CIRCULAR STEM – BOOSTING CIRCULAR ECONOMY COMPETENCES FOR STEM TEACHERS

CIRCULAR ECONOMY is based on three principles: eliminate waste, reintroduction of products and materials in the production loop so that nature can regenerate. As the CIRCULAR ECONOMY is also a transversal subject dealing with a lot of topics included in the school curriculum, **STEM plays an important role in supporting the transition to CIRCULAR ECONOMY**. The EU has adopted a Circular Economy Action Plan to help achieve this transition and achieve the Green Deal objectives.

These above-mentioned elements constitute the project's backbone idea that was launched in September 2022. **This Erasmus+ KA2 Strategic partnership project entitled "Circular STEM"** aims to provide STEM teachers' with competences to introduce education about circular economy at school by integrating it with STEM subjects, developing an interdisciplinary methodology that makes clear links between circular economy concepts and school subjects. The methodology will transversally cover digital and entrepreneurial skills, with a special attention to raise girls' interest in STEM, because of the existing gender gap in the sector. Furthermore, **the project has an underlying approach focusing on empowering girls in using digital tools and raising their interest in STEM subjects.**

The project consortium consists of the following organisations:
– Agrupamento de Escolas de Frazão, Paços de Ferreira from Portugal
– EUROPEAN DIGITAL LEARNING NETWORK ETS from Italy
– Institut za moderno obrazovanje from Serbia
– POLITEKNIKA IKASTEGIA TXORIERRI S.COOP from Spain
– EKONOMIKAS UN KULTURAS AUGSTSKOLA from Latvia
– EIT RawMaterials GmbH from Germany

During its lifetime (24 months in total), **the partners will be involved in the development of the following results:**
- Training methodology to develop lesson plans on STEM subjects introducing circular economy, digital and entrepreneurial competences based on a learner-centred approach to stimulate them to actively participate in the classroom activities, also making use of digital tools.
- Training Contents developed based on real-world challenges, consolidated through the piloting activities organised by the partner schools.
- CIRCULAR STEM Academy, a E-learning platform hosting all project results.
- Toolbox made of additional online and offline resources to support the methodology and the training contents.


The project and its activities are mainly addressed to:
- Secondary school STEM teachers – the project will have an impact of the Continuous Professional Development of teachers and enable them to take a more active role in promoting education about the circular economy, adopting innovative digital tools for their lessons and promoting the entrepreneurial spirit of students.
- School Principals – School principals must be involved and informed about available tools to integrate circular economy into the school curriculum, enabling secondary school students to adopt forward-looking skills that can contribute to the transition to a low-carbon economy.
- Secondary school students aged 13 to 18 (indirect target group) – the global youth movements rising in the past few years have shown how young people are concerned about environmental issues and are willing to take action to make a difference; the results produced by the projects will be used for this target group.
- Students' parents and families – by having an impact on students, the project will also reach their families.

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CIRCULAR CITIZENSHIP IN A DIGITAL AGE: A NEW PEDAGOGICAL PERSPECTIVE FOR STEM CAREERS.
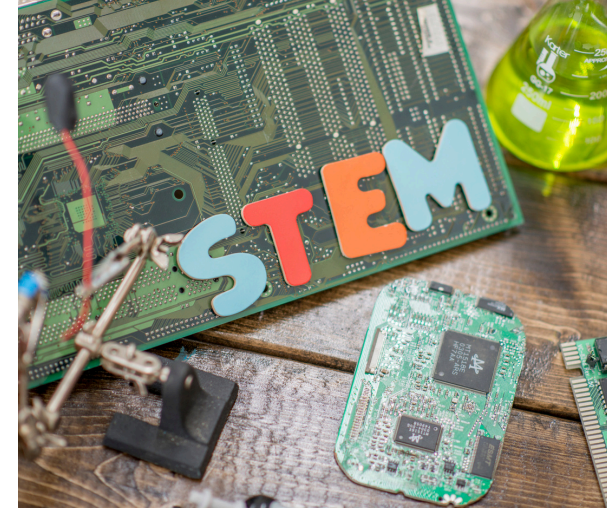
The circular economy (CE) concept aims to tackle global issues of resource overuse and waste generation, particularly the significant challenge of managing electronic waste (e-waste). According to the United Nations, **in 2021, the average person produced 7.6 kilograms of e-waste, resulting in 57.4 million tonnes generated worldwide.** Alarmingly, only 17.4% of this waste is properly collected and recycled. Even in the European Union, which leads the world in e-waste recycling, only 35% of e-waste is officially reported as properly recycled. The remaining 82.6% often ends up in landfills or is managed through unsafe practices like open-air burning and acid baths. As reliance on electronic devices increases, so does the volume of e-waste, creating a pressing global challenge that necessitates a new perspective on production and consumption.

E-waste spans the entire lifecycle of electronic devices, from design to disposal. Designers, manufacturers, investors, traders, and policymakers must work together to minimize waste and preserve value within the system. Integrating sustainability-oriented education is also crucial, as future generations of consumers and producers will play a significant role. **European Union initiatives, such as the EU Circular Economy Action Plan, emphasize the importance of embedding these principles in education strategies, including the Digital Education Action Plan 2021-2027.** Specifically, integrating an ecosocial perspective in STEM education is essential, as many STEM graduates will likely enter technological and digital fields, where inclusive and environmentally conscious thinking is a valuable asset.

STEM education must adopt new pedagogical perspectives to prepare students for sustainable futures and develop environmentally critical thinking. The shift from an industrialist perspective of learning, focused on memorization and standardized testing, to a modern environment supporting collaboration, critical thinking, and analytical skills, is vital. Overcoming barriers such as teachers' understanding of the circular economy and bridging the gap between schools and the community is essential. **Integrating CE principles into STEM education can leverage problem-based learning to address real-world issues, connecting scientific curiosity to cultural shifts toward more sustainable consumption and production behaviors.**

EU-funded projects, like the Circular STEM project, aim to integrate the circular economy into secondary schools by equipping STEM teachers with skills to adapt the curricula. This project, developed by five EU partner organizations, targets students aged 13 to 18, focusing on enhancing digital and entrepreneurial competencies and increasing girls' interest in science subjects. Directly targeted groups include STEM teachers and school principals, while secondary students benefit indirectly through increased knowledge and skills.

In conclusion, **integrating circular economy principles into STEM education is crucial for preparing future generations for sustainable IT futures and fostering environmentally critical thinking.** The global challenges posed by resource overuse and electronic waste underscore the urgency for a shift in educational approaches. By bridging the gap between industry stakeholders, policymakers, and educators, initiatives like the Circular STEM project demonstrate a commitment to equipping students with the skills necessary to address real-world issues through interdisciplinary learning. As we navigate towards a future where sustainability is integral to progress, integrating circular economy principles into education remains essential.