



Review

Educational values and services of ecosystems and landscapes – An overview

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ABSTRACT

Education is one of the multiple services that ecosystems and landscapes provide to societies. Despite its importance to formal and informal learning and nature-based, cognitive tourism, it is hardly taken into account in the various quantification approaches of ecosystem services. The article provides an overview of landscape educational values and the educational ecosystem service. Here, the forms of the use of landscape educational values have been summarised and the indicators for the quantification of the educational ecosystem service proposed in the literature reviewed. The criteria for the evaluation of the educational values of landscape were acquired from the literature and discussed. In order to obtain more practical viewpoints on those criteria, an exploratory survey with young experts ($n = 37$) from two universities of environmental sciences was conducted. Within this step, the expert method for the evaluation of the educational values of landscapes was applied. However, the results show an extremely high level of subjectivity and dependence on personal experience regarding outdoor environmental education. Nonetheless, the article can contribute to acquiring knowledge in cultural ecosystem service assessment and the application of this concept, especially in terms of the criteria and indicators which can be potentially used for the assessments.

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1. Introduction

The educational values of landscapes or ecosystems are important, but usually not fully appreciated assets of the natural environment. Here, educational values are understood as both biotic and abiotic features of the natural environment (ecosystems or landscapes) which can be potentially used to acquire knowledge about the structure and functioning of the current and past natural environment. Those features include, e.g., rock and soil outcrops, landforms, water bodies and plant communities as well as other effects of environmental processes, occurring in different combinations. The usage of the educational values of landscapes and ecosystems for the purpose of learning is here called “educational ecosystem service”. The delineation between an ecosystem and a landscape is difficult and depends on the context. Both provide potentials and services (Bastian et al., 2012), so these terms are used here as synonyms.

In contemporary societies, the need for environmental education, both formal (e.g., during school classes) and informal (e.g., during private travels), is obvious for several reasons. It is required to shorten the distance between the scientific and popular knowledge. It can contribute to a better understanding of the environmental risks (Bangay and Blum, 2010; Bird et al., 2010; Hiwasaki et al., 2014) and to increasing public awareness and acceptance for nature conservation (Caro et al., 2003; Coratza and Waele, 2012) as well as to the popularisation of public participation in decision making (Le Lay et al., 2013). Furthermore, it can lead to a better comprehension of the interactions between societies and ecosystems (Ploaie and Turnock, 2001), including many services provided by ecosystems to societies (=ecosystem services), i.e., the benefits people obtain from ecosystems (MA, 2005). Therefore, education within the scope of Earth and Life Sciences is an indirect way to support the conservation of the Earth’s natural heritage (Newsome and Dowling, 2010), which at the same time leads to the preservation of its educational values. From this perspective, environmental education constitutes an important ecosystem service which can contribute to the sustainable development of a region as well as to the human well-being of societies (MA, 2005; Smith et al., 2013).

Formal and informal education about nature can be carried out in buildings (e.g., at school classrooms, museums, educational centres) or in the outdoor environment in the form of field classes, workshops and educational trips (inter alia, within the scope of ecotourism and geotourism) as ecosystems provide many learning opportunities at many levels of education (Smith et al., 2013). Learning directly from ecosystems, although it is more difficult from the organisational side, is more beneficial for the learner of any age. According to social sciences studies (Davis, 2002; Hassan et al., 2009; Mirrahimi et al., 2011; Spalje et al., 2011), outdoor environmental education improves the process of learning and remembering due to the usage of all the senses (learning by doing), enhances observation capabilities and critical thinking, gives inspiration towards learning and contributes to an expansion of interests in nature (e.g., by engaging students through their hobbies). The two last advantages can be supported by the fact that the opportunity to participate in field classes is one of the incentives to start geography studies for 30% of the students in the study by Hibszer et al. (2012). Hence, outdoor environmental education creates a basis for shaping the attitude of the future experts of environmental topics.

For those reasons, education was included in the framework of the ecosystem services concept as it is one of the benefits people obtain from ecosystems (MA, 2005). It was listed in several classifications as one of the cultural services (Haines-Young and Potschin, 2013; Kandziora et al., 2013; MA, 2005; TEEB, 2010). In the Millennium Ecosystem Assessment (MA, 2005, p. 40), the authors refer to this service as “educational values”, which is explained as

follows: “Ecosystems and their components and their processes provide the basis for formal and informal education in many societies”. Plieninger et al. (2013, p. 120) relate educational values only to “sites that widen knowledge about plant and animal species”. Another ecosystem service listed in the MA classification that strongly relates to environmental education is called “knowledge systems” which is defined as: “Ecosystems influence the type of knowledge systems developed by different countries” (MA, 2005, p. 40). Martín-López et al. (2011) use the term “environmental education” for this service; however, they do not provide a definition. Kandziora et al. (2013, p. 61) define in their classification of ecosystem services “knowledge systems” as “Environmental education based on ecosystem/landscape, i.e. out of a formal school context, and knowledge in terms of traditional knowledge and specialist expertise arising from living in this particular environment.” In *The Economics of Ecosystems and Biodiversity Study* (TEEB, 2010), the authors refer to nature-based education as “information for cognitive development”. Böhnke-Henrichs et al. (2013) describe this service as the contribution that an ecosystem makes to education, research, etc. In the Common International Classification of Ecosystem Services (CICES) (Haines-Young and Potschin, 2013), the educational service is included within the ecosystem service called “information and knowledge”. Loomis and Paterson (2014) defined the “education” in the context of the ecosystem services concept as formal and informal educational opportunities created by access to particular ecosystems. As this short overview has shown, some authors refer to educational values as the opportunities for environmental education, which describe the potentials to provide this ecosystem service (e.g., Loomis and Paterson, 2014), whereas the others define it as the actual use of ecosystem services, referred also as “flow” of those services (see Burkhard et al., 2014). In summary, a common definition and delineation of educational ecosystem services and values has yet to be provided in the literature.

In this article, we suggest to specify “**landscape educational values**” as the potentials of landscapes and ecosystems which they provide to the educational service (i.e., opportunities for formal and informal environmental education). On the contrary, the “**educational ecosystem service**” reflects the real usage of landscape values for educational purposes, which, therefore, can be considered as ecosystem service flows.

The benefits of outdoor environmental education explain entirely the need for the evaluation of the educational values of landscape features and their use. Thus, it is important to review the criteria for the assessment of the landscape educational values and the criteria and indicators of the educational ecosystem service, which constitutes an indicandum here. In this respect, the main objectives of this article are to show the state-of-the-art within the specific cultural ecosystem service of education and the educational values of landscapes, and to apply the concept in a case study by an expert survey.

Specifically, the following key questions will be analysed and answered:

- (1) How can the **educational values** of landscapes be assessed and what criteria have been defined so far within the existing literature?
- (2) Which criteria are the most appropriate for such assessments according to university students and graduates within a survey of exemplary landscapes?
- (3) In which ways do humans use the **educational ecosystem service** and what are the indicators to quantify it?

This article consists of two parts: the first part comprises a short review conducted by a research of the relevant literature using the key words of “landscape educational values”, “landscape educational potential”, “education ecosystem service”, “outdoor

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