

# Intellectual Output 1

A1: Rationalization Phase –  
Qualitative & Quantitative verification



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# 1. Introduction

## 1.1 The scope of the project

On the point of creativity and innovation being the roots of European cultural and socio-economic growth, respecting others' work becomes a far-reaching need both for professional and personal development of individuals (EUIPO, 2017). On the other hand, nowadays that online sharing of information is rife, one cannot help but wonder whether people are aware of proper ways to attribute others' ideas along with the necessity to reap the benefits of intellectual potential given the fact that most innovations are now highly related to technology.

Au contraire, the absence of Intellectual Property (IP) protection of educational materials and innovations – with online learning only deteriorating the situation – reveals a significant problem in many European countries. In fact, while uncontrolled access is given to educational resources across the Web, the majority of learners are not aware if IP is implemented in their work as well as ways to protect their own intellectual property (Evans, 2016).

On the grounds that STEAM comprises continuous innovation, invention, discovery and understanding of technical knowledge that lead to (commercial) products, the protection of inventions becomes more and more complex (National Inventor Hall of Fame, 2019). Conceivably, this reveals the rationale behind the lack of IP in school education. In particular, recent research has depicted the knowledge and implementation gaps related to IP, resulting in lack of knowledge about working definitions of IP in the field of Arts. In conjunction with the fact that most European countries are not in position to capture the relevance of IP in STEM, the need to integrate IP in STEAM curricula becomes even more significant (Office for Harmonization in the Internal Market, 2015).

## 1.2 The project objectives

In order to address the lack of IP knowledge resulting in inefficient implementation of IP in the world of inventions, the IPinSTEAM project aims at promoting IP strategies in schools and more specifically in STEAM education under the prism of confronting this issue from its roots. To achieve generating awareness about Intellectual Property across European educational institutions, the project will develop an innovative ICT-enabled training package focused on the needs of K-12 STEAM teachers.

Towards that purpose, the project will develop and validate training materials tailored to the real needs of school teachers, educational institutions and STEM departments towards giving shape to the integration of IP concepts into STEAM curricula.

## 1.3 The project target group

The **direct target group** of the project involves STEAM teachers, mainly primary school and lower secondary school teachers (ages up to 12). They will learn the key concepts of Intellectual Property along with useful information and guidelines about ways to efficiently implement IP strategies in STEAM-related subjects and integrate them into their curricula. By all means, all school STEAM departments can be regarded as direct target group of the project.

The **indirect target audience** of the project comprises:

- Students up to 12 years old
- Schools and educational institutions teaching STEAM-related subjects
- Law schools and departments
- Policy makers responsible for the design and implementation of actions relevant to ICT strategies for educational purposes
- Other institutions or organizations that are active in school education

- Authorities or organizations that can organize specific actions in order to contribute in the development of high-quality education
- Networks, voluntary associations and other NGOs that are active in school education
- Research communities active in the broader field of lifelong learning
- E-learning enthusiasts

## 2. National state of play

### 2.1 The scope of the report

The objective of the present report is to diagnose and analyze the current situation of the project target group with regards to the implementation of Intellectual Property aspects in STEAM teaching. Documentation on the main findings will result in the identification of the actual needs of K-12 teachers based on their level of IP knowledge and the skills required to properly integrate relevant concepts into their curricula. Consequently, the goal is ultimately the formulation of a complete training package covering their needs in terms of bridging the gap between the current state of play and the desired situation.

### 2.2 Main findings

#### 1. Which are the most commonly taught STEAM subjects in your country's school curricula?

In Greece, compulsory education starts at the age of 4 with pre-schooling for 2 years, followed by primary/elementary education level, which starts at the age of 6, and comprises 6 consecutive grades. Afterwards, follows the lower secondary education, called gymnasium, with 3 grades and finally the upper secondary education, called high-school or lyceum with 3 grades. The curriculum in each level along with educational programmes and materials are organized at national level by the Ministry of Education in collaboration with the Institute of Educational Policy. The Ministry of Education is the main state organization that is responsible for all reforms, curriculum updates, instructional directives and materials to be given and distributed to all schools and teachers in the country each academic year. In recent years strong digitalization efforts were implemented and today all school textbooks, educational materials and additional online resources are collected and are publicly available in a central repository, the Greek National Aggregator Of Educational Content also known as "Photodentro" (Photodentro - Greek National Aggregator Of Educational Content). In addition to the central official repository, school teachers usually have access to and contribute educational content, lesson plans and best practices of projects through various online portals or local websites of schools.

STEAM (Science-Technology-Engineering-Arts-Mathematics) subjects in school education in Greece starts in primary level and encompasses the domains of Natural Sciences, of Information and Communication Technologies, of Arts and of Mathematics. They are described in more detail in the followings.

#### **Science**

In this domain the related curriculum subject is that of Natural Sciences. Its objective is to introduce school students at early age to main topics of various sciences including Physics, Biology, Chemistry,

Earth Sciences/Geography/Geology. Students start by observing, exploring and gradually understanding their natural environment, its main natural phenomena and processes, the human body and other living organisms, the structure and function of their organs, the basic concepts and laws of nature etc. The main subject of Natural Sciences is further enriched in primary education by the teaching subject of Environmental Education and Interdisciplinary Projects. In the latter, teachers usually utilize the class hours allocated in the curriculum to instruct and guide students through a research project and develop educational activities and materials with a broader interdisciplinary scope that includes science and technology. Teachers use and develop various educational methodologies to enhance learning, including scientific inquiry and experimentation, demonstration of audiovisual materials, gamified interactive applications etc. The goal of the subject of Natural Sciences is on one hand to teach students to acquire basic concept and content knowledge and on the other to develop and enhance their skills and competences such as scientific curiosity, independent research, critical and creative thinking (Institute of Educational Policy, Guidelines and recommendations for teachers - School year 2020-21) .

### **Technology and Engineering**

In the standard school curriculum of Greece there is no specific subject of Technology and Engineering. These are covered partially by the subject of Information and Communication Technologies which is introduced at the primary level. In this students first learn and practice common tasks such as how to use of a computer, how to launch a program, use a text editor, play a simple digital game and later are gradually introduced to simple programming by using easy block-based languages. In this subject students are also taught topics about safe internet practices, how to handle personal information, how to protect from cyber-bullying etc. In order to engage more students in the field of science, technology and engineering schools and teachers usually develop extra-curriculum activities on educational robotics, on construction and programming of basic circuits and electronic devices to participate in thematic school contests, tech exhibitions or fairs. Further the subjects of Natural Sciences and Interdisciplinary Projects offer some opportunities to teachers and students to expand into more advanced technology and engineering topics and practices e.g. by designing a smart house or city. Doing so students are engaged in addressing present and future societal challenges, propose or imagine solutions, understand deeply how technology affects everyday life. (Institute of Educational Policy, Guidelines and recommendations for teachers - School year 2020-21)

### **Arts**

The standard school curriculum in the field of Arts includes the subjects of Visual Arts, Music and Theater. They are taught separately and start from the early years of primary education. The subject of Visual Arts includes basic hand drawing, sketching, painting on paper or canvas, constructions of colorful artifacts using various materials, exploring paintings of famous artists etc. The subject of Music includes teaching of music notes, tunes and rhythms, identifying different music instruments, play a simple song with an instrument and later or at advanced level be part of an orchestra or choir. The subject of Theater and Theatrical Education covers various topics of emotional, behavioral and social development such as expression of our emotions, understanding another individual's feelings and character, sympathize, diversity and inclusion, role playing, story telling, fairy tales, myths and symbolisms, development and performance of a theatrical play. Through these subjects in Arts students learn how to express themselves, their concerns and understandings, to develop, nurture and channel their creativity, to understand the importance and the need of communication of one's emotions for well being, to explore their paths in artistic expression and creative thinking, to

sympathize and respect diversity (Institute of Educational Policy, Guidelines and recommendations for teachers - School year 2020-21) .

## **Mathematics**

The subject of Mathematics is one of the fundamental pillars of school education in Greece, the other being Language. Both together are encompassing the skills of numeracy and literacy respectively. The subject starts from the first grade of primary level and gradually covers the topics of arithmetics, basic numerical operations, patterns, fractions, geometrical shapes and objects, geometry, equations, trigonometry, probability and basic statistics. The traditional paper-based school textbooks have been recently modernized and enhanced with online educational resources and interactive applications such as quizzes and gamified exercises to further attract the interest of students in the subject. In addition the pedagogical approach has been altered towards aiming at the development of those mathematical skills, attitudes and beliefs that will help students to deal effectively with problems, both in mathematics and through mathematics. Such an approach reflects the course of the formation of the discipline of Mathematics as a science on its own, that is, the attempt to interpret and understand the world. In this context the scope of its teaching is to help students to develop and improve their skills of analytical thinking, procedural thinking, perseverance, problem-solving (Institute of Educational Policy, Guidelines and recommendations for teachers - School year 2020-21) .

### **2. What teaching skills do STEAM teachers regard as the most important?**

School teachers of STEAM subjects regard as the most important teaching skill the following: strong domain concept and content knowledge, communication and collaboration skills, problem-solving and critical thinking, flexibility and creative thinking in adapting to circumstances, organizational skills. Also school teachers regard as very important and of significance value opportunities for professional development and trainings on innovative teaching methodologies, best practices on STEAM etc. (Institute of Educational Policy, Guidelines and recommendations for teachers - School year 2020-21)

### **3. What is the level of awareness of Intellectual Property concepts in your country? How IP is implemented (sections, purposes and target groups)?**

Greece is member state of WIPO (World Intellectual Property Organization) since 1976. It has established a Hellenic Copyright Organization under the Ministry of Culture (Hellenic Copyright Organization HCO). Its national legislation with respect to protection of intellectual property and related rights is updated regularly and amended accordingly in line with the directives and standards of the European Union (European Office for Harmonization in the Internal Market (Trade Marks and Designs) 2015).

The law of Intellectual Property rights in Greece is addressed to individuals and to institutional entities or organizations that can apply for protection of their intellectual properties such as patents, trademarks, logos, product or service design, business branding and copyright. Each category has its respective granted protection framework with respect to time duration, scope and applicability at local, national or international level, registration renewal periods, certification, target groups etc.

With respect to patents, a certificate is granted to inventions and new processes with target groups being individual inventors or industrial entities. The protection period is 20 years with annual renewal starting from the 3rd year. The related application procedures and costs/fees depends on the level of registration at national, european or international. The certificate of patent and registration gives to the holder exclusive exploitation rights for the period that the certificate is valid (Patent Office - Hellenic Industrial Property Organization).

Regarding trademarks, this intellectual property category refers to logotypes and names that are linked with an organization, company, product or service. The protection period can be indefinite provided a registration renewal every 10 years. Trademarks are to protect and strengthen the commercial exploitation of related products and services, facilitate and enhance their branding and marketing scopes of companies and organization (Trademark Office, General Secretariat of Commerce & Consumer's Protection, Ministry of Development & Investments).

The category of copyright has validity of up to 70 years after the death of the holder/creator. Holders of copyrights are professionals of creative works such as artists, writers, musicians, composers, dancers/choreographers, photographers, cinematographers, designers etc. The materials under copyright protection are usually books, articles, songs, films, documentaries, paintings, photographs, or artwork in general but also software, algorithms or other digital artifacts (Hellenic Copyright Organization, Ministry of Culture).

### **Intellectual property in education**

In the standard school curriculum of Greece opportunities of teaching Intellectual Property related topics exist to some extent but they are not adequate enough to cover all categories. Indirectly concepts like protection and respect of copyright, appropriate use or acknowledge of intellectual property rights, trademarks and patents can be taught through thematic projects or through participation of students in school contests. In particular the concept of copyright and intellectual property rights is included in the school curriculum of Greece at the level of primary education through the domain of Information and Communication Technology lessons. The Institute of Educational Policy of the Ministry of Education publishes every year specific teaching guidelines and recommendations for teachers on these subjects along with example educational activities, however the allocated time in the school program is limited (Institute of Educational Policy, Guidelines and recommendations for teachers - School year 2020-21). Nevertheless in general school teachers in Greece have high awareness on the issue of copyright and intellectual property rights. Furthermore all school textbooks are registered with ISBNs and all educational materials administered in the official portal and aggregator of the Ministry of Education have full references to authors, content creators and sources (Photodentro - Greek National Aggregator Of Educational Content).

In brief, IP related learning objectives in the school curriculum cover the following topics: in primary education (in subject of Interdisciplinary Project and Environmental Studies) intellectual rights, civic education, education for responsible consumers, connection between products and jobs, cultural heritage; in lower secondary: value of work and related rights; in all levels: (in Information and Communication Technologies/Informatics) critical thinking, new technologies, copyright protection, security of information, behavior on the internet; innovation, human rights, protection of human dignity; (European Office for Harmonization in the Internal Market (Trade Marks and Designs) 2015)

In the school education community there are initiatives of improvement towards inclusion of more IP related topics in the curriculum of students or in the training of teachers. In this regard, the Hellenic Copyright Organization (HCO) of the Ministry of Culture has developed in collaboration with teachers a training programme called “Copyright School” for teachers of primary and secondary levels. The programme is approved by the Ministry of Education for the purpose of informing and raising students awareness, from all grades of primary school and beyond, of the significance of the work of the authors and related rights holders. The authorization of the programme by the Ministry is renewed on an annual basis with a view to informing both students and teachers of the value of copyright within the educational system. Since 2015 HCO’s “Copyright School” organizes seminars and training events in most cities around Greece and has attracted the interest of more than 1000 teachers. In its mission statement HCO *“regards it as essential that the public will be both informed and educated about the significance and value of copyright and related rights protection. Furthermore, in this respect, the attitude of the younger people towards copyright and related rights is of particular importance, since they constitute the principal users of the internet whereas the phenomena of piracy are predominantly taking place. In addition, they constitute the citizens and professionals of tomorrow, who will benefit in the future -as potential creators- from the protection of their rights over their works”* (Hellenic Copyright Organization Ministry of Culture - Education initiatives).

The training programme has received financial contribution by the European Union Intellectual Property Office (EUIPO) to cover the following actions: development of information material, printing and distribution to teachers and students; organization and conducting of training courses and seminars; development of electronic educational games for children; creation and maintenance of website where the relevant materials are freely available for the general public and for primary and secondary school students, teachers and parents (Greek Copyright School Project of the Hellenic Copyright Organization).

For the moment there are no published data to assess its efficacy and impact to teachers and students. In general in Greece, school teachers regard as very important and of significance value opportunities for professional development and trainings and there is a constant demand for them. Thus we feel that IPinSTEAM will be well placed to address their needs on these subjects. In long term this also may facilitate the introduction of IP related teaching subjects and practices in school curricula in support of similar initiative like the one mentioned above.

#### **4. Is copyright implemented in STEAM? If yes, how and in which subjects?**

The concept of copyright and intellectual property rights is included the school curriculum of Greece already at the level of primary education through the domain of ICT lessons. The Institute of Educational Policy of the Ministry of Education publishes every year specific teaching guidelines for teachers on these subjects along with example educational activities (Institute of Educational Policy, Guidelines and recommendations for teachers - School year 2020-21). In general school teachers have high awareness on the issue of copyright and intellectual property rights. Furthermore all school textbooks are registered with ISBNs and all educational materials administered in the official portal and aggregator of the Ministry of Education have full references to authors, content creators and sources.

#### **5. Are trademarks implemented in STEAM? If yes, how and in which subjects?**



Trademarks are not included in the standard curriculum of primary education in Greece. Indirectly it may be introduced in secondary education through thematic projects related to STEAM subjects or in entrepreneurship, or through participation of students in school contests or other extra-curriculum educational events.

#### **6. Are patents implemented in STEAM? If yes, how and in which subjects?**

Similar to trademarks, the concept and the importance of patents are not covered in the standard curriculum of primary and lower secondary education in Greece. Patents can be indirectly introduced in school education through thematic projects (e.g. focused educational projects on the subject of technological innovation, history of innovation, etc) or through participation of students in school contests on entrepreneurship and innovation that are organized annually at country or regional level by educational institutions, business entities or other stakeholder.

#### **7. Is design implemented in STEAM? If yes, how and in which subjects?**

The subject of design, specifically product design or service/solution design, is not included in standard curriculum of primary and secondary education in Greece. As in previous items, design may be practically introduced through thematic projects in STEAM (e.g. where students design an object or artifact using ICT tools), extra curriculum activities and educational contests (in graphic design or website design as part of an interdisciplinary project).

## **3. Conclusions**

Greece is member state of WIPO (World Intellectual Property Organization) since 1976. Its national legislation with respect to protection of intellectual property and related rights is updated regularly and conforms with the directives and standards of the European Union. The law of Intellectual Property rights in Greece is addressed to individuals and to institutional entities or organizations that can apply for protection of their intellectual properties such as patents, trademarks, logos, product or service design, business branding and copyright. Each category has its respective granted protection framework with respect to time duration, scope and applicability at local, national or international level, registration renewal periods, certification, target groups etc. Although the level of IP awareness and of acknowledgement of its significance is high at business and industrial sectors as expected however it is not introduced as teaching subject in school education.

In Greece, compulsory education starts at the age of 4 with pre-schooling for 2 years, followed by primary/elementary education level, for ages of 6 to 12, then secondary education for ages up to 18, divided in lower and upper levels, called gymnasium and lyceum respectively. The curriculum in each level along with educational programmes and materials are organized at national level by the Ministry of Education in collaboration with the Institute of Educational Policy which publish annually specific guidelines for teachers of each subject. All school textbooks, educational materials and additional online resources are collected and are publicly available in a central repository, the Greek National Aggregator Of Educational Content administered by the Ministry. In addition school teachers usually

have access to, share and contribute educational content, lesson plans and best practices of projects through various online portals or local websites of schools.

STEAM (Science-Technology-Engineering-Arts-Mathematics) subjects in school education in Greece starts in primary level and encompasses the domains of Natural Sciences, of Information and Communication Technologies, of Arts and of Mathematics. Opportunities of teaching IP related topics exist to some extent but they are not adequate enough to cover all categories in the standard school curriculum, only indirectly through thematic projects or through participation of students in school contests. In particular the concept of copyright and intellectual property rights is included in the school curriculum of Greece at the level of primary education through the domain of ICT lessons. The Institute of Educational Policy of the Ministry of Education publishes every year specific teaching guidelines for teachers on these subjects along with example educational activities, however the allocated time in the school program is very limited. In general school teachers have high awareness on the issue of copyright and intellectual property rights. Furthermore all school textbooks are registered with ISBNs and all educational materials administered in the official portal and aggregator of the Ministry of Education have full references to authors, content creators and sources.

The Hellenic Copyright Organization of the Ministry of Culture has developed a training programme called “Copyright School” for teachers of primary and secondary levels. Since 2015 it organizes seminars and training events in most cities around Greece and has attracted the interest of more than 1000 teachers. However there are no published data to assess its efficacy and impact to teachers and students. In general in Greece, school teachers regard as very important and of significance value opportunities for professional development and trainings and there is a constant demand for them. Thus we feel that IPinSTEAM will be well placed to address their needs on these subjects. In long term this also may facilitate the introduction of IP related teaching subjects and practices in school curricula.

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