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A Navigation Chart for Sustainability for the Ocean i3 Educational Project

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Abstract: The complex nature of sustainability challenges implies the need to provide students with interdisciplinary learning experiences and environments based on active and reflective learning. To know whether these experiences result in real learning, there must be a way of capturing and measuring the competences required to promote sustainable development using suitable indicators. This paper presents the process of building a competence map that is used as a navigation chart to monitor the sustainable education competences in the Ocean i3 experience. An action-research methodological approach is used involving participant observation, field notes, informal interviews, and documentary analysis. The participants were 38 students, 23 teachers, 3 project coordinators, and 2 researchers, and the context of the study is the five workshops carried out in the Ocean i3 project. The result is a navigation chart that traces the students' learning journey through dialogue between the competences, learning outcomes, and activities. In conclusion, this approach to curricular planning can serve to inspire other learning environments and experiences on how to tackle the challenge of envisioning their sustainability competence development pathway. Above all, it can serve to improve competence development training schedules for sustainability.

Keywords: education for sustainable development; sustainable development goals; quality education; Agenda 2030; education challenges

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1. Introduction

Monitoring and tracking the competence development process is not a simple task. Verifying whether university students develop certain competences requires complex curricular planning. This paper illustrates the construction of a navigation chart that sets up a dialogue between competences, learning outcomes (LOs), and activities to ensure sustainability competences are developed within the Ocean i3 project. This project is linked to Sustainable Development Goal (SDG) Target 4.7, which refers to the social, human, and moral aims of education and explicitly links education to other SDGs.

Ocean i3 is an inter-university cross-border educational innovation project (Basque-New Aquitaine Coast) jointly developed by the University of the Basque Country (UPV/EHU) and the University of Bordeaux. The project responds to the positioning of both universities with respect to sustainability and how they value oceans, directly addressing the following Agenda 2030 SDGs adopted by the UN General Assembly in September 2015: 14. Life below water, 6. Clean water and sanitation, and 4. Quality education. Ocean i3 has been selected by the European Regional Development Fund (ERDF) through the Interreg V-A Spain-France-Andorra Programme (POCTEFA 2014-2020) as a project of interest for territorial development. In September 2021, the Sustainable Development Solutions Network (SDSN) included the project as good practice to accelerate education on the SDGs in universities.

At the beginning of the 2020/21 academic year, the community involved in the project identified the need to create a navigation chart to map the competences that students should develop during the course of the study. Accordingly, the IkasGura research group (Basque Government's level B, IT 1348-2019 consolidated group) took up the task of constructing the navigation chart for the project. This chart identifies the competences to be developed by the students participating in Ocean i3 and the LOs associated with each competence. In addition, it analyses, assesses, and links the activities included in the didactic choreographies created to promote education for sustainability within the framework of the SDGs.

2. Theoretical Framework

2.1. Cartography for Competence Development

Cartographic language belongs to an applied science of collecting and analysing measurements and data from regions of the Earth and representing them graphically with different linear dimensions and maps. By extension, cartography is the name given to the set of territorial documents referring to a specific field of study for different purposes, and its application in the field of social sciences is well known to boost community participation processes [1]. When the term is applied within the sphere of didactics, its use is also versatile. Thus, cartography may take the form of an educational activity used to design teacher or student training [2,3] or as a methodology for curricular planning and design. The former refers to university teaching mapping, which involves framing teaching actions within a shared context. As a result, the complexity of the issue is made evident in order to deliberate, review, organise, and improve teaching [4]. It would involve mapping the progression of student learning for sustainability by representing the interaction of disciplinary, learning, and teaching-assessment concepts in a three-dimensional way [5].

In the second case, curricular mapping is defined as a graphical representation of the curriculum. The elements that make up the curriculum are placed on the map, which helps the relationships between them to be observed [6]. When the map or chart is used for planning purposes, it is presented in the form of a table with a structure that allows inconsistencies or overlaps between the elements to be detected and improved. It is therefore a necessary tool for developing, reviewing, improving, and redefining a complex curriculum by integrating all elements [7]. At the same time, its creation implies reflecting on each of its constituent concepts both individually and as a whole [8].

Several authors have studied the importance of curricular mapping in the design of university programmes [9–12] and in mapping curricular elements such as competences, assessment systems, and instruments to detect inconsistencies, deficits, or repetitions [13,14]. There is therefore a consensus across the literature that curricular mapping is a graphical and visual representation of curricular elements and of the interactions between such elements, which may result in an action.

However, it should be acknowledged that competences are currently the cardinal elements in learning-teaching processes. As mentioned above, these elements are key components of the two/three-dimensional education maps. Consequently, many universities and research teams are defining the most relevant key competences for sustainable development in Higher Education [15–25]. While they all point to cross-disciplinary competences such as anticipatory, normative, strategic, problem-solving, interpersonal, and systems-based thinking, there does not appear to be a global agreement on the debate about which competences are the most important ones [23]. Nevertheless, this lack of consensus does not detract from their value since such competences are crucial for making sustainable progress in response to the serious and global challenges facing humanity [9].

A further level of complexity is added to this issue by the need to create authentic and meaningful formal and informal learning environments to develop these sustainability competences, in which LOs can be evidenced, and competences accredited [26]. There is the argument that the complex or perverse nature of sustainability challenges leads to the need for a learning experience emphasising active and reflective learning across all disciplinary areas, both individually and in an inter-related way [20]. Hence, the literature suggests that

integrative, active, and collaborative approaches that directly involve students in learning and in the practice of cross-disciplinary engagement are most beneficial for students and the environment from the perspective of sustainability [9]. It should not be overlooked that knowing how to organise stimulus-rich learning environments which bring about an active learning process is inherent to teaching [27]. These environments designed to link what students must learn with the context created for learning are known as teaching or institutional choreographies [28]. In the former, the teaching staff create and recreate the structure on which their students' learning is based. In the case of institutional choreographies, the institution programmes the teaching and learning processes that take place inside and/or outside the organisation but which are integrated into its educational project. What is important is that institutions have a greater impact on student learning [27]. The explanation is simple: if the university and its academic practices encourage participation, students become more meaningfully and intensely involved, and this involvement has an impact on their learning [29].

2.2. Competences for Sustainability

The first step in mapping sustainability competences is to define each of the competences.

While diverse approaches have been proposed to select sustainability competences, there is no international agreement on which approach is the best or the most important. Haan proposed a model of competences in education for sustainable development (ESD) that has been developed and disseminated in connection with two programmes in the Federal Republic of Germany [16]. It aimed at implementing the ESD concept in schools throughout the country. Rieckmann reviewed which individual key competences are essential to understanding the central challenges facing global society and contributing toward a more sustainable future [20,21]. The results of their research conclude that there are eleven crucial key competences for sustainable development. Of these, the most relevant ones are systematic, anticipatory, and critical thinking. Based on the different classifications of competences proposed by UNESCO, research has been conducted on recreating a basic matrix of sustainability competences, highlighting critical analysis, systematic thinking, collaborative decision-making, and a sense of responsibility towards present and future generations [17].

On the other hand, the catalogue of cross-disciplinary competences used by the University of the Basque Country (UPV/EHU) [30] references the competence classification used in the Asia-Pacific project [31]. This catalogue specifies the following competences: autonomy and self-regulation, teamwork, critical thinking, innovation and entrepreneurship, professional responsibility and ethics, information management and digital citizenship, communication and multilingualism, and social engagement. Of them, communication and multilingualism refer to the use of verbal and non-verbal language from a gender perspective within an inclusive, multicultural, and multilingual context. Social engagement is also closely related to the SDGs, as it refers to having empathy and taking responsibility for social, environmental, and economic challenges at local, national, and global levels, as well as basic democratic values in today's society.

Finally, it should not be forgotten that the LOs to be assessed in relation to these competences must also be identified [20,21]. Moreover, the development and assessment of these competences should take place in both formal and informal learning environments [26].

In view of the above, the hypothesis of this research is that identifying and monitoring the competences to be worked on within a project can help to redirect the course of such a project. Thus, the aim of this paper is to present the navigation chart that the Ocean i3 educational innovation project has built to monitor sustainability competences in Higher Education. The objectives are: (1) to describe the navigation chart building process and (2) to identify initial areas for improvement that can serve to redirect the course of the project.

3. Context and Research Method

The UPV/EHU approved its own educational model *Ikaskuntza Kooperatiboa eta Dinamikoa* (IKD) in 2010, precisely at the time when the EU Higher Education policy came into force. It is a cooperative, multi-lingual, inclusive model that focuses on students owning their own learning processes and being trained in a comprehensive, flexible way that adapts to the needs of society [32].

This model has been reviewed since then, bringing it into line with current pedagogic guidelines and European political priorities. The result is the IKDi3 model (***I****kaskuntza*/Learning × ***I****kerkuntza*/Research × ***I****raunkortasuna*/Sustainability), which consists of multiplying learning through research and sustainability, i.e., the exponential growth of each of the terms enables unprecedented processes and products to be developed.

The model aims to ensure that the UPV/EHU's research and transfer capital is more fluidly linked to the degrees; knowing how to research, investigate, and innovate must be integrated into the basic and desirable competences for all students in order to further complex competences.

Sustainability is the third component of this exponential formula because the ability to learn multiplied by the ability to research is not enough if the major challenges facing the planet, as set out in the SDGs, are not in focus. Therefore, these challenges must form part of the actions taken by the university community, creating a dialogue between educational practices and the social, economic, environmental, and cultural environment [33].

3.1. Empirical Context

Ocean i3 is an example of one particular experience based on the IKDi3 model. In this project, students are offered the chance to develop various work modalities (Final Degree Project (Capstone-FDP), End-of-Master's Projects (Master's Thesis-MT), voluntary internships, projects, and coursework, etc.) aimed at a common mission, which focuses on ocean plastic pollution in this first stage (2019/20 and 2020/21 academic years). It is tackled using the so-called *Mission-Oriented Research and Innovation* approach [34,35], which claims to point research, innovation, and training toward global challenges to thereby transform them into achievable, specific, and measurable territorial objectives.

Teaching staff and students from the UPV/EHU and the University of Bordeaux work within their own curriculum framework which is integrated into Ocean i3 to share, contrast, and enrich their contributions in an international, intercultural, and interdisciplinary environment. This enables collaboration with social actors, and real challenges/problems from the cross-border coastline are established. The link with territorial agents strengthens the territorial development dimension (network of territorial agents and challenges) and encourages students to develop employability competences (an entire repertoire of competences that transcend the academic and professional sphere) within the framework of the blue economy along the cross-border coastline [36].

The Ocean i3 project therefore creates a favourable environment where competences that are difficult to develop in other curricular spaces can be explored. It is also a privileged context as it:

1. Is multilingual (Spanish, French, and Basque, with English as the lingua franca);
2. Is transdisciplinary, involving students and teaching staff from different universities with different degrees/fields of knowledge;
3. Places a complex and perverse challenge on the horizon—that to reduce ocean plastic pollution along the shared coastline;
4. Acts on tangible missions aimed at providing solutions to real, concrete problems posed by community agents (social, economic, technological, etc.).

In other words, it is an artificial context within which perverse challenges are tackled with a focus on sustainability. Its characteristic values are cross-disciplinarity (for academic aspects), multilingualism (communicative aspects) and cross-border (territorial aspects).

In this context, five concatenated choreographies are offered in a workshop (Ws) format over six months, with the aim of impacting student learning. In between these Ws,

the Oktonike (Ok) platform is used to support additional work and complete individual tasks (see Figure 1).

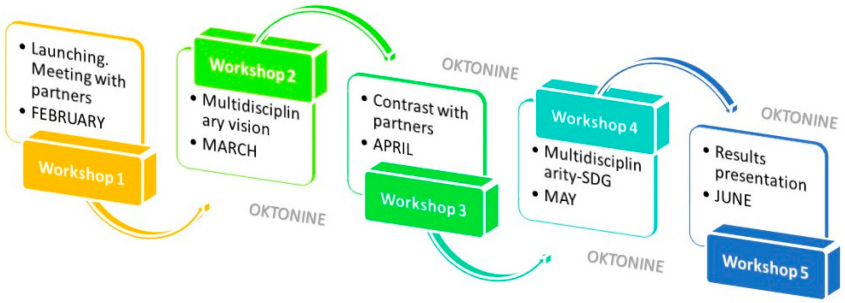

Figure 1. Concatenated choreographies in Ocean i3.

3.2. Method

The UPV/EHU's IkasGura research group is monitoring the pedagogical development of the project within this empirical context. The group is observing the changes over time and recording the responses of the participants during the training itinerary [37]. The general methodological approach to building the navigation chart has been action-research, which starts from a concern or need detected by the community that becomes the axis of the improvement strategy [38]. A classic approach has been followed to establish a plan of action around the community's problematic issue or need (planning, action, observation/reflection, and replanning), leading to the construction of the chart [38–40]. The terms research and action have offered the opportunity to translate developing ideas into critically informed action to achieve increased harmony between the ideas and the developed action [38]. Figure 2 shows the research approach.

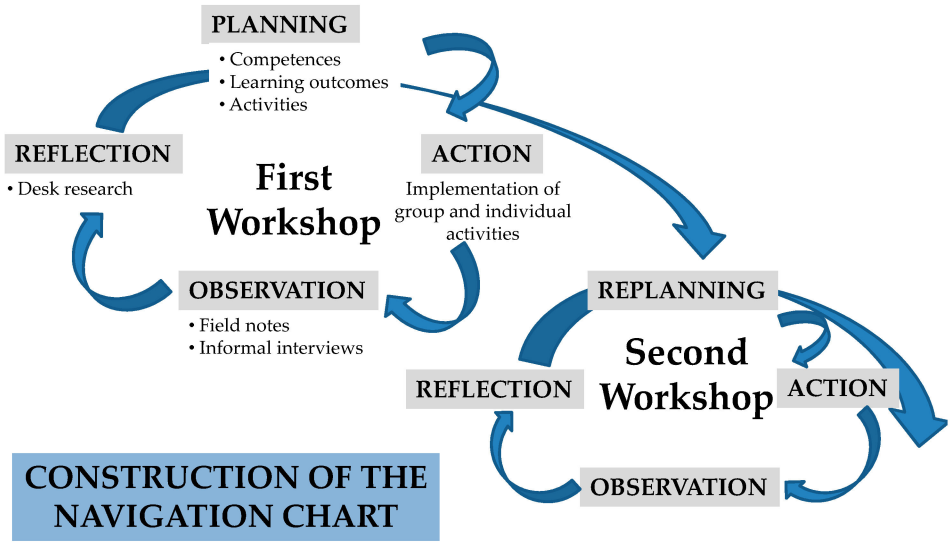

Figure 2. Action-Research design.

This research is also an internal action as researchers are community members and have privileged information that allows them to approach the project in a realistic and critical way. The researchers must transcend their own subjectivity by using the quality of the data, understanding the data, making reasonable judgements, and taking responsible actions [41]. The research group has therefore been immersed in the project at all times, being a complicit partner with the context and the actions of the participating community. Specifically, the community was made up of 38 students, 23 teachers, 3 project coordinators, 2 researchers, social agents, and other itinerant participants (such as special guests) [36].

3.2.1. Research Instruments

The research instruments used are consistent with the methodological approach based on the action plan [38]. The aim was to merge qualitative instruments of an interactive nature, such as participant observation and informal interviews, with non-interactive instruments, such as desk research (see Table 1).

Table 1. Research instruments.

Instruments	Informants	Evidence	Timing
Participant observation	All participants	Field notes	During workshops
Informal interviews	Students Teachers Coordinating team	Conversational inquiries	During and after workshops After workshops
Desk Research	Coordinating team	Timing of workshops, Records, proposals, draft reports	Before workshops
	Coordinating team	Minutes	After workshops

Participant observation has been used throughout the five Ws to involve the observer in what is happening and obtain perceptions of the reality studied that would be difficult to achieve without this effective involvement [42]. These observations were registered in the form of field notes. In these notes, of a more informal nature, everything that seemed significant to the observer was noted down.

Informal interviews were also conducted, which were not scheduled and did not follow a formal structure [43]. Instead, information on competences was obtained by questioning the participants (teachers, students, coordinators) in each of the workshops about the proposed activities. Moreover, the research team used breaks and teamwork activities to ask questions in a non-intrusive way. There was no predefined script for these interviews, and questions were asked as the conversation progressed.

Finally, desk research consisted of a systematic analysis of the internal working documents generated by the coordinating team regarding the competences developed (records, proposals, drafts reports, etc.) and the material derived from the Ws observations, recorded as minutes. These minutes documented what happened and the agreements reached [44]. The analytical procedure was carried out as the instruments were deployed in each of the Ws. This has represented an essentially inductive, dynamic, and systematic process that has required identifying, selecting, ordering, comparing, and interpreting the information collected by the different instruments [45]. The complexity of the situations is therefore faced with consensual and negotiated rigour, interpreting the data in a way that gives value and visibility to the different points of view [46,47]. The emerging categorical system was as follows (see Table 2):

Table 2. Categorical system.

Category	Subcategory
Construction process for Ocean i3 project navigation chart elements	Definition of Competences (C)
	Definition of the Learning Outcomes (LOs)
	Drawing up the two-dimensional map (C and LOs)
	Drawing up the three-dimensional map (C, LOs and Activities)
Preliminary identification of areas for improvement to refocus the project	

Therefore, the analytical procedure consisted of content analysis, with the theoretical framework defining how to observe, analyse, and research. The data derived from the research instruments are used to understand how to build the navigational chart for this sustainability experience. The information collected from each instrument was analysed as it was gathered and manually incorporated into the categorical system.

3.2.2. Ethical Considerations

Privacy and anonymity have been preserved when processing the information gathered, and values such as the dignity and integrity of individuals have been taken into account at all times. Consequently, the information provided by the participants through the different instruments has been safeguarded with the highest trust and discretion, as indicated by the UPV/EHU's Ethics Committee for Research Involving Human Subjects [48].

3.2.3. Information Quality

The most important criterion for naturalistic research is truthfulness, which must be present throughout the qualitative research process [49]. Truthfulness is articulated and embodied in this research through the following characteristics:

(a) Credibility: an attempt has been made to gather as much information as possible with the aim of building the navigation chart using information from the theoretical framework but also from the experience of implementing the project [50];
(b) Transferability: this study can be inspiring and valuable for similar contexts where the aim is to work on sustainability competences in real-life learning contexts;
(c) Dependence: in this study, different instruments have been applied with very similar outcomes, allowing the stability of the results to be proven.
(d) Confirmability: this is underlined by using descriptors with a low level of inference (the transcripts) and reporting reality as closely as possible.

4. Results

4.1. Construction Process for Ocean i3 Project Navigation Chart Elements

4.1.1. Definition of Competences

When the Ocean i3 project emerged, a series of generic competences were proposed. These were:

(a) Learning:
    1. Ability to communicate in intercultural contexts
    2. Negotiation capacity, horizontal participation, and commitment to share results
    3. Active listening ability, interpretation, interrelation, and interaction;
(b) Research:
    4. Ability to analyse, understand, and solve complex problems
    5. Creativity: modelling problem solving from divergent angles
    6. Ability to prepare expert reports based on research methods;
(c) Sustainable development:
    7. Cross-sectional approach to problems: capacity to integrate and manage concepts from various disciplines
    8. Integration of SDG values
    9. Development of a systemic and integrating view of problems.

The project competences therefore needed to be redefined to take into account the UPV/EHU's educational model and the literature review on sustainability competences.

As a result, the competences to be developed have been redefined around each of the three "I's" presented in the Ocean i3 project. That is, the competences linked to each of the three competence areas that the students aim to develop: Learning/*Ikaskuntza*, Research/*Ikerkuntza*, and Sustainability/*Iraunkortasuna*. As shown in Figure 3, there are 10 competences in total, all of which are linked to sustainability.

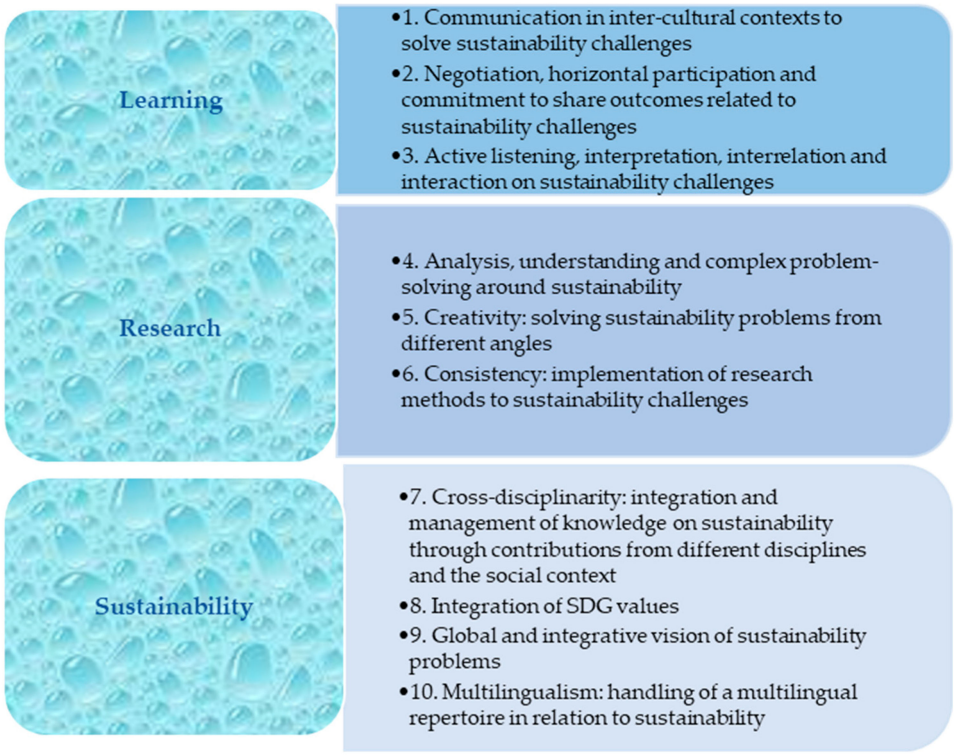

Figure 3. Competences that the student should develop in the Ocean i3 project.

4.1.2. Definition of the Learning Outcomes

After identifying the ten competences that make up the project framework, the activities and tasks conducted by the Ocean i3 community in the different didactic choreographies were analysed. The LOs that the students are expected to develop are then identified in relation to each choreography. A sum of 38 LOs is formulated in terms of what the student is expected to demonstrate after having participated in the project (refer to Table 2).

4.1.3. Drawing Up the Two-Dimensional Map That Links Competences to LOs

Based on the two previous elements, the third outcome of the work consisted of drawing up a map relating the competences in each field with the LOs to be worked on and evaluated. Table 3 shows the competences corresponding to sustainability and the LOs—essentially, what the student must demonstrate to have the knowledge, skills, and presence of mind to achieve.

Table 3. Excerpt from the map linking sustainability competencies and LOs in Ocean i3.

Competences	Learning Outcomes
1. Communication in inter-cultural contexts to solve sustainability challenges	1.1 Use technical-scientific language appropriate to the degree course studied, incorporating terms and concepts of sustainable development. 1.2 Present ideas using verbal and non-verbal communication appropriate to the cultural context of the working group of the Ocean i3 community. 1.3 Use positive, non-sexist language that avoids the use of cultural pre-judgments and stereotypes. 1.4 Show respect in different academic and professional practice contexts without engaging in socio-cultural and/or gender discrimination.

Table 3. *Cont.*

Competences	Learning Outcomes
2. Negotiation, horizontal participation and commitment to share outcomes related to sustainability challenges	2.1 Act proactively in the design and development of an action/initiative/research that responds to a social need within the Ocean i3 framework. 2.2 Participate collaboratively with others in the design and development of initiatives that respond to a social need within the framework of Ocean i3.
3. Active listening, interpretation, interrelation, and interaction on sustainability challenges	3.1 Maintain active listening skills in working groups composed of people from diverse social, cultural, and academic backgrounds. 3.2 Show respect and empathy towards cultural differences that arise in the communicative exchange within Ocean i3. 3.3 Anticipate the impact of personal, local, and national decisions or activities on other people and regions of the world.
4. Analysis, understanding, and complex problem-solving	4.1 Identify the needs of the economic and employment context, valuing dignity at work and prioritising employability. 4.2 Analyse the environmental impact of proposed scientific and technical solutions/actions/improvements, assessing their functionality and relevance according to sustainability and social justice criteria 4.3 Analyse the social impact of the proposed scientific and technical solutions/actions/improvements, assessing their functionality and relevance according to sustainability and social justice criteria. 4.4 Identify the process to be followed for the implementation of an innovative solution to a problem related to people's quality of life. 4.5 Identify opportunities and challenges for a more sustainable development in the design of actions linked to a given context or area of study.
5. Creativity: solving sustainability problems from different angles	5.1 Propose innovative solutions to problems related to healthy consumption habits. 5.2 Question the social and environmental reality by analysing the principles, facts, attitudes and values involved in it in order to define their own position. 5.3 Think and evaluate ideas for sustainability-driven innovation and entrepreneurship. 5.4 Positively modify one's own actions as a result of a process of contrast with experiences and learnings of others.
6. Consistency: implementation of research methods to sustainability challenges	6.1 Interpret information obtained from different sources, assessing from a critical perspective the relevance and social, linguistic, and cultural scope of the same. 6.2 Produce academic documents based on research methods using different languages, according to established formal and content criteria. 6.3 Use the appropriate research method to define sustainable objectives in the proposed work. 6.4 Apply the appropriate research method to find transformative and environmentally friendly solutions.

Table 3. *Cont.*

Competences	Learning Outcomes
7. Cross-disciplinarity: integration and management of knowledge through contributions from different disciplines and the social context.	7.1 Formulate interdisciplinary proposals that respond to the challenges related to sustainable human development. 7.2 Interact with people from different environments and areas (academic and social) to build the scientific knowledge generated within the framework of Ocean i3 in a cross-disciplinary way. 7.3 Disseminate the scientific knowledge generated in a cross-disciplinary way in forums, networks, and academic spaces. 7.4 Link knowledge from various disciplines or academic areas to identify problems and their possible solutions from a sustainable approach.
8. Integration of SDG values	8.1 Propose actions, interventions, and improvements individually or jointly, including the SDGs in them. 8.2 Reflect on the degree of responsibility exercised in carrying out the tasks assumed to respond to a challenge proposed by a social partner within the framework of Ocean i3. 8.3 Evaluate the ethical consequences derived from the decisions made in view of a situation. 8.4 Sustainably manage the available resources in accordance with responsible consumption habits. 8.5 Be aware of the link between decisions made and the SDG values that are fostered. 8.6 Be able to identify with the SDGs.
9. Global and integrative vision of problems	9.1 Present the implications of the use of specific policies, programmes or practices to promote the SDGs on an individual, social, cultural, environmental, and/or global level. 9.2 Reflect on how individual lifestyle decisions influence the social, economic, and environmental development of the immediate environment. 9.3 Show others the impact of human beings on oceans and the importance of healthy and clean oceans. 9.4 Have a sense of responsibility for the environmental and social impact of one's own lifestyle. 9.5 Raise other people's awareness so that they can change their behaviour and attitudes with respect to sustainability.
10. Multilingualism: handling of a multilingual repertoire	10.1 Express ideas/arguments properly in the different languages used in the Ocean i3 community. 10.2 Prepare academic documents based on research methods, using different languages, in accordance with the established formal criteria and content.

4.1.4. Drawing Up the Three-Dimensional Map That Links Competences, LOs, and Project Activities

Once the general competence map of the project integrating the LOs has been established, each of the activities and tasks carried out in each of the choreographies planned in the project was analysed in detail, as shown in Figure 2. To do so, opinions were col-

lected from both teachers and students once each Ws was completed. As an example, one student noted:

"I had not realised that we were working on so many competences at the same time".

A teacher also commented that:

"(. . .) In addition to all the sustainability competences, [students] are working on the competence of how to autonomously lead their own learning process".

In addition, three researchers from the IkasGura research team visited the different groups and took notes on the evolution of each of the Ws in relation to the Ocean i3 competences.

Based on this work, a map was created formed by a combination of different grids. Firstly, a grid was created in the form of a double-entry table, in which each of the competences is related to the activities to be carried out. Some of the activities from Workshop 2 are shown in Table 4 by way of example. For instance, this table is used to verify whether each of the ten sustainability competences is worked on as part of the proposed activities.

Secondly, ten grids were created corresponding to each of the ten competences. As can be observed in Table 5, the relation between the planned activities and the LOs related to each competence is mapped in each grid. The results are recorded by using a numeric code. The first digit corresponds to the number assigned to the competence, and the second corresponds to the LO related to the competence.

Table 4. Example of the relationship between Ocean i3 competences and the programmed activities in one of the workshops.

Workshop 2	**Competences**									
Activities	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Collective design of a first outline of the deliverable to the social agent	√	√	√	√	√	√	√	√	√	√
Collective identification of the structure (sections, titles, etc.)	√	√	√			√				√
Collective definition of contents	√	√	√			√				√
Planning the action						√	√			
Preparing an Elevator Pitch	√	√	√		√					√
Sharing proposals	√		√							

Table 5. Example of the relation between some activities planned for Workshop 4 and the LOs related to the competence: Integration of SDG values.

Workshop 4 Activities	**Learning Outcomes**
Appreciation of the learning facilitated by Ocean i3	8.2, 8.3, 8.5
Contribution to the SDGs (pyramid exercise using cubes)	8.1, 8.2, 8.3, 8.5
Review of the contrast made with the social agent in the previous workshop (Workshop 3)	
Identification of improvements to be made to the prototypes to solve the challenge in a sustainable manner	8.1, 8.4
Action planning: what and how to make these improvements	8.1, 8.2, 8.3, 8.4, 8.5
Impact of individual work on 2 slides	8.2

The final Ocean i3 competence map or navigation chart results from assembling these grids. An overview of the navigation chart with regard to the sustainability competences is provided in the supplementary material, the aim of which is to show the complexity of the overall assembly.

4.2. Preliminary Identification of Areas for Improvement to Refocus the Course of the Project

In general, the navigation chart has helped to see how the competences are being defined in terms of LOs. Likewise, this complex representation of elements has demonstrated which competences are being focussed on with more activities, and therefore, how these competences are developed through each didactic choreography. The supplementary material therefore reveals the weight of each competence by counting the number of activities deployed to develop each competence and the global calculation by competence area.

The most obvious result is the imbalance between the three competence areas. In this sense, the chart has demonstrated that the sustainability area is reinforced the most in the choreographies through multiple activities. In contrast, the research area is identified as the one that would need to be reviewed and improved in order to take on future actions (refer to Table 6). In particular, creativity, analytical capacity, understanding, and complex problem-solving seem to be the activities that are present to a lesser extent in the activities planned in the project (they would be worked on in eight and nine activities, respectively).

Table 6. Tally of activities to develop sustainability competences in Ocean i3.

Ocean i3 Competences	Activities		Competence Area
Communication in inter-cultural contexts to solve sustainability challenges	20	52	Learning
Negotiation, horizontal participation and commitment to share outcomes related to sustainability challenges	13		
Active listening, interpretation, interrelation and interaction on sustainability challenges	19		
Analysis, understanding and complex problem-solving around sustainability	9	31	Research
Creativity: solving sustainability problems from different angles	8		
Consistency: implementation of research methods to sustainability challenges	14		
Cross-disciplinarity: integration and management of knowledge on sustainability through contributions from different disciplines and the social context	14	70	Sustainability
Integration of SDG values	20		
Global and integrative vision of sustainability problems	11		
Multilingualism: handling of a multilingual repertoire in relation to sustainability	25		

Similarly, certain imbalances are visible between the competences in the sustainability area. In this sense, Table 6 seems to indicate that multilingualism (which is worked on in a total of 25 activities) and the integration of SDG values (20 activities) are the competences that are present to a greater extent in the project. However, the competence relating to the integration and management of knowledge through contributions from different disciplines, and that of the global and integrative vision of problems, are associated with a smaller number of activities (14 and 11, respectively).

With regard to the relationship between the same project activity and the different competences to be worked on, the chart also shows areas of greater intensity and gaps. It can be observed from the navigation chart (refer to the supplementary material) that certain activities, such as those related to planning, can mobilise the development of all

project competences. However, other planned activities are only related to one of the competences to be developed. This is the case of the individual reflection activity in which the student is invited to reflect on how they experience the development and management of multilingualism by participating in the project.

5. Discussion

In accordance with the objective of this work, the research carried out has investigated the relationship between the three key elements of the teaching-learning process: competences, learning outcomes, and activities.

The observations of the activities implemented to develop the students' sustainability competences have been used to identify the link between both. Based on this relationship, LOs have been formulated that allow the project community to collect evidence on whether students are effectively acquiring these competences. This could be interpreted as a positive outcome given the nature, meaning, and purpose of the work. It should be recalled that the research was designed based on an action-research model, and the intention was to plan the project by observing and reflecting upon the project activities. During this process, it was questioned whether the competences originally proposed were really designed in terms of sustainability [51]. Evidently, the answer was that these competences were designed in a very generic way. Furthermore, there is little understanding of what kind of learning related to sustainability competences could be developed by students. When the original competences of the sustainability project were reconsidered, the LOs associated with these competences could be adapted and the activities refocussed in a way that helped to acquire them. Therefore, one result of this research has been the reformulation of the initial project competences.

Furthermore, the navigation chart has revealed that the research competence area is not sufficiently covered by the activities carried out. The chart points to the research area as the one that needs to be drawn in more detail, so more attention must be paid to it in the future. This area includes aspects such as analysis, understanding and complex problem-solving around sustainability, solving sustainability problems from different angles, and the implementation of research methods to sustainability challenges.

In accordance with the above, the mapping exercise has exposed inter-relations between the navigation chart elements and invited reflection. Consequently, some of the gaps detected have been implicitly repaired to improve the competence development processes generated in Ocean i3 along the lines proposed by several authors [5–8].

6. Conclusions

Sustainability competences have been mapped as part of the development of this educational innovation project in line with the different didactic choreographies studied and the activities carried out along these lines. This mapping has created a dialogue with the learning ecosystems while providing flexibility and opening up these systems to be restructured to accommodate the decisions taken. It is therefore concluded that:

- The action-research methodology has contributed to the redefinition and consequently to the improvement of the project;
- Representing the three key elements of teaching-learning design (Competences/LO/Activities) in an inter-related way to create a multidimensional map provides a systemic overview that favours competence development monitoring;
- The mapping perspective helps to correct the course of activities included in the didactic choreographies, thus consciously influencing the training roadmap for competence development;
- Mapping can be used to identify inconsistencies and overlaps between the didactic elements mapped. Moreover, it is able to detect gaps as they stand out on the map. In this way, the activities are incorporated and sized in a way that reinforces the development of the competences. In this sense, this study on sustainability competences has

highlighted the need for further action, reflection, and improvements in the research area for sustainability in the project.

In summary, this navigation chart has allowed the project to stay on course towards its aim, which is none other than to reach Target 4.7 of the SDGs by creating learning environments and activities that aim to train university students for sustainable development.

Moreover, the learnings from this collective experience could be transferred to other education projects for sustainability, taking into account that:

- Action-research allows for continuous contrast between participants, and as such, the elements that make up the navigation chart can be continuously adapted;
- Competences to be developed by the students must be defined in detail in relation to sustainability;
- LOs linked to competences must be defined in terms of sustainable behaviours to be observed and assessed;
- Activities should promote sustainability and contribute to the achievement of the LOs;
- The navigation chart should be a tool used to adjust, modify, and verify the elements identified as crucial in an education project for sustainability.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su14084764/s1. This navigation chart presents ten competences from the three competence areas (Learning, Research, and Sustainability), the 38 learning outcomes LOs, and the 43 activities designed to induce and demonstrate learning. Figure S1: Navigation chart for Ocean i3 competences.

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