knowledge Metrics			
Description		**Progression levels**	
1	**Evaluate and analyse the information generated during their research career, determining its impact on sustainability**	A	Identifies research results that improve sustainability
		B	Can compare different research results and select the most important for sustainability
		C	Thoroughly evaluates the sustainable consequences of research results
		D	Compares their research results with other similar results, determining the impact on the environment
2	**Determine whether a research idea is truly novel in terms of sustainability**	A	Raises different ideas for sustainable research
		B	Compares the different ideas of sustainable research
		C	Evaluates different sustainable research ideas and establishes the best alternative for a given research project
		D	Exposes and defends their research idea before their research group
3	**Analyse the quality of scientific-technical information in terms of sustainability generated by the scientific community**	A	Knows the main authors who make scientific contributions to sustainability in the PhD student's line of research
		B	Identifies, with the help of their tutor, the most relevant scientific contributions and scientific projects in the field of sustainability related to the PhD student's research
		C	Compares the impact of research conducted by other authors in terms of sustainability
		D	Can explain and discuss in a scientific seminar the most important sustainable scientific contributions of recent years

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4	**To argue for sustainable decisions and actions during the research career**	A	Identifies the actions and decisions that have the greatest impact on the environment
		B	Argues in writing their own actions and decisions during their research career from the perspective of sustainability
		C	Defends to other researchers their own actions and decisions during their research career from the perspective of sustainability
		D	Can argue about the decisions and actions of other researchers in terms of sustainability

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GC6	Problem Framing		
Definition	Formulate current or potential challenges as a sustainability issue, to identify appropriate approaches to anticipate and prevent problems, and to mitigate and adapt to existing problems		
Goal	Identification of sustainability issues/challenges in engineering research and the ability to define strategies to mitigate and resolve these challenges		
Knowledge Metrics			
Description		**Progression levels**	
1	**Identify appropriate strategies to mitigate, adapt and potentially solve sustainability issues in research**	A	Identifies possible solutions to scientific-technical sustainability challenges/problems
		B	Compares the different solutions, determining the advantages and disadvantages of each
		C	Explains the most appropriate solution to mitigate or resolve sustainability issues in research projects
		D	Defines in depth the sustainable scientific-technical solution to a given problem
2	**Analyse and compare the different sustainability challenges of research project management**	A	Identifies sustainability challenges in research project management
		B	Compares different sustainability challenges in research project management
		C	Analyses the challenges of sustainability in the management of research projects from different levels
		D	Investigate new solutions to improve sustainability in the management of research projects
3	**Assess scientific-technical sustainability issues/challenges from the point of view of different stakeholders**	A	Understands that the challenges differ depending on the stakeholder
		B	Can establish which stakeholder has the most interest/power in the sustainability challenge
		C	Analyses sustainability issues from the perspective of different stakeholders
		D	Can explain to the different stakeholders the other stakeholders' perspective on the scientific-technical sustainability problem

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4	**Quantify and define the work involved in executing a sustainability challenge in the current one**	A	Knows the difficulty of implementing the solution to a sustainability problem in current research
		B	Quantifies, with tutor support, the work involved in implementing the challenge
		C	Autonomously plans the steps required to execute the challenge
		D	Autonomously manages and adapts the work during the execution of the challenge

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GC7	Futures literacy		
Definition	Understand future trends in sustainability in engineering research and identify short-, medium- and long-term steps		
Goal	Be able to analyse the limitations and risks of future sustainable research strategies to be able to anticipate and establish lines of action		
Knowledge Metrics			
Description		**Progression levels**	
1	**Identify sustainable trends in engineering research**	A	Recognises general trends in sustainability
		B	Outlines specific examples of trends in engineering research
		C	Identifies relevant and current sources on sustainable trends
		D	Relates identified trends to specific areas of engineering
2	**Evaluate short-, medium-, and long-term sustainable trends in engineering research lines.**	A	Assesses, with the help of an expert, the short-term trends of one's own line of research in terms of sustainability
		B	Autonomously assesses the short-term sustainability trends of its own line of research
		C	Autonomously analyses the medium- and long-term sustainable trends of its own research line
		D	Analyses trends in different lines of research from a sustainable point of view
3	**Understand the constraints, risks and opportunities of future sustainable research trends**	A	Identifies constraints to future trends
		B	Identifies constraints, risks and opportunities for future trends
		C	Clearly assesses the relationship between constraints, risks and opportunities
		D	Assesses in depth and in detail the relationship between constraints, risks and opportunities

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4	**Evaluate and compare different future research strategies in terms of sustainability**	A	Identifies and superficially analyses future research strategies
		B	Compares the advantages and disadvantages of strategies in an appropriate and detailed manner
		C	Evaluates the sustainable impact of each strategy in a thorough and accurate manner
		D	Proposes very detailed and well-founded improvements based on evaluation

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GC8	Adaptability		
Definition	Manage uncertainty and risk associated with complex situations affecting sustainability during their research career		
Goal	Know that actions carried out during the research career can generate unpredictable situations that affect the environment		
Knowledge Metrics			
Description		**Progression levels**	
1	**Identify risks and uncertainties affecting sustainability generated in different complex situations during the research career**	A	Recognises common risks in complex situations
		B	Identifies and describes specific uncertainties in research contexts
		C	Identifies sources of risk in research projects
		D	Assesses the likelihood and impact of the risks and uncertainties analysed
2	**Understand that there are actions affecting the environment that need to be adapted to reduce the impact within engineering research**	A	Identifies actions with a negative impact on the environment
		B	Analyses the impact of these actions on research projects
		C	Proposes adaptations to mitigate negative impacts
		D	Evaluates the effectiveness of proposed adaptations
3	**Test different alternative solutions to improve the sustainability of the research project management**	A	Identifies possible alternative solutions
		B	Evaluates the feasibility of each solution
		C	Implements solutions in research projects
		D	Can measure the impact of implemented solutions
4	**Adapting research to address unexpected changes (with uncertainty) affecting the environment**	A	Recognises unexpected changes during the research
		B	Assesses the potential impact of changes on the project
		C	Develops strategies to adapt the research to changes
		D	Implements and reviews adaptive strategies

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GC9	Exploratory thinking		
Definition	Explore different engineering disciplines to improve the sustainability of research and employ new experimentation methods and research methodologies to enhance the sustainability of society		
Goal	Understand different perspectives to successfully address sustainable engineering research and explore new research methods		
Knowledge Metrics			
Description		**Progression levels**	
1	**Explore new methods of experimentation and novel research for the promotion of sustainability**	A	Identifies superficially one or two novel experimentation and research methods
		B	Explains in a basic manner how these methods can contribute to sustainability
		C	Clearly relates these methods to specific improvements in sustainability
		D	Innovatively integrates these methods into research projects to maximize sustainability
2	**Manage research projects sustainably through innovative methodologies**	A	Has a limited understanding of novel methodologies for sustainable research project management
		B	Describes several novel methodologies for the sustainable management of research projects
		C	Integrates these methodologies into the planning and execution of specific projects
		D	Continuously evaluates and improves management processes to maximize sustainability in research projects
3	**Propose engineering research projects based on circular economy strategies**	A	Has a superficial understanding of circular economy strategies
		B	Proposes projects that integrate these strategies in a basic manner
		C	Shows concrete examples of projects that effectively integrate these strategies
		D	Evaluates the impact of these projects and proposes continuous improvements to optimize sustainability

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4	**Be able to synthesize and analyse sustainable information obtained from research in different engineering disciplines**	A	Collects information in a limited manner and shows difficulties in synthesizing and analysing sustainability data
		B	Conducts basic analyses and shows how this information can contribute to sustainability
		C	Effectively applies this knowledge in research to promote sustainability
		D	Integrates information into research projects to enhance sustainability and drive improvements.

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GC10	Political agency		
Definition	Navigate the political system, identifying policies that promote sustainability through engineering research		
Goal	Be able to understand and analyse political strategies that promote sustainability within their research career		
Knowledge Metrics			
Description		**Progression levels**	
1	**Identify political strategies that promote sustainability within their research career**	A	Identifies superficially one or two political strategies related to sustainability
		B	Can give specific but limited examples of how these relate to their research career
		C	Identifies and explains in detail multiple political strategies related to sustainability
		D	Effectively integrates these strategies into their research career and proposes improvements or innovations
2	**Understand European political strategies that promote sustainability through engineering research**	A	Lacks a deep understanding of how these strategies affect engineering research
		B	Can explain generally how these strategies are applied in engineering research
		C	Relates these strategies to concrete examples of projects or policies in their field
		D	Conducts a deep and critical analysis of European political strategies and their relationship with engineering research
3	**Design research political strategies to promote the sustainable development of public and private entities**	A	Has difficulties connecting these ideas with sustainable development
		B	Designs basic political strategies that promote sustainability in specific contexts
		C	Develops well-founded and detailed political strategies for sustainability
		D	Conducts impact assessments and proposes adjustments based on a deep analysis of public and private entities

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4	**Know the main agents that promote sustainability through political strategies**	A	Has a superficial understanding of their role in sustainability politics
		B	Provides basic examples of their impact on research and sustainable development
		C	Identifies and analyses in detail multiple key agents in sustainability politics
		D	Proposes new forms of collaboration and strategies to maximize their impact on research and sustainable policies

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GC11	Collective Action		
Definition	Faculty to lead and collaborate in collective efforts that address environmental challenges in engineering research projects		
Goal	Develop skills that enable doctoral students to drive sustainability through joint action and implementation of innovative solutions		
Knowledge Metrics			
Description		**Progression levels**	
1	**Identify the main sustainability stakeholders in a scientific-technical sustainability challenge**	A	Recognizes the importance of knowing the main sustainability stakeholders
		B	Understands the influence of stakeholders on the sustainability of the project
		C	Performs an in-depth analysis of stakeholders and their interconnections in a sustainability challenge
		D	Leads the strategic identification of stakeholders in sustainable challenges
2	**To understand the importance of collective action to promote nature and support fairness in research projects**	A	Recognizes the importance of collective action to implement sustainable research practices
		B	Demonstrates a consistent understanding of how collective action contributes to promoting the natural
		C	Contributes to the conceptualization and design of collective action strategies to address sustainable challenges
		D	Demonstrates how collective action can significantly transform the direction and impact of research
3	**Collaborate with sustainability stakeholders to solve scientific and technical sustainability challenges**	A	Collaborates in a basic way with stakeholders in sustainable research projects
		B	Consistently collaborates with stakeholders, demonstrating measurable impact in solving scientific-technical challenges
		C	Significantly contributes to the generation of innovative solutions through effective collaboration
		D	Acts as a benchmark in transformative collaboration with stakeholders to solve scientific-technical challenges

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4	**Identify individuals and organizations to work collectively on scientific and technical sustainability challenges**	A	Recognizes a few key individuals and organizations to address scientific-technical sustainability challenges
		B	Understands how strategic partner selection contributes to project success
		C	Contributes to the design and implementation of collaborative strategies to address sustainable challenges
		D	Leads the formation of strategic alliances to address scientific-technical sustainability challenges

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GC12	Individual Initiative		
Definition	Ability to recognize opportunities, have confidence in personal influence and act proactively to address sustainable challenges		
Goal	Empower individuals to confidently and consciously take sustainable initiatives in their lives, becoming agents of change and role models to inspire others		
Knowledge Metrics			
Description		**Progression levels**	
1	**Individual Initiative in carrying out Sustainable Research Projects**	A	Increases awareness of one's own potential to influence positive change
		B	Recognizes opportunities for individual actions to promote sustainability
		C	Establishes cause-and-effect relationships to identify the actions with the greatest potential
		D	Inspires others to take sustainability initiatives and acts as a role model
2	**Initiative in Managing Projects Sustainably**	A	Recognizes some key elements of sustainability in project management
		B	Demonstrates an understanding of how sustainable management can positively impact project outcomes
		C	Develops innovative strategies for sustainable project management
		D	Uses advanced strategies and innovative approaches to maximize sustainability on major projects
3	**Evaluate own potential for improving sustainability in research projects**	A	Recognizes the importance of personal contribution to improving sustainability in research projects
		B	Implements preventive actions whenever there may be possible harmful consequences for the environment
		C	Demonstrates ongoing critical evaluation and adaptation to maximize sustainable impact
		D	Inspires others by showing how constant personal evaluation can transform the contribution to research projects towards sustainability

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4	**Evaluate own potential for sustainable research management**	A	Performs a conscious self-assessment of one's own impact on sustainable research management
		B	Develops a personal improvement plan to contribute more effectively to sustainable management
		C	Develops internal policies that promote social and environmental responsibility in the workplace
		D	Leads teams in the collaborative design of sustainable strategies for companies and institutions

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