



Teachers' Perceptions of Fisheries Ecolabels and Game-Based Learning Activities in the Framework of Education for Sustainable Consumption

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Abstract. Socio-environmental sustainability in oceans implies that marine fisheries should be sustainable, and the Education for Sustainable Consumption could promote sustainable artisanal fishing. Our survey on elementary school teachers' perceptions on fish ecolabels, including environmental and social values of sustainable fisheries, showed positive opinions. However, most of them do not read the labels information of products in fishmongers and supermarkets before making their purchases. With the aim to provide teacher resources on sustainable fisheries, an educative experience linking Environmental Education, Education for Sustainable Consumption, and knowledge about small-scale fishing is proposed. This didactic sequence includes explanatory activities, reflection and debate on responsible consumption, sustainable fisheries and ecolabels, as well as game-based learning activities. This intervention will promote students to be aware of the concept of sustainable fisheries, training them towards responsible consumption through critical and supportive attitudes related to Sustainable Global Goals 12 (ensure sustainable consumption and production patterns) and 14 (conserve and sustainably use the oceans, seas and marine resources).

Keywords: Education for sustainable consumption · Sustainable fisheries · Environmental education

1 Introduction

Increased interest in oceans socio-environmental problems and opportunities can promote support to obtain environmental sustainability and human well-being [1]. This way, many efforts are being made to mitigate negative effects on marine ecosystems and achieve sustainable fishing, although fisheries have rarely been sustainable [2]. Economic development, social objectives and environmental protection are key areas in this fishing sustainability; combining them properly is a necessary and possible challenge

in fisheries management [3]. Fisheries management needs to be addressed towards the achievement of the sustainable development goals (SDGs) [4], and the protection of marine areas, with resources extraction and pollution limited, are essential for the conservation of marine biodiversity and ecosystems [5]. On these paths are the artisanal fisheries (small-scale fisheries), defined based both on the characteristics of the fishing fleets [6] and on the own culture forged around artisanal fishermen [7].

Ocean literacy can contribute to improving sea conservation, mainly incorporating questions about environmental problems, from pollution to biodiversity loss and natural resource depletion [8–10]. Game-based learning activities have shown to be suitable approaches to understanding these environmental problems, allowing to relate causes and effects in their sustainable management [11–14].

Most of these educational approaches are oriented towards the management and knowledge of biodiversity (included as marine natural resources), therefore from the perspective of the SDG14 on conserving and sustainably using the oceans, seas, and marine resources for sustainable development. This represents dealing directly or indirectly with several of its targets, mainly reducing marine pollution (target 14.1), protecting and restoring marine ecosystems (14.2), sustainable fishing (14.4), and conserving coastal and marine areas (14.5). This suitable perspective could be complemented with educational actions that reinforce empowerment as citizens through awareness as responsible consumers. That is, carrying out educational actions aimed at SDG12 to ensure sustainable consumption and production patterns.

The Education for Responsible Consumption educates to achieve environmental sustainability [15], being one of the actions from the educational field required for the involvement of citizens in the urgent global transition to fairer and more sustainable societies [16]. With the Education for Sustainable Consumption, students obtain tools for their active participation in the economic, cultural, political, and social context of their nearest environment, their community, and their country. Precisely for this reason, education for consumption is so important, because educating for consumption is preparing students to access products competently and effectively and, in turn, to become aware of the positive and negative implications of their acts of consumption, understanding that, when consumed excessively, the destruction of resources is also exorbitant [17].

In the case of marine natural resources and fisheries, not only the resources consumed are important, but also how these resources have been obtained, so as to minimize wasted resources and the effects of their extraction on marine ecosystems, while maximizing the positive socio-environmental impacts. That is, carry out educational actions oriented towards the targets 12.2 Sustainable management and use of natural resources, 12.7 Promote sustainable public procurement practices, and 12.8 Promote universal understanding of sustainable lifestyles, while promoting the target 14.9 to support small-scale artisanal fishers' access to markets.

The Education for Sustainable Consumption can help in the consecution of this goal, facilitating that the consumers understand the labels of the fish and can choose between the different options, those coming from sustainable fisheries.

Here, we explore teachers and preservice teachers' perceptions about fish (eco)labels and propose game-based learning activities on marine fisheries for primary education in the framework of the Education for Sustainable Consumption.

2 Teachers' Perceptions and Attitudes on Fish Ecolabels

2.1 Context and Methodology

This study was developed in the framework of the Ecos(i)Food project, on Scientific, Educational and Management tools for the sustainability of traditional fisheries in the Principality of Asturias (North of Spain). This project is funded by the State Programme of R + D + i oriented to the Challenges of Society (code MCI-20-PID2019-108481RB-I00/AEI/10.13039/501100011033). In Asturias, with more than 335 km of shoreline along the Bay of Biscay artisanal fisheries constitute a cultural and traditional identity factor, and a source of employment and income for coastal communities [18].

The assessment of teachers' attitudes and perceptions about fish ecolabels importance and use was evaluated through the Ecosifood's questionnaire. This questionnaire, implemented in *Google Forms*, was voluntarily and anonymously filled out by the students (pre- and in-service teachers) of a postgraduate teacher training course on research and innovation in early childhood and primary education at the University of Oviedo. The questionnaire was answered by 21 teachers (76.2% women, 23.8% men; 25 years old average age), 55% of the students enrolled in the postgraduate programme. A descriptive data analysis was performed with the statistical software PSPP v.1.4 (<https://www.gnu.org/software/pspp/>).

2.2 Results and Learning Needs

Postgraduate teachers' perceptions of fish ecolabels, including environmental and social values of sustainable fisheries, are positives. They buy fish mainly in supermarkets (61.9%) and, to a lesser extent, in fishmongers (28.6%), choosing fresh fish most of the times (38.1%) or always (33.3%). Almost everyone (90%) is aware of seeing labels with the fish displayed for sale. The issues that they say to consider when buying fresh fish are in Table 1. Price, fish in season, and their perception of the fish are the main factors to choose the fish to buy, being the geographic origin the fourth variable. Fishing gear types and label information are less considered in the choice, and one quarter (23.8%) never take into account the fishing gear. This attitude may be due to not knowing the impact that the different types of gear can have on the sustainability of fisheries and the conservation of marine biodiversity.

Their recognized attitudes are different from their own perceptions about what they consider to be important to make a purchase decision. Most consider that an ecolabel should be mandatory (71.4%) or necessary (28.6%), but do not read (76.2%) the labels' information in supermarkets and fishmongers before making their purchases.

These results, obtained from those who educate the next generations, show the need to design teaching materials that can be used in their teaching-learning experiences. This way, their students not only will not only consider the existence of ecolabels important, but also use them in their fish purchasing decisions.

3 Game-Based Learning Activities Design

With the aim to provide teacher resources on sustainable fisheries for these primary education teachers, an educative experience linking Environmental Education, Education

Table 1 Issues that teachers and preservice teachers say to consider in their fish consumer' choices (percentages showed, n = 21)

Items	Always	Most of times	Sometimes	Never
Geographic origin	28.6	47.6	23.8	0.0
Fishing Gear types	19.0	23.8	33.3	23.8
Fresh fish (and seafood) seasonality	33.3	52.4	9.5	4.8
Price	33.3	57.1	9.5	0.0
Labels' information	23.8	38.1	9.5	28.6
Own perception	33.3	53.4	14.3	0

for Sustainable Consumption, and knowledge about small-scale fisheries (in the regional context of Asturias, N. Spain) is proposed (see Table 2 to learning objectives).

Table 2 Learning objectives of the didactic intervention proposal for primary education

Learning objectives
Conceptualize sustainable development, sustainable fisheries and responsible consumption
Differentiate between types of fishing and the fishing gear used in the Bay of Biscay
Recognize the most representative fish species of the Cantabrian Sea
Identify attitudes and behaviors that favor care and respect for the marine environment
Develop attitudes and values that promote sustainability and responsible consumption
Compare sustainable fishing with destructive fishing
Discern between the concepts of consumption and consumerism
Analyze how fish eco-labels are related to responsible consumption

Therefore, a didactic sequence with five types of activities has been designed (Table 3). This didactic sequence includes explanatory activities, reflection and debate on responsible consumption, sustainable fisheries and eco-labels, as well as game-based learning activities. Fishing for hits is proposed including several independent tasks designed as learning games (alphabet games, getting the concept, question games). These learning games were aimed at learning different characteristics of marine biodiversity, marine natural resources collected in small-scale fisheries, the chain of consumption that goes from fishing boats to the purchase of fish by the consumer, and the possible content of ecolabels. An example of a virtual alphabet game is this Ecosifood Rosco Pesquero (in Spanish: <https://bit.ly/Roscopesquero>), made with the *Genially* application for interactive slideshows, in which students must choose the correct word related to fisheries and responsible consumption to advance through each letter of the alphabet.

Table 3 Learning activities for the education for sustainable consumption on fisheries resources didactic proposal

Learning activities	Brief description
1. Sustainable fisheries versus destructive fishing	Explanation related concepts about: <ol style="list-style-type: none"> 1 Sustainable development 2. Sustainable fishing and destructive fishing <ol style="list-style-type: none"> 2.1. Environmental and social effects 2.1. Artisanal fishing in Asturias 3. Fish and seafood <ol style="list-style-type: none"> 3.1. Cantabrian Sea representative fish species 3.2. Protected marine species 4. Ecolabels Summary by students
2. Consumption versus consumerism	Learning video Socio-environmental impacts consumerism Responsible consumption Relationship among ecolabels, sustainable fisheries and responsible consumption
3. Game-based learning	<ol style="list-style-type: none"> 1. Escape room The Kraken 2. Fishing for hits <ol style="list-style-type: none"> 2.1. Alphabet games 2.2. Getting the concept 2.3. Question games
4. Designing eco-labels!	What should an ecolabel include? Collaborative design by students
5. Educational field trips	Optional, depending on the school's possibilities and locality: <ol style="list-style-type: none"> 1. Fish market 2. Fishmongers

Most the environmental education approaches to ocean literacy [see [8–10]] are mainly related to knowledge and management of marine biodiversity and their environmental problems (the SGG 14). Instead, this educational proposal, while working on some of the SDG14 goals, is aimed at changing consumption behaviors, making students aware of what represents responsible consumption (SDG12), in order to promote sustainable fisheries. The designed didactic sequence uses various types of activities, from exposure to reflection, highlighting those with a game-based learning focus. In this sense, it is methodologically close to other formal and non-formal educational approaches that use games to learn about the oceans, marine natural resources, and their conservation [11–14], in which concepts are learned, and environmental problems are analyzed and debated, from various educational games specially designed for each case.

From the perspective of Education for Responsible Consumption, not only is the role of different actors (external to the students) in marine environmental problems considered [11], but a holistic approach to the whole of society is sought, just as it is

desirable against other marine environmental problems (e.g., marine litter: [19]). In our case, the aim is that students become aware that they can be, using their environmental knowledge, leading actors in solving environmental problems [20], with possible effects on the rest of society. Specifically, becoming empowered citizens through their conscious consumption decisions [21], which can have positive impacts on promoting sustainable fisheries.

This way, this educative intervention will promote students to be aware of the concept of sustainable fisheries concept, training them towards responsible consumption through critical and supportive attitudes. In this sense, that students knowing whether the fish they are going to consume comes from sustainable fisheries, could make them aware of the economic and socio-environmental process of fisheries, and introduce them to sustainable development and environmental care, developing social skills and positive values, such as solidarity and empathy.

4 Conclusions

- Elementary (pre- and in-service) schoolteachers shown positives perceptions about fish ecolabels, including features based on environmental and social values of sustainable fisheries.
- However, most of them do not read the labels information in fishmongers and supermarkets before making their purchases.
- Results show the need to design teaching materials which can be used in their teaching–learning experiences to promote sustainable fisheries through citizen empowerment in the Education for Sustainable Consumption framework.
- A didactic sequence including explanatory activities, reflection and debate on responsible consumption, sustainable fisheries and eco-labels, as well as game-based learning activities, is proposed.
- This intervention will promote students to be aware of sustainable fisheries concept, training them towards responsible consumption through critical and supportive attitudes related with Sustainable Global Goals 12 and 14.

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