



Analysis

Teaching and Learning Ecosystem Assessment and Valuation

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ABSTRACT

There has been very little research on teaching, learning and communicating core concepts from Ecological and Environmental Economics. Yet, shedding light on these issues is important for more effective teaching, and to support the public debate on ideas, which aim to shape a sustainable future. This paper investigates teaching and learning about one of the most researched, applied and contested concepts in Environmental and Ecological Economics: Ecosystem Assessment and Valuation (ESAV). It presents students' conceptions on ESAV gained through group discussions. The transcripts were analyzed with the phenomenographic and documentary method. The analysis focuses both on the way students describe ecological, social and economic aspects, and on the criteria they use to make political and management decisions. The main results are that students tend to see nature as a place for recreation and wildlife, do not see knowledge as uncertain and hardly bring up the idea of an economic valuation. Based on students' conceptions, as well as research from Ecological and Environmental Economics and Economics Education, I suggest a curriculum for ESAV.

1. Introduction

In the field of Economics Education, three different research approaches on teaching sustainability have evolved (Seeber and Birke, 2011): (1) Categorical analysis orients toward central elements of the discipline. The only categorical research specifically dedicated toward sustainability is Seeber (2001), who derives contents for learning processes from core texts of ecological economics; (2) Paradigmatic approaches are also closely connected to economics; however, they focus more on deriving an economic way of thinking, and less on typical contents of the discipline. Krol (2001) and Schug (1997) emphasize the need to see ecological problems as undesired by-products of economic activities.² They aim to complement ecological education with concepts from social science as ecological education often heavily emphasizes individual responsibility (Karpe, 1998; Krol, 2001); (3) Economic Ethic approaches focus on a discussion about “correct” values. Here, in a radical version, Evans (2011) calls for the “absolute negation of the capitalist world order” as a goal of sustainability education; Gibson (2008) proposes a critical reevaluation of the belief in “technical-instrumental solutions.” Weinbrenner (1997) finally calls for a new paradigm in economic education oriented toward ecological limits and a rejection of homo economicus.

Empirically, only very few studies in economics education have covered sustainability-related topics. Davies et al. (2002) find a lack of knowledge of British students regarding economic environmental

policy. Davies and Lundholm (2012) discover different students' conceptions concerning the question whether goods should be provided for free. They range from a mere recognition that some goods are provided for free toward a desire to set incentives to internalize externalities. Harring et al. (2017) find that after one semester of studying economics, Swedish students become slightly more likely to evaluate economic policy instruments for the environment (taxes and subsidies) as good and efficient, and less likely to consider regulatory and informational instruments as good and efficient. Interestingly, this result is independent of whether students improved their economic knowledge. Ignell et al. (2017), as well as Löw Beer (2016a) focus on students' conceptions regarding externalities, and find that most of the students want environment-friendly products to be cheaper than other products. Ignell et al. (2017) additionally point out that students focus more on the supply than on the demand side when arguing why ecological goods are more expensive. Löw Beer (2016a) finds that the vast majority of the students interviewed does not specifically connect the price adjustments to the ecological harms or benefits of products. Finally, Lundholm (2007) reports that ten of the eleven students entering a masters course in Sustainable Enterprise in Sweden describe the idea of pricing nature as difficult, insufficient or even dangerous.

To the best of my knowledge, there is no thorough conceptual and empirical research on how to teach, and learn, about Ecosystem Assessment and Valuation (ESAV). This is surprising as ESAV has been one of the most researched topics in Ecological and Environmental

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² This is very similar to the externality concept (Bator, 1958).

Economics in the last years (Castro e Silva and Teixeira, 2011; Hoepner et al., 2012; Ma and Stern, 2006). At the same time, ESAV remains controversial within economic disciplines. This is reflected in the foremost textbooks published in the last years. While Environmental Economics textbooks mainly focus on technical aspects of different valuation methods (e.g., Perman et al., 2011; Tietenberg and Lewis, 2016), Ecological Economics textbooks tend to put more emphasis on the ethical evaluation of ESAV (Costanza et al., 2015; Daly and Farley, 2010).³ The combination of being highly present, and at the same time contested, provides a strong rationale for dealing with ESAV in any sustainability-related Economics courses.

Based on the categorical and paradigmatic approaches described above, the first aim of this paper is to structure the broad literature on ESAV in Ecological and Environmental Economics from a didactical perspective. Thereby, I suggest core contents of ESAV which need to be learned in order to understand the concept and important literature. Secondly, I present results from an empirical study conducted in two German universities on students' preconceptions⁴ on ecosystem-use conflicts (Löw Beer, 2016b). Here, I show how students who have not been formally trained to use ESAV approach problems that could be tackled using the ESAV approach. I demonstrate where students differ from in disciplinary knowledge, and I suggest how teaching can be designed to help students gain a better understanding of the ESAV concept, and to approach it critically.

The remainder of this paper is structured as follows: In the following second part, core teaching and learning elements of ESAV are developed based on a literature review from Ecological and Environmental Economics and pedagogic guiding principles. Thirdly, the research methodology of phenomenography and the research design are described and justified. Fourthly, results from an empirical study with 69 teacher trainees in economics are presented. Fifthly, contents and preconceptions are brought together to outline a teaching sequence. Finally, conclusions are presented and future research areas are proposed.

2. Core Elements of ESAV for Teaching and Learning

A core research area of subject didactics is concerned with determining what contents from a subject are relevant, and how they should be framed for educational purposes. Such a selection always involves some subjective elements. Therefore, the points raised in this section are primarily meant as a starting point to foster further discussion.

To identify relevant contents, I performed a structuring content analysis (Mayring, 2014). This process involved the Millennium Ecosystem Assessment (United Nations, 2005), the TEEB reports (TEEB, 2010a, 2010b, 2010c), articles referred to in the reports, textbooks from Ecological and Environmental Economics and the 100 most relevant, or most cited articles in the ISI Web of Science and Google Scholar using the search terms “ecosystem services,” “valuation,” “ecosystem services” and “assessment.” Content selection is further guided by (a) an acknowledged principle from civic education and (b) an established pedagogic methodology.

(A): Controversy is seen “as a key aspect in democratic education” (Hess, 2009) in civic education.⁵ In Germany, this is formalized by an agreed consensus, according to which (1) overwhelming students is prohibited, i.e., even for “good purposes” one may not “impart desirable opinions,” and hinder students from “forming an independent judgment,” and (2) “matters which are controversial in intellectual and

political affairs must also be taught as controversial in educational instructions”.⁶ This is in line with a basic objective of Education for Sustainable Development, which is not to force students to act sustainably, but to enable them to shape sustainable societies if they wish to do so (De Haan, 2006).

(B): The big comparative international educational studies, such as the Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS), use a literacy⁷ approach with dimensional analysis to determine contents from a scientific discipline for teaching and learning (Bybee, 1997; Mullis and Martin, 2013; OECD, 2016). At its heart lies the educational aim of enabling individual and social participation through a critical analysis and reflection of scientific concepts (Prenzel et al., 2001). The present study used the methodology related to this literacy approach to find relevant elements of ESAV for education. This involved terms, models, ways of questioning and thinking and methods, as well as the role of science in society (ibid.). In the following, I define these elements and relate them to aspects of ESAV.

Firstly, necessary and helpful terms should be made accessible, particularly those that point to differences between routine and scientific understanding. Basic terms of the ESAV model are natural capital as a metaphorical expression covering the whole limited stock of physical and biological resources (Costanza and Daly, 1992). ES as the flow of value to human societies (TEEB, 2010a), and also differentiating between provisioning, supporting, (socio-)cultural and regulating ES (United Nations, 2005), along with noting the differences between substitutable and complementary goods, the distinctions between use- and non-use values and between risk, uncertainty and radical uncertainty or ignorance (Knight, 1921; Perman et al., 2011).

Secondly, a systematic connection between the terms needs to be established. In economics, this is mainly linked to basic concepts. From an Ecological Economics perspective the concept of joint production is particularly important for ESAV (Baumgärtner et al., 2001), in Environmental Economics it is the similar concept of market failure (Bator, 1958). They are important because ESAV is supposed to help to cope with the inability of markets to understand that certain ecological benefits and costs need to be considered. Further important concepts are:

- social welfare functions, because they make it possible to compare values of different sources against each other
- discounting, as ESAV is almost always concerned with costs and benefits occurring at different times
- knowledge uncertainty, which concerns both human limits to perceiving nature, as well as the quality of ESAV
- the relationship between ES and human welfare (United Nations, 2005)

In the third stage, typical ways of questioning and thinking, as well as special methods of the ESAV approach are considered. This relates, on the one hand, to valuation methods. From the variety of different approaches, it seems important to focus teaching on at least one method with revealed, one with stated preferences, and also one with biophysical valuations to compare different methodologies. On the other hand, typical applications of ESAV need to be covered. To focus on this part, one can restrict the content to the applications, which differ most from

³ Only Edward-Jones et al. (2004) look in detail both at philosophical and technical questions.

⁴ A preconception here is understood as an idea or opinion that someone has before learning about something directly.

⁵ See also Schulz et al. (2010); Ten Dam and Volman (2004); Torney-Purta et al. (2001); Zohar and Nemet (2002).

⁶ The consensus was agreed on in 1976 in the German town of Beutelsbach, and is therefore called the “Beutelsbacher consensus.” At the following website, you can find a translation of the text: www.lpb-bw.de/beutelsbacher-konsens.html < rev. 12/4/2017 > .

⁷ In pedagogy, the term literacy was originally linked to the ability to read and write. Over the years its semantic content has been shifted toward skills which enable people to “contribute to socio-economic development, to developing the capacity for social awareness and [for] critical reflection as a basis for personal and social change” (UNESCO, 2005)

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