Workshop: How to connect basic sciences and sustainable development in the school curricula

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Abstract. Interest of youth in physics and engineering is declining, even though new generation of specialists is needed to ensure the continuation of cutting-edge research, primordial for innovation, economic progress and sustainable development (SD) [1]. While SD becomes ever more popular and even obligatory subject in schools, because of lack of teaching resources compatible with curriculum, high-school students situate SD outside of physics / STEM. Workshop aims to invite different stakeholders from science / academia, physics education and industry to brainstorm on how to tackle the issue of bridging the gap between science education and SD in the classroom.

Introduction

The interest of the young generation in STEM (Science, Technology, Engineering and Mathematics), and especially physics and engineering studies, is declining, despite the fact that jobs in these areas are growing at a rate three times faster than in any other sector. Projections, given current trends, indicate that 7 million new STEM jobs will be created in Europe by 2025 and there will not be enough skilled people to fill them [2]. Moreover, the high-tech companies and physics-based industry, witness already today difficulties to recruit enough high-quality employees. A new generation of physicists and STEM specialists is needed to produce technologies and innovations to solve global societal challenges, like climate change, energy, health etc., summarized as 17 UN Sustainable Development Goals (SDGs) [3]. 2022/2023 has been declared by UNESCO as International Year of Basic Sciences for Sustainable Development (IYBSSD) [4]. Yet, the awareness about the strategic role of basic sciences for sustainable development (SD) is rather low and SDGs are generally considered as a topic for specialists on economics, law, social sciences, finance and international relations [5]. Education for sustainable development (EDD) is considered as a goal in itself, as well as a means of attaining the SDGs [6,7]. Today, the subject of sustainable development is being official part of curriculum of many high-schools in many countries (e.g. in Switzerland [8]). However, this subject is generally tackled only during the classes of geography and economy, and because of lack of teaching resources compatible with curriculum of basic sciences, highs school students situate the subject of SD outside of physics and other basic sciences and do not realize how needed the STEM specialist are. No awareness is instilled on the need of STEM specialists to attain the SDGs!

Basic research and especially physics are largely misperceived by society as complicated, abstract, and disconnected from real life. This is to large extend due to the rare exposure to modern natural sciences in school curricula [9], but also lack of information about concrete usefulness of

the often perceived as “useless knowledge” from science [10]. This is generally also the case of most of the extra-curriculum programs offered by science community (e.g. CERN [11, 12] and IPPOG [13, 14]) to bridge the gap between cutting-edge modern science and school curricula.

Concept

New pathways are to be found in order to effectively reach a broader population with low or no interest in hard sciences and inspire more young talents to become engineers and physicists. Connecting research with society appears to be a correct way, even though this avenue has not been extensively explored so far towards reaching this objective. It has been observed in several studies [15,16,17], that while small fraction of students (population) are naturally interested in technical subjects of abstract nature, the majority find physics much more appealing when presented in an authentic context, e.g. in relation with nature, universe, humans, applications and relevance for the society [18,19,20]. Today the strategic role of basic sciences, fundamental research and STEM education as driver of innovation for resolving global challenges, their omnipresent applications in everyday life (knowledge transfer (KT) success stories, spin-offs), their socio-economic impact, peaceful scientific international collaboration for noble goals and the vast and interesting career opportunities in and beyond academia (business & industry) are not sufficiently emphasized and understood and are even largely unknown by society and in schools [21,22]. And yet, it has been proven, that they are extremely inspirational for boys and especially girls, when hesitant about the choice of career in physics / engineering [15,23]. For example, the UK schools participating in extra-curricula activities on medical applications from CERN, reported a 38% increase in interest in engineering studies compared to a 33% decrease in other schools nationwide, whilst the increase in interest for girls was 200%.

Workshop proposal

The innovative pilot project aiming to increase the interest of youth in physics and STEM studies (see abstract #62 submitted) through the inspirational industry-research collaboration resulting in applications for society and sustainability is one of the pathways how to provide the connection of physics and societal challenges in the classrooms. The workshop aims to bring to the table different stakeholders from science / academia, physics teachers and industry to brainstorm on how to tackle the issue of bridging the gap between science education and sustainable development in the classroom.

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