

DECODE



The European Digital Pattern for Education

Author:

Antonio Cocozza

Maria Chiara De Angelis

Concetta Fonzo

Stefania Nirchi

Mario Pireddu

Emanuela Proietti

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Foreword

The present report is part of the first intellectual output of the DECODE PROJECT - DEvelop COmpetences in Digital Era. Expertise, best practices and teaching in the XXI century, an Erasmus+ KA2 - Strategic Partnerships in the field of Education.

DECODE moves from:

- the awareness that the Information and Communication Technology (ICT) is an increasingly important economic sector in Europe and the integration of these technologies in teaching practices and the development of teachers' digital competences could be strategic in this field;
- the need to fill a void of information on real teaching practices.

ICT Competences in Digital Era are crucial for promoting digital literacy, media literacy, the overcoming of digital divide, the promotion of social innovation and social inclusion. Digital competences are strategic to respond the new demands of the information and learning society and to develop innovative education systems. DECODE is an action research project, which aims to create the best conditions of exchange best practices in teaching digital skills; but the main objective of DECODE is to contribute to the improvement of the school digitization processes by:

- the spread of best practices at European level, and the improvement of media and digital literacy;
- the understanding of the real organizational and educational processes, useful in providing important sources of information to policy and decision makers;
- the improvement of teachers' strategic skills in the use of ICT in education and didactical activities;
- the experiment a new training model for teachers.

For this reason DECODE has built a partnership among universities, research centers, training institutions, schools, schools associations, including various approaches and experiences. Partners of the project are:

- from Italy: Fondazione Link Campus University (FLCU); Centro di ricerca CRES-IELPO, Dipartimento di Scienze della Formazione - Università Roma Tre; ANP Associazione nazionale dirigenti e alte professionalità della scuola;
- from Spain: Fundació per a la Universitat Oberta de Catalunya;
- from Finland: Omnia, the Joint Authority of Education and Regional Center in Espoo;
- from Romania: Institutul de Științe ale Educației;
- from United Kingdom: Aspire International.

The main activities will be developed, during the next three years, following a stepwise approach. A first step regards the definition of the entire research design (IO1), which has to be shared with all partners in relation to: methodology, instruments, and outputs. In this step, DECODE will produce two important reports: a European Digital Pattern for Education and a Template for national research and tools. This report presents the Digital Pattern.



The Template is meant as a tool for sharing a frame on the digital challenges for the school in the digital era and for outlining a common shared frame.

They are prepared by Roma Tre University, in cooperation with the other Italian partners (FLCU and ANP).

These two first reports will be shared during the first meeting between all the Partners.

In a second step, DECODE aims to realize five National Researches Reports on “Training models and pedagogical teaching methods for teachers in the digital age” (IO2). Each Partner country conducts its qualitative research on the bases of IO1, identifying more interesting training models and pedagogical teaching methods for teachers to improve their digital skills and favor their incorporation of digital resources in their daily teachers practices.

In a third step, DECODE aims to produce “Guidelines for Assuring Quality in the process of Integration of ICT tools in the teaching-learning process” (IO3). Partners have to involve around 30 key actors from national and local institutions in in depth interviews based on a common standard.

In a fourth step, each country conducts a quantitative research and produces a report, titled “Practices, skills and training needs of digital teachers” (IO4), based on the results of national online survey.

During the fifth step, DECODE aims to produce the training testing to improve teachers’ competence (IO5), and then to realize a national report to share evidence of testing.

The sixth step intend to gather all intermediate national reports to elaborate the Comparative international Report. This output contains all the notes and operative tools to transfer DECODE into other contexts, countries and situations.

The seventh step explains the communication plan. This is a relevant and transversal action, which will accompany the entire project.



Introduction

With the advent of the Internet, the way to produce and manage knowledge has changed profoundly, thanks to an extraordinary technological development.

The Eurydice report (2011), Key Data on Learning and Innovation through ICT at school in Europe, recommended the promotion of innovative pedagogical approaches, to enable students to learn in appropriate ways.

The report confirms that ICT are widely promoted by the central authorities as a tool for teaching and learning but there are still major disparities regarding their implementation.

At the level of primary and secondary school, most countries recommend, or suggest, a wide range of innovative teaching methods based on active and experiential learning, to increase student engagement and help to enhance their results. There are few countries, which have already implemented e-portfolios as an approach for the evaluation, Italy being not among them. Moreover, there are not widespread training courses, or updating and validation of digital skills in school. There are few countries where there is the dissemination of guidelines for integration and enhancement ICT in educational settings and teaching processes. Few countries recommend, at the central level, the use of ICT to assess students in compulsory education, Italy being not among them.

The EU member states have recognized the importance of teacher training and they are committed, with the European Council (2007), to develop digital skills in the initial training of teachers, and to continue to promote them through the top of the support career and continuing professional development (OCSE, 2015).



1. Digital Skills: the European policies

In the following paragraphs, we will provide a recognition of the EU resolutions, recommendations and scientific projects about the development of digital skills in education. Among them, we remember in particular:

- European Digital Agenda (Europe 2020, 2010);
- Education and Training Framework 2020;
- Bologna Process Implementation (2015) and Modernization of Higher Education (2013);
- DigComp 2.0: The Digital Competence Framework for Citizens.

The current document is intended as a non-exhaustive partial overview, aimed at providing some elements related to European policies on ICT in education. The goal is to present a common pattern to the project partners, to focus the development of the political and legislative context in which is located our research.

1.1 The European Digital Agenda: the seven pillars of Europe 2020 Strategy

The Digital Agenda presented by the European Commission forms one of the seven pillars of the Europe 2020 Strategy which sets objectives for the growth of the European Union (EU) by 2020.¹ The Digital Agenda proposes to better exploit the potential of Information and Communication Technologies (ICTs) in order to foster innovation, economic growth and progress. The Digital Agenda for the decade of the digital skills development plays a central role in the initiative in order to ensure the three goals of smart, sustainable and inclusive growth of the EU countries.²

The European Digital Agenda focuses on the creation of an appropriate infrastructure to ensure sustainable socio-economic benefits through the dissemination of broadband for all and defining a clear legal framework of rights and regulation of the global governance of Internet.

An additional element in the center of the European debate is also the promotion of the member countries of actions to digital literacy and growth of specific skills to be acquired lifelong. These topics are the subject of the initiative "Agenda for new skills and jobs". The key points of the initiative contribute to promoting employment growth that in 2020 should cover 75% of people aged between 20 and 64 years.

The Union is committed to absorb the gap between the skills demanded in the labor market and those currently available, reaffirming the transversal role of ICT skills to be developed through "targeted actions to promote

¹ Cfr. Communication from the Commission of 3 March 2010 - Europe 2020 A strategy for smart, sustainable and inclusive growth [COM(2010) 2020 final – Not published in the Official Journal]

² Cfr. Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions of 23 November 2010 – *An agenda for new skills and jobs: A European contribution towards full employment* [COM(2010) 682 final – Not published in the Official Journal]



basic computer literacy for low-skilled citizens, less skilled and older workers and for workers of SMEs, but also to promote specialized and advanced skills in the field of ICT for specific professionals such as ICT specialists”³.

But what does Europe when referring to digital skills and how it seeks to enhance the digital skills among its citizens? Digital competence is considered one of the eight key competences, which provide guidelines for policy makers, education, and training agencies, organizations and all Union citizens. Digital competence is defined as:

Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.⁴

The definition then lists the skills required in the use of the main computer tools (word processing, spreadsheets, databases, relevance in the information) and the awareness efforts that European citizens are expected to make in relation to the dissemination of information and legal/ethical principles that emerge in the use of information society technologies (IST).

The European Community recognizes the critical attitude and the responsible use of new technologies as an integral part of digital competence, which therefore includes three basic dimensions: cognitive, technological and ethical dimension, that integrated allow the subject to:

- manage life’s events (develop critical thinking related with the use of ICT and know how to deal with problematic situations);
- manage change (to be able to accommodate changes produced by technological innovation).
- be a social subject (to be part of a community and interact with it).⁵

The question is whether the education and training systems have taken up the challenge of an integrated education to ICT. The problem for the education and training system can not be reduced to a banal question of technology infrastructure and access. The relational and social factor is of considerable importance and can not be ignored.

The European Digital Agenda states that “it is essential to educate European citizens to use ICT and digital media and particularly to attract youngsters to ICT education”. In the previous Commission Recommendation 2009/625/EC of 20 August 2009 on media literacy in the digital environment, the EU highlighted the need to develop European citizens’ ability to better understand and analyse the media messages and content they

³ Cfr. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *A Digital Agenda for Europe I** COM/2010/0245 final *

⁴ Cfr. Recommendation 2006/962/EC of the European Parliament and of the Council of 18 December 2006 on *key competences for lifelong learning* [Official Journal L 394 of 30.12.2006].

⁵ Cfr. Istituto dell’Enciclopedia Italiana, *Enciclopedia Scienza e Tecnica – Informatica*, Vol VII, 2012.



encounter and to acquire the skills, which will enable them to play their role of citizen fully. In this direction between the actions outlined by the Digital Agenda, we remember:

- to consider digital literacy and competences as a priority for the European Social Fund regulation (2014-2020);
- to develop tools to identify and recognise the competences of ICT practitioners and users, linked to the European Qualifications Framework and to EUROPASS and develop a European Framework for ICT Professionalism to increase the competences and the mobility of ICT practitioners across Europe⁶.

1.2 European Education and Training framework and the digital competences

European Countries are responsible for their own education and training systems, but the EU helps them set joint goals and share good practices. The EU policies, initiatives and strategies in Education and Training are designed to tackle youth unemployment by improving young people's skills and employability. EU policy is designed to support national action and help address common challenges, such as ageing societies, skills deficits in the workforce, technological developments and global competition. Education and training 2020 (ET 2020) is the framework for cooperation in education and training. ET 2020 is a forum for exchanges of best practices, mutual learning, gathering and dissemination of information and evidence of what works, as well as advice and support for policy reforms. In order to ensure the successful implementation of ET 2020, Working Groups composed of experts nominated by member countries and other key stakeholders work on common EU-level tools and policy guidance. Funding for policy support and innovative projects is available through Erasmus+ for activities that promote learning and education link to another EC website at all levels and for all age groups. In 2009, ET 2020 set four common EU objectives to address challenges in education and training systems by 2020:

- 1) Making lifelong learning and mobility a reality;
- 2) Improving the quality and efficiency of education and training;
- 3) Promoting equity, social cohesion, and active citizenship;
- 4) Enhancing creativity and innovation, including entrepreneurship, at all levels of education and training.

The following EU benchmarks for 2020 have been set for education:

- at least 95% of children (from 4 to compulsory school age) should participate in early childhood education;
- fewer than 15% of 15-year-olds should be under-skilled in reading, mathematics and science;
- the rate of early leavers from education and training aged 18-24 should be below 10%;
- at least 40% of people aged 30-34 should have completed some form of higher education;
- at least 15% of adults should participate in lifelong learning;
- at least 20% of higher education graduates and 6% of 18-34 year-olds with an initial vocational qualification should have spent some time studying or training abroad;
- the share of employed graduates (aged 20-34 with at least upper secondary education attainment and having left education 1-3 years ago) should be at least 82%.

⁶ <https://ec.europa.eu/digital-single-market/en/download-scoreboard-reports>



Progress on the EU benchmarks is assessed annually in the Education and Training Monitor. The European Commission and the Council of the European Union have agreed on common priorities in the area of education and training for 2020. The focus will now be on the effective implementation of those priorities, in particular through the ET2020 Working Groups.

In 2014, the Commission and EU countries engaged in a stocktaking exercise to assess progress made since the 2012 Joint Report and help prepare the next priorities for cooperation in education at European level. Drawing on the conclusions from the stocktaking, the European Commission has proposed six new priorities for 2016-2020.

The following EU new priorities for 2020 have been set for education:

- 1) Relevant and high quality skills and competences, focusing on learning outcomes, for employability, innovation and active citizenship;
- 2) Inclusive education, equality, nondiscrimination and promotion of civic competences;
- 3) Open and innovative education and training, including by fully embracing the digital era;
- 4) Strong support for educators;
- 5) Transparency and recognition of skills and qualifications to facilitate learning and labour mobility;
- 6) Sustainable investment, performance and efficiency of education and training systems.

In particular, related to priority 2, a more active use of innovative pedagogies and digital skills and tools is required. In fact, several Member States report initiatives to increase teachers' and learners' digital skills and one third have introduced national strategies for digitalisation of education. Still, huge challenges remain. The digital revolution is boosting demand for digital skills and competences; education and training must address this need, which requires investment in infrastructure, organisational change, digital devices and digital competences of educators, and the creation of digital (and open) educational resources and high quality educational software. Education and training should reap the benefits of new ICT developments and adopt innovative and active pedagogies, based on participatory and project-based methods. Open learning environments can help collaboration between educational sectors including for disadvantaged learners. Linked to the above priority, there is a strong need to support educators. Nowadays, many Member States report measures for enhancing teacher training and emphasize that initial education and the continuing professional development of teachers and trainers should be fit for purpose, combining subject matter, pedagogy and practice. Educators should be trained to deal with the growing diversity of learners, prevent ESL and use innovative pedagogies and ICT tools in an optimal manner, while enjoying induction support early in their careers. Staff shortages increasingly hinder quality instruction in many countries, while interest in teaching careers is in decline. Comprehensive long-term strategies are required to select the most suitable candidates, with diverse backgrounds and experiences, considering that the profession has a strong gender bias, offering them attractive career prospects.



Furthermore, digital learning and recent trends in Open Educational Resources (OER)⁷ are enabling fundamental changes in the education world, expanding the educational offer beyond its traditional formats and borders. New ways of learning, characterised by personalisation, engagement, use of digital media, collaboration, bottom-up practices and where the learner or teacher is a creator of learning content are emerging, facilitated by the exponential growth in OER available via the internet. Furthermore, access to information, rapid changes in the world of work and the increasing diversity of societies require different competences from all people – they need to be active, able to adapt and learn continuously. The Key Competences Framework, prepared by experts from 31 countries and European level stakeholders, helped policy makers, education and training providers, employers and learners themselves in reforming education and training systems to respond to these challenges. The key competences are:

- 1) communication in the mother tongue;
- 2) communication in foreign languages;
- 3) competences in maths, science and technology;
- 4) **digital competence**;
- 5) learning to learn;
- 6) interpersonal, intercultural and social competences, and civic competence;
- 7) entrepreneurship;
- 8) cultural expression.

The Commission has adopted the **Recommendation of the European Parliament and the Council on key competences for lifelong learning**, as a European framework of basic skills to be provided through lifelong learning which was originally requested in the Lisbon conclusions in 2000. The proposal is one of the concrete outcomes of the Education and Training 2010 work programme and aims to encourage and facilitate national reforms by providing, for the first time at the European level, a reference tool on key competences that all citizens should have for a successful life in a knowledge society⁸. Many of the competences in the Framework⁹ (as for e.g. digital competences) cannot be taught in 'traditional' ways but require new approaches in organising learning. Teachers need to work together with each other, with the local community and deal with heterogeneous groups. Obviously, teachers also need new competences and continuous learning in order to respond to these new challenges. The Commission is working with Member States on this issue with a view of proposing a

⁷ Open Education Resources (OER), as defined by UNESCO in 2002, are "teaching, learning or research materials that are in the public domain or released with an intellectual property license that allows for free use, adaptation, and distribution". Open Education (OE) is a wider concept that refers to practices and organisations aiming at removing barriers to entry to education. OER are a part of OE, which has received a strong push through the use of ICT. For further information please consult the UNESCO website on OER: <http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/open-educational-resources>.

⁸ The Recommendation calls for Member States to ensure that all young people are given the possibility to develop the package of 8 key competences by the end of initial education and training and that a specific attention is paid to disadvantaged learners. In order to enable all adults to learn, maintain and update their key competences, the Recommendation calls for comprehensive infrastructures and coherent strategies, developed in collaboration with social partners and other stakeholders.



Recommendation related to teacher training. In the last years, a large number of countries have introduced reforms that explicitly use the Key Competences framework as a reference point. Good progress has been made in adapting school curricula. But there is still much to be done to support teachers' competence development, to update assessment methods, and to introduce new ways of organizing learning, as mentioned in **Education and Training 2020, Work programme - Thematic Working Group 'Assessment of Key Competences', Literature review, Glossary and examples.**

Across the EU, reforms have streamlined curricula. They have introduced national standardised tests; established an infrastructure of literacy, maths and science centres; created teacher networks and continuing professional development; and stepped up action to improve digital and media literacy. Nevertheless, underperformance remains and addressing low achievement is now urgent. Moreover, The quality of education relies on a mix of different educational materials. To achieve this, wider access and use of OER needs to be accompanied by clear quality standards and mechanisms to assess and validate skills and competences acquired through it. Education and training institutions, which have not yet integrated OER, should also seek cooperation with technologically more advanced educational providers in order to meet the expectations of digital-born learners. Teachers tend to acquire ICT teaching skills through initial education rather than through professional development; it is essential that they are well equipped to embrace the potential of the new technologies in the way they teach, in order to stimulate and engage learners. **The quality of their teaching has a direct effect upon learners' attainment.** High quality and well trained teachers can help learners develop the competences they need in a global labour market based on ever higher skill levels, and evidence shows that a primary influence on learners' performance is the quality of teaching and learning. However teachers now face unprecedented challenge, including the need to insert new tools and technologies in their teaching methods. So, while the use of ICT in education and training has been high on the policy agenda, critical elements are not in place to enable digital learning and OER to be mainstreamed across all education and training sectors. A coherent strategy at EU level could address the scope, size and complexity of the challenges in support of actions of the Member States and the entire chain of stakeholders.

1.3 ICT and the modernisation of Europe's higher education

The high level group that produced the report "Modernisation of Higher Education. Improving the quality of teaching and learning in Europe's higher education institutions" (June, 2013) highlights three areas of emerging key skills that seem to identify the profile of a teacher who wants to compete with the challenges of the digital era:

- **Communication skills** through which educators (teachers/tutors) can facilitate the learning process. It can be considered central skills both in face to face as in online training;
- **Social and leadership skills** that appear relevant to how many (teachers and tutors) are compared continuously with dynamic group management, diversity and conflict;
- **Digital skills** for integration/enhancement of ICT in educational practices.

The group recognizes the great value of ICT in higher education in terms of:



- 1) new opportunities and challenges for formal education systems,
- 2) free and open access to knowledge for all,
- 3) new forms of delivering education (open and massive open online courses - OOCs and MOOCs -, blended teaching and learning, and using ICT to enhance 'traditional' ways of delivering education),
- 4) redefinition of the role of students and teachers in the learning process (who, then will be the teacher?).

For all these reasons, the report emphasizes that: higher education institutions – facilitated by public administrations and the EU – should support their teachers so they develop the skills for online and other forms of teaching and learning opened up by the digital era, and should exploit the opportunities presented by technology to improve the quality of teaching and learning. (Recommendation 11)

The document is still a step forward with the recommendation 13, where it recalls the need to:

- promote innovative teaching and learning methodologies and pedagogical approaches to encourage guidance, counseling and coaching;
- improve the design of educational programs, taking into account the results evidenced in the most recent researches on learning;
- organize professional training and development of teachers, trainers and staff involved in educational processes;
- make a periodic and systematic collection of data on issues affecting the quality of teaching and learning.

The communicative approach is therefore central in determining the teacher-student relationship and the way it handles the interactions in the group (classroom climate, encouragement, respect, trust, etc.). These elements are essential dimensions in defining the quality of the learning process, because different communication methods produce different types of learning and trigger different behavior patterns.

According to these recommendations, teachers will have to learn to:

- create and edit digital audio;
- use blogs and wikis to generate platforms for learning;
- use digital images, audio/video content for their use in the classroom (virtual or not);
- learn the essential elements of computer graphics to visually stimulate students;
- use social networks;
- create and deliver presentations;
- create an e-portfolio of contents;
- have knowledge about online safety;
- be able to detect plagiarism in the student's work;
- acquire knowledge on copyright.

These guidelines also highlight the elements that distinguish a quality teaching. We can summarize them in four main statements:

- 1) the best teaching helps students to question their preconceptions, and motivate them to learn;
- 2) quality teaching and learning has broad horizons, taking place in a research-rich environment;
- 3) university, facilitated by public administrations and the EU should support teachers to develop skills for online learning and other innovative teaching methods;



- 4) online learning quality is not only a challenge for the classroom but a challenge for the entire model of education.

Bologna Process Implementation Report “**The European Higher Education Area in 2015**” also underlines the importance of innovative learning and teaching through new technologies and Open Educational Resources (OER). In particular, the document highlights the role that in a near future will have the massive open online courses (MOOCs) as new internationalisation instruments. Currently the share of higher education institutions offering MOOCs is very low and is rarely above 10 %. A notable exception is Spain where 30 % of institutions are offering MOOCs. In addition, in Ireland and the United Kingdom (Scotland), they are relatively common. MOOCs are most numerous in Spain (over 200 courses) and the United Kingdom (over 150 courses). The current situation of higher education in Europe still shows critical issues, among them for our purposes we wish to highlight:

- Student-centred learning, based on carefully planned goals, remains underdeveloped.
- The potential of digital technologies to transform learning and teaching has not yet been grasped everywhere.

1.4 DigComp 2.0: The Digital Competence Framework for Citizens

The Digital Competence Framework for Citizens (also known as DigComp) was developed by EC JRC IPTS on behalf of DG Education and Culture and it was first published in 2013 by the European Commission.

It is a tool to improve citizens’ digital competence, help policy-makers formulate policies that support digital competence building, and plan education and training initiatives to improve the digital competence of specific target groups.

From 2013 up until now, DigComp has been used for multiple purposes, particularly in the context of employment, education and training, and lifelong learning. The DigComp framework has been well received and taken up by various stakeholders. This versatile instrument is used for various purposes in the context of education, training and employment, as follows: 1) Policy formulation and support; 2) Instructional planning for education, training and employment, 3) Assessment and certification.

In 2016 DigComp was updated by JRC in its conceptual reference model, through a revision of vocabulary and descriptors (the competence areas, the competence descriptors and their titles). It is a phase 1 of the update of the framework. The phase 2 will include further refining the DigComp proficiency levels for the 8 levels of learning outcomes, which will be validated in the course of 2016. The JRC will also continue to monitor the implementation of the DigComp framework at regional and national levels and ensure that it is up-to-date and policy relevant in the future.

DigComp identifies the key components of digital competence; 5 areas and 21 competences. Each competence is presented in the same format including a title and a descriptor. DigComp 2.0 keeps the same overall structure of 5 competence areas, but with a change in the name of competences (in italics):

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1. Information *and data literacy*;
2. Communication *and collaboration*;
3. *Digital* content creation;
4. Safety;
5. Problem Solving.

Also competence descriptors are changed as a result of a detailed mind-mapping exercise that was conducted in order to reflect the scope of each competence. In the Annexes the document contains also tables with cross-references between DigComp and the UNESCO'S MIL (Media and Information Literacy Curriculum for Teachers - 2011), the UNESCO "Global Media and Information Literacy Assessment Framework" (2013) and e-CF. Review and comparative tables are available in the Report [DigComp 2.0: The Digital Competence Framework for Citizen](#).



2. Research studies and projects on ICT in education

To understand a possible state of the art of the use of ICT in school, it is useful to refer also to the most recent surveys, commissioned by the EU, and to international projects, founded by the EU. They may represent a starting point for our research and suggest new research topics.

Survey of Schools: “ICT in Education”

In 2013, we especially underline the contribution of the survey **ICT in Education**. This study was commissioned in 2011 by the European Commission (Directorate General Communications Networks, Content and Technology) and it collects and benchmarks information from 31 European countries (EU27, HR, ICE, NO and TR) on the access, use, competence and attitudes of students and teachers regarding ICT in schools. The Survey is one of a series within the European Union’s cross-sector benchmarking activities comparing national progress towards the Digital Agenda for Europe (DAE) and EU 2020 goals. The Survey was Based on over 190,000 responses from students, teachers and headteachers collected and analysed during the school year 2011-12, and it was conducted in partnership between European Schoolnet¹⁰ and the University of Liège (Service d’Approches Quantitatives des faits éducatifs, Department of Education). From the survey, it is clear that students perceive themselves more capable in the safe usage of the internet browsing and less competent in the responsible use of the information.

A key finding of the survey shows that, across countries surveyed, students are more confident in their digital competences when they have high access to/use of ICT at home and at school compared to students having low access/use at school and high access/use at home, or low access/use at both places. Around 50% of students at grade 8 and 11 in vocational education still have yet high access/use at home, but low access/use at school; it decreases to 35% at grade 11 in general education. Even more alarming is that between 18-28% of students, depending on the grade, have low access to/use of ICT at home as well as at school.

As regards the teachers’ confidence in using ICT, teachers who are confident in using social media is substantially lower than those taught by teachers confident in operational ICT¹¹. The survey shows that teachers

¹⁰ Cfr. <http://www.eun.org>

¹¹ **Operational ICT skills** are the fundamental skills needed to use generic ICT tools (e.g. Word, Excel, Outlook, PowerPoint) to function in the information society and in working life. They therefore include key computer and internet skills. For the purposes of this survey, teachers’ operational ICT skills comprise the following: production of text using a word processing programme; capturing and editing digital photos, movies or other graphics; editing online text containing internet links and images; creating a database; editing a questionnaire online; emailing a file to someone/another student or teacher; organizing computer files in folders and subfolders; using a spreadsheet; using a spreadsheet to plot a graph; creating a presentation with simple animation functions; creating a presentation with video or audio clips; and downloading and installing software onto a computer. **Social media skills** enable users to interact and collaborate with each other as consumers of user-generated content in a virtual community. For the purposes of this survey, teachers’



do not use frequently ICT in teaching activity, to communicate with students' parents, to follow the remote work of the students and to assess learning both ex post and in itinere.

The survey focuses a positive correlation between teachers' and students confidence in their operational and social media skills and the participation respectively in professional development and the participation in the school-specific programs aimed at promoting safe and responsible use of the internet. This results confirm the value of a systemic and integral approach to the development of digital skills, which not only limits to ensure access to the network and the infrastructure, but to support teachers and parents in their role as competent support for young digital natives, cultivating critical thinking and responsibility.

From this awareness, in recent years, the European Commission states the great responsibility that the school has in the promotion of critical thinking and creativity of students, for most of which, the approach to ICT takes place in informal settings. EU needs to shift the focus on cross-cutting and ethical responsibilities, emphasizing how people construct themselves and relationships with others, conforming their conduct to the reference values, and investing in the emotional side.

The survey shows that ICT provision and use in European schools is improving but several obstacles remain.

- **Infrastructure constraints:** teachers still believe that insufficient ICT equipment is the biggest obstacle to ICT use in many countries.
- **Methodological limitations:** whilst teachers are using ICT for preparing classes, ICT use in the classroom for learning is infrequent. Teacher training in ICT is rarely compulsory and most teachers devote spare time to private study.
- **Policy constraints:** students and teachers have the highest use of ICT and ICT learning-based activities when schools combine policies on ICT integration in teaching and learning. However, most schools don't have such an overarching policy. Therefore it is not surprising that teachers generally believe that there is a need for radical change to take place for ICT to be fully exploited in teaching and learning.

In summary, the 'recipe' suggested by findings of the Survey of Schools: ICT and education could be termed the '**5C approach**':

- Capacity building, through sustained investment in teachers' professional development
- Concrete support measures, accompanying specific policies at school level
- Combined policies and actions, in different policy areas within a systemic approach
- Country-specific support, addressing large differences and degrees of ICT provision and implementation
- Competence development: these four actions directed at effectively and dramatically increasing young people's digital competence and the key competences described in the European framework.

social media skills are more precisely defined as consisting of the following: the ability to participate in an online discussion forum; the ability to create and maintain blogs or websites; and the ability to participate in social networks.



Living Schools Lab Project

The project **Living Schools Lab** was a two-year project, funded by the 7th Framework Programme of the European Commission and it ended in September 2014. It was coordinated by European Schoolnet, not-for-profit organisation, which aims to bring innovation in teaching and learning to key stakeholders: Ministries of Education, schools, teachers, researchers, and industry partners.

The main goals of the project are to create:

- **A sustainable, growing network of primary and secondary schools**, based around regional clusters, that showcase and share best practice and ways to successfully embed the use of technology in teaching and learning (T&L) across the whole school.
- **A strong community of practice**, with supporting continuous **professional development opportunities for teachers**.
- **Opportunities for schools to get involved in action-based research**, creating links with outside partners including industry and other pan-European projects.

The objectives of the project are:

- To establish a pan-European network of 'living schools' demonstrating and showcasing a diverse range of innovative pedagogical practice involving ICT.
- To identify successful strategies for taking change management to scale – moving from a single class to ICT being embedded across the whole school.
- To establish a sustainable **Living Schools Lab (LSL)** network of schools offering a baseline validation methodology and service for future projects and research.
- To promote a dynamic system of 'living schools' encouraging change and organic growth with new schools joining the network of LSL schools.
- To create a strong community of teachers, with access to continuous professional development to help them with changing pedagogical practice.
- The two-year Living Schools Lab project promoted a whole-school approach to ICT use, scaling up best practices in the use of ICT between schools with various levels of technological proficiency:
 - Advanced Schools, where **technology is embedded** in teaching and learning across the whole school.
 - Advanced Practitioner Schools: where technology is only **partially embedded** within the school.

The participating schools were supported through peer-exchanges in regional hubs, pan-European teams working collaboratively on a number of themes, and a variety of opportunities for teachers' ongoing professional development.

Each partner country has selected two Advanced Schools (AS). These will be joined by five Advanced Practitioner Schools (AP) to form the first regional hubs in year one.

- Group AS1 (1 secondary + 1 primary at each country) = 24 schools
- Group AP1 (3 secondary + 2 primary at each country) = 60 schools
- Countries involved France, Italy, Lithuania, Portugal, UK, Cyprus, Czech Republic, Austria, Belgium, Ireland, Norway and Finland.

The schools within the network have benefited from:



- **Regional hubs** – They served as meeting points for schools from the same region. During the hub meetings (online and/or face-to-face) the teachers developed the teaching practice through peer exchanges, learn of different school strategies and given examples.
- **Collaborative work around ICT themes** – The current LSL schools worked around six themes (incl. interactive technologies, 1:1 devices, and collaborative learning) and showcase their best practices for each.
- **Learning Snacks** – The Living Schools Lab provided various Continuing Professional Development (CPD) opportunities for teachers. These CPD "snacks" could be short Twitter discussions, practitioner-led webinars, or topic-specific webinars. The participation was free and open to all those interested in developing their teaching practice and discovering tips and ideas to try out in schools and classrooms.
- **The LSL training course for whole school development** – Based on the project's findings and recommendations, a full length training course was available for school leaders interested to improve and strengthen their school's ICT and change management strategies.
- **ICT audit** – The LSL schools completed an ICT audit and benchmark their school scores against the European/country-based averages.
- **Opportunity to become a LSL validation school** – Part of the LSL schools was invited to take part in validation studies or providing feedback on new technologies provided by European projects and industry partners.
- **Support for schools' development plans** – LSL case studies, findings and recommendations provided a firm starting point to any school wanting to set goals, plan strategies and take them into action.

The main outputs resulting from the LSL project are summarised as follows:

- 1) Involvement of sharing practices in schools (outputs: Over 70 best practice videos shared by LSL schools to demonstrate their practice; a series of articles presenting the schools participating in the Living Schools Lab network);
- 2) Sharing the methodology used and insights from the observation visits (outputs: observation blog, a final report covering the observation visits to schools, country case studies produced with the support of the national coordinators);
- 3) Professional Development of teachers (outputs: A library of over 30 short, online learning events for teachers and schools, a collaborative schools professional development course developed from observation visits.
- 4) Validation (outputs: a manual for EC projects, companies and organisations interested in running validations in schools in Europe, access to the network of validation schools, a consultancy services from the European Schoolnet validation experts).

21st Century European Classrooms

The project **21st Century European Classrooms: meeting the challenge of the digital era with innovation and creativity** is a two-year project, funded by the Erasmus+ Programme (Sub-programme: Cooperation for innovation and the exchange of good practices; Action: Strategic Partnerships addressing more than one field). It lasted from 2014 to 2016 and it was indicated - during the selection phase - as a good practice.

It departs from the assumed need of diminishing the gap between the digital use of technology inside and outside the School and also the need to be creative and innovative by using digital tools and strategies incorporating



ICT techniques. In schools and in classes, it is important to be able to keep amazing about learning and teaching. Improving skills, exchanging good practices and building new dynamics for classroom in a ICT and digital context, allows students and teachers to potentiate the evolution needed towards the future classroom. Teachers are fundamental to potentiate the evolution needed towards the future classroom.

Today's teachers are confronted with mastering the huge amount of digital skills and simultaneously also challenged by the need to be updated and to be innovative and creative in a world where the digital format constitutes an indispensable bridge towards the day by day reality of the students. The idea is to reinforce digital bridges of communication in a learning and teaching context, seeking to perform good practices concerning strategies and tools that can be of use and help, both for students and teachers, in the classrooms or more broadly in the school, understood as an open space of learning and teaching meaningful experiences.

To keep up with the ICT dynamics and to use them adequately in classroom context, it is a challenge where the school is always a bit late. Being conscientious of such a gap, nevertheless the schools cannot afford to stand still or too late. So the project is about students and teachers around Europe, in several and diverse contexts and with plural ways of relate with ICT technologies, in different kinds of classrooms, gathering experiences of different ways of dealing with the challenges mentioned above, defining and assuming good practices and creating school dynamics that facilitate overcoming some difficulties or problem situations regarding the digital era and the needs to obtain better performance by the European classrooms in the 21st century.

The project aims to face some challenges:

- Mastering the huge amount of digital skills;
- Being updated, innovative and creative (using ICT);
- Using ICT adequately in a classroom context;
- Diminishing the gap between the digital use of ICT inside and outside Schools;
- Approaching on ICT impacts in a wider range of subjects, ages, themes and classes.

Its main goals are to:

- Reinforce digital bridges of communication (in a learning and teaching concept);
- Perform good practices concerning strategies and tools that can be of use and help, both for students and teachers;
- Gather experiences of different ways of dealing with the mentioned challenges, defining and assuming good practices and creating school dynamics that facilitate the overcoming of some difficulties or problem situations regarding the digital era;
- Obtain better performance in the European classrooms in the 21st century;
- Seek for innovative classroom management, appealing to ICT resources and strategies;
- Debate and develop awareness on steps needed and taken in different schools (with different backgrounds and different kinds of solutions or ways to deal with sometimes similar problems).

The transversal nature stated by the project goals, both for students and for teachers, creates a greater impact dimension for the wanted results at the end of the projects. As curriculum concerns, this transversal approach on digital and ICT impacts in wider range of subjects, ages, themes and classes.



The partnership is trans-sectorial: it was coordinated by the Agrupamento de Escolas de Atouguia da Baleia (Portugal) and had as partners the “Fundação Calouste Gulbenkian (Portugal), the “Miejskle Gimnazjum nr 1 im. Jana Pawła II z siedziba wKnurowie” (Poland), the “IIS Vittorio Emanuele II” (Italy), the “IES Las Banderas” (Spain), the “SOUEE Konstantin - Kiril Filosof” and Promethean Limited (United Kingdom).

There is a wide range of educational systems and contexts to provide a good foundation for debating the issues and to address the work needed to build a good framework for the good practices notebook, understood as an open document to grow along the growth of the digital dynamics and evolution on education fields.

The project has as fundamental goals, not only the exchange of experiences, building and sharing of good practices, skills improvement and pedagogical materials product in, but also the need for teachers around Europe debate and develop awareness on steps needed and taken in different schools, about the theme of this project, with different backgrounds and different kind of solutions or ways to deal with sometimes similar problems. Other goals intended by this project are: the joined investigation on subjects concerning the mainstream underlined on this project title, regarding education, ICT and pedagogy; the production of materials to spread debates and the good practices awareness, departing from the partner countries and sharing with others, using ICT ways (etwinning for instance).

Finally, even foreign language improvements will certainly be achieved by the participants and constitute an important way of reaching the idea of Europe identity. This project is about presenting and exchanging innovative projects among the partners, to eventual sharing activities with the other teacher around Europe, seeking an innovative management of the psycho-pedagogical classroom, appealing to ICT resources, tools and strategies. It's all about experiences exchange aiming for the improvement in classroom work, objectifying strong and weak point in the use of the digital ways in class.

The final product of the project is a presentation in context of some of the **good practices** founded during its progress and it represents an open document to be added with more testimonials of good practices presented by educational institutions or other stakeholders wanting to share them with the European public.

This notebook is about presenting and exchanging innovative projects among the partners, to eventual sharing activities with the other teacher around Europe, seeking an innovative management of the psycho-pedagogical classroom, appealing to ICT resources, tools and strategies. It is all about experiences exchange aiming for the improvement in classroom work, objectifying strong and weak point in the use of the digital ways in class.

The basic assumption of the project is that a good practice can only be considered a true good practice when reporting/referring to a given specific context, and in a different context could not be so. Partners are aware of the weight of the context, therefore they underline how and how much it is important always relativize the specific good practices evidenced: it is possible only to say that practice works in that context.

The notebook is organized in different chapters:

- Chapter 1 - Future Classroom: creativity and innovation;
- Chapter 2 - Effective Communication and successful learning and teaching;
- Chapter 3 - Internet and Web tools in the 21st century education;



- Chapter 4 - Future Classroom: students' evaluation system;
- Chapter 5 - Digital Literacy on students and teachers;
- Chapter 6 - Interactive Pedagogy: the use of educational aimed tools.

For each chapters, partners try to explain to readers what a future classroom is - for each school partner of the project - using creativity and innovation in that scenario. They try to show what they think that can be the future dynamics inside classroom that they have already started in their schools. They do this throughout interactive presentations, videos and presentation schemes of good practices implemented.

Chapter 1 - Future Classroom: creativity and innovation

The future classroom has to be a place that nourishes creativity and that is also a “room” for innovation. Pedagogical innovation, renewed interaction dynamics, strong competences on presentation and exchanging ideas and thoughts; a place to be happy and to learn and share at the speed of the brain. It is not important to debate on what we can call “future classroom”, because it is about something that is already here, not in the future, but now. At least, today, for some of us, not for others, because our contexts and structures are different, as different are our society demands and expectations. So for us, the future classroom might be the school knowledge place where the most recent learning scenarios are in place articulating with pedagogical approaches that use the advantages of the technology and of the science advances to get a better education for our students. It's the place in schools where the innovation and creativity should be more stimulated and where the most advanced notions of education are putted in place to get the best results for educational goals.

Chapter 2 - Effective Communication and successful learning and teaching

A major issue for a teaching and learning successful process is to render the communication effective. That means the quality of the communication, as well as the language, the channels, the understanding of the participants is fundamental to get things done in matter of education. The digital language cannot stand outside schools as if it was a lesser way of communication, not worthy of the school universe. The digital language is the language of students and using it inside classes is narrowing the gap between school and the 21st century. Usually the School, namely teachers, have entered the new millennium in adelay facing the challenges that the communication and technological revolution as set in motion. Most schools still stand analogical in a digital Era, dealing with digital native students.

Chapter 3 - Internet and Web tools in the 21st century education

Good practices presented in this chapter are specifically related to the structuring axes of the Educational Project, namely: the importance of the bilingual education with a strong component of ICT in the curriculum and in the day by day practice in classroom. Also the cooperative learning and the diversity of students' levels, are fundamental conditions to understand the selected good practices on effective communication. There were several issues that have stimulated the development of the underlined practices, such as: the importance of sharing information with other teachers, students and parents; the existence of problems in getting a successful communication using the traditional ways: ordinary mail, letters, students' diaries. Also a demanding situation was some lack of creativity in spite of technology presence in classrooms, sometimes caused by the excess of



individual work (isolation of teaching/learning process). In the other hand there was an increasing concern and interest in adopting new ways of communication using ICT.

Chapter 4 - Future Classroom: students' evaluation system

The assessment is one of the most important tasks for the teachers and students involved in improving their learning and teaching activities. To have a clear, available, immediate information on the learning and teaching activities can make the difference and will allow teachers and students to develop adequate strategies and activities to improve their results and accomplishments. Using ICT in assessment is one of the clearest advantages of the digital world in its articulation with the educational field. The impact of immediate response, the systematic structure of assessment data gathering and the reduction of the delay on feedback of student's assessment allows all the educational community to participate in the improvement of the educational process.

Chapter 5 - Digital Literacy on students and teachers

Digital literacy is emerging in school and education as an important issue to address considering the specific problems raised by the information society. To be able to select information, to determine the accuracy and the reliability of the information at the disposable of a single mouse touch is a task to consider so we can free our school digital users of the dangers/risks and the misuses of the digital tools and information. New needs, new possibilities raising ethical issues and new problematics in accessing to knowledge and sensible information. To grant students and teachers the tools to deal with the digital era positively and take advantage of its potential.

Chapter 6 - Interactive Pedagogy: the use of educational aimed tools

The recent evolution in the educational digital market, has produced a considerable amount of diverse educational aimed tools in the digital dominium. However the quality and the huge amount of such tools present a challenge, both for teachers as well as for school management in order to select quality tools and needed ones. It is very important to salute the investment of stakeholders in the production of software and hardware with educational main purposes. That kind of investment is supported by research and most of the time by a tremendous attention payed to school environment, stakeholders needs (mainly teachers, students, parents) and to the pedagogical issues presented by nowadays educational system. It is very important the partnership that several schools are establishing with technological companies in order to get more adequate tools responding to the needs of the 2st century school.

C2Learn project

C2Learn was a three-year research project (November 2012 – October 2015) supported by the European Commission (EC) through the Seventh Framework Programme (FP7), in the theme of Information and Communications Technologies (ICT) and particularly in the area of Technology-Enhanced Learning (TEL) (FP7 grant agreement no 318480). The C2Learn project proposed and tested concrete ways in which current understanding of creativity in education and creative thinking, on the one hand, and technology-enhanced



learning tools and digital games, on the other hand, can be fruitfully combined to provide young learners and their teachers with innovative opportunities for creative learning.

The aim of the C2Learn project was to **design an innovative digital gaming and social networking environment** incorporating diverse computational tools, the use of which can **foster co-creativity in learning processes in the context of both formal and informal educational settings**. The C2Learn project was implemented by a consortium comprising expertise of the highest level and quality in diverse areas, including: educational, cognitive and philosophical research with emphasis on creativity in education and creative thinking; educational practice and educational policy making; learning technologies research and development, knowledge representation and acquisition research and technologies, digital games research and technology; and the digital games industry. This consortium co-designed and implemented the proposed innovation in systematic interaction and exchange with stakeholders following participatory design and participative evaluation principles. The designed innovation has been implemented and tested in and around school communities, covering the spectrum from upper primary education to the end of secondary education and beyond (learner ages from 10 to 18+ years).

C2Learn has been focused on innovating methodologically by designing a game-based creative learning environment on conceptual foundations based on recent research-based understandings about creativity. The project team introduced two non-linear thinking processes (heuristic devices in fostering creativity, as Diagrammatic Reasoning and Emotional Reasoning) based on recent results of cognitive science research on the roots of reasoning and its relation to emotion and representation. They implemented these non-linear thinking methodologies in game environments in order to enhance the motivational component and to enrich the manner and opportunities of engagement with these activities. The aim was to find a way to use digital gaming and social networking technology to promote creative thinking in children and the young. This theoretical background is coupled in the C2Learn project with a direct link to real-life educational practice, which places the design process in continuous interaction with innovative teaching and learning communities. An additional technological challenge addressed was interoperability of generated content with existing Learning Technology standards-conformant Learning Management Systems, so as to maximise the impact and exploitation of the generated content itself, and to enable existing educational content to be reused within the context of the C2Learn Digital Game Environment.

The Project partners: Ellinogermaniki Agogi (EA), University of Edinburgh (UoE), Open University (OU), NCSR "Demokritos", The University of Malta (UoM), Denmark Serious Games Interactive (SGI), Austrian Ministry of Education and Culture (BMUKK).

The **main goals of the project** were:

- **to define a clear and detailed methodology comprising the conceptual framework, the issues at stake, and the parameters** which need to be addressed in the project from a theoretical perspective, so that the design of the C2Learn game-based creative learning environment will be based on solid conceptual groundings and strongly innovative propositions relating to creativity in education and creative thinking, originating in acclaimed cutting edge theories in pedagogy, cognitive science and philosophy.



- to **provide the necessary gaming infrastructure and integrate all tools in a unified gaming and creative learning environment**, through the design of the gaming scenarios, the development of the methodology and tools supporting mixed model (human – human, human – machine) content generation, the development of the game engine, and the integration and deployment of the C2Learn system and user-end environment.
- to **select, adopt, adapt, design and develop appropriate computational tools** that will be embedded in the C2Learn digital game environment, through customizing existing state-of-the-art semantic reasoning tools; extending existing, or developing new, computational tools for diagrammatic reasoning; developing new computational tools supporting emotive reasoning; developing a user profiling service; and, finally, defining the interoperability specifications for the C2Learn computational tools, so that they can be integrated in a unified digital gaming and creative learning environment.
- to test the use of the designed technology and corresponding pedagogical interventions and evaluate their impact in real-life educational settings, by carrying out focused experiments embedded in the wider context of in-depth qualitative case studies, closely involving users in continuous participatory design and evaluation within stakeholders' communities of practice developed around the project.
- to disseminate the messages and outputs of the project widely in Europe and beyond through targeted communication actions addressing all stakeholders (school communities including teachers and students as well as parents, educational administrators, teacher trainers, curriculum designers and educational policy makers, the pedagogy, cognitive science and philosophy academic communities, technology-enhanced learning experts, game design and game-based learning experts, knowledge representation experts, the gaming and educational technology industries).
- to exploit the results of the project at the European level as well as at national and institutional level, making them easily available to stakeholders and all interested parties, through carefully designed exploitation work.
- To manage the research project efficiently so as to assure in-time delivery of best-quality project outcomes according to the work plan, effectively addressing any organisational and operational issues that may arise, and maintaining a close coordination with the European Commission.

The C2learn consortium partners have built strong relations with national and international projects and networks in order to disseminate the outcomes of the project and to build synergies in related initiatives. The efforts to build a community of interested and motivated stakeholders around the project has yielded many other interesting results, including active links for potential collaboration in the third project year with schools, creative learning clubs, and university researchers in many places in Greece. What is more, close collaboration of the C2Learn project, through EA, with large-scale European networks such as Open Discovery Space (<http://opendiscoveryspace.eu>) and Inspiring Science Education (<http://www.inspiring-science-education.net>) contributed a lot to C2Learn community building and extended dissemination and exploitation possibilities in Europe.

The **main exploitable outcome** of the project was **the C2Learn solution: an integrated solution offered to schools as well as to a wide spectrum of spaces of non-formal and informal learning** (from museums and camps to groups of friends and families) so that they can gamefully foster creative thinking and co-creativity in their learning activities. The solution was integrated but also modular: it makes sense to use it as a whole; at the same time its various components have their independent identities and potential usefulness as tools in other contexts. The components of the solution were the following:



- *the C2 Space*: a gameful web-based environment for co-creativity and learning, which can be deployed in diverse ways depending on preference and data protection considerations: from being installed within an institution such as a school for own use, to being accessed as a service.
- *the C2 Experiences*: games and playful applications; some of these can be used both as integral components of C2 Space and independently as stand-alone applications, and some as stand-alone applications only.
- *the C2Methodology*: a conceptual and pedagogical framework enabling a complete gameful creative learning experience, ready to support diverse uses of C2 Space and C2 Experiences.

All the project deliverables are available for further use and exploitation mainly through the project website as well as through appropriate alternative routes. In relation to digital prototypes produced by the project, in particular, most C2Learn components, with the exception of the APKs of the games/gamified demonstrators, are made available as open source software. The source code of the services implementing the C2 Learn Computational Tools produced by NCSR-D is available under the GPL v3.0 license. It is available to download via GitHub, a popular code hosting platform. All services implemented by UOM (C2 Assistants) are also made available under the GPL v3.0 license and hosted at C2 Learn and UOM webpages as well as GitHub.

The consortium developed initiatives with potential for both short-term impact, i.e. impact even before the end of the funded project period, as well as long-term, sustained impact after the completion of the project. It became high priority for the consortium to disseminate the now publically presentable prototypes intensively and widely, exposing the C2 Learn solution to motivated users not only in the context of narrowly defined piloting, but also in the context of extrovert communication initiatives which complemented and enhanced the main piloting activities. A central element in the final public image of the project as reflected in its updated website is 'c2challenges'. The 'creativity challenges' format was inspired by the successful 'Algebra Challenges' of the Center for Game Science at the University of Washington, USA, as a platform that will allow regular repetition of contests with the participation of large numbers of students and teachers.

The partner Ellinogermaniki Agogi (EA) has decided to implement, beyond the end of the funded project period, a programme of international teacher training courses on the use of C2Learn outcomes and, through this, more widely on game-based and creativity-enabling learning approaches in education. Therefore, EA added 'c2academy' to the final public image of the project as reflected in its updated website. This was a continuation of the efforts for the organization of C2 Learn summer schools in the previous project years. Under the motto 'c2academy, let's develop', the project invited education professionals to join c2academy to explore how they can foster creativity in education, how they can use student-engaging games in this effort, how educators can design learning activities to this end, as well as how they can involve students as creative agents in this design.



Annexes

Researches and projects summary tables

Research Summary Table
Title: "Survey of Schools: ICT in Education"
Programme: The Survey was commissioned in 2011 by the European Commission (Directorate General Communications Networks, Content and Technology) to benchmark access, use and attitudes to ICT in schools in 31 countries (EU27, Croatia, Iceland, Norway and Turkey).
Research question and goals:
<p>The survey was based on over 190,000 responses from students, teachers and headteachers collected and analysed during the school year 2011-12, and it was conducted in partnership between European Schoolnet and the University of Liège (Service d'Approches Quantitatives des faits éducatifs, Department of Education).</p> <p>The main goal of the study is to develop indicators and gathering and analysing data on students' use, competence, and attitudes to ICT through:</p> <ul style="list-style-type: none"> a detailed benchmarking snapshot in time of ICT in Europe's schools (section 1-6); a deeper analysis of trends over time and of the patterns and inter-relationships that emerge from the data (sections 7 and 8). <p>The main areas of investigation are:</p> <ul style="list-style-type: none"> • Students' digital competence and attitudes towards ICT • Students' ICT use in /out of classroom • Teachers' professional ICT use in/out of classroom • Teachers' attitudes towards pedagogical ICT use • School infrastructure, connectivity and ICT access • School leadership in ICT and ICT for pedagogy
Methods (design, participants, materials, procedures)
<p>The survey looks at four different school levels, which are described in terms of grades, as is the convention in OECD and other studies The collected data from schools (school heads), classrooms (teachers), and students at ISCED 1 level 1 (primary level of education), ISCED level 2 (lower secondary level of education) and ISCED level 3 (upper secondary level of education).</p> <p>Three questionnaires were created and piloted in schools in France and the United Kingdom before being Translated into 23 languages and published online:</p> <ul style="list-style-type: none"> A questionnaire focused on head teachers (SC), A questionnaire focused on classroom teachers (TE)



<p>A questionnaire for two groups of students (ST): those at ISCED 2 (grade 8 – 13.5 years old on average) and those at ISCED 3 (grade 11 – 16.5 years old on average); All questionnaires contained closed questions, on facts (e.g. access to ICT and use) and on opinions (on statements, for example). The sample design is a two-stage stratified cluster sampling .</p>
<p>Results</p>
<p>The survey shows that ICT provision and use in European schools is improving but several obstacles remain. Infrastructure constraints: teachers still believe that insufficient ICT equipment is the biggest obstacle to ICT use in many countries. Methodological limitations: whilst teachers are using ICT for preparing classes, ICT use in the classroom for learning is infrequent. Teacher training in ICT is rarely compulsory and most teachers devote spare time to private study. Policy constraints: students and teachers have the highest use of ICT and ICT learning-based activities when schools combine policies on ICT integration in teaching and learning.</p>
<p>Key implications for our research</p>
<p>Research design and results may be a start point for our research, especially in referring to IO4</p>
<p>Link: https://ec.europa.eu/digital-single-market/en/survey-schools-ict-education Data: https://ec.europa.eu/digital-single-market/en/news/ict-education-essie-survey-smart-20100039</p>

<p>Research Summary Table</p>
<p>Title: “Living Schools Lab Project”</p>
<p>Programme: The project was funded in 2011 by the 7th Framework Programme of the European Commission.</p>
<p>Research question and goals:</p>
<p>The research was coordinated by European Schoolnet and it involved 15 partners, including 12 Ministries of Education. The main goal of research was to propose a whole school approach to technology supported change through the development of:</p>



A sustainable, growing network of primary and secondary schools, based around regional clusters, that showcase and share best practice and ways to successfully embed the use of technology in teaching and learning (T&L) across the whole school.

A strong community of practice, with supporting continuous professional development opportunities for teachers.

Opportunities for schools to get involved in action-based research, creating links with outside partners including industry and other pan-European projects.

Methods (design, participants, materials, procedures)

LSL Project promoted best practices in the use of ICT between schools with various levels of technological proficiency:

Advanced Schools, where technology is embedded in teaching and learning across the whole school.

Advanced Practitioner Schools: where technology is only partially embedded within the school.

The participating schools were supported through peer-exchanges in regional hubs, pan-European teams working collaboratively on a number of themes, and a variety of opportunities for teachers' ongoing professional development. LSL outputs include:

network of schools in regional hubs;

a framework to help schools consider the school environment supporting change;

collaborative schools course for teachers and practitioners;

free resource (best practice videos, trainer's guide for development of collaborative schools course; webinar events for teacher professionalization, case studies, a validation manual for European Commission projects, companies and organizations interested in running validations in schools in Europe).

Results

The project LSL confirms the value of:

regularly exchange between schools (LSL regional hub), policy makers and funding authorities to share information;

a school learning and teaching strategy that embeds the use of technologies across the curriculum for all students;

staffing and professional development;

a minimum specification of technology for teaching and learning spaces (es. A robust WIFI access for all classrooms);

involvement of students in whole school development providing valuable feedback about the use of technology;

physical and virtual spaces used to support teaching and learning;

Partnership and networking to encourage a culture of collaboration within the school to help support change.

Key implications for our research



The LSL project shows the value of partnership and networking to promote methodological innovation in school at different level (school regional hubs, policy makers and funded authorities, students, parents and other ICT professional stakeholders). Furthermore the project enhances a multidimensional approach to the use of ICT in school, considering also the socio-organizational dimension. The project is a value good practice for the development of IO2.

Link: <http://isl.eun.org/>

Research Summary Table

Title: 21st Century European Classrooms: meeting the challenge of the digital era with innovation and creativity

Programme: Programme: Erasmus+ 2014-1-PT01-KA200-001006

Research question and goals:

Its main goals are to:

Reinforce digital bridges of communication (in a learning and teaching concept);

Perform good practices concerning strategies and tools that can be of use and help, both for students and teachers;

Gather experiences of different ways of dealing with the mentioned challenges, defining and assuming good practices and creating school dynamics that facilitate the overcoming of some difficulties or problem situations regarding the digital era;

Obtain better performance in the European classrooms in the 21st century;

Seek for innovative classroom management, appealing to ICT resources and strategies;

Debate and develop awareness on steps needed and taken in different schools (with different backgrounds and different kinds of solutions or ways to deal with sometimes similar problems).

Methods (design, participants, materials, procedures)

Throughout transnational meetings and some teachers training events, a space of debate and exchange of ideas and innovative projects, among teachers, has been opened.

The final product of the project is a presentation in context of some of the good practices founded during its progress and it represents an open document to be added with more testimonials of good practices presented by educational institutions or other stakeholders wanting to share them with the European public.

Results



The main result is the production of a notebook with good practices.
The notebook is organized in different chapters:
Chapter 1 - Future Classroom: creativity and innovation;
Chapter 2 - Effective Communication and successful learning and teaching;
Chapter 3 - Internet and Web tools in the 21st century education;
Chapter 4 - Future Classroom: students' evaluation system;
Chapter 5 - Digital Literacy on students and teachers;
Chapter 6 - Interactive Pedagogy: the use of educational aimed tools.
For each chapters, partners try to explain to readers what a future classroom is - for each school partner of the project - using creativity and innovation in that scenario. They try to show what they think that can be the future dynamics inside classroom that they have already started in their schools. They do this throughout interactive presentations, videos and presentation schemes of good practices implemented.

Key implications for our research

It represents an interesting excursus of good practices concerning the use of ICTs in school.
From each chapter of the notebook it is possible to take good examples of methods and tools to develop the use of ICT in school.

Link:

<http://ec.europa.eu/programmes/erasmus-plus/projects/eplu-project-details-page/?nodeRef=workspace://SpacesStore/fdc04775-b49b-400c-ad86-074f390a8e01>
<http://www.21digitalclass.com/>

Research Summary Table

Title: "C2Learn project"

Programme: three-year research project (November 2012 – October 2015) supported by the European Commission (EC) through the Seventh Framework Programme (FP7), in the theme of Information and Communications Technologies (ICT) and particularly in the area of Technology-Enhanced Learning (TEL) (FP7 grant agreement no 318480).

Research question and goals:

The research was coordinated by the educational organization Ellinogermaniki Agogi (EA) and involved 7 partners, including 1 Ministry of Education and Culture. The main goal of the project was to design an innovative digital gaming and social networking environment incorporating diverse computational tools, the use of which can foster co-creativity in learning processes in the context of both formal and informal educational settings. The C2Learn project had the following specific objectives:



to provide the necessary gaming infrastructure and integrate all tools in a unified gaming and creative learning environment, through the design of the gaming scenarios, the development of the methodology and tools supporting mixed model (human – human, human – machine) content generation, the development of the game engine, and the integration and deployment of the C2Learn system and user-end environment.

to select, adopt, adapt, design and develop appropriate computational tools to embed in the C2Learn digital game environment, through customizing existing state-of-the-art semantic reasoning tools; extending existing, or developing new, computational tools for diagrammatic reasoning; developing new computational tools supporting emotive reasoning; developing a user profiling service; defining the interoperability specifications for the C2Learn computational tools, so that they can be integrated in a unified digital gaming and creative learning environment

to test the use of the designed technology and corresponding pedagogical interventions and evaluate their impact in real-life educational settings, by carrying out focused experiments embedded in the wider context of in-depth qualitative case studies

to disseminate the messages and outputs of the project widely in Europe and beyond through targeted communication actions addressing all stakeholders (school communities including teachers and students as well as parents, educational administrators, teacher trainers, curriculum designers and educational policy makers, etc).

Methods (design, participants, materials, procedures)

A clear and detailed methodology comprising the conceptual framework, the issues at stake, and the parameters which need to be addressed in the project from a theoretical perspective, in order to base the design of the C2Learn game-based creative learning environment on solid conceptual groundings and strongly innovative propositions relating to creativity in education and creative thinking, originating in acclaimed cutting edge theories in pedagogy, cognitive science and philosophy.

C2Learn co-creativity involves novelty emerging through a process of ‘possibility thinking’ (PT) – the transition from what is to what might be through ‘what if’ thinking (enquiry) and ‘as if’ thinking (imagining). Inherent within C2Learn co-creativity is attention to impact of creative outcomes in terms of the immediate and wider context. This ethically framed creativity therefore foregrounds the role of values in generating fundamental small-scale creative change (quiet revolutions). This conceptualisation also attends to how creative activity generates change in the makers as well as change by the makers (a process of becoming through making and being made). This ethically framed co-creativity or wise, humanising creativity (WHC) involves within it, creative emotional reasoning (CER). CER is an umbrella term and refers to: a principled, unifying theory of non-linear thinking techniques that foster co-creativity within C2 Learn’s computational tools. CER is premised on a notion of creativity as an intervention resulting in reframing. Intervention involves ‘stepping into’ C2Learn participants’ thinking and creative process in order to change how the participants are thinking and acting. With CER embedded within a set of creative learning tools the aim is to disrupt established routines and patterns. CER is embedded within WHC to foster co-creativity. The aim is to seek an organic fusion that will provide WHC with additional structured techniques taking advantage of and further enabling WHC’s creativity opportunities. And in return CER is housed within a much-needed ethical and cultural framework and the most appropriate conditions for fulfilling its potential. Developed theoretically alongside WHC is the idea of Living Dialogic Space (LDS). These spaces are characterised by debate and difference, openness to action, working ‘bottom up’, and different modes of idea exchange, and have been connected in previous projects with the facilitation of WHC.



One of the main challenges in creating C2Learn's Assessment Methodology was to productively integrate a mixed methodology which seeks to document change, as well as the lived experience of engaging in the C2 Space learning environment. Tools: Gameplay/Discussion data forms, Video data capture, Creativity wheels, Researcher field notes and interviews with teachers, Computational data.

The consortium has invested effort in building communities of educators and students around the C2 Learn project, in Austria, Greece and England. In close collaboration with these communities, research teams in the three countries gather user requirements, co-design locally appropriate solutions for the introduction of the proposed C2 Learn innovation in real life learning settings, and negotiate and plan various instances of such an introduction for the purposes of piloting and evaluation. Educational scenarios constitute that aspect of the design of the C2Learn solution which is most strongly shaped by the collaborating school communities and framed by their educational realities. They are a design tool aiming to provide input directly from educational practice, so that the innovative technologies deployed and practices introduced will correspond to the needs, circumstances, expectations and aspirations of the end users. They were intended to illustrate to the world of education the range of possibilities offered and examples of effective use of the C2 Learn solution. Educational scenarios translated learning design and game design into plans for the implementation of concrete activities in real life educational settings, predominantly in the pilots run within the project, but also in other educational settings. They were developed collaboratively with educators, and their development was interwoven with processes aiming at establishing user expectations and requirements.

Results

[Semantic Reasoning Computational Tools](#)
[Diagrammatic Reasoning Computational Tools](#)
[Emotive Reasoning and Emotion Detection Computational Tools](#)
[User Profiling and Behaviour Detection](#)
[Computational Tools Interoperability Specification](#)
[Game Design](#)
[C2Learn Content Representation](#)
[Mixed-initiative Procedural Content Generation](#)
[C2Learn Game Prototyping](#)
[C2Learn Scenarios, Use Cases and User Requirements](#)
[C2Learn User Evaluation Plan](#)
[C2Learn User Pilots](#)
[Co-creativity Evaluation Analysis](#)
[Knowledge Kit](#)

Key implications for our research

The project deals with Information and Communications Technologies (ICT) and particularly in the area of Technology-Enhanced Learning: it worked on concrete ways to understand and promote technology-enhanced learning tools and digital games, and creative thinking in education, combined to provide young learners and their teachers with innovative opportunities for creative learning. Innovative digital gaming and social networking environment incorporate diverse computational tools, to foster co-creativity in

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learning processes in the context of both formal and informal educational settings. The innovation was co-designed, implemented and tested in systematic interaction and exchange with stakeholders following participatory design and participative evaluation principles, especially school communities covering a learner age spectrum from 10 to 18+ years. Research design and results may be interesting for our research, especially in referring to IO2.

Link: <http://project.c2learn.eu/>