Chapter 8
Lessons Learned from Educational Methodologies Using Art and Science

Check for updates

Petru Sandu, Valentina Tudisca, and Adriana Valente

Abstract Co-creation and other Responsible Research and Innovation (RRI)-related principles and tools can be successfully applied in the field of art and science, valorization of cultural heritage, giving value to territory, community development, innovation and well-being and promoting gender equality in science. By the use of modern, digital techniques adapted to their capacities and preferences, millennials can be attracted into active community participation, be delivered relevant education in art and science, equipped with necessary hard and soft skills for the twenty-first century work market and empowered to assume leadership roles in preserving the cultural heritage and territory of their communities, making them relevant and sustainable, socially and economically.

Keywords Art and science · Participatory approaches · Co-creation · RRI · Education

Although inapparent to the untrained eye, art and science share an important number of attributes, methods and instruments, both require rules but also creativity and each can foster advancement in the other's domain.

Despite of these similarities and complementarity between art and science, school systems do not generally incorporate these two topics jointly in educational processes and do not promote Science, Technology, Engineering, Arts and Mathematics (STEAM), referred to combining art and science as a general practice, depriving current generations of hard and soft skills that, according to education work market studies, seem to become—or even already be, in some fields of activity—invaluable.

P. Sandu
University Babes-Bolyai, Cluj-Napoca, Romania

V. Tudisca (✉) · A. Valente
Institute for Research on Population and Social Policies of the National Research Council of Italy, Rome, Italy
e-mail: valentina.tudisca@irpps.cnr.it

A. Valente
e-mail: adriana.valente@cnr.it

71

At the same time, educational participatory approaches related to connections between art and science, including STEAM and storytelling, can help to successfully address social challenges, community innovation and well-being through an inclusive process, as it should be. As a matter of fact, the real-life case studies included in the current volume show that these approaches can allow to detect the real needs of communities and foster the collaboration with relevant stakeholders, transforming schools into agents of community well-being, innovation and development.

This volume includes a collection of real-life case studies incorporating art and science in the more complex frameworks of participatory approaches to education and Responsible Research and Innovation (RRI). The purposes are stimulating co-creation in research and education, community development and well-being, giving value to territory, promoting the cultural heritage, supporting gender balance in science, by using modern, attractive, digital methodologies (such as digital storytelling) to produce easy to disseminate digital products, relevant for the current generation of young people as part of their own cultural identity. A synthesis of the conclusions derived from the case studies presented *in extenso* in this volume follows.

Valorization of the cultural heritage by the means of digital storytelling can contribute to improvements in students' digital competences (oral, written, visual), literacy and communication, interpersonal social and civic competences and to the development of students' transversal and soft skills, scarcely cultivated in the traditional curricula, but fundamental in a RRI approach: relational and communication skills; autonomy and self-esteem, enthusiasm, self-motivation and awareness, social and co-operative skills (such as working in group/different teams, building partnerships and involving other people; empathy; interests toward their communities; ability to plan and project management).

The use of *crowddreams* implies starting from an individual insight, creating a compelling story about a desirable future and developing from that story a well-designed innovation project that can shape the shared dream into a reality. The implementation of a crowddream originated project can lead to population wide positive outcomes, such as increased community engagement, cultural heritage appreciation and capitalization, young people feeling they can build own places in the community, but also quantitative benefits such as creation of workplaces, active involvement of young people and other stakeholders in community initiatives and increase in the number of visitors of developed projects, such as museaters.

Open Schooling methodology, that involves schools and other community stakeholders to become agents of community well-being, through a variety of community oriented educational activities, can address issues such as limited access to STEAM education, high rate of school failure, demotivation and drop-out, low innovation and reduced capacity for investment and entrepreneurship and lack of collaboration among entities from remote or undeveloped regions, even from developed countries. A variety of community-oriented educational activities can promote the development of student-led projects based on the real needs of the community and foster the collaboration with relevant stakeholders, transforming schools into agents of community well-being, innovation and development.

The use of Learning Science Through Theater (LSTT) methodology, that includes scenario writing, music composition, designing sets, costumes and developing choreographies, can establish a culture of scientific thinking and promote a deep conceptual change in policymakers and stakeholders, educational institutions and school communities, promoting different perspectives of knowledge. Previously unexplored RRI key aspects can be experienced during a LSTT initiative, leading to acting and thinking differently about science in both teachers and students.

Gender-based stereotyping regarding the unfitting of girls in careers in the scientific disciplines can be addressed and mitigated through tales, reports and videos about gender equality in scientific careers and women's roles in these disciplines. School competitions can be effective tools to sensitize students regarding Responsible Research and Innovation topics and could be used as educational tools for high-school students, with a relevant impact on group learning dynamics, increased student self-awareness and teachers' active involvement.

Curricula innovation and the creative use of art and science in an inter-transcultural disciplinary approach can lead to acquisition of innovative cultural perspectives and interpretations, emotions, hopes, wishes and values. The perspectives of artists, regarding the existence of mutual intellectual and emotional inputs of the experiences placed at the intersection between art and science and the raising awareness of the intellectual and spiritual deprivation in the absence of art, are invaluable in the process of integrating art in science education, within a more complex and comprehensive framework of community participation, co-creation of concepts, products and values, and adherence to RRI principles.

More generally, a STEAM approach to education embedded in the broader frameworks of co-creation, community participation and Responsible Research and Innovation can result in multiple benefits from an individual level (increasing knowledge, awareness and skills of students, teachers and other actors involved in the collaborative projects), to the community level (promoting innovation, social cohesion, well-being, valorization of cultural heritage and economic development). RRI concepts, principles and tools could be used both symbolically and instrumentally for incorporating the current social needs and values into research projects, educational and community interventions. Schools, families and local communities have to engage collaboratively in promoting innovative learning methodologies and instruments, adapted to the needs, capabilities and interests of young people/students, so as to foster their engagement in solving social problems relevant to their community and identify themselves as central change agents in a fast-pace changing world. Similar initiatives to the ones presented in the current volume should be promoted, in order to validate and contextualize the value of co-creation and RRI in art, science, valorization of the territory and community development.