The Educational Process in the Aspect of the Study of Circular Economy

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Abstract. Changes in the global economic model for the use of Natural Resources will increase mainly due to reductions on a point scale of about 90 billion USD native resources. It is expected to reach 190 billion USD by 2060. This will lead to a significant increase in carbon dioxide emissions and a reduction in raw materials needed for high technologies. The only way to counter these challenges is to move to a circular economy. Circular economics calls into question the linear system and requires a rethink of the production process, considering the process of recycling goods. It offers significant potential for innovation, employment opportunities, quality of work, and ultimately a more inclusive economy that serves the needs of all people. The role of the educational system in the process of forming a circular economy. The importance of education is emphasized in the transition to a circular economy. The education system is a key player in the transition from a linear to a circular economy, which should begin to guide this transformation. To do this, the education system must first adapt to new requirements by adopting circular economics teaching in classrooms. Secondly, to ensure an effective large-scale transition by developing students’ proper skills and systems thinking. However, circular economics cannot be tied to a single profession or discipline because its success requires dialogue between different actors. This is an inter-social economic model that is needed in the fields of engineering, design, military operations, and business. Therefore, the teaching of circular economics should also be interdisciplinary and cover different areas of Education.

1 Introduction

Obstacles to an effective transition to a circular economy are inappropriate attitudes of the population, a lack of specialists, insufficient investment in established operational models, and a high threshold for implementing new business models. The Sitra Foundation estimates that improving resource and cycle efficiency will provide Finland’s national economy with an annual growth potential of 2-3 billion euros by 2030 in only a few sectors (construction, food processing, sharing economy, paper industry, mechanical engineering, nutrient cycle) [6]. The strengthening of the circular economy market is likely to have a
significant positive impact on the Finnish economy in the long term. Construction, textiles, food production, mining, forestry and electronics are projected to be promising industries for creating new jobs in the transition to a circular economy [3].

The experience gained from the pilot project was recognized at the Finnish government level, which is reflected in the Finnish Strategic Program for the Circular Economy, adopted in 2021. The program provides for various activities in the field of education, in particular [8]:
- inclusion of circular economy competence in the education system and work-life skills;
- joint foresight of higher education and labor market competence needs in circular economics;
- inclusion of circular economics in curricula, qualification requirements and educational degree;
- increased teaching of circular economics in Finnish schools;
- encouraging Western and vocational schools to include the circular economy as a strategic priority;
- increasing continuing education with a circular economy for teachers;
- accelerate cooperation, partnership and research between companies, vocational and technical institutions, higher education institutions, research institutes and other research subjects on circular economics;
- recommendations for educational institutions to adhere to the principles of circular economics in its activities;
- development of competencies at different stages of working life.

2 Research Methodology

The purpose of training specialists in circular economics is primarily to develop graduates’ competence in circular economics and innovative competencies. This goal can be specified in three directions:

1) formation of students’ awareness of the importance of circular economics for Sustainable Development; Education of a socially active person who is guided in his life by the principles of circular economics;
2) creation of conditions for students to master knowledge and skills in professional activities in circular economics;
3) meeting the urgent needs of production in qualified specialists whose level of training would meet the requirements of the circular economy.

The knowledge that students receive at home and when studying the basics of sciences does not provide proper training for successful family activities, does not educate economically literate citizens who know their rights as consumers and citizens. There is a contradiction between the level of preparation of schoolchildren for family economic activity and the demands of real life. In this regard, the problem arose of developing such a course that would prepare students for future family, economic and social life.

The methodological basis of the research was: the concept of general secondary education as basic and continuing economic education; psychological and pedagogical theory of personality; basic provisions on methods, forms and means of teaching, both traditional and active, general pedagogical and psychological foundations of economic education and upbringing.

3 Results and Discussions
A study by The Ellen MacArthur Foundation found that of the 138 Western military districts, 38% are in Finland and the Netherlands — countries that clearly implement the principles of a circular economy at the level of business and politics. Another 15% of Western military districts offer circular economy programs in the UK, 11% in China and 7% in the US. The remaining proposals are distributed among other European states [10].

Finland has been teaching circular economics at all levels of education since 2017. In the 2017-2019 academic year, circular economics began to be actively studied in primary, secondary and vocational institutions, universities and universities of Applied Sciences throughout Finland. More than 70,000 children and young people across Finland participated in the training, of which 75% of 12-year-olds and 40% of 15-year-olds learned about the principles of circular economics.

Since then, Finland has rapidly become a leading country for training specialists in circular economics. Training in the field of circular economics begins with a kindergarten, where children are taught to think about reducing food costs and properly sort waste, this training continues in institutions of general secondary, vocational and higher education. In the course of such training, students will gain knowledge about materials, business activities and skills that are necessary during the transition to a circular Economy and Lifelong Learning Society [4].

Note that higher education in Finland has more programs and courses in circular economics than anywhere else in the world. In addition, the principles of circular economics have been integrated into lifelong learning processes, starting with kindergartens. Thus, in 2020, more than 70,000 Finns from different levels of Education studied the circular economy, as it was implemented in all areas of society, and was not a separate sector. Universities of Applied Sciences in Finland have played an important role in turning the circular economy into practice. For example, the Sitra Foundation and Turku University of Applied Sciences launched a circular summer school project in 2020 aimed at retraining specialists from Finnish companies in the field of Environment, Technology and machine building. Experts believe that Finland can become a global precursor, paving the way for the implementation of circular economy solutions around the world, as well as training relevant specialists. In a post-pandemic world, this is much more important, as many people who have lost their jobs need new skills and tools for the future.

It should be noted that the education of a socially active person in a sustainable development society begins at school and continues at universities, which ensures the training of specialists in a continuous learning environment. So, in institutions of general secondary education, the purpose of training is to raise awareness of the importance of the circular economy and get acquainted with its principles. In addition, an important goal of teaching students in general secondary education is to develop math and science skills, as Finland has seen a negative decline in the popularity of high school math since the early 2000s, which is worrisome. During the transition to a circular economy, Finland experienced a shortage of specialists with knowledge of mathematics and Natural Sciences, which are extremely important in such key areas of the circular economy as mechanical engineering, business, agriculture and forestry. The number of new students enrolled in these fields is equal to the number of graduates, and the specialty recycling technology has no recruitment [6].

However, in the new environment of advancing a more sustainable economic model, more material knowledge in mathematics and science is needed to move towards business models and products that fit the circular economy. Specialists in mathematics and natural sciences are also needed to understand the natural resources of the planet and the ability to invent environmentally friendly materials for production. Thus, the construction industry alone uses almost half of the world’s extracted natural resources and is responsible for a quarter of the world’s carbon dioxide emissions. The training of “green” specialists will
make it possible to use materials wisely and produce products from the Earth’s natural resources [12]. For processing materials and designing products, you need a thorough knowledge of mathematics and science. They provide a solid foundation for understanding the environmental impact of materials. Accordingly, to fill the labor market with “green” specialists (in the field of sustainable development of materials, materials processing and product design), Finland has introduced a program of in-depth study of mathematics and Natural Sciences in the context of circular economics in secondary education institutions to promote professions of a new profession among young people [11].

The purpose of professional training of specialists in colleges is to study the tools of circular economics related to a particular profession. In addition, modern educational programs of Finnish universities consider the current needs of the circular labor market for qualified specialists, in the following industries: machine and equipment manufacturing, forestry and paper production, agriculture, retail and restaurant service, construction, as well as private consumption [10].

Methodology for training specialists in circular economics. It should be noted that important aspects of didactics and education in circular economics are systems thinking and networking. Systems thinking refers to a skill that young people must develop in school to understand a complex and changing society, as well as be able to find alternatives to existing situations. Experts emphasize the importance of starting such an educational process from school age [5].

Online experience exchange (or team training) is organized through the development of multidisciplinary projects by students. They increase motivation to learn, and for teachers, they are a good way to collaborate with colleagues. In addition, collaboration with external participants (campaigns and businesses) is an effective way to communicate online. Many companies are interested in engaging students in mastering the concept of circular economics, which gives them the opportunity to get a new perspective on solving problems in the transformation of the economy. In addition, students gain professional experience and feel full-fledged members of the Society of change [7].

In addition, during teamwork on projects, students should develop innovative competencies. Innovation competencies are understood as a set of knowledge and skills necessary for future employees to participate in various innovation processes; this is the ability to solve complex problems in professional life that require innovation, as well as a new and creative approach to work. Innovative competencies integrate five dimensions [9]:

1. Creativity - the ability to go beyond existing ideas, rules, practices, or contexts of thinking; the ability to create or modify appropriate alternatives, ideas, products, methods, or services, regardless of their potential utility or added value [13].
2. Critical thinking - the ability to analyze and evaluate the advantages and disadvantages of various issues and risk factors, considering their intended use.
3. Initiative-the ability to make decisions or take actions for positive change; the ability to influence the actions of people who create and implement ideas.
4. Teamwork-the ability to work effectively with other group members.
5. Online experience exchange — an opportunity to use the knowledge and experience of participants outside the group (for example, at the enterprise).

Domestic research and development of the issue of the functioning of the circular economy mainly focuses on the analysis of foreign experience, certain issues of logistics, production and processing technology, and ecology [14].

The current economic system in the world uses resources for a year, which take a year and a half to restore, thus having an irreversible impact on the planet’s ecosystem [3].
Recently, government and corporate structures have increasingly turned their attention to the need to take measures aimed at maximizing waste recycling and creating new resources based on them. Thus, there is a rethinking and gradual understanding of the need
to move from a linear economy to a so-called circular economy.

In the linear economy, the principle of “Take-make – waste” is professed, in the circular economy, the basic principle is “production – consumption and use – processing”.

Basic prerequisites for a general transition to a circular economy [15]:
- population growth;
- increase in resource consumption;
- limited resources, their inevitable shortage in the future.

In principle, the following problems should be solved in a circular economy:
- reducing waste generation through the development of recycling;
- reducing the negative impact on the environment by reducing the use of resources during production;
- the emergence of new markets, the creation of new jobs, the growth of the overall level of well-being.

The circular economy is restorative in its intention and intent. The idea behind its development is that instead of throwing away products before their value is fully realized, use these products repeatedly.

It should be noted that over the past decades, there has been a relative separation of economic growth from the use of resources. The achievements that have been made so far are quickly absorbed by economic growth combined with the impact of returns (resources that are released due to increased efficiency are used very quickly due to increased consumption) [4].

The circular economy uses the huge economic potential invested in materials and resources that are already used by society. Understanding the value of the materials and goods that make up the infrastructure used by society is actually the driving force behind circular economic models [8].

Analyzing the current social needs of humanity and their impact on the economy, we can distinguish seven basic needs:

1. Housing, Infrastructure and their maintenance. To meet this need, the largest reserve of resources is used (approximately 38.8 billion tons annually).

2. Nutrition. It is the second largest category in terms of resource usage. Agricultural products, such as crops and animal husbandry, require the use of 21.3 billion tons per year. At the same time, food products have a very short life cycle in the economy and are quickly consumed after production [16].

3. Mobility. It requires the use of significant resources, in particular, for the construction of transport technologies and vehicles (cars, trains, planes) and the ability to move (burning fossil fuels for power).

4. Consumer goods. It is a diverse and complex group of products that usually have a short and medium service life.

5. Services. Attracting resources to meet this need is almost insignificant and consists in using professional equipment, office furniture, computers and other infrastructure.

6. Healthcare: in addition to buildings, these include the use of Capital medical equipment, medicines, hospital equipment, disposable goods, and home care equipment.

7. Communication. Increased connectivity promotes a circular economy, through digitalization, which makes physical products irrelevant and promotes better use of existing assets, including supplies, construction funds, and infrastructure.

Product as a service – a model in which customers use products by “renting” with payment upon use. It acts as an alternative to buying a product by providing it for use, for example, through a lease agreement, lease agreement, and so on. The business model is used in such companies as Rolls-Royce, Mud Jeans, De Kledingbibliotheek [11].

These business models are gradually being implemented in our country to one degree or another [17].
An important issue that arises today is to ensure access to the resources necessary for clean technologies, digital, space and Defense Development by diversifying supplies from both primary and secondary sources, which is one of the prerequisites for a major transition to a circular economy.

The development of digital technologies such as artificial intelligence, the fifth generation of mobile networks (5G), computing in the “cloud” (cloud computing) and on the periphery (edge computing) [8], the Internet of things (the internet of things) are among the decisive factors in the development of a circular economy that can accelerate and maximize the impact on policies to combat climate change and protect the environment [3]. With the help of digitalization, new opportunities for remote monitoring of air and water pollution, optimization of the use of energy and natural resources become available.

4 Conclusions

In the coming decades, politics and economics should be focused on making activities that contribute to the transformation of society into a more environmentally friendly one economically profitable. Today, we very often see exactly the opposite: manufactured goods soon become obsolete, deteriorate or go out of fashion. Consumers are willing to buy new products and demand more. This approach brings profit to business, but society loses.

The most obvious step should be to ban subsidizing any activity that is harmful to the environment. A prime example is subsidies for fossil fuels in transport, mining, forestry and fishing.

The abolition of subsidies is one of the obvious and important measures that must be taken. It is equally important to allow market prices to reflect true costs. Unfortunately, the markets themselves do not offer environmentally friendly and resource-saving goods and services. This requires both purely economic measures in the form of taxes, tariffs and fees, green certificates, as well as regulatory measures and stimulating public procurement. If we encourage the production and consumption of such products, they will become competitive in the future and require less support from the government.

References


