

Moving towards a Circular Economy: The Need to Educate – Why and How?

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Abstract

Waste remains a significant contemporary problem despite many educational initiatives to address this issue and the necessity to reduce-reuse-recycle. In the policy field, the concept of circular economy has been introduced, emphasizing the need for structural and cultural changes. This paper demonstrates the significance of education in the transition to a circular economy and addresses questions like: why has Education for Sustainability (EFS) not managed to bring about desired changes in waste generation behaviors? What kind of education is needed to achieve a circular economy and a society with no waste? It proposes that education should be designed to promote “circular” and systemic thinking, critical knowledge capacity, collaborative skills, and socio-political literacy. For educators to effectively deal with the new challenges, integration, collaboration and systemic and “circular” thinking should become central in the education of teachers - university professors and engineers.

Keywords

Education for circular economy, Education for Sustainability, critical pedagogy, educational design.

Introduction

Developed world. Progress. Spacious houses, with all utilities, with many electric and electronic devices making our life easy. People with many sets of clothing, many pairs of shoes, several mobile phones, more than one car, educational opportunities, access to internet and a wealth of information. Cities with many lights, many private cars, many shops, a variety of services to buy. Life is more comfortable today than in the past. We are lucky to live here and now. So, we believe.

But this way of life generates much waste as it heavily depends on consumption of resources and overconsumption patterns. Waste management is a significant challenge contemporary Western societies face. It is a problem of increasing significance as more and more waste is generated. In recent decades, many policies have been drafted and adopted to address this issue, starting from promoting recycling and setting recycling goals, moving to promoting the hierarchy of principles “reduce – reuse – recycle”, resource efficiency, and now the concept of the circular economy. We have come to realize that a significant shift is needed in our conception of waste: from waste as a problem to “waste” as a used resource that can be reused somehow, somewhere, by someone. But how is it possible to move towards a circular economy and more sustainable societies if this way of living is everyone’s dream?

This paper focuses on why education has a key role to play in the transition towards a circular economy, as well as the characteristics such an education should have. It will address questions like: why has Education for Sustainability (EFS) not managed to bring about desired changes in waste generation behaviors? What kind of education is needed to achieve a circular economy and a society with no waste? A set of guidelines for such educational programs will be proposed.

Circular economy

The concept of circular economy was relatively recently introduced in the European Union. In the relevant EU action plan (2015), circular economy is described as “where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised.”[1] The transition to a circular economy is a systemic change, requiring changes in the economic, political and socio-cultural realms. This systemic change requires innovations: technological (e.g. in the production process and in product design), economic (e.g. secondary raw materials market, new business models, industrial symbiosis, new consumption behaviours), and socio-cultural (e.g. consumption attitudes and values, conception of wastes and of relations of humans with nature and natural resources, and conception of role and proper behaviour of industries).

The concept of the circular economy introduces two progressive elements: first, it highlights the need for a systemic change, removing the overemphasis on individual action – “a shift towards ‘systems and citizenship’ rather than ‘me and consumerism’.” [2] (p.311); and second, it proposes a new model for the economy, one that works on insights from the way nature works rather than on machine analogies.

The transition to a circular economy then presupposes a paradigm shift, “an organizational and cultural shift” as Peter Lacy (2015) [3] indicates. No technological innovation alone can change the cultural underpinnings of social practices, and in particular of waste generation and waste management practices. Economic innovations also require a

new organization, a new mindset and new forms of action for industrial players. How can we make the move from this society towards a circular economy, which is more akin to the past-less developed state of societies, look desirable, rather than a necessary evil, an unwanted backward move? How can industrial players choose to adopt sharing practices or to design products that have a long life in the market? Education from an early age to higher education should cultivate a new vision of society and economy: a circular, sharing economy and a cooperative and caring society. On the one hand, technological and economic innovations require a qualified workforce that can effectively design, promote and implement them. Consequently, a new form of specialized technical education (like engineering or business education) is required – one that is redirected towards systemic, “closed loop” (i.e. no waste) thinking [4]. At the same time, education should prepare active citizens (who can be innovative industry owners or managers, politicians, decision makers, designers among other things) with a sense of stewardship for the environment and social/collective responsibility: “ecological citizens” as Dobson (2007) [5] says. Dobson too highlights the significance of education in the preparation of ecological citizens.

Education for Sustainability (or Education for Sustainable Development)

Education for Sustainability has been a proposal for such an education; a systematic effort towards sustainable societies and reduction of waste.

Education for Sustainability (EFS) – previously Environmental Education – has a history of almost 40 years [6] [7] [8] [9] [10] (Flogaiti, 1998; Kalaitzidis & Ouzounis, 2000; Flogaiti & Liarakou, 2009; Marouli, C., 2002, Goncalves, F. 2012). It started from education on/for/in the environment and moved to Education for Sustainability (or Education for Sustainable Development), emphasizing the integration of environmental – social – economic aspects and aiming to change of values and behaviours. Its desired outcome has been “educated citizens who take an interested and active part in their communities and in their country.” [11] (p. 30). EFS has contributed to higher awareness of environmental issues and sustainability (although still a fuzzy term) in contemporary societies. It has also made significant contributions to education by promoting student engagement in the learning process and problem solving, often via projects; active learning, which emphasizes the engagement of students in the creation of knowledge and problem solving (see also Shen & Xu, 2015) [12], is now a mainstreamed term in the field of education [12]. It is proposed as a desired alternative to traditional educational practices which can empower learners to address contemporary social challenges.

Despite its significant achievements and the fact that waste management has been an important theme tackled in Education for Sustainability, we are still far from sustainable waste management, a circular economy or a sustainable society. Why? How should education be organized to lead to not only value changes – a significant challenge by itself – but also to behavioural changes?

As Tilbury et.al. (1999) [13] indicated that EFS instructors often continued their usual teaching practices, albeit in a more interactive manner. Thus, they did not create educational spaces where students were creators of knowledge or fora that cultivated the feeling that they could and should change their waste generation and management practices. But even when EFS initiatives were effective in promoting active learning, they often lacked adequate

emphasis on the ‘big picture’ – a systems focus – and a contextual analysis, as meaning arises in relation to a context. (see also Webster, 2013) [2].

We can gain some useful insights for an effective education for a circular economy from the literature on critical, empowering and transformative pedagogy and action research. Our aim below will be to extract lessons for educational design and practices that can promote skills and worldviews for a circular economy.

Education for transformation

“The significant problems we face cannot be solved
at the same level of thinking that we used when we created them.”
—Albert Einstein

Critical pedagogy, introduced by Paulo Freire [14], advocates that education should aim to generate liberated thinkers, able and interested in acting upon the world. According to it, a main characteristic of humanness is that humans are agents who transform their world through cycles of reflection and action. According to Ada (2007) [15]:

"In critical pedagogy our purpose is to support the growth and liberation of all participants. We understand human liberation as the result of praxis; a process of reflection as a preparation of action, followed by reflecting on the results of our action, which leads us to new insights and therefore to new action, in an ongoing cycle of growth and learning. An essential part of that learning is a critical analysis of our own culture." (p. 110)

Thus, education should aim to facilitate this process. It should aim to make active citizens; people that have the ability to critically reflect on experiences and information and synthesize into new knowledge, and then apply it to address real life situations; learners that pose challenging questions and have the ability to and interest in solving problems; citizens that have a sense of social – collective responsibility and that understand the connection between individual action and social structures.

Aside of the above, transformative learning also emphasizes the democratic and liberating character education should have.

Critical pedagogy is a reflective facilitation of learning. According to it, the educational praxis should be a liberating process, so that it can result to “subjects who know and act” [16]. This implies validation of learners’ experiences and knowledge, democratic dialog, critical questioning and problem solving, collaboration of and interaction among all participants, and access to and integration of diverse bodies of knowledge. Transformative learning generates knowledge, mobilizes feelings and develops socio-political skills. This way, it empowers learners and mobilizes them to action.

According to Ada (2007) [15], the following principles should guide education:

- “...we learn better in an environment that offers love and respect, and allows us to experience and honor the truth of our thoughts, emotions and feelings.”
- “... we learn better in an environment that allows us to learn at our own pace and in our own way, that honors what we care about, and that builds on what we have already learned from our life experience.”

- “ Racism, as well as other forms of prejudice and oppression ...are pervasive in our world and influence all of us in unconscious ways. Therefore we need to begin by recognizing prejudice and oppression in order to unlearn them.”
- “... we learn better in an interactive, supportive and non-competitive environment. As we live in a competitive society, it takes intention and effort to establish a co-creative atmosphere.”
- “ ... To be most effective, [needed] improvement [in a culture] needs to come from within the culture or in partnership with it, rather than imposed upon it.”

Education for circular economy: How?

As the transition to a circular economy is a significant systemic transformation, it presupposes changes at both the social – structural and the individual level. So, the education that can support such changes should be: learning for individual change, learning for empowerment, learning for social transformation, learning for integration. Its main characteristics include:

- It should broaden the “possible” (creativity, innovation);
- It should promote systemic thinking; understanding of how the environment, economy, society and culture, and power inequalities work and how they interrelate (systems analysis);
- It should cultivate “circular” thinking (exploration of cycles in the environment and life);
- It should cultivate social and environmental responsibility (service learning);
- It should prepare “global citizens”, including critical appraisal of rights and obligations, justice and fairness and political literacy [5] (citizenship responsibility and skills);
- It should be integrative – integrating different bodies of knowledge, different experiences, different viewpoints;
- It should reveal the integral connection between individual issues/action and social problems;
- It should be an ongoing exploration (action research);
- The educational context should foster trust and openness, with both individual and group learning opportunities

In terms of the teaching methods and the learning context, an education that supports the transition to a circular economy should: provide a forum for the required knowledge and skills via a classroom that is a “think tank” and research site; be relevant to the learners’ own lives, connecting with their experiences; include democratic dialog and group work to cultivate skills of active citizenship; and mobilize feelings and the desire to do something (affection and connection).

Table 1 below connects educational purpose with the learning content and context and the desired outcomes, with the ultimate aim being a transition to sustainable sharing societies and a circular economy. It provides a schematic summary that connects learning purpose, teaching methods, tools and desired outcomes so that educators can make the best design choices for their selected instructional purpose.

Table 1: Design guidelines for education for circular economy – Schematic summary of connections between instructional purpose, characteristics, methods, tools and desired outcomes

Teaching / Learning purpose	Characteristics / skills targeted	Learning context - Teaching methods	Instructional tools	Key outcomes
For individual change → Critical learners	<ul style="list-style-type: none"> - Critical thinking - Creativity & innovation - Knowledge creation 	<ul style="list-style-type: none"> - Case study analysis - Dialogic classes - Problem analysis - Class as a “democratic forum” 	<ul style="list-style-type: none"> Case studies Audio visual materials Role playing Laboratory activities (guided) 	<ul style="list-style-type: none"> Critical knowledge Analytic ability Synthetic ability
For empowerment → empowered (and critical) learners	<ul style="list-style-type: none"> - Real problem solving - Desire to act on knowledge - Sense that you can cause individual and social change - Political literacy - Systems thinking 	<ul style="list-style-type: none"> - Real life problem solving - Investigating connection of individual issues & social problems (‘personal is political’) - Service learning (offer your services and learn) - Experiential learning (learning concepts by doing) - Class as a “think tank” 	<ul style="list-style-type: none"> Projects on problems/questions seeking answers Group activities in class & outside Experiments Field work Work in a NGO Internet searches – use of knowledge data bases 	<ul style="list-style-type: none"> Problem solving Systems thinking Research ability
For integration → critical & engaged citizens (and critical & empowered learners)	<ul style="list-style-type: none"> - Integration of different bodies of knowledge - Integration of experience & knowledge; of diverse sources of knowledge - Circular logic - Local and global connections 	<ul style="list-style-type: none"> - Integrative projects, requiring diverse sources - Multicultural exchanges - Investigation of end-of-life uses - Multi-scalar analysis (local, regional, national, global) - Class as a “research group” 	<ul style="list-style-type: none"> Group projects & in-class group activities Different groups - on different aspects of a multi-faceted problem Local / international problems Social media / web based tools Use of synchronous & asynchronous internet-based tools 	<ul style="list-style-type: none"> Wholistic – circular – transdisciplinary thinking Connection & relations Communication ICT skills
For social transformation → empowered citizens (and critical citizens, critical & empowered learners)	<ul style="list-style-type: none"> - Understanding socio-political, economic and cultural context / dynamics - Collective action, social responsibility & participation in community affairs 	<ul style="list-style-type: none"> - Action research (local problem, investigation, collaboration with community, problem solving, policy implications) - Connection with society - Democratic decision making in class 	<ul style="list-style-type: none"> Group work - Working on a local problem/issue Collaboration with local community & other experts People research On line tools (ICTs) - for connectivity 	<ul style="list-style-type: none"> Social responsibility Socio-political savvy Action research capabilities

Concluding thoughts

As the transition to a circular economy implies systemic change, “circular” and systemic thinking, critical knowledge capacity, collaborative skills, and socio-political literacy should constitute main aims of education. All education should go beyond its emphasis on the individual (individual behaviours, individual change, etc.); it should become a collaborative practice, with social responsibility, socio-political capabilities and the common good as goals. Educators should facilitate learning spaces and processes for critical thinkers, engaged learners, interested and empowered citizens, adopting appropriate teaching methods and educational tools (as indicated in the table above). Education for the circular economy and sustainable societies should always promote the understanding of the close interconnection on the one hand, between individual actions and social problems (just like the slogan of the feminist movement “personal is political”), and on the other, of local and global concerns, thus preparing ‘global citizens’. Active learning, critical pedagogy and action research can help educators in this endeavour. Real life problem solving, multiscale analysis, service learning, integrative modules and a combination of individual and group activities are some useful teaching methods. Information and Communication Technologies (ICTs), if used with a clear perception of the purpose (as indicated in the table above), provide some useful tools for interaction, communication, integration of diverse bodies of knowledge, and local-global connections.

For educators to effectively deal with the new challenges, integration, collaboration and systemic thinking should become central in the education of teachers and university faculty. These same characteristics and a “circular” logic should inform engineering and business education as well, in order to prepare graduates that can propose innovative engineering designs, alternative business practices and new forms of decision making.

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