

Ecosocial literacy: Circular Economy conceptions in initial teacher training

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Abstract

The serious environmental degradation in which we are immersed and the speed of its rise, make necessary evolve into a new paradigm of environmental education where citizenship empowers through the acquisition of skills that allow them to make a way of life more sustainable. In this sense, the circular economy provides a key framework.

The main objective of this work is to analyse what are the conceptions that have students from last year of the degree of primary education on some, essentially, of the key environmental aspects of the circular economy. For, based on them, to prepare a proposal of scientific literacy, enabling them to acquire the necessary skills to develop ecosocial processes of teaching and learning in the classrooms of primary education. To do this, the questionnaire has been used as an information collection tool, through intentional sampling with declared data. An analytical study was done in which both numerical and non-numeric primary data have been obtained. With the data obtained, a mixed analysis, quantitative and qualitative, was carried out. The main results have shown that: 1) The lack of knowledge about key ecological aspects of the circular economy is very high among the surveyed students 2) Most of the respondents have loop references on the correct answers.

It is concluded that effective ecosocial literacy is necessary with students who are going to perform teaching and learning processes in the early educational stages of the next generations.

Keywords: *Ecosocial Literacy, Circular Economy, Initial teacher Training, Misconceptions, Science Didactics.*

1. Introduction

The concept of sustainable development emerged from the necessity to change the harmful effects on ecosystems caused by the life models that people have. It is increasingly acknowledged that there is a serious environmental deterioration. Among the scientific community there is a broad consensus; It is necessary to restore the natural function of the ecosystems in the best possible way taking into account, above all, the rate of the world's population growth and the demands produced by the consumption of the rising middle class.

It was in 1972, with the celebration of the United Nations Conference on the environment in Stockholm, when people deepened in the relationship between the environment and economic development. Later on, and partly influenced by this, other significant studies would come up, as the Brutland report, which defined the concept of Sustainable Development that advocates meeting needs in a way that the regeneration of ecosystems is full filled. This concept has evolved the paradigm of the circular economy [1]. However, there are also other prominent preceding concepts which have influenced their conception; Permaculture, industrial ecology, the Natural Step, Natural capitalism or blue economy [2].

Sustainable Development has three dimensions of sustainability: economic, social and environmental [3]). These sustainability dimensions must be inescapably addressed in education due to the numerous advantages that their competencies provide to ecosocial improvement. A field of knowledge that contributes holistically to sustainability is the circular economy. The circular economy is not only a new economic revolution but also a global one because it implies the adaptation of the whole society. Therefore, it can be considered as an inescapable pillar in the improvement of the environment. It provides a very wide range of content covering the three dimensions of sustainability. Its application is meant to be carried out by responsible agents for territorial organization, companies and society. The latest, society, is the main aim, and its application is intended to be achieved especially through the eco-conception, which considers the environmental impacts throughout the life cycle of products and integrates them from its conception.

The educational system must take steps to guide people towards acquiring skills that allow them to move towards a circular economy. When it comes to working the contents in the classroom, it is necessary to start from the didactic assumption that students do not have a blank mind, but have



previous knowledge. It has been found through numerous works [4], [5], [6], [7], [8], [9], to cite only a few that students of different levels have notions, sometimes erroneous, on concepts related to environmental operation.

1.1 Circular Economy

The Circular economy is a relatively new concept whose principles and content have not been clearly defined yet. The Circular Economy "is an economy constructed from societal production-consumption systems that maximizes the service produced from the linear nature-society-nature material and energy throughput flow. This is done by using cyclical materials flows, renewable energy sources and cascading-type energy flows". Circular economy also respects natural reproduction of cycle rates [10]. It is presented as an alternative to the linear mode of current development in that many products are discarded without reusing or recycling them. In this sense, there is still a lot of work to do due to the fact that sociometabolic approach shows that, currently, only 6% of all materials processed by the global economy are recycled and contribute to closing the loop. If all biomass were considered a circular flow regardless of production conditions, the degree of circularity would increase to 37%. [11]

1.2 Missconceptions

Since Piaget's works in the 50s in which it was shown that children thought about the world in a different way from adults, at the end of the 70s, many studies started to be carried out about the conceptions that included these different contents. The majority of these works have been oriented to the study of the conceptions of students in relation to the scientific concepts. The main result of these works shows that students do not have a blank mind. On numerous occasions, people have conceptual schemes that are alternative to scientific knowledge. These are often very difficult to modify [12] and they pose an added difficulty in achieving meaningful learning [13]. Therefore, it is important to consider if there are some structures on the conceptions that are repeated, in order to work on the contents that we want to address in the classroom.

Although, there is a wide variety of names to refer essentially to the spontaneous conceptions, all of them generally refer to the students' conceptions that produce a systematic pattern of errors [14].

Spontaneous conceptions share a series of common characteristics, which are not always present in all of them, but they appear with some frequency. According to [12] they are produced in terms of their nature, their origin and their development. Among them, it should be noted that the conceptions arise produced naturally from the interaction of the student with the world that surrounds the individual, usually influenced by their general cultural identity and not the educational system. The student, many times, is unable to verbalize. In addition, they are resistant to change, ubiquitous, often shared and sometimes have a historical character.

As previously contextualized, the starting hypothesis of this study is that it is expected to find prototype conceptions in students about the circular economy based on the idea that students do not have a blank mind. Thus, the main objective is to know what these conceptions are since they will serve as a basis for the elaboration of didactic proposals.

2. Methodology

The study was carried out with a sample of 29 last-year students from two Faculties of Education; of the University of Castilla-La Mancha and from the Faculty of Education of the Polytechnic Institute of Lisbon. To do this, the questionnaire has been used as an information collection tool, through intentional sampling with declared data. An analytical study was done in which both numerical and non-numeric primary data have been obtained. The Questionnaire has been designed under the construct of to know some of the beliefs and conceptions that students have about circular economy and some of its key aspects as well as checking if they know how to describe them. In order to validate the questionnaire, a cognitive pretest has been carried out with a group of students from lower courses of the same institutions. An assessment of the content was also made by a group of experts. With the data obtained, a mixed analysis, quantitative and qualitative, was carried out.

3. Results

The main results obtained have shown that students indicate to ignore the concept of circular economy. This statement is reinforced when describing the concept of circular economy since the answers are very imprecise and only seven individuals responded correctly. Most of the misconceptions about the concept of circular economy focus on understanding circular economy as a "process in which the companies produce and consumers buy" or "the economy that needs the participation of all because it works as a cycle". Also, there have been responses in which the term is



defined as the line of chain of the economy production. In addition, students understand circular economy as an economic cycle, obviating social or environmental aspects. When they were asked about environmental concepts or other types of economies related to circular economy, the main results (table 1) have shown that the sample did not know the bases.

Table 1. Main results obtained in the questionnaire on the self-knowledge of some concepts related to circular economy

Concepts	Totally unknown %	Pretty unknown %	Little Know %	Pretty know %	Perfectly know %
System	20.7	20.7	27.6	24.2	6.9
Cycle	10.3	13.8	24.2	37.9	13.8
Ecosystem	6.9	6.9	10.3	44.8	31
Lineal production	44.8	24.2	20.7	3.4	6.9
Sustainable develop	6.9	3.4	17.2	44.8	27.6
Degrowth	13.8	17.2	34.5	20.7	13.8
Overexploitation	0	13.8	20.7	34.5	31
Pollution	6.9	0	0	37.9	55.2
Integral wáter cycle	17.2	6.9	20.7	17.2	37.9
Cycles of recycling	6.9	10.3	34.5	27.6	20.7
Climate change	6.9	0	20.7	24.2	48.3

It has been found that surveyed students are more familiar with the concept of pollution, followed by climate change. At the same time, the less pointing concepts to know are production and decrease of the linear models.

In line with what students indicate, when they define the production-consumption linear model, only six people can define it well. Most of them replied that they could not define it. The most frequent responses given for concept, when they define it, are not correct. They just write that linear model "is a system that runs a product", "a model in which companies produce and consumers consume" or "a greater consumption increases production".

When defining ecosystem most of the answers indicate some knowledge of the concept but when students define it, they generally allude only to biological aspects; living beings, flora and fauna species. Also, they refer to the space, place or environment. However, only 9 people wrote the word relationships and most of them do it to define relationships between living beings.

Regarding the concept of cycle, where most of the samples show a knowledge which ranges between "a bit" and "a lot", the definitions usually resemble the scientific definition enough, although the word "order" is not repeated frequently.

As it has been pointed out, most of the respondents indicate that they know well the verb contaminate. When it comes to defining it, the answers vary; to harm, dirt, transmit harmful substances or alter. Also, they answer that it means to destroy the environment.

Finally, it should be noted that in the results there are no significant differences between the responses of the students from Lisbon and Spain except in relation to climate change, where students from Lisbon indicate less knowledge of the term. Also in the definitions, which Spanish students usually answer more accurately.

4. Conclusions

It is concluded that, given the ignorance of key aspects about circular economy, it is necessary to carry out a literacy process that, starting from its conceptions, trains the students.

Likewise, [12] it is considered important to emphasize that it is necessary to make the student take into account his ideas to overcome his spontaneous conceptions about scientific terms. On the other hand, the fact that some ideas are repeated makes us think that the information processing structure of people leads to the construction of certain conceptions.

All in all, it is necessary to bear in mind that it is a first approximation to a very broad phenomenon that requires a broader study.



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