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IPin STEAM

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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 leads 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 schoolteachers, 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 to 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 analyse the current situation of the project target group with regards 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 Cyprus kids above the age of 5 are following the mandatory education in the primary school which last 6 years. Children at the age of 12 can be in the last year of their education in primary school and maybe in the first year of their education in the secondary school, known as the Gymnasium. The educational programme followed by the teachers, either in a public school or in a private school, it is organised by the Cypriot Ministry of Education. The ministry is responsible to update the educational materials provided to the teachers, the informative documents to support the parents and the content of the educational materials that are distributed to the students. (Cyprus Ministry of Education, Culture, Sport and Youth, 2016) (Cyprus Ministry of Education,Culture,Sport and Youth (1))

Apart from the guidelines and educational materials that the working groups of the Ministry create, there are several educational programmes created by the teachers in each Cypriot school. These materials are available online on the website of each lesson to be available for other teachers.

Due to the Covid-19 restrictions, additional materials were created appropriate for distance learning and to attract the attention of the students, especially of those in the first classes of primary school. These materials are presentations, pdf documents and guidelines for creative projects using materials that normally exist to each child's home. Some materials are designed in an accessible way to be used by children with visual disabilities.

Cypriot students since their early years in school are introduced in basic STEAM subjects. These are the subject of Mathematics, the subject of Physical Sciences, the subject of Digital Technologies and the Design of Mechanisms, the subject of Fine Arts and the subject of Music. In the following paragraphs, we categorised each subject according to each category in the STEAM concept (Science, Technology, Engineering, Art, Mathematics).

Science

In the field of science, the respective course is around the Physical Sciences. It is included in the educational program of each of the 6 school years in the primary school and the later school years, it is divided in physics, biology, and chemistry.

In this subject, the students are getting to understand the environment, the living organisms, the materials the physical phenomena. They learn how to orientate and what is the meaning of the power and the motion. Additionally, they are acquiring information on the human body structure, its functionalities and how to remain healthy. In bigger classes, the students are also introduced to the topics of electricity and which are the basic sources of lightning. The educational methods include the theoretical knowledge to be acquired through books, informative videos and exercises, but also the experimentation through laboratory equipment.

The scope of the subject is that the students will acquire the basic knowledge of Physical Sciences and will understand better the several phenomena they meet in their everyday life. Moreover, this subject raises their ability and attention for research, critical and creative thinking. (Cyprus Ministry of Education,Culture,Sport and Youth (1))

Technology & Engineering

These topics are covered through a multipurpose subject for design and digital technologies. The scope of this subject is to introduce the children, since their early stages, in technological development and the different types of it.

In the first school years, the introduction to technology and engineering is basically through paintings and easy constructions such as the design of a car on the paper. The practical part of the subject is also followed by a theoretical one through educational materials such as books, presentations, and educational videos.

In the last two classes of the primary school, the educational units on this subject are more advanced and include the theory of the technological development, the design process, the use of electricity and constructions based on electrical signals, the creation of mechanisms using everyday materials etc. Additionally, the students get introduced to the basic programming using software such as Scratch, BEE BOT, Studio Code, and they learn about the control systems and the functionalities in Robotics. In the later years of school education, the students are introduced to more advanced theoretical knowledge in the IT field. (Cyprus Ministry of Education, Culture, Sport and Youth (2))

Since 2015 there is a provision on the integration of the information technology applications in the educational process and for this reason, each school should have a responsible counsellor to guide and train the teachers on how to use these applications. (Cyprus Minisrty of Education, Culture, Sport and Youth (3))

Art

The one subject in the field of Art is that of Fine Arts. The ministry has 4 educational modules in this topic with the respective materials for students and teachers. The 1st module covers the first and second year of primary school, the 2nd module covers the third, fourth and fifth year of the primary school, the 3rd module covers the sixth year of primary school but also the first and second year of gymnasium and the 4th module covers the 3rd year of gymnasium and the 1st year of High School.

The modules addressed to the 1st and 2nd class of primary school are designed in a way to bring in contact the child with the art and to get to know the basic colours and shapes of elements (lines, circles etc) so as to start creating and expressing its point of view and feelings through the art. In bigger classes the children get to know the spaces and the design of them, getting introduced in famous actors such as Leonardo Da Vinci and Henri Rousseau, through educational Videos and presentations. This knowledge is followed by several test and quizzes. Additionally, in order for the children to come in contact with the continuous technological evolution of our era, there are units in which children can design their robots through painting on the paper or construct them by using recyclable materials. (Cyprus Ministry of Education, Culture, Sport and Youth (4))

The second subject of this category is that of Music. This subject has also 3 modules which cover a different range of ages. Through the Music lessons, the children gain the basic knowledge on how to compose music, rules, and musical notes, and additionally on how to produce sounds through the use of the various musical instruments and everyday materials. Furthermore, there are projects which introduce to students the graphic representation of the sound through technological means and projects with more creative character in which children construct musical instruments with everyday materials. (Cyprus Ministry of Education, Culture, Sport and Youth (5))

Through these courses, the students can cultivate their way of expression and critical thinking through creative processes and the democratic dialogue thus contributing to the development of critical, conscious viewers. At the same time, communication and teamwork are strengthened, through the expression of concerns related to society and modern reality. For the children, this represents a way to discover their identity and their existence in a group maintaining the individuality and respecting the diversity.

Mathematics

Mathematics is a basic subject that kids start learning from the first grade of primary and continue to learn and use it throughout their lives. The lessons in the first school years targeting to teach the numbers to children also through games with images. In the later years, the educational materials are more enriched with more complicated mathematic rules and the lessons are followed by exercises, quizzes, and exams.
The scope of the subject is that the educational programme will raise the interest of the students in mathematics and problem solving, that the technology is linked to mathematical procedures and thus the value of this subject should be perceived by all students. Mathematics is not presented just as a subject but as a creative procedure. (Cyprus Ministry of Education, Culture, Sports and Youth (6))

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

It is commonly known that for the teachers, who teach STEAM subjects, it is valuable that they have high skills in **problem-solving** and **critical thinking** at first. For the creation of better educational methods, it is important for a teacher to be **creative** and **collaborative** and have very good **communication** skills to transmit more effectively the knowledge to the students. Though, related research on Cypriot teachers, working in STEAM subjects, expressing their opinion on the important skills could not be found.

It is important to support teachers and provide frequent training to raise not only the skills that are related to the teaching methods but also the skills related to the **self-development** and to come up with new methodologies. The ministry indeed announces on the website of each lessons several opportunities for training and informative seminars. Though, we are not sure of the actual participation of the teachers in these initiatives.

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

Cyprus joined in 1984 the World Intellectual Property organisation. Since 1976 Cyprus has issued Laws for the protection of the Intellectual Property, which are frequently amended in recent years in order to match the European Law Framework.

Regarding the Intellectual Property rights in Cyprus each individual, company, organisation can apply for protection of its intellectual property covering Patents, Trademarks, Industrial Design or Sample and Copyright. Each category has a different protection framework regarding the years and the region (local, national, international), different registration cost, renewal periods but also different target groups. The Cypriot Department which is responsible for the Intellectual property and the procedures to apply in different categories has created manuals for each of the categories but also a guide categorising the usual target groups who apply for an Intellectual Property certificate. (Ministry of Energy, Commerce and Industry-Department of Registrar of Companies and Official Receiver)

Referring to the Patents the certificate is applied to innovative inventions, new processes, a new mode of product operation and the target group is usually inventors. The protection period is a maximum of 20 years with an annual renewal starting from the 3rd year. The costs and the procedures of the registration differ according to the regional level that the patent is going to be registered, National, European or International. The benefits of obtaining a patent for the inventor, are the exclusive exploitation rights for all the period that the certificate is valid. (Ministry of Energy, Commerce and Industry-Department of Registrar of Companies and Official Receiver)

Coming to the Trademark category, refers to logotypes and name that are linked with a product, a company or a service. The protection period is indefinite but needs renewal every 10 years. This category is destined to entrepreneurs, service providers, product owners and secures the commercial and financial exploitation of the trademark. (Ministry of Energy, Commerce and Industry-Department of Registrar of Companies and Official Receiver)

On the topic of the Industrial Design or Sample, the validity of the certificate is 25 years with renewal every 5 years. This category is usually applied by designers and product owners to secure the exterior

design and appearance of their product. Through this certificate, it is secured the exclusive exploitation of the design for the entire registration's validity period. (Ministry of Energy, Commerce and Industry-Department of Registrar of Companies and Official Receiver)

The category of Copyright has validity up to 70 years after the death of the creator, the renewal is automatic and has no registration fees. This category usual includes writers, artists, architects, music composers, choreographers, programmers, and other professionals of creative works. The materials to be protected by this certificate are usually books, articles, scripts, songs, choreographies, architectural works, software, databases, paintings, photographs, or another artwork. (Ministry of Energy, Commerce and Industry-Department of Registrar of Companies and Official Receiver)

In all the fields of Intellectual property, it is provided a thorough explanation on the website and guidelines available for all the users, but also the ability to start your procedures online. Additionally, it is provided with a tool which can guide the users in 3 steps to select the correct Intellectual Property certificate for your creation. (Ministry of Energy, Commerce and Industry-Department of Registrar of Companies and Official Receiver)

The concept of Intellectual property in the field of education it is introduced and taught to all the levels of education in Cypriot schools from primary to upper secondary & vocational. According to a study of the European Office for Harmonization in the Internal Market, Cyprus stands out in Europe in the teaching IP rights and issues through their school curricula. The IP topic is not a stand-alone subject, but it is presented with entry points in subjects related to civic education, creative subjects such as music, theatre, art, and technology. IP education is taught also in teachers either through their initial studies or through on service training. It is important to mention that Cyprus is one of the countries that identify the IP topic in the STEAM subjects' curricula, while most EU nations do not. (European Office for Harmonization in the Internal Market (Trade Marks and Designs), 2015)

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

The concept of copyright in Cyprus is introduced in the school curricula in primary and lower secondary education through the STEAM lessons. Additionally, the copyright topic is included in the curricula of vocational training of the teachers. (European Office for Harmonization in the Internal Market (Trade Marks and Designs), 2015)

The educational materials provided in the Cypriot schools, also in the STEAM-related subjects, by the Ministry of Education, Culture, Sports and Youth are registered with ISBNs and of copyright by the Ministry with reference on the name of the people who consisted the working group for the creation of each material. Though, in the extra materials which are provided by other teachers in Cypriot Schools and are free for other professionals, there is nothing more than just a reference with the name of the creator and the name of the School. In general, there are no findings of research referring to the implementation of copyright in STEAM subjects by the teachers, even if they have the respective knowledge.

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

Trademarks are introduced only in the curricula of the lower secondary education as entries in STEAM subjects. Concerning the implementation of trademarks in STEAM subjects in Cyprus there is no research to demonstrate information of this topic and no trustworthy reference on the web. (European Office for Harmonization in the Internal Market (Trade Marks and Designs), 2015)

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

With reference to the patents, the topic is not introduced in any educational level in Cypriot schools and also not in the vocational training of teachers. Additionally, there is no reference on the web for application of this Intellectual Property concept in STEAM subjects. (European Office for Harmonization in the Internal Market (Trade Marks and Designs), 2015)

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

As regards to design, the topic is not introduced in any educational level in Cypriot schools and not in the vocational training of teachers. Furthermore, there are no findings from the desk research that Intellectual property in design is implemented in STEAM subjects. (European Office for Harmonization in the Internal Market (Trade Marks and Designs), 2015)

3. Conclusions

In Cypriot schools, there are STEAM subjects that are taught to children and are a major part of the school programme. The educational materials are provided by the Ministry of education but also from other teachers and are available in online databases. The educational methods include the traditional theoretical knowledge and the exams but also interactive sessions to increase the collaboration and creativity between the children and the teachers.

Even though STEAM subjects exist in all school years, further research on the needs and the opinion of the teachers has not been conducted yet, at least one with trustworthy results. Problem-solving, critical thinking, communication and collaboration are skills that teachers need to develop to provide more attractive education for students in the STEAM lessons. The ministry has a range of educational programmes for teachers, but we cannot confirm if these were effective and to which level the educators participated.

Regarding the application of laws in the field of Intellectual Property, it seems that Cyprus is very well organised and has a well-structured database in its website to help users understand the different types of certificates and select which is appropriate for the work they would like to secure. It is an important fact that Cypriot laws are revised frequently to match the European Law framework.

On the topic of education of IP rights in Cypriot schools, it seems that the Country is performing better than many other European Countries. The Cyprus includes IP in the presentation of the Universal Declaration of Human Rights (Article 27) in the school curricula. In the STEAM subjects there is reference to copyright in all the stages of the education and in the training of the teachers, though the topics of trademark, design and patents are not elaborated thoroughly in the Cypriot education field.

Concerning the implementation of Intellectual Property practices in STEAM subjects in Cyprus, unfortunately, there are no relevant findings. The Ministry of education, culture, youth, and sports has the copyright of the materials provided in the school education, either for the teachers or students and parents. Though other materials, which are created by the several teachers are not protected under any Intellectual property certificate.

Thus, it is evident, that there is need for the introduction of the concept of Intellectual Property in the teachers who are occupied in the STEAM subjects and help to provided more qualitative materials but also to protect their creations in the field of education.

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