Fun@Science project

Intellectual Ouput 5 – FUN@SCIENCE

Implementation Guidelines

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1. Introduction

On the basis on the activities achieved during the Fun@Science project, this document aims to give suggestions for the implementation of global education models incorporating informal schooling based on 3D printing activities in school curricula. The Implementation guidelines have been developed by using the results from the national study circles, the ideas and feedback received from the information meetings conducted, feedback from the piloting in each country.

We strongly believe that this output will help authorities in charge of school education and training in the school system in planning policies about teachers' initial/continuous training and in developing measures for improving students' interest in scientific careers and in the development of logic and mathematics skills. The outputs of the project are made public which is crucial for further sharing of these inspiring results achieved by the participating organizations and individuals.

2. National Study Circles Results

This part deals with Study Circles Results in the participating countries. We will see the different actors of the project in each country, their vision on digital competences at school and the use of technological tools printers especially 3D printers. The results have shown that the use of technological tools is good for improving digital skills.

Italy

The study circles carried out in Italy were developed through three meetings involving 20 teachers from infant school, primary school and secondary junior school selected through free individual availability and through the invitation of teachers who had received training. The meetings were organized according to the model established by the partnership, focusing on the importance of digital competences promotion and implementation in the school curricula, freely discussing both the value of the digital curriculum in the school since primary school and the specific contribution of 3D in

terms of content and methodology.

Although the participants were familiar with 3D printers and some of their applications, they had never used these technological tools in formal and non-formal teaching activities. The opportunity created by the training provided by the Fun@Science project awakened curiosity, so the trainers had the chance to highlight the opportunities that 3D printer methodology can offer.

The aim of the meetings was to develop a reflection on digital skills and on the use of technological tools useful for curricular disciplinary teaching. After the meetings the following results were achieved:

- Establishing the role of technologies in the development of European key competences
- Implementation of traditional didactics with the introduction of digital tools, for the innovation of the teaching/learning process
- Identification of the elements of learning about the use of 3D printers, taking into account the skills and competences produced by both the knowledge and use of programming software and machine specific software.

During the focus groups there was almost unanimous positive evaluation of the use of new technologies, both because it represents one of the main tools for an innovative methodology capable of capturing the interest of new generations and because it allows, through coding, the development of logical and scientific thinking.

From the teachers discussions the following weaknesses have been identified:

- there is a gap between current educators, mostly of average age, and young pupils. The first are digital migrants who are divided between those who believe and rely on technology and those who are not interested in it, and are the most of them, while the other mainly have a playful attitude towards technology.
- Lack of tools and technical training is the biggest obstacle

- It is important to integrate new technologies in the traditional lessons, as long as it is done in the right quantity, without leaving out the classic teaching methods.
- On the other hand, the strengths of 3D printing methodology highlighted are:
- The educational importance of innovative technologies and tools known only as leisure tools.
- Students have the opportunity to use technologies as a learning aid they can get to know, they also have the possibility to learn how to make conscious use of digital tools.
- Teachers and pupils can use the digital tools for facilitating, simplifying and enhancing the skills acquired through the implementation of traditional disciplinary teaching.
- The use of 3D printers technology requires planning and design paths, with laboratory strategies, as the key European competences claim
- They promote interdisciplinary paths, being a tool that involves the motivations to learn, beyond the specific contents.

Poland

This project has lead us to multiple experiences. We went all the way from understanding what a 3D printer is, until using it in our classes. Through this project we earned the abilities and skills to use a 3D printer in the framework of our pedagogical resources and teaching strategies.

20 teachers participated in this study circle. Although the participants were familiar with 3D printers and some of their applications, they had never used these technological tools in formal and non-formal teaching activities. The opportunity created by the training provided by the Fun@Science project awakened curiosity, so the trainers had the chance to highlight the opportunities that 3D printer methodology can offer. The main strenght of the training was the fact of having the teachers from different education levels that had various experiences as far as the students they teach is concern but also various experiences with the topic. This allowed for a very wide spectrum of

discussions and examples. At the same time, this mixture of experiences was a challenge as teaching nonhomogenious group is difficult. Although this particular audience was able to find the best methods in order to gain as much from the training, as possible. At the beginning there was a session devoted to expressing fears and expectations of the participants, then the content itself was thaught and learned: introduction to 3D printers, 3D design, online tools and 3D printing applications. Important part of the training were experimenting and discussions about various teaching methods. At the end of the training participants evaluated the sessions and discussed about fears and expectations that were expressed at the very beginning.

Portugal

Overall this project has lead us to multiple and very rewarding experiences. From the point of understanding what a 3D printer is, until actually using it in our specific classes, the aim of this project brought each and every one of us the ability and the skills to put a 3D printer working for our pedagogical resources and teaching strategies.

We had in this study circles the participation of 36 teachers.

Czech Republic

As part of the study circles we have worked with participants from Gymnázium Elišky Krásnohorské and ZŠ a MŠ Tyršova in Prague and we incorporated 20 teachers willing to discover more about the potential of 3D printing. Our objective was not to overwhelm the teachers with technical data and information as for most of them it was their first experience with 3D printing. Our aim was to introduce the technical principals that 3D builds on and to explain the input and output principal, i.e. slicing and modelling options with freeware programs that would not cost their schools additional funds. Moreover, the objective was to make them think about 3D printing as an integral part of the curriculum. In other words, to establish the technology as a means (a tool) that can be used in a wider context. For this the knowledge of basic principles and ideas of what 3D printing can do is essential.

We didn’t apply any particular methodology as such. We wanted to share our knowledge of the

technology and its potential in education in such a way that would not bore the teachers and make them believe that although it may seem very complex and irrelevant for their work it can actually be a great complementary element to various topics. We applied an informal style and as little theoretical lecturing as possible. We also made them work in groups so that any individual fears of unconfidence would be overcome.

Although the teachers were sceptical at first about the technology as such and its relevance in education as well as about their own abilities to use it, we arrived at a point where they realized the potential and started to be eager to learn more not only about the modelling and slicing processes but also about the technical aspects of the printers.

Greece

This project has lead us to multiple experiences. We went all the way from understanding what a 3D printer is, until using it in our classes. Through this project we earned the abilities and skills to use a 3D printer in the framework of our pedagogical resources and teaching strategies.

20 teachers participated in this study circle.

3. Feedback from Stakeholder Committees / Multiplier Events

In the chapter, we will see the feedback from stakeholder committees and the multiplier events during the project. Actors have shared benefits of using the 3D printing technologies for improving the students' logic and mathematics skills and discover the scientific careers. Generally, the feedback gained from the abovementioned events was very positive and the participants agreed these technologies and digital tools should not be considered as subjects in their own right, separated from disciplinary curricula. The implementation of Fun@Science improves logic, mathematics skills for students and it can help them in their future professional careers.

Italy

During the project lifecycle Stakeholder Committees, composed by project partners and schools representatives, met two times aimed at analysing and discussing the project achievements in order to provide suggestions for the implementation of the activities based on 3D printing technologies. The first Multiplier Event took place in May 2019 and was addressed to teachers, trainers, stakeholders for presenting the draft of Fun@Science educational model, sharing the advantages of using the 3D printing technologies for improving logic and mathematics skills in the students of primary and secondary junior schools, and for increasing the interest of secondary school students for the scientific careers.

The feedback gained from the abovementioned events was very positive: the participants agreed this technologies and digital tools should not be considered as subjects in their own right, separated from disciplinary curricula, as these facilitate students' learning. Through these it is possible to develop technological skills, especially of those who base their knowledge on a new cognitive style, that of technological intelligence.

The expected results from the implementation of Fun@Science model in the school should be the acquisition by the students the following skills and competences:

- Solve life problems
- Plan experiences and projects
- Use new tools to learn and study
- Transfer study content to study objects via digital products
- Learn with more motivation and curiosity
- Develop technical skills

The methodological approach presented during the events is the laboratory one, meaning by this the organization of a careful planning of the lessons in the form of detailed learning units in which the title of the lesson, the organization of the classroom, of the materials and of the timetable is foreseen from the beginning. The activities are designed as articulated in moments that are repeated for each

lesson, to ensure that students can also acquire a recognizable and shared rhythm of time.

Poland

The first Multiplier Event took place in July 2019 and was addressed to teachers, trainers, stakeholders for presenting the draft of Fun@Science educational model, sharing the advantages of using the 3D printing technologies for improving logic and mathematics skills in the students of primary and secondary junior schools, and for increasing the interest of secondary school students for the scientific careers.

Participants were asked to complete an Evaluation questionnaire at the end of the event. The evaluation was anonymous and allowed for gathering feedback to account for project development/sustainability.

Participants were interested in the contents presented and shared to them, remaining interested to find out about remaining project activities.

The collected feedback proves that the partnership has well-developed project results and properly presented them via the project website in order to provoke interest among the project target groups.

Portugal

The multiplier event no.1 was done in Portugal on the 6 September 2020, with the participation of 33 teachers. During this event, the teachers and trainers learned more about the methodology and intellectual outputs of this project.

In the end of the event, all the participants had give a excellent marks in all aspects, and in the open question, where we ask to give us some feedback, the word *congratulations* was present in many of this surveys. This event is publish on https://www.facebook.com/134973703846016/posts/380666025943448/?sfnsn=mo or in the project webpage https://www.fun-and-science.erasmus.site/multiplier-event-e1-portugal/

Czech Republic

The multiplier event no. 1 was organized on 24.9.2019 and the ME no. 2 on 27.11.2019. Both events incorporated more than 40 teachers and showed practical matters touched by the project. Participants were able to work with numerou 3D printers (MK3s from Prusa Research s.r.o.). During these events, they discovered the practical dimension of the modelling process and learned about the connection between the modelling and successul 3D print. Overall the feedback was very positive making it clear that the technology has its potential in various school subjects. Of course, there were suggestions on improvement mainly in respect to time contratints and the need for more workshops focused in-depth on particular steps of modelling and printing. However, as a starting point of the learning curve among the teachers we thought the multiplier events have done a great job. Moreover, it introduced an interesting fact that the best 3D printers in the world come from the Czech Republic.

Greece

The multiplier event no.1 was done in Greece on the 9th of November 2019, with the participation of 20 teachers and trainers. During this event, the teachers and trainers got to know more about the methodology and intellectual outputs of this project.

In the end of the event, all the participants gave excellent remarks in all aspects. When they were asked to give us some feedback, they *congratulate* us for the innovative idea and for the effort that this European partnership put in order to create this methodology. This event is publish on https://www.facebook.com/funatscience/posts/448710212472362

4. National Piloting Results

In most countries The Fun@science piloting experience implemented was very positive for both teachers and students. Moreover, it could be possible to train some teachers in using of 3D printing technology to make them able to use it during the school curricula programme. Results are positive

and many teachers involved have agreed about the importance to include this learning approach in the school programme to help the students to study, understand scientific topics, improve technical skills, team working and autonomy at work.

Italy

The Fun@science piloting experience implemented in Italy was very positive. We can cover all school levels, starting from primary school to high school. The 175 students involved were aged between 7 to 19 years old. The trainers who led the activities were external experts on 3D printing technologies, but also teachers of the school participating at the activities. In this way, in addition to the training addressed to the students, it could be possible to train also some teachers in using of 3D printing technology, so to make them able to use it during the school curricula programme.

The methodology used by the experts/teachers was interactive providing the active involvement of the students in all training phases. At the end, students showed the projects realized during the activities to their parents and other school pupils (in the case of primary/secondary junior school) and to other teachers (in the case of secondary school).

The general feedback from the teachers in terms of training contents, methodology and coordination was very positive. Teachers believe that the 3D printing learning approach can improve the students' logic and mathematical skills, because they can draw, project and made 3D models that represent important concepts of maths and science, such as the angles and the molecules. This learning approach help the students to study and understand easier abstract scientific topics. The approach could be useful also for helping students with special learning needs. As well as improving technical skills, this methodology can help students for increasing some of soft skills, such as critical thinking, problem solving and team working.

The challenges met during the activities implementation were the limited number of facilities (3D printers) in relation to the number of students, and the difficulty to include the technology into the disciplinary contents. At this regard, it needs to highlight that not all the school teachers were agreed

to use this learning approach in the curricula programme, due to their lack of digital skills and experience in this field.

Anyway, the piloting experience was relevant for the grow up of the students, both at scientific and social level. Although the mixed ages, the groups reached a good degree of knowledge of the 3D modeling program, acquiring a strong understanding and autonomy in the design and conception of the project.

The general impression of the piloting experience was very satisfactory: teachers highlighted the relevance of this learning approach in order to improve the logic and mathematics skills in their students, as well as increasing students' interest in scientific careers. The motivation and engagement of students have been evaluated very high and their involvement during the workshops shows just that.

All the teachers involved are agreed about the importance to include this learning approach in the school programme, although the lack of funds for the purchase of appropriate equipment and teachers' training could be an obstacle to the project sustainability.

Poland

The piloting results was held in September 2019. In this piloting, we had the participation of 30 teachers. The general feedback from the teachers in terms of training contents, methodology and coordination was very positive. Teachers believe that the 3D printing learning approach can improve the students' logic and mathematical skills, because they can draw, project and made 3D models that represent important concepts of maths and science, such as the angles and the molecules.

Portugal

The piloting results was held from 9 to 11 September 2019.

In this piloting, we had the participation of 32 teachers. During 12 hours, this group of teachers had put in practice/test the FUN@SCIENCE methodologies, with the technical support, they had start, the

most part of them, their first print 3D.

Some photos of this event are present at
https://www.facebook.com/134973703846016/posts/391380061538711/?sfnsn=mo

Czech Republic

The activities were implemented in one primary school (ZŠ Tyršova, Prague) and also a secondary school (Gymnázium Elišky Krásnohorské, Prague). We approached students from 10 to 14 and 15 to 18 years of age respectively. During the activities, we worked with more than 20 teachers who participated in the preparation phase and of course during the workshops themselves.

Implemented activities

Biology

The methodology was based on a connection between the theoretical biological concept of a DNA structure and the practical dimension of modelling and creating a 3D model that is a tangible object for the pupils and helps them to develop a complex idea about the key elements of the human body. At the same time, it increases creativity as the students are asked in the first phase to model DNA from the top of their heads before being shown the exact shape which they will in the second phase try to reproduce and print. Given the complexity of this activity and also the curriculum requirements this activity was implemented among students between 15 and 18 years attending secondary school. The total duration of the activity was 8 hours.

Chemistry

The methodology is based on a connection between the chemical concept of a water molecule structure and the practical dimension of modelling and creating a 3D model that is a tangible object for the pupils and helps them to develop a complex idea about the key elements of nature (water). At the same time, it can be used for other molecules visualization. This activity increases creativity as the students are asked in the first phase to model the water molecule from the top of their heads before

being shown the exact shape which they will in the second phase try to reproduce and print. This activity was implemented among students of 10 to 14 years of age. The total duration of the activity was 7 hours.

Overall the answers of the teachers showed a positive inclination to the technology itself as well as the general thought of project-based learning enriched by contemporary trends. Majority of the teachers valued the creativity embedded into the concept of 3D printing and the ability for the students to create tangible objects that can help them to better understand various abstracts concepts they encounter during their classes. The pupils were excited for the most part that they will get to work with a 3D printer. Unlike many of the teachers, they are familiar with the basic concept of technology, some of them even at a more advanced level. The strong point was the team collaboration and coming up with not only appealing but a functional and printable model.

Greece

The piloting of the project was held in the last week of September 2019.

With the participation of 20 teachers and 126 students, we hold classes using the 3D printing technology. During the piloting period, the group of teachers put in practice/test the FUN@SCIENCE methodologies teaching their study program. They had the technical support-where needed- and they experienced this new tool with their students.

Some photos of this event are present at
https://www.facebook.com/funatscience/posts/456772044999512

5. Overall Conclusions and Recommendations

All the participating countries have formulated conclusions and recommendations for the future based on the results of the project. Even if the project was positive for the majority, some countries made recommendations. Firstly, the conclusion of the project allows us to see the importance of

digital competences in the school curricula. The project has brought a lot of positive things for the involved students professionally and personally. However, the training of teachers who can use the 3D printing technology in their curricula programmes can take time and it can sometimes be very complex.

Italy

The implementation of FUN@SCIENCE activities in Italy points out the importance of digital competences in the school curricula in terms of the value of the digital curriculum in the school since primary school and the specific contribution of 3D content and methodology.

The opportunity offered by the Fun@Science training awakened the teachers' curiosity, so the trainers had the chance to highlight the opportunities that 3D printer methodology can offer. The students who participated to the piloting learning experience acquired and improved their technical and logic skills, as well as the soft skills such as problem solving, team work and communication.

At the end of Fun@science project implementation, the following results were achieved:

- Establishing the role of technologies in the development of European key competences.
- Integration of traditional learning methodologies with the digital tools in order to introduce the innovation of the teaching/learning process.
- Identification of the elements of learning about the use of 3D printers, taking into account the skills and competences produced by both the knowledge and use of programming software and machine specific software.

From the training experienced in the primary school, it turns out that, despite the great results in 3D design achieved by the children, there were some difficulties in using the keyboard and, being smaller, they had more difficulty in solving the small problems encountered in the design. This has meant that some of them worked side by side with other older children working less and not achieving the objectives prefixed. For this reason, it could be better to work with small group of

children with same age so to be able to guarantee them a continuous support during all the project phases, achieving the learning objectives.

Another suggestion concerns the training of teachers who can use the 3D printing technology in their curricula programmes. The technical and procedural complexity of the software requires having longer training times and accompanying the work of the teachers with the support of experts who can collaborate with the classes.

Having more time and more equipment available, it will be possible to test further Fun@science Handbook activities, involving a greater number of class groups.

In technical and scientific high schools, it is suggested to increase awareness, at management level, of the use of this learning approach in order to stimulate students' interest in scientific careers. In this regard, the cooperation between the scientific faculties of Universities and high schools is of considerable importance. Academic experts should regularly organise workshops with students attending the last year of high school in order to introduce them to 3D and additive manufacturing technologies.

Anyway, schools that already have 3D printers could be made aware of the need to make greater use of it in the science subjects of the school curriculum, and it could be useful to look for tenders/calls for proposals aimed at buying adequate facilities so to enhance the 3D technology approach the future.

Poland

The opportunity offered by the Fun@Science training awakened the teachers' curiosity, so the trainers had the chance to highlight the opportunities that 3D printer methodology can offer. The students who participated to the piloting learning experience acquired and improved their technical and logic skills, as well as the soft skills such as problem solving, team work and communication.

It is recommended to incorporate the project results into the partner schools curriculum, ensuring future use by teachers as part of the teaching process. Moreover, the results of the Fun@Science

project will be disseminated throughout various educational conferences and seminars, in which the partners take part regularly.

Partners will also use the methodology of the project and recommend it, along with the remaining project results, to their stakeholders.

Portugal

Bearing in mind that new technologies were created to simplify our everyday life, it's our job as thinking beings to put those creations to good use, to widen their original purposes to each field of our expertise. The Fun@science project incorporates entities from different origins and functions, thus opening up a wide array of 3D printer uses. In the field of education, our members /partners start at the very beginning in Kindergarten and go all the way up to University.

Understanding how much a 3D printer can allow us to do and how far we can go with it in its multifaceted capabilities, has been perhaps the most important development of this programme.

In the meantime, we got to understand what this magnificent piece of technology is, how it works, how many different materials and final products can be created and how each partner will be able to incorporate those objects in their projects.

Watching an object, we created from scratch, being printed and gradually appear before our eyes, was as rewarding as opening a present we longed for on Christmas Day. Then knowing how much more captivating it will be for a child or a young student, to be able to incorporate this final product in his learning process, is indeed a priceless feeling.

To sum up this whole project just a few words of advice. The whole process of 3D printing, though fascinating as it may be, takes some time, particularly if you consider the actual printing time. Anyone planning to use it in any context has to bear that in mind. Unlike the printers we all have at home, 3D takes time, especially if you want a good finish and a really useful and resistant object.

Czech Republic

All in all, we consider the project a success. Of course, there was a limited scope and the technology is rather new to all the participants. But the idea was put in their heads that there is an affordable and attractive way how to promote certain areas of the curriculum. As for suggestions or even complaints, teachers mostly stress that the activity is time demanding and very difficult to implement into the contemporary education system which is strongly rigid. Also, the matter of having enough 3D printers to be able to serve all the pupils in a reasonable time has risen as an issue. However, the concept was accepted fondly by the teachers and many of them express the desire to promote it and take it further. the individual context of the national education system that is to be examined in order to find a way to introduce modern technologies such as 3D printing into everyday practice at schools. The question remains if 3D printing can serve all subjects well or it will be focused more on STEM.

Greece

The FUN@Science project incorporated entities from different origins and functions, thus opening up a wide array of 3D printer uses. In the field of education, our members /partners started from Kindergarten and go all the way up to University.

The understanding and exploration of the potentials of a 3D printer, has been the most important development of this programme.

In the meantime, found out what this piece of technology is, how it works, how many different materials and final products can be created and how each partner can incorporate those objects in their projects.

Watching an object, that we created from scratch, being printed and gradually appear before our eyes, has been a very captivating process for everyone, let alone for a child or a young student. To be able to incorporate this final product in their learning process, is indeed a priceless feeling.

To conclude, for anyone interested in using a 3D printer, they should bear in mind that the process of 3D printing, though fascinating as it may be, takes time, particularly if you consider the actual printing time. Unlike the regular printers, 3D printers printing time is more, especially if you want a good finish and a useful and resistant object.

5. Future Exploitation and Sustainability

To finish, the last part will summarizes the actions in the future. More and more schools will use 3D printing technology to promote technical skills. It will stimulate the student's open-mindedness and teamwork ability. The important aspect of this project is to encourage teachers about the idea of implementing technology inside their long-term projects and make the education more attractive for students. After the Fun@Science project, it's necessary to continue to work with the teachers about the technology and to help young people in their studies and future projects.

Italy

Currently, in Italy many technical/technological high schools use 3D printing technology for implementing the lessons of Mechanics, Computer Science and Graphics in three dimensions, aimed at promoting technical skills.

Therefore, it is necessary to promote and enhance 3D printing technologies in the compulsory school curriculum (primary and secondary junior school), which is still rather sporadic and not replicable.

From the testing of the Fun@science project activities, the following sustainability factors have been identified:

1. In the **compulsory school (primary and secondary junior school)** the educational model based on 3D technology could be integrated into the school curriculum in order to create learning experiences that can develop students' logical and mathematical skills, completing and deepening the activities that take place in the classroom and succeeding where traditional

lessons might fail. The use of this methodology in the school curriculum can provide different benefits: it stimulates the student's open-mindedness and teamwork ability, the development of digital citizenship and computational thinking skills, defined as the fourth fundamental competence after reading, writing and math.

2. In **secondary schools** the Fun@science educational model could be applied to the following contexts:
   - In technical drawing: creating live solid models to help students better visualize the drawings to be made with orthogonal projections, auxiliary plans, axonometries or perspectives, and in the study of shadows.
   - In chemistry field: creating models of molecules.
   - In physics field: realization of object models to better understand concepts of statics and dynamics in rigid bodies.
3. It is necessary to establish an active **collaboration between the different educational institutions - scholastic and academic** - for the elaboration of new experimental models based on 3D printing technology in order to create a set of educational models transferable to other contexts, and to compose a team able to train teachers interested in including this methodology in the daily teaching. In fact, one of the biggest challenges is overcoming the mental obstacles that teachers face when dealing with new technologies and digital tools. Promoting the integration of 3D printing technology in the curricular contents becomes an important factor of sustainability to be discussed with local and national school authorities. The Fun@science model tested in Italy will be submitted to the regional authorities under the National Digital School Plan, in order to be included among the existing good practices.

Poland

All the results of the project that have their digital form will be maintained through the project website for at least three years after the end of the EU funding. This means that they will be available

in all the Fun@Science project partners' languages, thus increasing the likelihood of more persons becoming interested in or downloading them, not only from where the project partners come from, but by anyone speaking one of the languages of the Fun@Science Consortium or English.

The access to the results of the project is and will be free and based on the principles on a Creative Commons Attribution-ShareAlike 4.0 International (CC BY-SA 4.0), which is coherent with the definition of Free Cultural Works.

Danmar will ensure the availability of the Fun@Science project results and will be storing them on own servers, hosting the project website under the current domain on own servers, updating the project website when necessary and covering all costs related to the maintenance of this website from own funds and by own human resources.

Portugal

Even though nowadays 3D printers can print other materials such as metal and wood, it is crucial to remember that in most cases plastic is the main prime material. Using the printer just to discover how it works, can lead to waste of material and therefore unsustainable practices. So, no matter how curious we are to see our projects take shape, let's not forget that if it isn't going to be really useful, we needn't print it. Although it's already possible to recycle the main material, this is still very limited. Let's hope that recycling becomes a better reality in a near future.

Czech Republic

The potential that the project discovered in the school environment is potentially vast. The crucial thing is to get the teachers behind the idea of implementing technology inside their long term projects. 3D printing should not bet the goal of the day. It is simply a powerful complement that can make certain areas of the school topics much more attractive. Therefore we will continue to work with the teachers and encourage them no to be afraid of the technology as there is really very little

that can go wrong when experimenting with it.

Greece

The piloting period showed us that the use of 3D printing technology in schools can result very beneficial for both the teachers and the students. The participating students in their majority, seemed to enjoy a lot the process of learning through 3D printing, even though at the beginning they did not know what to expect. The teachers enjoyed the process too and the strongly believe that 3D printing inside the school class can be a very powerful teaching tool. However they ensured to express their fears and concerns regarding the exploitation of such tool from public schools. What is more, teachers who are environmentally sensitive, expressed their skepticism regarding the waste of plastic at the time of printing the designed objects, therefore we think it is important to communicate to the users of 3D printers that they should not print their objects unless they are useful, in order to avoid the waste of plastic.