Izpostavljanje povezanosti med ohranjanjem tal in trajnostnimi skupnostmi v okoljski vzgoji

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Izvleček
Degradacija tal je pomembno vprašanje moderne dobe. Po desetletjih nepremišljenega uničevanja rodovitne prsti, pa je sedaj prišlo do resnih razprav o katastrofalnih učinkih, ki le-to povzroča na kmetijsko produktivnost, kakovost okolja in sekvestracijo ogljika. Dvig okoljske zavesti je mogoče zagotoviti preko različnih ukrepov v urbanih in ruralnih skupnostih, pri tem pa ima vzgoja in izobraževanje pomembno vlogo. Boljše razumevanje ključne vloge tal pri ustvarjanju in vzdrževanju življenja pa je ključnega pomena za dobrobit človeštva in našega planeta.
V članku smo obravnavali pristop do te problematike v sklopu okoljskega izobraževanja, ki se je danes razvilo v vzgojo in izobraževanje za trajnostni razvoj (VITR). Predstavili smo različne pristope pri razlaganju pomena prsti za trajnostni razvoj in poudarili nekatere inovativne izobraževalne vidike projekta *Življenje iz prsti*.

Ključne besede: prst, trajnostni razvoj, okoljsko izobraževanje.

Spotlight on sustainable community and soil conservation linkages in environmental education

Abstract
Soil degradation is an important issue in the modern era. After decades of inconsiderate fertile soil and land damages, now it has raised some serious debates because of its disastrous effects on agricultural productivity, environmental quality and carbon sequestration. Raising the environmental consciousness by different actions in urban and rural communities is possible and education has a relevant role in this process. Understanding of the vital role of soil in life creation and maintenance is crucial for the welfare of humanity and Earth.
In this article, we analyzed the approach to this challenge inside environmental education, nowadays evolved in education for sustainable development (ESD). Different educational approaches to soil linked to sustainability were argued. Innovative educational elements proposed by project *Life from soil* (LFS) were emphasized.

Key words: soil, sustainable development, environmental education.

1 Introduction

The 68th UN General Assembly declared the year 2015 for the International Year of Soils (UN, 2014). In the resolution is written that fertile soil conservation and preservation is crucial for a sustainable agricultural development, which would assure natural agro-ecosystems functions and food security. Hence, it is a key to sustainable life on Earth. Indeed, it is stated, that only with a sustainable soil management we can address the pressure of the growing human population and assure a food secure world for the future generations. Furthermore, it can significantly contribute to mitigation of climate changes, improvement of water availability and reduction or eradication of poverty. To resume, the aim of World Soil Day (5th of December) and the International Year of Soils (Year 2015) is to contribute to: a) raise awareness about the importance of soil for human life, b) educate about the key role of soil in food security, climate change adaptation and mitigation, essential ecosystem services, poverty alleviation and sustainable development, c) support policies, investments, actions for the sustainable management and protection of soil, d) raise concern about desertification, environmental degradation, wetland loss and drought as global challenges.

Soil is a dynamic amalgamation of living, dead, and abiotic components. As an ecosystem, soil performs a number of ecosystem services to support human welfare (Lal, 2004; Robertson and Swinton, 2005; Finvers 2008; Schahczenski and Hill, 2009), including: a) production of biomass, b) storage, filtration and transformation of nutrients, substances and water, c) provision of habitat, species and genetic biodiversity, d) provision of the physical and cultural environment for humans and their activities, e) provision of raw materials, f) carbon storage and cycling. However, this important Earth ecosystem presents many anthropogenic abuses, not limited only to mismanagement of soil performed by non-sustainable farming practices. In fact, it is a more complex phenomena connected also with urbanization and humans' attitude toward these issues. To be more specific, the percentage of world urban population is increasing drastically together with the expansion of urban and suburban infrastructures and the reduction of the space for natural and semi-natural habitats (De Kempe and Morel, 2000; Higgitt, 2004). Indeed, apathy and tacit support of urban population to intensive farming production of cheap and plentiful food have significantly contributed to soil degradation and mismanagement. Consequences of this mismanagement are also deforestation, desertification, soil acidification, soil salinification, loss of soil biodiversity, unsafe and unhealthy food production (Grieve, 2001).

Conventional profit driven agriculture in the last few decades has led to the escalation of rural communities' destabilization and has speeded up the detrimental effects on both the farmland and neighboring natural environments. However, bottom-up movements started by ecologically conscious farmers and NGOs that support a shift to more sustainable agricultural practices and food production are taking place worldwide. Probably we are finally understanding that a successful management of agricultural resources is based on satisfaction of human needs while maintaining environmental quality and conserving natural resources at the same time. Therefore, economic profits of farmers and food processing industry are increasingly combined with the demand for environmental and social benefits. Furthermore, organic agriculture which aspires to bring social, economic and environmental well-being is increasing worldwide (Willer, 2011). It requires the optimal use and management of soil that implies enhancement of soil biological activity and long-term soil fertility and thereby organic crops safety and quality (Singh *et al.*, 2011). Nowadays, also public opinion supports with more emphases soil conservation measures and demands government conservation policies. However, larger consensus in the society is still needed to create a relevant pressure to the actual industrial agro-food socio-technical system and to sustain local organic, ethical and nature friendly food production. Maybe a deeper comprehension of the role that healthy soil plays in personal health preservation and creation of sustainable communities would be useful to inspire more individuals to have an active role in solving these issues.

Raising awareness and moving towards a more sustainable relationship with soil could be achieved with different actions driven in rural and urban communities, but primarily with environmental education (EE) linked to education for sustainable development (ESD). It should start at primary or

secondary level and continue at tertiary level (Marentič-Požarnik, 2010; Zupan *et al*., 2008). Engaging and empowering individuals with new skills and knowledge about soil ecosystem functions and the important role of them for the entire planet would be insufficient without an impact on learners' affective domain; thereby a drastic change in their attitudes, values and a new proactive environmental behavior is needed. To assure effective learning outcomes, we have already proposed a holistic, multidisciplinary, proactive experiential learning methodology integrated with positive psychology concepts for students of the tertiary level (Vižintin, 2015; Vižintin and Logonder, 2014).
In this article, we will focus on educational aspects of soil as an essential natural resource abused by anthropogenic impact. The relation between sustainable communities and healthy living soil needs more attention, since it is linked with environmental, social and economic well-being. Furthermore, we will review the development of environmental education as education for sustainable development, including transformative learning, experiential learning and community base learning. As an example of implementation, we will analyze approaches proposed by some educational projects and in particular we will argue for some innovation aspects proposed by educational project Life from Soil (LFS, Erasmus+, Strategic partnership in adult education, 2015-2017).

1.1 Soil as a precious natural resource

What type of soil forms depends on several different factors; the parent rock material, local topography, local climate, water availability and so on. Soil developed very slowly in the Earth history. Indeed, fertile soil formation that continually undergoes also today is a long lasting process, since it takes hundreds or thousands of years and could be easily influenced or disturbed by anthropogenic or natural factors. Nowadays, soil is a lively habitat filled with many living organisms maintaining the underground "factory of life". Hence, "healthy soil" performs numerous functions and ensures that planet Earth remains habitable for all living organisms (Rajeshwar Reddy *et al.*, 2014; Bhardwaj *et al*., 2014; Singh *et al.*, 2011; Wall and Moore, 1999).
Klaus (2013) reported that a handful of soil contains more organisms than the number of humans on the planet, but only a small fraction of these soil organisms are known to science. In 1928, Alexander Fleming discovered the first antibiotic, penicillin that is a natural substance released by *Penicillium* sp. soil fungi. Soil, therefore, is studied as a "pharmacy", since after this first discovery, numerous new substances connected with soil organisms become important medications. Plants are largely dependent on soil organisms, since decomposers turn dead organic material into a stable substance called humus that plays a central role in the maintenance of the nutrient, water and carbon cycles. Furthermore, over 80% of plant species form a mutually beneficial symbiotic relationship (called mycorrhiza) with specific soil fungi that increase plants' root growth system, enhance their assimilation of nutrients and protect plants against pollutants and pathogens. Consequently, soil has a particular ability to control and maintain nutrients/gas cycles and energy flows between the atmosphere, hydrosphere, biosphere and lithosphere.
The most evident soil service for humans is the production of food, animal feed and wood. But soil is a limited natural resource. If we care for the future generations, fertile soil should be carefully conserved (García-Mier, 2013; Klaus, 2013). To assure long-term soil natural fertility, agricultural practices that preserve the richness of soil life are needed (Altieri and Nicholls, 2005; Singh *et al*., 2011). Soil organisms and soil habitats are damaged by intensive agriculture, monocultures, overuse of mineral fertilizers, liquid manure and pesticides. Large amounts of artificial fertilizers and liquid manure can result in exceeded nitrate content, which leaches to the groundwater with rain and impairs the quality of our drinking water. Another problem concerning the overburdened nitrogen cycle is the formation of nitrous oxide, a highly potent greenhouse gas produced in the soil when nitrogen fertilizers are processed.
Soil is the third-largest repository for carbon, after oceans and fossil fuels (Schahczenski and Hill, 2009). However, the amount of carbon stored in the soil depends on temperature, soil moisture, the amount and type of dead plant material. The conversion of natural ecosystems into cropland and grazing pastures as well as over-utilization of the soil are the main causes of the increased release of CO_2 from the soil.

Furthermore, soil systems are low-maintenance water filters that guarantee excellent cleaning of water over the long term. Only with intact soils texture and functionality can groundwater be used as drinking water without expensive water treatment (Klaus, 2013). With their extensive networks of burrows, earthworms enhance porosity and are especially important helpers in protection against floods since the capacity of soil to store water depends on the proportion of the pores. Beside flood protection, a part of the water in the soil is also available to plants, which would otherwise dry up (Sullivan, 2004).
Globally, 24 million tons of soil is washed into the sea or blown away by the wind each year causing desertification and soil erosion (Klaus, 2013). At the same time, urbanization is claiming ever more valuable land, but after an industrial use, a polluted soil is very difficult to be restored.
To conclude, fertile soil loss is a growing threat to global food security that can lead to conflicts in the future. Our modern high-tech civilization has lost contact with healthy soil and healthy life. However, our well-being today depends on healthy soil even more than in the past.

1.2 From environmental education to education for sustainable development

In the 1970s, the international community started to give more emphases on education that should address new environmental and developmental challenges. The derived strategy of environmental education was firstly described in the Belgrade Charter of 1975, which outlined goals, objectives, and target audiences for environmental education (UNESCO, 1975). These ideas were deeper explored at the Intergovernmental Conference on Environmental Education (UNESCO, 1977) in Tbilisi. The Tbilisi Declaration (UNESCO, 1978) defined environmental education as lifelong education, responsive to changes in a rapidly changing world. Such education prepares individuals to understand challenges of contemporary world and provide them skills and attributes needed to play a productive role in society, towards improving life and protecting the environment with due regard given to ethical values. Therefore, the declaration recommends three main goals of environmental education: a) to foster awareness of economic, social and ecological interdependence in urban and rural areas, b) to provide learners with knowledge, values, attitudes and skills needed to protect and improve the environment and c) to create new patterns of proactive environmental behaviour of individuals, groups and society.
During the evolving process of environmental education, the concept of sustainable development began to emerge in the 1980s, popularized by the World Commission on Environment and Development – The Brundtland Commission (UN, 1987). The Brundtland Commission Report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". It was revisited in 1992 through the United Nations Conference on Environment and Development in Rio de Janiero (UN, 1992), known as AGENDA 21. Inside a holistic new model, this agenda emphasized the interconnection between ecological, social, political and economic aspects of sustainability.
At the origins, environmental education focused only on the ecology of natural environments and therefore it failed to understand the role of human decisions and actions in causing ecological problems. Nowadays, it can't be neglected that many global challenges are a consequence of industrialization, excessive consumerism and unsustainable lifestyle. We need to face these challenges through new economic, social, political policies and technological changes. Indeed, to sustain and conserve all life, we need new skills to develop social harmony, peace, equality, human rights and democracy (Cloud, 2005).
To encourage education for sustainable development, the UN General Assembly declared a Decade of Education for Sustainable Development (DESD) for the years 2005-2014 (UNESCO, 2007). As a result of this, strategies and action plans for ESD implementation have been formulated in different countries and also in Slovenia (Zupan *et al*., 2008). In the Slovenian document, environmental education (EE) at secondary level was described as education for sustainable development (ESD) that represents an increasingly important component of the modern secondary school curriculum. This kind of environmental education promotes critical thinking (important to evaluate the consequences brought by scientific and technological advancement) and problem solving (for monitoring and

solving of environmental issue for which is more than one correct solution). These skills are vital for growing awareness and concern about the complexity of challenges and about caution regarding simple, one-way solution. Indeed, a holistic, cross-curricular, multidisciplinary, proactive and experiential approach is emphasized in EE connected with ESD.

Environmental education for sustainability (EEFS) was presented by Tilbury (1995) as a new model of environmental education evolved from this process. In this model, environmental improvement is an important educational goal. EEFS goes beyond approaches that are limited to understand and appreciate the environment and to have a concern *about* environmental issues. It develops in fact a sense of responsibility and active students' participation in the resolution of environmental problems. Furthermore, it adopts a holistic and interdisciplinary approach, a global outlook about challenges and diverse critical education goals within an issue-based pedagogy. EEFS spreads between students also the ambition for a greener economic, social and political environment. During lessons, students should consider the existing complex natural and cultural environment and should think about questioned alternative futures. EEFS boasted in the three-fold approach: education *about* the environment /*in* the environment /*for* the environment.

Service learning could be also very useful in new models of environmental education. It is a part of experiential pedagogy in which students at tertiary level render services in their communities for an academic credit (Bringle and Hatcher, 1996). It can be performed in different ways; for example as volunteering, activism, internship, out-of-class activities, projects and other (Kendall, 1990; Mooney and Edwards, 2001). Contemporary use of various service learning and/or community based learning approaches in EE/EESF, encourage students to better understand the complexities of the issues threatening environment education and sustainability in a particular social and ecological context (Vižintin, 2015). Advantages of this kind of approach, beside cognitive and effective learning outcomes, are community benefits as: a) enhancement of relations with the local community, b) improvement of intergenerational help, c) new community energy and enthusiasm in action to protect natural heritage at local level, d) improvement of well-being and community values.

2 Holistic approach to soil in education driven by international cooperation

In most agricultural faculties, soil science courses are traditionally taught using a combination of traditional teacher-centred lectures and laboratory formats. But advancements as new pedagogical approaches, including problem solving learning (Soaud, 2010), project-oriented and team-based approach (Smiles *et al*,. 2000; Amador and Görres, 2004; Kelley, 2004), have shown more promising results in achieving course objectives and positive learning outcomes. These new teaching models shift the focus to student-centred learning since students' teams are responsible for working on assigned themes, identifying and obtaining the information and skills they would need for development of a satisfactory solution.

However, there is still a big lack on pedagogical approaches connected to soil at different educational levels that include sustainability issues. In this regards, to link pedagogy and pedology in education for sustainable development, the concept of *living soil* was coined to design a more holistic approach to soil. Practical experiences and bio-cultural diversity was embraced in this concept that was implemented in learning gardens and other initiatives (Williams and Brown, 2011). Indeed, the curriculum called *The Living Soil* was developed and tested by the network of Iowa's agriculture teachers and students. The aim was to reinforce awareness of the role of earthworm activity in sustainable agriculture and concern about soil health. Evaluation revealed that team teaching was effective in conveying this material to students (Weber and Gamon, 1996).

The project *Life from soil* (Erasmus +, Strategic partnership for adult education) started in 2015 by a consortium of 9 partners from 9 countries from all geographic parts of EU that share the same goals: a) to improve the quality of life of learners, b) develop missing skills and motivate learners to participate in life learning process c) develop a high quality guidebook and modular course for independent learning and assisted teaching. To gain these objectives, the consortium decided to focus on soil, a widely available natural resource that supports life on the Earth from the very beginning of human society. The concept of *life from soil* was coined to emphasize the fundamental role of soil in life

creation and maintenance. Tailored open-source educational tools and tested interdisciplinary educational processes are centred on soil-community connection aspects as agriculture and food production, social and horticultural therapy, sustainable landscape management and community settlements as eco-villages. The aim is to straighten out vulnerable target groups of local rural communities, improving sustainability of their lifestyles and their attitudes toward soil, sustainable soil and landscape management, safe and high quality food. Most important intellectual outcomes are going to be: a) a best practice guidebook, b) a modular training course and c) a demonstration-testing site for practical evaluation of educational tools. In order to share knowledge, develop skills, establish twinning and lasting relations, the project is going to organize transnational learning/teaching activities, various dissemination platforms and events. The ambition of the project is a relevant and measurable impact on green job orientation and creation in target communities. Connections between learning and job creation are going to be highlighted and demonstrated in dissemination activities. Members of the consortium are NGOs' activists, academic researchers and educators in formal and non-formal adults and vocational education. This innovative stakeholder involvement in the educational project conveys to an integrated model of education that embrace experiential learning, community base learning and problem solving elements.

3 Conclusions

Soil supports life on this planet and provides many benefits for humans. Nevertheless, soil manifests increasing signs of damage, degradation and erosion that are all consequences of a poor land management and of pollution caused by humans' activities. Loss of soil biodiversity leads to a decreased role of soil organisms in removing pollution, water filtration and balanced regulation of gasses in the atmosphere.
Environmental education (EE) evolved to new models that include education for sustainable development (ESD), experiential and community-base learning (CBL). It claims a more holistic approach that includes cultural, social and economic elements.
Project *Life from soil* emphasizes the importance of soil in our life and uses this concept in education. It represents an innovative approach in education based on analyses of good practices that embrace interdisciplinary and multicultural dimensions.

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