TRANSFORMING THE SCHOOL SCIENCE LABORATORIES INTO CIVIC TECH HUBS FOR SHARING KNOWLEDGE AND IDEAS

Kalathaki Maria

ABSTRACT

The issue of transforming the School Science Laboratories into civic tech hubs for sharing knowledge and ideas is much discussed in recent years among the Science Teachers of Secondary Education in Greece, since the last 10 years many initiatives have been undertaken by the Greek Ministry of Education in the field of Science teaching in Schools, focusing in Science Laboratory and ICTs use.

Though all students have their own knowledge since beginning, most knowledge is scattered, and the students cannot understand how to apply the scattered knowledge into practice, especially under various contexts. Youth Education and Training is the investment of the societies for the future. Teaching in Schools with Creativity and Innovation is National and European Strategy targeting to the economic development and progress of local societies. European Union, in accordance to the international academic trends, direct the transformation and reconstruction of Science Curricula and Teaching Methodologies from the traditional of teacher-centered lessons to student-centered learning events. There is the need, Research, Education, and Training to cooperate locally, think and work globally in order to cultivate the future science, environmental, digital literate students. In accordance with the targets of Erasmus+, in Science Education, we need to make the schools an open space where to discuss about and build up the future post 2020. We want to achieve more, reach out further and be even more inclusive. We want to do this together, and transform the School Science Laboratories into civic tech hub of sharing ideas.

INTRODUCTION

The deeper level of an organization's culture consists of collective assumptions related to human nature, human relationships, truth, the environment, assumptions, such as the fact that teachers are a family to which they accept, respect and care for one another. They are responsible, capable of controlling themselves and making decisions for the benefit of their students, encouraging the cultivation of values such as independence, professionalism and autonomy (Kiousi, 2008). Research has shown that individual educational policy initiatives have only limited success, for example, in removing barriers to integration, unless combined with wider social and economic reform programs linking education and training with action in other policy areas (EC, 2007). Education and training systems cannot stand alone in the fight against skills shortages. Companies can work in parallel of the public sector and invest in the further VET training of their employees, and offer quality apprenticeships and jobs (PDECP, 2015).

The stronger participation of civil society peer-learning or peer-review activities is linked to policy making and ministerial decisions. The issue of transforming the School Science Laboratories into civic tech hubs for sharing knowledge and ideas is much discussed in recent years among the Science Teachers of Secondary Education in Greece, since the last 10 years many initiatives have been undertaken by the Greek Ministry of Education in the field of Science teaching in Schools, focusing in Science Laboratory and ICTs use. The New Science Curricula transform the teacher-centered teachings into more student-centered by shifting the center of the teachings from the teacher to student, so they both become educators and educated, trainers and trainees in the classroom's, and wider the school community of learning. Consequently, and in accordance with the targets of Erasmus, the schools can open to the society and become a space where is discussed and built up the future, post 2020. With these new and more inclusive frameworks, the young citizens will achieve more, reach out further and be more successful in their lives. We want to do this together, and transform the

School Science Laboratories into civic tech hub of sharing ideas, good practices, information, knowledge and wisdom, with goodness and love, for a more hopeful future.

In the European Framework of Basic Competences, a reference tool for the basic skills that all people need to succeed in a knowledge-based society, key competences relate to knowledge, skills and attitudes that serve personal integration, social integration and active citizenship and employability. It includes 'traditional' skills such as mother tongue knowledge, foreign language skills, basic skills in Mathematics and Natural Sciences, and digital competence as well as transversal skills such as "learning how to learn", social ability and capacity to exercise citizenship, initiative, entrepreneurship and cultural sensitivity and expression (EC, 2007).

Digital agenda for Europe believes that should be given greater importance to STEM (Science, Technology, Engineering and Mathematics) Education in order to improve digital literacy and teaching and underlines the close link between creativity and innovation, and therefore calls for the arts and creative learning to be included in the STEM agenda (EP, 2017). Also considers that girls and young women should be encouraged to study in STEM fields from an early age. Since there is no universally agreed-upon definition of STEM, experts generally agree, that STEM workers use their knowledge of science, technology, engineering, or math to try to understand how the world works and to solve problems. Their work often involves the use of computers and other tools in interdisciplinary approaches, closely related and building on each other. Vilorio (2014) tried a deep and extended approach of the term with a brief description of the life and physical sciences, computer science, engineering, and mathematics and exploring some data shows the selected STEM occupations with the most employment and projected job openings and growth. His conclusions reward and challenge the STEM work and describe how to prepare for a career in a STEM field. However, the poor performance and low attractiveness of Vocational Education and Training (VET), along with its poor quality in some European Member States, discourages students from starting up in promising STEM fields and sectors where there is a shortage of labor and is expected to grow by about 8 % by 2025, much higher than the projected average growth of 3% for all professions.

METHOD

The study is a content analysis in European Union's documents of the last Decade through the prism of STEM Education. During the critical reading of the archival material, notes with comments and interpretations held referring to the studied content. In the study of the texts in a qualitative analysis, phrases were searched, in a structured way, which were recorded in the categories originally created (Bell, 1997; Iosifidis, 2003). The recording unit was the phrase.

There is much data and large number of references related to the investigating issue. This research is a case study, with detection, description and synthesis, of many important documents in order to be approached the discussing issue, most retrieved from the official journal posted on the website of the European Commission. The analysis became inductively, that is the categories were not fixed from the beginning, but located by the progress of the analysis of data. Finally, there were created 5 thematic categories, corresponding to the research sub-questions – objects: I. Europe Needs to Be More Active, II. Emphasis on Innovation and Creativity, III. STEM in Education for the Professional Work, IV. A New Vision for School Education, V. Support to Youth

RESULTS AND DISCUSSION

The need for young people to acquire the necessary basic skills and improve their educational attainment is an essential part of the European Union's Growth and Jobs Strategy and for Sustainable Development which is based on the objectives set by the Member States

in their National Reform Programs (EC, 2007). The demand for skills has two strands: on the one hand, rapid technological progress requires high and constantly upgraded skills; on the other, increasing globalization and new ways of organizing businesses, eg with horizontal hierarchies, require social, communication, entrepreneurial and cultural knowledge and skills that help people adapt to changing environments.

Although the EU market is the largest in the world, it remains fragmented and is not sufficiently innovation-friendly. With a view to changing these trends, the EU has developed the concept of an 'Innovation Union', which aims to make Europe a world-class science performer, to remove obstacles to innovation, like expensive patenting, market fragmentation, slow standard-setting and skills shortages which currently prevent ideas getting quickly to market,. EU aims into revolutionize the way the public and private sectors work together, notably through the implementation of Innovation Partnerships between the European institutions, national and regional authorities and business (FS, 2016).

I. Europe Needs to Be More Active

In 2010, EU adopted its Europe 2020 strategy to put Member States back on track following the crisis shocks of 2008. Education was identified as one of five key areas needing specific measures to support economic recovery which could not be based exclusively on financial and budgetary reforms. Efforts are also to be made to reach a sufficient supply of science, technology, engineering and mathematics (STEM) graduates. The strategy indicates this as the way forward to restore Europe's competitive edge and open possibilities for job creation. The headline target was accompanied by the flagship initiative 'Youth on the move', whose actions were subsumed under the Erasmus+ program from 2015 (Europe 2020, 2010).

-In Education, Training and Lifelong Learning, since a quarter of all pupils are experiencing reading difficulties and one in seven young people is leaving education and training very early. Around 50% reaches a medium skill level but this potential often fails to meet the needs of the labor market. Less than one in three people aged 25-34 have a university degree compared to 40% in the US and over 50% in Japan.

-In Digital society, since global demand for information and communication technologies represents a market worth 2.000 billion Euros, but only a quarter of this amount corresponds to European companies. Europe is also lagging behind high-speed internet, which affects its ability to innovate, even more in rural areas, and the same applies to online dissemination of knowledge and the online provision of goods and services. Information and communication technologies hide enormous possibilities to support autonomous learning, collective knowledge building and skills development.

-Into Innovation policy, and to re-focus on the challenges facing our society, such as climate change, energy efficiency and resource efficiency, health and demographic change. Every link in the innovation chain needs to be strengthened, from basic research to marketing.

-In Youth mobility in Higher Education to improve overall quality at all levels of education and training in the EU by combining excellence and equality through the promotion of student and learner mobility and the improvement of the employment situation of young people.

II. Emphasis on Innovation and Creativity

Digital agenda for Europe stresses the need to integrate new technologies into the teaching and learning process and to facilitate the learning through practical and real-world experience, based on age-appropriate ICT and media curricula. With respect for the development and well-being of children, and with timely guidance for responsible use of technology and the promotion of critical thinking, people can acquire the right set of skills, abilities and knowledge and develop the full range of digital knowledge that individuals and companies need in an increasingly digital economy (EP, 2017).

The project ATC21S is built on the foundation of a conviction that students develop and grow socially and intellectually both naturally and through intervention by school and community-based programs. ATC21S™ has been designed to help that process of social and cognitive growth. As Commission considers that the key drivers of EU 2020 should focus, among the other priorities, in empowering people in inclusive societies, in acquisition of new skills, fostering creativity and innovation, with developing of entrepreneurship and a smooth transition between jobs that will be crucial in a world which will offer more jobs in exchange for greater adaptability (EC, 2009). Since skills are the key element for Europe's economic and productivity growth and for job creation, we should look ahead and match future skills better to future needs, particularly for new types of jobs such as "green" jobs and other growth areas (EC, 2009). Horizon 2020 (EE, 2014) is the new EU framework program for researchers. It is the largest multinational support program in the field of research and development of innovation with five areas of Science of Excellence, Industrial Supremacy, Societal Challenges, Expanding Excellence and Enhancing Participation, and "Science in society and with society".

To become Science attractive to students and teachers there is only one way, to promote inquiry learning of Nature and its mechanisms to reveal the grandeur of life in front of the eyes of astonished students and curious to answer how and why. Modern Science Laboratories require laboratory instruments and materials for live experiments, digital media to study the virtual reality, so they will lead to deeper knowledge of Nature and Life. Teachers will be the facilitators in the learning process of students who, with the use the innovative teaching techniques and tools propose modern teaching and pedagogy in the school communities. With suggestions, discussions, workshops, constructions, educational visits, lifelong and distance learning guide the students in restructuring and reframing of the existing knowledge, into a lifelong learning pathway. With flexible curricula, they can, through collaborations, to design and apply creative and innovative educational activities, to experientially reflect on theoretical and practical issues of STEM, more scientific and pedagogical for a better quality of everyday life.

Though all students have their own knowledge since beginning, most knowledge is scattered, and the students cannot understand how to apply the scattered knowledge into practice, especially under various contexts. The experience from the Internship of Universities can be very useful to the schools on how to transform the theoretical knowledge to practical, since internship helps students to touch the authentic context of knowledge in the conditions of real life. Students participating in internship must learn to face random matters which less likely to happen during their traditional theory study. In this way, they asked to combine two kinds of knowledge into practice (Yong, 2012).

III. STEM in Education for the Professional Work
In Vocational Education and Training, as shaped internationally by the labor market, a combination of many knowledge and skills is required. To this, it is necessary to adapt the school vision, curricula and teaching programs into work-centric learning in order to facilitate young people in their transition from Education to Work and to prepare in best as new professionals. A research on Youth Education & Entrepreneurship which carried out by the EU focused on the development of entrepreneurial learning for young people aged approximately 13-19 years who attend Secondary Education schools or colleges. It seeks to address three questions: a. is entrepreneurship treated as a key competence at school? b. how open are schools to "incursion" from the "business world"? c. have there been any "revolutions" in the education/training system? If so, how far have those fundamental changes gone?

While contemporary business and social practices engage people in collaborative efforts to solve complex problems and create and share new ideas, traditional instructional and assessment practices require students to work individually as they recall facts or perform simple procedures in response to pre-formulated problems within the narrow boundaries of

school subjects (Griffin et al, 2012). Lisbon European Council (LEC, 2000) in Presidency Conclusions, invited the member states to meet many targets, among them is a European framework should define the new basic skills to be provided through lifelong learning: IT skills, foreign languages, technological culture, entrepreneurship and social skills. Further, Lisbon European Council (2000) suggested an affective element to the process, influencing willingness to engage in the various actions involved in pursuing an inquiry and to take notice of results which may require a change in pre-existing ideas. All this, too, is embedded in a cultural context which can promote or inhibit the development of understanding through inquiry. Evidence or data relating to science understanding and inquiry skills may come from observing, a portfolio of work collected material, presentations made by students individually or in groups (Harlen, 2013).

Under 'Inclusive growth' of EUROPE 2020 European Commission flagship initiative, charged with education-related tasks, 'Agenda for new skills and jobs' aimed to develop a strategic framework for lifelong learning, in the 'European platform against poverty and social exclusion' and provide innovative education opportunities to deprived communities. Resolution of 2015 on promoting youth entrepreneurship through education and training emphasizes the importance of developing entrepreneurial skills and competencies in young people and specifies the role of EU institutions in terms of coordination, methodology and financial tools (Europe 2020, 2010). They are invited scientists, experts, workers, businessmen from the fields of Education, Training, Research, Entrepreneurship, Enterprises, Governance and Policy, to discuss on the initiatives that they have been undertaken until now and make future plans in a peer conference, sharing knowledge and experience, wisdom and visions, with teachers and professors. In this way, will be achieved progress in the transition of knowledge into practice.

At the beginning of the 21st century, schools have to prepare tomorrow's citizens of the world village for employment and smart, sustainable and inclusive growth, occupational mobility and social progress. They are facing the new challenges of Science, Technology, and Society, a Society for Employment, Smart and Sustainable Development. Taking into account that the demand for STEMs and other related professionals is expected to be increased in order to secure jobs for young people with intelligent, sustainable and inclusive growth, it should be promoted the proficiency in STEM (EP, 2017). Dlabajová M and Nekov M in their Report on a new skills agenda for Europe (2017/2002 INI) to the Committee on Employment and Social Affairs on Culture and Education, believe that should be given greater importance to STEM Education in order to improve digital literacy and teaching and underlines the close link between creativity and innovation, the inclusion of arts and creative learning in the skills STEM, as well as encouraging women to study in STEM fields from the young age (EP, 2017). Links between teacher educators, teachers and professors, the world of work and other factors should be strengthened. Higher education institutions have an important role to play in building effective partnerships with schools and other stakeholders to ensure that their teacher training programs are based on specific elements and appropriate classroom teaching experience (EC, 2007).

IV. A New Vision for School Education

Rapid technological development, based on artificial intelligence, advanced materials and biotechnology, leads to a variety of developments that rapidly transform our lifestyle and work. As the changes are not waiting for us, they happen and overtake us before they are well understood, Youth Education and Training becomes an imperative investment for the future (SEC, 2008). In the educational reforming of 'The New School-First the Student' which carried out by the Greek Ministry of Education, Lifelong Learning and Religious Affairs, developed new Curricula in order to be adopted new principles of the New School organization and implementation (YPTH, 2010). The old curricula applied, despite the fact that describe the

adoption of modern principles do not have in practice changes to school. They do not motivate student to investigate and discover the knowledge but offer ready answers to memorizing, while leaving no space to teachers to develop initiatives. The 'New Curricula' are: i. Open and flexible to the teacher who will have possibility of intervention and self-action in content and method of teaching, ii. Focused, to clearly describe the development of basic knowledge and skills and choice arises of content and structure of matter and teaching methods, also assessment, iii. Brief, to be a communication and guidance tool in the educational act that is accessible to teachers and understood by parents, iv. Crosswise in the sense that they are promoted and cultivated in a way transversal basic skills-abilities as well as theme development and values across the range of individual courses, v. Pedagogically differentiated to take into account the different students' learning rhythms, the peculiarities of the class, the different social-cultural representations and everything else elements that make the teaching a unique, non-standardized procedure.

Surveys show that the quality of teaching staff is significantly correlated and directly related to the learner's learning level, and this represents the most important introspective factor affecting student performance. Its impact is much stronger than that of the organization, management or financial situation of the schools (COM, 2007). In addition, other surveys found a positive relationship between in-service teacher education and student performance, that the implementation of in-service teacher education programs improves student' performance. In Antalya Declaration on Interdisciplinary Practices in Science and Technology Education is underlined the need of work in collaboration with UNESCO, science teacher associations, national and regional governments and other NGOs to further the cause of science and technology education in a changing world. While there are some teachers who may not realize they are already incorporating interdisciplinary practices, not enough teachers have been trained nor are enough student teachers being prepared for the interdisciplinary of education through science and technology (AD, 2016).

Democracy in schools is also practical, since it is an effective way to build confidence and responsibility within schools. In the new vision for Education 2030 (UN, 2015), quality education fosters creativity and knowledge, and ensures the acquisition of the foundational skills of literacy and numeracy as well as analytical, problem solving and other high-level cognitive, interpersonal and social skills when it is applied in democratic classes. It also develops the skills, values and attitudes that enable citizens to lead healthy and fulfilled lives, to make more in-depth and informed decisions, and respond to local and global challenges through education for sustainable development (ESD) and global citizenship education (GCED).

Basic learning approaches that can be used on a case-by-case basis and in combination with each other are: the cross-thematic approach in order to feed the knowledge, the work plans to be transformed from memorize to research into team work with the collective spirit, the diversified pedagogy concerning the needs of each student and not the class in general, the exploitation of new technologies in teaching - which is a key factor in the new reality that is the digital school.

V. Support to Youth

Youth Education and Training is the investment of the societies for the future. Teaching in Schools with Creativity and Innovation is National and European Strategy targeting to the economic development and progress of local societies (SEC, 2008; COM, 2009). European Union, in accordance to the international academic trends, direct the transformation and reconstruction of Science Curricula and Teaching Methodologies from the traditional of teacher-centered lessons to student-centered learning events. There is the need, Research, Education, and Training to cooperate locally, think and work globally in order to cultivate the future science, environmental, digital literate students.

Since 2005, the European Youth Pact has evolved into a key tool for European action for youth. It covers a wide range of measures aimed at facilitating the transition from education to employment and reconciling work, private and family life. The document "Investing in Youth: a Self-Empowering Strategy", issued in April 2007 by the European Policy Advisers Board of the European Commission, points out that substantial investment in youth is the key to a future favorable both in economic terms on a social level. Member States should recognize the common challenges they face in the long-term goal of empowering youth and adapt their economic and social policies respectively (EC, 2008). This strategy opened a new window and direction to the European and national strategies in the following years, and many initiatives were undertaken to promote and support the youth. The Erasmus+ Generation Online Meeting Point is an open space for the 9 million Erasmus+ participants to have a say on the future of Erasmus+ post 2020. It is for them who want to achieve more, to reach out further and be even more inclusive, to work together in civic tech hub, the spaces for sharing ideas and opinions, plans and perspectives. The platform offers a range of features that allow to propose topics for discussion, plan events related to the youth, share and vote for preferred ideas, debate and comment on the suggestions of other Erasmus+ Generation members, chat with other users. It is kind of like what would happen if Facebook and LinkedIn teamed up to provide a platform for the Erasmus+ Generation Online (http://app.wetipp.com/erasmusplusgeneration/wall/).

In the same strategic direction, CORDIS is the Community Research and Development Information Service. It is the European Commission's primary public repository and portal to disseminate information on all EU-funded research projects and their results in the broadest sense. The website and repository include all public information held by the Commission (project factsheets, publishable reports and deliverables), editorial content to support communication and exploitation and comprehensive links to external sources such as open access publications and websites. CORDIS is managed by the Publications Office of the European Union, on behalf of the European Commission's research Directorates-General and Agencies (http://cordis.europa.eu/research-eu/magazine_en.html)

EPILOGUE
Finally, what the evidence alludes to, is that EU strategies should aim at longer term goals, including to invest in the key competences of basic skills of individuals so as to enable their adaptability and at the same time further encourage creativity, innovation and entrepreneurship. A stronger social dialogue needs to be built to sustain the development and utilization of skills of people within high quality jobs (PDECP, 2015). At national level, the strategies promote cooperation between universities, researchers and businesses in the design of curricula that develop creativity, innovation and entrepreneurship. In accordance with the targets of Erasmus+, in Science Education, we need to make the schools an open space where to discuss about and build up the future post 2020. We want to achieve more, reach out further and be even more inclusive. We can do the school science laboratories pillars and cores to transform the school communities into civic tech hub for sharing ideas, knowledge and wisdom.

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