

## O1 - fun@science report

Working sheet – Collection of interesting practices

Rev. 01 Date 14.12.2017

### INTERESTING PRACTICE TITLE: PRINT STEM PROJECT

<b>Brief description</b>	<p>PRINT STEM project focus is to develop, carry out and validate training programs and related tools for transferrable use of 3D printers in secondary schools.</p> <p>The project goal is to overcome the students' learning difficulties with reference to mathematical and scientific literacy competences; in fact they often perceived this subjects as something abstract, unrelated to their daily experiences and perceptions.</p> <p>For this reason, it is fundamental to develop new teaching methods that promote interest and motivation for mathematics and scientific disciplines also by 3D printers, that are the new frontier in experimental teaching.</p> <p>The partnership involves 10 organizations of different and complementary nature: 5 Secondary Schools (2 IT, 1 GR, 1 Turkey, 1 UK), 1 VET centre (IT), 1 training service company of entrepreneurial association (IT), 2 IT companies (1 E, 1 PL), 1 European Development Agency (CZ).</p>
<b>Education level</b>	<p> <input type="checkbox"/> Infant school  <input type="checkbox"/> Primary School  <input checked="" type="checkbox"/> Secondary Junior School  <input type="checkbox"/> High School  <input type="checkbox"/> Other (specify) _____         </p>
<b>Reason behind the project/practice</b>	<p>In the European context, it was observed that among the causes of early drop-out from upper secondary school by students with a low level of basic competences, there is the failure in learning mathematical and scientific literacy competences and, more generally, of formal and coded languages. In 2009, in Europe, the figure for students with insufficient abilities in science related subjects, according to the PISA standard, was 17%, the share of European students who did not reach a sufficient score in mathematics was 21%.</p> <p>It is important to contrast this lack of interest towards such disciplines and the progressive abandonment of subjects that provide an important asset in the European labor market, because this is a market that offers many employment possibilities to people with those skills.</p>
<b>Aims and objectives</b>	<p>The PRINT STEM project aim is to decrease the number of 15-years aged European students with insufficient skills in the field of mathematics and science, to less than 15% by 2020.</p> <p>The general objectives are developed, carrying out and validating training programs and related tools for transferrable use of 3D printers in secondary schools, so to transfer and adapt good practices of partner countries who have already tested their effectiveness in their respective schooling/training systems.</p>

Proj. n. 2017-1-PT01-KA201-035929

*This project has been funded with support from the European Commission.*

*This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.*

<b>Implemented activities and final outcomes</b>	<p>The project activities have been:</p> <ol style="list-style-type: none"> <li>1) analysis-study of the potential application of 3D print technology to experimental teaching of mathematics and science(IO1);</li> <li>2) guidelines for the setting up of an interdisciplinary team of teachers for experimental teaching with 3D printer, thus they will get new teaching approaches (IO2);</li> <li>3) elaboration of 5 extracurricular project work programmes (independent learning and pupil-led experimentation) (IO3);</li> <li>4) realisation of 5 experimentations aimed at the mediation of abstract concepts in mathematics teaching (teach-led experimentation), accessible as OER (IO4);</li> <li>5) implementation of 5 experimentations aimed at the mediation of abstract concepts in the teaching of physical and natural sciences (teach-led experimentation), accessible as OER (IO5).</li> </ol> <p>The impacts registered was:</p> <p>On students: over 85% with higher appreciation of the experimental methodology in comparison to traditional didactic methods and average reduction by 7% of low achievers in Math and Science ex-post experimentations.</p> <p>On STEM teachers: development of new competences related to experimental and innovative didactics.</p> <p>On schools: innovation of own pedagogical context, improvement of effective didactic teaching of STEM subjects, validated introduction of 3D printer use in curricula activities, 10 new school-business partnerships with local companies for the carry out of work-based learning experiences with use of 3D printers, increase in reputation on the territory and increase in number of students enrolled in the schools.</p> <p>On technology/business oriented organizations: 6 new cooperation with local schools, development of know-how in development of experimentations with use of 3D printers for didactical aims.</p>
<b>Approach and methodologies</b>	<p>The students worked with an interdisciplinary approach on teaching subjects with innovative technical approach, they use the methodology of learning by doing.</p> <p>Teachers led lessons where the focus has been on 'made logic' so it wasn't necessary to have constant access to the printer. However, during learning, where experimentation and refinement is a central learning strategy, students' easy access is crucial.</p> <p>Moreover, the project has implemented two possible approaches in the use of a 3D printer in schools, called "SIMPLE approach" and "ADVANCED approach". Is important to point out that the choice of one method did not exclude the use of the other one at a later time; in both of them the role of the student was fundamental: students haven't been mere observers but they were prompted to work, suggest solutions and ask questions to attain the best results. In both of them the teachers following the students during the process must have a good knowledge of the software they were using for modeling</p>

	objects, scaling them and interacting with the printer.
<b>Target groups</b>	<p>The project involve the secondary schools students and teachers as well as technician assistant.</p> <p>The aim of this project is testing the possibilities of exploitation of 3D Printers in Schools to enhance aged 15yr old students' capabilities in STEM subjects, which is when the greatest drop off occurs for schools in Europe.</p> <p>The students were divided in group sizes of over 15, the access for individual learners to the hardware would not be possible within the normal lesson context unless multiple devices are utilized. Small sub groups of around 5 students could be formed who would then work independently of the main group, with the support and supervision of a technician or teaching assistant enabling a far more manageable learning environment.</p>
<b>Duration</b>	The project lasted 2 years, it started on 01 September 2014 and finished on 31 August 2016.
<b>Main strength and weaknesses</b>	<p><b>Strenghts</b></p> <ul style="list-style-type: none"> <li>• Development of skills very relevant for finding a job in the future.</li> <li>• Possibility to use, or integrate, 2 different approaches on the basis of students' previous competences.</li> <li>• Concretely bring closer students to scientific disciplines.</li> <li>• Development of new cooperation at local level.</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• The action could be also addressed to students of junior and primary schools so to develop earlier the attitude to scientific disciplines.</li> </ul>
<b>Lead organisation</b>	<p><i>Name of organisation:</i> Istituto di Istruzione Secondaria Superiore "A. Berenini"</p> <p><i>Type of organisation:</i> School/Institute/Educational centre – General education (secondary level)</p> <p><i>Mission:</i> The technology institute from city Fidenza, Italy with longlasting history provides high quality education in technical fields such as mechanization, automatization and chemistry.</p>
<b>Partner organisation</b>  (add rows for each partner)	<p><i>Name of organisation:</i> Istituto Istruzione Superiore "C. E. Gadda"</p> <p><i>Type of organisation:</i> School/Institute/Educational centre – Vocational Training (secondary level)</p> <p><i>Mission:</i> Institute from Italian Fornovo of Taro is specialized in scientific subjects – ICT, chemistry, biology, mechanics – and in economical subjects.</p>
<b>Partner organisation</b>	<p><i>Name of organisation:</i> Cisita Parma s.r.l.</p> <p><i>Type of organisation:</i> School/Institute/Educational centre – Vocational Training (tertiary level)</p> <p><i>Mission:</i> For more than 25 years Cisita Parma Srl. contributes to the business development and supports different aspects of the management and human resources development</p>
<b>Partner organisation</b>	<p><i>Name of organisation:</i> Kirkby Stephen Grammar School</p> <p><i>Type of organisation:</i> Other</p> <p><i>Mission:</i> Grammar school which provides education for about 400 boys and girls aged between 11 and 19 excels at sport and is also well known for the amazing range of extra-curricular activities.</p>
<b>Partner</b>	<i>Name of organization:</i> SABANCI MESLEKI VE TEKNİK ANADOLU LİSESİ

Proj. n. 2017-1-PT01-KA201-035929

This project has been funded with support from the European Commission.

This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

<b>organisation</b>	<p><i>Type of organisation:</i> School/Institute/Educational centre – Vocational Training (secondary level)</p> <p><i>Mission:</i> Modern technical and vocational high school.</p>
<b>Partner organisation</b>	<p><i>Name of organization:</i> Danmar computers</p> <p><i>Type of organization:</i> Small and medium sized enterprise</p> <p><i>Mission:</i> Danmar Computers Company was established in 2000 as a IT company. The main objective of activities are trainings and IT system implementations. Since 2004 company has participated in many European educational projects.</p>
<b>Partner organisation</b>	<p><i>Name of organization:</i> Asociación de Investigación de la Industria del Juguete, Conexas y Afines (Spain)</p> <p><i>Type of organization:</i> Other</p> <p><i>Mission:</i> AIJU is a research centre specializing in toys, children’s products and leisure, based in Spain. AIJU provides technological innovation as a tool to improve Competitiveness and Enterprise Development.</p>
<b>Partner organisation</b>	<p><i>Name of organisation:</i> Forma Futuro Soc. Cons. a r.l.</p> <p><i>Type of organisation:</i> Accreditation, certification or qualification body</p> <p><i>Mission:</i> Consulting and education agency specialized in human capital development from Parma provides training and professional courses and consultancy services.</p>
<b>Partner organisation</b>	<p><i>Name of organization:</i> 1 Epal of Chania</p> <p><i>Type of organisation:</i> Other</p> <p><i>Mission:</i> Educational institution from city Chania, Greece focusing on financial services marine sector, construction industry, agriculture and the environment.</p>
<b>Partner organisation</b>	<p><i>Name of organization:</i> Evropská rozvojová agentura, s.r.o.</p> <p><i>Type of organisation:</i> Other</p> <p><i>Mission:</i> EUDA European Development Agency is a EU-wide network of experts in regional development, innovation, education and evaluation based in Prague, Czech Republic.</p>
<b>Financing Body and Programme</b>	<p>The project was co-funded by ERASMUS+ Programme within Key Action 2 “Cooperation for innovation and the exchange of good practices” and within Action Type “Strategic Partnerships for school education” through INDIRE Italian National Agency.</p>
<b>Project area intervention</b>	<p><input checked="" type="checkbox"/> International (IT, GR, TK, UK; PL; CZ)</p> <p><input type="checkbox"/> National</p> <p><input type="checkbox"/> Local</p>
<b>Webpage</b>	<p><a href="http://www.printstemproject.eu/">http://www.printstemproject.eu/</a></p>