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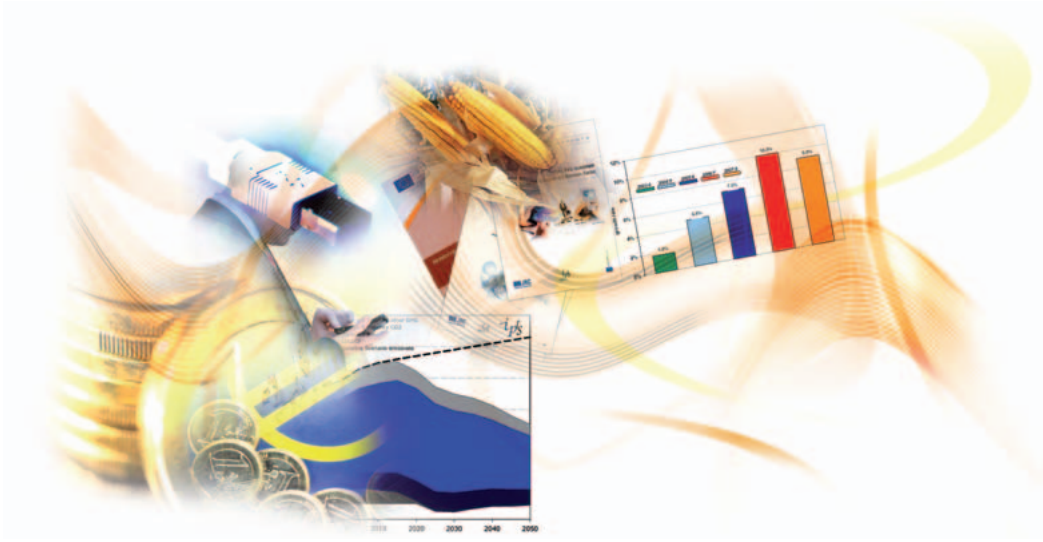
Creative Learning and Innovative Teaching

Final Report on the Study on Creativity and Innovation in Education in the EU Member States

Authors: Romina Cachia, Anusca Ferrari, Kirsti Ala-Mutka and Yves Punie



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ipts Institute for Prospective Technological Studies

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The mission of the JRC-IPTS is to provide customer-driven support to the EU policy-making process by developing science-based responses to policy challenges that have both a socio-economic as well as a scientific/technological dimension.

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Preface

This report is the final report of a project on 'Creativity and Innovation in Education and Training in the EU27 (ICEAC)' carried out by the Institute for Prospective Technological Studies (IPTS) under an Administrative Agreement with DG Education and Culture, Directorate A, Unit A3. This project aims to provide a better understanding of how innovation and creativity are framed in the national and/or regional education objectives and applied in educational practice at primary and secondary school level. It collects and analyses the present state of affairs in the Member States as regards the role of creativity and innovation in primary and secondary schools. The project started in December 2008 and the following methodological steps were taken:

- A scoping workshop (held in Seville on 23-24 February 2009);
- A literature review on the role of creativity and innovation in education by IPTS;[1]
- A report on the analysis of curricula by empirica;[2]
- A report on a teachers' survey conducted by IPTS and European Schoolnet and analysed by IPTS with the support of the University of Seville;[3]
- Interviews with educational stakeholders by Futurelab and IOE;[4]
- A report on good practices by Futurelab and IOE;
- A validation workshop (held in Seville on 1-2 June 2010);
- This final report.

More information on the project can be found at:
http://is.jrc.ec.europa.eu/pages/EAP/iceac.html

More information on current and past projects on ICT for learning can be found at:
http://is.jrc.ec.europa.eu/pages/EAP/eLearning.html

The studies and results of the IPTS Information Society Unit can be found on the Unit website:
http://is.jrc.ec.europa.eu

1 http://ftp.jrc.es/EURdoc/JRC52374_TN.pdf
2 http://ftp.jrc.es/EURdoc/JRC61106_TN.pdf
3 http://ftp.jrc.es/EURdoc/JRC59232.pd
4 http://ftp.jrc.es/EURdoc/JRC59833_TN.pdf

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Executive Summary

The importance of creativity and innovation in addressing the economic, environmental and social crises has been recognized in policy discussion in Europe. Recent policies call for the strengthening of Europe's innovative capacity and the development of a creative and knowledge-intensive economy and society through reinforcing the role of education and training in the knowledge triangle and focusing school curricula on creativity, innovation and entrepreneurship. It has been recognized that schools and initial education play a key role in fostering and developing people's creative and innovative capacities for further learning and their working lives.

Notwithstanding the intensive policy discourse in this area, there is little research or evidence on the status, barriers and enablers for creativity and innovation in compulsory schooling at a European level. This report aims to fill this gap by collecting evidence on creativity and innovation in education in schools in the EU27. Evidence comes from a literature review, a survey with teachers, an analysis of curricula and of good practices, stakeholder and expert interviews, and experts workshops. This report elaborates and synthesises the data and results gathered from each phase of the study.

It is argued that creativity, in the educational context, should be conceptualized as a transversal and cross-curricular skill, which everyone can develop. Therefore it can be fostered but also inhibited. This report proposes five major areas where effort and improvement is needed to enable more creative learning and innovative teaching: namely, curricula, pedagogies and assessment, teacher training, ICT and digital media, and educational culture and leadership.

Curricula: The study shows that the terms 'creativity', and 'innovation' and their synonyms are mentioned relatively often in the EU27 curricula. Many teachers and education experts however, feel that the curricula in their countries do not, as yet, sufficiently encourage creativity and innovation, mainly because they are not clear how creativity should be defined and how it should be treated in learning and assessment. Furthermore, curricula are often overloaded with content, which reduces the possibilities of creative and innovative learning approaches in practice. This study highlights the need for the revision of curricula, so as to provide a consistent definition of creativity, and better guidance on how teachers should develop creativity and innovation in practice and encourage development of cross-curricular competences. Consultation and dialogue with all educational stakeholders, including parents or their representatives, in revising curricula may be a benign and participatory form of promoting debate and reflection on a shared understanding of quality and vision in education where creativity and innovation are encouraged.

Pedagogy and assessment: In terms of pedagogical practices, the teachers who participated in this study have highly positive views about the importance of creativity and innovation in education. They claim to encourage learning activities which are likely to allow students to be creative and also aim to foster skills and abilities that enable creativity and innovation. Despite such claims, it has been observed that conventional ways of teaching related to teacher-centred methods, frontal teaching and chalk and talk prevail in a good majority of schools in the EU27. Primary level teachers were more likely than secondary teachers to promote creative learning skills and abilities and active learner-

centred learning approaches in class. While teachers' lack of skills and confidence is one of the main reasons for creative practices, other factors - namely, tight timetables, overloaded curricula, lack of support in the class, too many pupils per teacher and a school culture that does not support new methods - were also highlighted. Teachers tend to be isolated and lack support and hence seem to prefer to encourage convergence and discipline instead of divergence because it is easier to handle in class.

The process of assessment comes up throughout the study as a major issue which affects school practice and culture, as it is both an enabler and a barrier for creative learning and innovative teaching. In most countries, grades and summative assessment are the main type of assessment, especially in secondary schools. However, examples of more versatile ways of assessing students, such as assessment through presentations, group work, peer feedback and portfolios, were also noted. There is resistance to changing the traditional assessment practices, as parents, teachers, and even students often consider grades as the most significant way of giving feedback about learning. This highlights the importance of dialogue and networking with all the educational stakeholders in order to support children's learning in creative and innovative ways. Furthermore, the study stresses the importance of accompanying curricula reforms with the revision of national exams and the principles of quality assessment for schools. Changes in learning objectives cannot be implemented in practice if assessment for pupils and schools remain the same.

Teacher training: In order to develop creative learning approaches, it is crucial that teacher training prepares new teachers to become reflective practitioners able to discern how a teaching method or activity can stifle or trigger creativity in their students. Results from this study show that teachers who were trained on creativity held more positive views about its relation to education. Similarly, teachers who had received training in ICT were more likely to sustain that new technologies are important for learning. This study also shows that teachers with most interest for innovation and changing pedagogic methods were those who have already some years of experience of teaching practice after the initial training. This suggests that while major improvement in Initial Teacher Training (ITT) is needed in the EU27, as only a quarter of the teachers surveyed considered that they had learnt how to teach during ITT, it is also important that more effort is dedicated at understanding teachers' life histories and trajectories. Teacher training programmes must be reviewed and revised to ensure that they promote diverse and innovative teaching methods, digital competence and teaching cross-curricular competences with plenty of hands-on classroom practice and efficient guidance. In addition, facilitating professional development of confidence and capabilities in enabling teachers to take creative risks within traditional and cautious systems is also important. The potential of the internet as a space where peer learning and interaction with outside experts could take place should be further exploited and existing European networking activities such as eTwinning should be more effectively promoted among all schools and teachers.

ICT and digital media: This study highlights the potential of Information Communications Technology (ICT) in enabling innovative and creative school environments. Technologies play a crucial role in learners' lives and can act as a platform to foster creative learning and innovative teaching. However, for ICT's potential for change to be realised, a policy drive is needed. Teachers who responded to the survey mostly use the Internet for retrieving information and for downloading or preparing resources. Only half of them used the Internet for collaboration and networking. Technologies are far from exploited for creative and innovative purposes in the classroom. Furthermore, despite the increase in the numbers of computers in schools, our survey results show that hands-on access for pupils

remains very low. Allowing students to play with the tools could enhance pupils' motivation to think, understand and learn in innovative ways. There is a need for personal and pedagogical digital competence for both teachers and students.

More research should be undertaken on how technologies are appropriated by teachers, in order to support them in developing more efficient pedagogical and innovative usage of the technologies for learning. Results from this study also demonstrate that the potential of new technologies for creative learning and innovative teaching cannot be exploited unless teachers' proficiency in using ICT and the quality of ICT in schools is improved, software in different languages is provided and more space for interaction between teachers and students is allowed. There is a strong need for pedagogic training which empowers teachers with the required ICT skills to help their students become digitally competent on the one hand, and for guiding students towards more exploratory and creative interaction with ICT tools on the other hand. Results from the best practice examples also show that enabling interaction between teachers and outside experts could be highly beneficial in terms of learning in innovative and creative way.

Educational culture and leadership: It becomes clear from the study that major changes are needed in the overall educational culture towards more creative learning and innovative teaching. People outside the classroom, such as school leaders, national policymakers and pupils' parents should also be involved in this change. Creativity and innovation are often perceived to be present in the school culture, however, they are often not a priority. Therefore, innovative teachers' personal classroom practice is not necessarily aligned with the culture they experience as their working context, nor is it rewarded or appreciated by school leaders. This highlights the importance of school leadership in supporting and appreciating teachers' efforts in implementing innovative pedagogic practices and experimenting with them. There is a need for a holistic strategy for implementing change towards more creative learning and teaching, taking into account curricula, assessment, teacher training, and funding, with joint dialogue between all stakeholders. The European Year 2009 of Creativity and Innovation had visible effects in most of the countries studied and similar European and national awareness raising events should be organised.

Throughout this report, it has been argued that educational actors have the power to unlock the creative and innovative potential of the young. However, they require substantial support, especially in terms of training, revision of curricula and assessment, and institutional change. There is a growing need for action at both national and European level to bring about the necessary changes required for an open and innovative European educational culture based on the creative and innovative potential of its future generations.

1 Introduction

"To be at the forefront of this new world, Europe needs to become more creative and innovative … The need for change and new initiative is urgent. Europe and its Member States must give full attention to creativity and innovation now in order to find a way out of the current stalemate."

Manifesto of the European Year of Innovation and Creativity (2009)

This is the final report of a study "Innovation and Creativity in Education and Training in EU27 (ICEAC)" launched by JRC Institute for Prospective Technologies in collaboration with DG Education and Culture. The study contributes to the debate on creativity in European education and training launched during the 2009 European Year of Innovation and Creativity.

The objective of the study was to provide a better understanding of how innovation and creativity are dealt with within the Member States learning objectives and practices of education and training (E&T) at primary and secondary level. The main research question of the study is: "How are creativity and innovation framed in educational objectives and practices in the EU27?" The question was approached through a variety of methods and the involvement of different stakeholders. This was done in collaboration with several researchers and research organizations. This introductory chapter describes the study context, outline and methodology. The following chapters provide the main results and messages arising from the study.

1.1 Policy context

Creativity and innovation in particular have played an important role in European policy discussions about growth and jobs during the last decade, and recently they have become even more important as a means of addressing the economic, environmental and social crises in Europe. Spring 2008 European Council recognized that a key factor for future growth is the full development of the potential for innovation and creativity of European citizens, built on European culture and excellence in science (European Council, 2008). Year 2009 was declared as European Year for Creativity in order to promote awareness and promote research and policy debate on the importance of creativity for the development of the knowledge society (European Parliament and the Council, 2008). The recently published Europe 2020 strategy (European Commission, 2010b) has launched several flagship initiatives such as "Innovation Union", "New Skills for New Jobs", "Youth on the Move", and "Digital Agenda". In these initiatives, creativity plays an important underlying role as a source of innovation, a key transversal skill and a strategic educational challenge. These are explored below.

1.1.1 Creativity as a source for innovation

Creativity is perceived in European policies as the prime source for innovation, which in turn is acknowledged as the main driver of sustainable economic development (Council of the European Union, 2008b, 2009b). It is seen as a process of generating ideas, expressions and forms, which can, in essence, amplify knowledge and lead to new ways of using the knowledge. European policies call for strengthening Europe's innovative capacity and the development of a creative and knowledge-intensive economy and society (Council of the European Union, 2009a) through reinforcing the role of education and training in the knowledge triangle (Council of the European Union, 2010) and focusing school curricula

on creativity, innovation and entrepreneurship (European Commission, 2010b).

1.1.2 Creativity as a key transversal skill for work and lifelong learning

The EU Key Competences Framework for lifelong learning (European Parliament and the Council, 2006) introduces 8 key competences and highlights the role of cross-cutting skills such as critical thinking, creativity, initiative, problem solving, risk assessment, decision taking and constructive management of feelings in all of them. The report of the progress of ET2010 (Council of the European Union, 2010) suggests that particular efforts are needed for the transversal key competences that are crucial for more creativity and innovation, and for success in the labour market and society at large. These transversal key competences include, for example, digital competence, learning to learn, social and civic competence, sense of initiative and entrepreneurship, and cultural awareness. Other policy documents also recognise that there is a growing demand from employers for transversal and cross-cutting skills, such as problem-solving and analytical skills, self-management and communication skills, linguistic skills, and more generally, "non-routine skills" (European Commission, 2008). All of these contribute and are linked to creativity, its development and expression. Creativity through lifelong learning is recognized as both a driver for innovation and a key factor for the development of personal, occupational, entrepreneurial and social competences, and the well-being of all individuals in society (European Parliament and the Council, 2008).

1.1.3 Creativity as a strategic challenge for education and training

Enhancing creativity and innovation, including entrepreneurship, at all levels of education and training has been named as one of the four strategic objectives of European Education and Training 2020 (Council of the European Union, 2009b). The Conclusions of the Council on developing the role of education in a fully-functioning knowledge triangle encourages education and training institutions to ensure that curricula and teaching and examination methods at all levels of education incorporate and foster creativity, innovation and entrepreneurship (Council of the European Union, 2009a). Member States have been invited to consider how to foster greater synergy between knowledge and skills on the one hand and creativity on the other, as well as how to best promote, monitor and assess creativity and innovative capacity, at all levels of education and training (Council of the European Union, 2008b). They should encourage teachers to develop their roles as learning facilitators and promoters of creativity, and help teacher education institutions to respond to the new demands of the teaching profession. At the same time, it is recognized that fostering creative abilities and attitudes within schools also requires the support of an organizational culture open to creativity and the creation of an innovation-friendly environment in general.

1.1.4 Creativity in the digital economy and society

The Digital Agenda for Europe (European Commission, 2010a) emphasizes the importance of digital skills, for both work purposes and participation in society, and requests that all European citizens should be made aware of the potential of ICT for all professions. The Communication on Youth Strategy (European Commission, 2009) recognized that technology offers today's 'net-generation' new opportunities for learning, creating and participating, and also brings challenges regarding privacy, internet safety and media literacy. Since an increasing share of learning occurs at the workplace, in non-formal contexts and in leisure time –often through new ICT-based learning tools and methods– the development of creative and innovative capacities has relevance for all aspects of lifelong learning (Council of the European Union, 2008b). This emphasizes the important role of schools in

nurturing these capacities from the very first levels of education. People must be equipped to express their creative and innovative potential through digital media and technologies. Furthermore, these provide opportunities for implementing learning approaches that foster creativity. The Education and Training 2010 progress report (Council of the European Union, 2010) pointed out the potential of new technologies for enhancing innovation and creativity.

1.1.5 Crucial role of schools in nurturing creative and innovative capacities

Schools and initial education in general play a crucial role in fostering and developing people's capacities. The recommendation by the European Parliament and the Council (2006) on Key Competences for Lifelong Learning asked Member States to ensure that initial education and training offers all young people the means to develop their key competences to a level that equips them for adult life. These key competencies will form the basis for further learning and working life. The Council of the European Union (2008a) recognized that "schools have a duty to provide their pupils with an education which will enable them to adapt to an increasingly globalised, competitive, diversified and complex environment, in which creativity, the ability to innovate, a sense of initiative, entrepreneurship and a commitment to continue learning are just as important as the specific knowledge of a given subject". Specifically, they invited the Member States and the Commission to promote creativity and innovative capacity in and through school education.

The Council of the European Union (2008b) asked for more dialogue, co-operation at different levels, research and evidence for developing learning environments especially conducive to creativity and innovation. The Commission was invited to support relevant research and analyse and exchange data, at both EU level and among the Member States –in cooperation with European and international research institutions– on the promotion and development of creative and innovative skills through education and training. The ICEAC study was launched by IPTS in collaboration with DG Education and Culture with a view to contributing to this policy context. The study provides evidence, data, examples of good practices and policy options for developing creative capacity at schools, which are in a key position for preparing children and young people for further learning.

1.2 Methodology of the study

The ICEAC study took place between December 2008 and December 2010. Given the complex nature of studying how creativity and innovation are framed in education, a mixed methods approach was employed. Table 1 describes the methodological framework which guided the study, and outlines the sub-research questions that have shaped the choice of methods and participants. The scope of the study was obligatory schooling (primary and secondary) within EU27.

1.2.1 Methods and approaches of the study

In order to get a better and wider understanding of how creativity and innovation are framed in education, the study employed a mixed-method approach so as to gather different insights from varied sources. Data was gathered from a wide spectrum of respondents who are, in one way or another, involved in creativity and innovation in education.

At the beginning of the project, an overview of the theoretical foundations for creativity and innovation in the context of education was provided through a **literature review**. The review systematically covered scientific literature, policy documents, research reports from international organisations and recent projects relevant for creativity in learning and teaching. Through an analysis of the reviewed literature, *enablers* were identified, describing circumstances or support

Table 1: Structure of the study

Phase	Objective	Method	Timing
How are creativity and innovation conceptualized in the educational context?			
1	To understand the implications of creativity and innovation in education	Literature review	Dec 08 – April 09
2	To validate methodological framework, focus and operation of the study	Scoping workshop	23-24 Feb 09
How are creativity and innovation explicitly dealt with in the Member States' learning objectives?			
3	To assess the role and relevance of creativity and innovation in the national learning objectives (curricula) of Member States	Analysis of the Curricula	Jul 09 – Aug 10
What is the level of creative learning and innovative teaching taking place in school? What is the link between educational policies on creativity and innovation and the practices?			
4	To assess teachers' opinions and practice s on creativity and innovation in each country at school level	Teachers' survey	Jul 09 – Jul 10
5	To assess the relevance of creativity and innovation in education at national level	Stakeholders' interviews	Nov 09 – Jul 10
What are good practices of creative learning and innovative teaching in Europe?			
6	To identify good practices of creativity and innovation in education in Europe	Good practices (Case Studies)	Nov 09 – Jul 10
What are the main results and policy options?			
7	To validate the results of the study	Validation workshop	1-2 Jun 10
8	To synthesize the main results of the study and develop policy options	Final report	Jun 10 – Oct 10

mechanisms that facilitate creative learning and innovative teaching. These enablers were clustered into eight thematic areas, namely: assessment, culture, curriculum, individual skills, teaching and learning format, teachers, technology and tools. For each area, the literature describes conditions that can encourage a creative environment. These enablers were used as a framework for designing the instruments of subsequent methods, in particular the survey and the interviews. In the curricula analysis, enablers related to each area provided a critical understanding of the distribution of frequencies. In the survey, using these enablers made it possible to gather teachers' views on how they foster or hinder creativity without explicitly mentioning creativity, thus lowering the desirability bias. In the interviews, the eight thematic areas of the enablers were used as a topic guide.

Workshops were used as a way of gathering insights from different experts in the field. Two workshops were organised during the project, one at the beginning and another one towards the end. For the workshops, a total of **32 education experts of 16 nationalities** were consulted. The first workshop aimed to gather the experts' insights on the role of Creativity and Innovation in the educational systems of their respective countries and to validate and discuss the proposed methodology of the study. The second workshop aimed to present the major results of the study's different phases and allow experts to question and discuss these results. Both workshops aimed to get active participation and contributions from experts from different fields, varying from presentations, joint discussion, group-work and feedback about the study.

In order to understand the state-of-the-art of how creativity and innovation are framed in school curricula in EU27, a **content analysis** of curricula document was carried out. This work was conducted by empirica (Heilmann & Korte, 2010) on behalf of IPTS, in collaboration with European Schoolnet and National Correspondents in each

EU Member State. In total, **37 countries and/or regions** were studied, the latter included the following: Wallonia, Flanders and the German-speaking community for Belgium; Bavaria, Lower Saxony and Saxony for Germany; Andalucía, Extremadura and Madrid for Spain; and England, Northern Ireland, Scotland and Wales for the UK. In total, around **1,200 curricula documents** were identified and analysed using the search terms "Creativity" and "Innovation" (and their stems creativ* and innovat*) and five synonyms of these terms. The analysis was carried out in the language of origin of each document. In this respect, the researchers have consulted national correspondents for their expertise on the terms. The software tool WordSmith was used to carry out this analysis. The frequency of use of the terms was analysed according to the category of the text where the terms appeared, i.e. primary or secondary school documents and type of subjects.

An **online survey** with teachers was conducted as part of our consultation with experts and practitioners of education. The questionnaire was designed by IPTS together with European Schoolnet and was based on the enablers recognized in the literature review. It contained 29 close-ended questions divided into three major sections: demographics and factual items, teaching practices and opinions about creativity for learning. It was translated from English into 22 other EU languages and was available online on the eTwinning platform[5] from 15 September 2009 until 15 October 2009. The survey was advertised through various European and national channels (national Lifelong Learning Agencies, Ministries of Education, and permanent EU national Representations among others). It was open to anyone and was answered by teachers on a completely voluntary basis. It took around 20-30 minutes to complete. In total, **12,893 teachers from 32 countries responded to the survey**.[6] The first analysis of this data, conducted in collaboration with European Schoolnet was based on responses solely from the EU27. This resulted in a brochure which was presented at the closing conference of the Year of Creativity and Innovation (Cachia, et al., 2009). The scope of the analysis for the ICEAC study was limited to responses from teachers teaching in obligatory schooling (ISCED levels 1 and 2) in the EU27. **In total, 7,659 responses were analysed** (Cachia & Ferrari, 2010).

Semi-structured **interviews** were also used to consult educational stakeholders who are directly involved at a national or international level in education practice, education policy or teacher training. This work was carried out by Futurlab (Banaji, Cranmer, & Perrotta, 2010b) on behalf of IPTS, in collaboration with the Institute of Education (University of London). For this study, **81 interviews were carried out with educational stakeholders from the 27 Member States** (3 interviews per country except in a few cases). Interviews were conducted mostly via Skype and digitally recorded. The duration of the interviews varied between 30 and 75 minutes. Most interviews were conducted in English, unless the interviewee could not speak English well and asked to be interviewed in another language. The topic guide of the interviews was elaborated using the *enablers* from the literature review and thus mirrored and complemented the teacher survey.

In order to address discrepancies between what the official documents on education state, what educational stakeholders think, and what actually happens in schools, educational practices which exemplify good models of creative learning and innovative teaching from compulsory schooling in EU 27 were analysed by Futurelab (Banaji, Cranmer, & Perrotta, 2010a). Ten **good practices** were identified and analysed according

5 eTwinning is a project which connects schools around Europe. It aims to encourage schools in Europe to collaborate on joint projects using Information and Communication Technologies (ICT): www.etwinning.net

6 EU 27, plus Croatia, Former Yugoslav Republic of Macedonia, Iceland, Norway and Turkey.

to even geographic and age distribution, variety of domains of knowledge, variety of scope and scale of the initiative and variety of examples that consider the different facets of creativity. These good practices showcase examples of a variety of ways of fostering creative learning and innovative teaching and of implementing creativity and innovation at different levels in school.

This **final report** brings together the results of the different parts of the study. As the different parts of the study were based on cross-cutting themes or thematic area of the enablers identified in the literature review, this report provides a comparison of the different results for each thematic area. The analysis presented in this report is based on the data of each phase of the study.

1.2.2 Limitations

Given the vast amount of empirical data gathered throughout this study and evidence from 27 countries which are all very different from each other, some methodological limitations must be acknowledged. This study is exploratory in nature and aims to offer a skin-deep overview of the relevance of creativity and innovation in compulsory education in Europe. As such, the study does not claim to provide an exhaustive account of the role and amount of creativity and innovation in each Member State's education and training.

As the scope of the study was extremely wide –all 27 EU Member States for both primary and secondary education and teacher training– choices had to be made. For instance, it was decided not to include pupils and students in the stakeholder consultations (survey and interview), as the efforts, time and precautions needed to collect opinions from students and particularly pupils in all the Member States would have gone beyond the time and budget allocated to the study. The reader should therefore be aware that children and young people have not been consulted in this report. Moreover, the study mainly focuses on compulsory education and gives just a few hints on the role of creativity and innovation in teacher training. A more systematic analysis of the content of programmes and curricula for Initial Teacher Training (ITT) and Continual Professional Development (CPD) would therefore be useful.

A limitation of the study lies in number and type of stakeholders (both teachers and educational experts) that were consulted. Although the study collects data from all Member States, the data collected cannot be considered as being representative of the whole of Europe. This is because respondents were not sampled and, in the case of the interviews and for some countries of the survey, the small number of respondents consulted means that we must be cautious when interpreting the data. Moreover, the differences between and within countries in terms of curricula, teacher training, educational culture and traditions and general organisation of the school establishment should be kept in mind when reading the report, as education in Europe is far from homogenous.

Moreover, each phase of the study had further specific limitations. For an overview of these limitations, we refer the reader to the specific reports of the different phases of the study.[7]

Despite these caveats, it must be noted that it is the first time that such a large number of opinions, insights and data and so much evidence have been collected on the topic of creativity and innovation for education in Europe. This report and this study should therefore be considered as the first step towards an understanding of the creative and innovative potential of European schools.

7 All reports can be downloaded from the project website http://is.jrc.ec.europa.eu/pages/EAP/iceac.html

2 Main messages from the different phases of the study

As mentioned before, the ICEAC study consisted of several phases. In this section, the main results of each phase will be briefly presented. Readers interested in reading more about any of the different parts of the study should visit the project website (http://is.jrc.ec.europa.eu/pages/EAP/iceac.html) where all the reports of this project can be found.

2.1 What the literature says

The IPTS literature review provides the theoretical grounding for ways in which creativity and innovation can thrive in a school environment and proposes a series of central factors which can support the shift towards a more creative and innovative education (Ferrari, Cachia, & Punie, 2009). In this review, creativity is conceptualised as a *skill* for all and it is argued that educational actors have the power to unlock the creative and innovative potential of the young.

The report emphasises the need to encourage the development of students' creative and innovative potential for several reasons. Creativity is a form of knowledge creation. Stimulating creativity therefore has positive spill-over effects onto learning, supporting and enhancing self-learning, learning to learn and life-long learning skills and competences. The report also develops the notions of *creative learning* and *innovative teaching*. Creativity is defined as a product or process that shows a balance of originality and value. It is a skill, an ability to make unforeseen connections and to generate new and appropriate ideas. *Creative learning* is therefore any learning which involves understanding and new awareness, which allows the learner to go beyond notional acquisition, and focuses on thinking skills. It is based on learner empowerment and centredness. The creative experience is seen as opposite to the reproductive experience. *Innovation* is the application of such a process or product for the good of a domain or field –in this case, teaching. Therefore, *innovative teaching* is the process leading to creative learning, the implementation of new methods, tools and contents which could benefit learners and their creative potential.

The literature shows that creativity is conceptualised in different ways by different people. It can be seen as arts-centred or as relevant to any domain of knowledge. It can also be seen as a quality some geniuses have or as a skill that anyone can develop. A common understanding of what creativity is for education and what it entails is therefore envisaged as the first step towards creative and innovative education. Moreover, research recognises several factors that could create a stimulating and creative environment. Teachers, for instance, are key figures in constructing a creative climate, but they need support from both policy-makers and institutions. In particular, curricula and assessment are key areas that must be addressed if creativity is to be allowed in the classroom.

The report also highlights the importance of technologies in learners' lives and how they can enable educational change towards an innovative and creative school environment. Both teachers and learners must acquire critical skills in their use of technologies to be able to benefit from them in an effective, innovative and creative way. Educational systems should also take into account the fact that new technologies can create an empowerment culture, which puts the learner at the centre of the learning process. Otherwise, there is the risk that education policies and systems become irrelevant for students' real and future needs.

These requisites were clustered into eight thematic areas or enablers, which represent the circumstances or support mechanisms that make creativity and innovation more likely to thrive. These thematic areas were presented for discussion at the scoping workshop (see Section 2.2) and their final contents took into account the perspectives of the experts and their contributions. The areas are: assessment; culture; curriculum; individual skills; teaching and learning format; teachers; technology; tools. The co-existence of several of these areas could lead to an enabling environment where creative learning and innovative teaching could blossom. If enablers are not present, creativity is less likely to flourish. However, even though all enablers are in place, it is still not possible to deduce that creativity and innovation are happening, as teachers and students still have to actively engage in the creative and innovative process. Enablers are therefore indicators of the kind of environment which could nourish creative learning and innovative teaching.

2.2 What the workshop participants say

Two workshops took place during the study, one at its beginning –the scoping workshop, February 2009– and one towards the end –June 2010. The aim of the scoping workshop was to gather information from experts on the role of Creativity and Innovation in the educational systems of their respective countries and to validate and discuss the proposed methodology of the study. The definition of creativity and how it should be measured was one of the main topics discussed in this workshop. Experts highlighted the need for a working definition of creativity which works for as many stakeholders as possible. The need for a change in assessment which enables teachers to measure creativity as a process, and not just as a product, was raised.

A major issue that came out of the discussion was that the term creativity may have different meanings and connotations in different countries. Stakeholders also discussed whether teachers should maintain a balance between ensuring basic skills and encouraging creativity or whether they should integrate the two. Learning from pre-primary schools where creativity is highly encouraged was suggested. Participants also suggested that we need to be clear with what we value, support and assess in education systems, including risk taking and resilience. It was highlighted that policy makers and practitioners need to be courageous, and allow time for fun and flow[8] even in times of economic crisis.

In the experts' view, a creative learning environment involves less teacher-centred practice, and making creative processes and collaborative ways of working more explicit. In order for change to take place, teachers need to be aware of the different aspects of creative learning and to be able to understand creative learning development. In parallel, curricula should allow integrated and flexible ways of working for innovative models of learning that can be transferred across other curriculum areas/domains.

During the workshop, it became clear that ICT is not that present in the discourse on creativity and innovation in education systems in Europe. Young people are ICT literate but they often lack the critical skills to be creative and innovative with new tools. Teachers nowadays do not have to teach information but how to use information to get knowledge. In this way, ICT should play the role of an enhancer. Students should be allowed to use the technology themselves, so as to learn how to make meaning from these tools. Teachers, on the other hand, should be trained to be able to understand how the tools can shape the creative process. Digital technologies are highly interesting from an ecological point of view because of their multiple abilities to connect or bridge processes between and within systems. It is in this sense

8 With the term 'flow', Csíkszentmihályi (1990) refers to a state of total absorption and involvement in an activity. The pleasure and concentration derived from this state are necessary for a creative moment.

Table 2: Relative occurrences of the search terms and synonyms in primary and secondary school curricula in EU27: country groupings

High (Relative occurrence >1.0)	Medium (Relative occurrence >0.5 - <1.0)	Low (Relative occurrence <0.5)
Austria	Belgium - Flanders	Belgium - Wallonia
Belgium (German speaking community)	Bulgaria	Germany - Lower Saxony
Czech Republic	Germany - Bavaria	Denmark
Estonia	Germany - Saxony	Italy
Hungary	Greece	Malta
Lithuania	Spain - Andalucía	The Netherlands
Latvia	Spain - Extremadura	Poland
Portugal	Spain - Madrid	Romania
Slovenia	Spain - national level	
United Kingdom - Northern Ireland	Finland	
United Kingdom - Scotland	France	
	Ireland	
	Luxembourg	
	Slovakia	
	Sweden	
	United Kingdom - England	
	United Kingdom – Wales	

that technologies can be seen as "catalysts" for change –by opening up new possible bridges and connections.

In the final workshop, workshop participants were asked to validate the major results of the ICEAC study and to provide concrete actions for policy makers. The methodological approach to the ICEAC study was discussed at length and various experts provided varied feedback. The major themes identified as needing policy actions were curricula, ICT and teacher training. The suggestions provided by the workshop participants have been taken into account in this report.

2.3 What the curricula documents say

In order to get a better understanding of how creativity and innovation are framed in EU27 at the policy level, the learning objectives/school curricula on compulsory education were analysed (Heilmann & Korte, 2010). Searches were carried out for the terms Creativity, Innovation and some selected synonyms in curricula documents and their frequencies analysed according to the level of school (primary/secondary) and the subjects groups (Arts, ICT, etc.) where the terms appear. This analysis shows therefore how often creativity, innovation and some synonyms are mentioned in curricula for compulsory schooling in each Member State.[9]

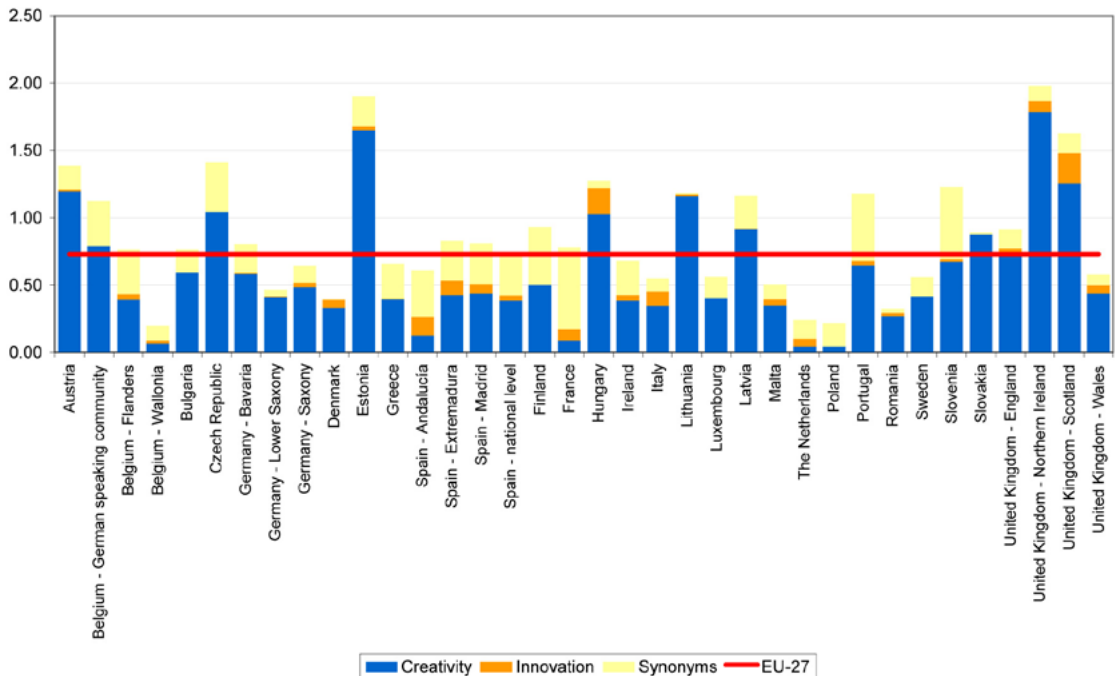
The main findings of the study demonstrate that the term *creativity* is relatively frequently mentioned in school curricula in many European countries. In comparison, the term *innovation* hardly occurs at all in school curricula. As can be observed in Table 2, eleven countries and regions show high, seventeen medium and only eight countries and regions rather low relative occurrences of the search terms in compulsory school curricula (general curriculum documents and subject curricula).

As can be observed in Figure 1, the term *creativity* is most prominent in the curricula of Northern Ireland (1.78), Estonia (1.65) and Scotland (1.25) and least found in The Netherlands, Poland (both at 0.04) and Wallonia (Belgium) (0.07).[10] There are only few exceptions in France, Andalucía (Spain), Netherlands and Poland where synonyms

9 Cyprus was the only Member State where this analysis could not be conducted due to major ongoing curricula reform.

10 These figures represent the per mil percentage of occurrence of the terms, i.e. how often the terms occur per thousand curricula words.

Figure 1: Relative occurrence of Creativity, Innovation and their synonyms in school curricula in Europe (EU27)



are more frequently used than *Creativity*. *Innovation* as a term only plays a minor role and is most prominent in Scotland and Hungary, but even there it remains at a very low level with a relative occurrence of only 0.23 and 0.20 respectively.

In the curricula analysed, creativity is generally used broadly and considered as a skill, as for instance, 'creative thinking' or 'creative problem solving'. It is seen as an integral part of the learning process to help children and young people to be successful learners, confident individuals, responsible citizens and effective contributors. Creativity is thus seen as a required skill that should be encouraged and developed in most subjects. There are also instances where it is used more narrowly in relation to Arts subjects and referred to as 'artistic' creativity. Only in a few cases and in the context of a few subjects (e.g. Handicrafts, Metalwork) creativity is conceptualised in relation to working with materials.

In terms of subjects,[11] *creativity* and its synonyms are most prominent in the 'Arts' subject group followed by the 'ICT' and 'Physical Education' subject groups. In some countries (e.g. especially in Northern Ireland, Scotland), *creativity* and the synonyms are frequently mentioned in all subject groups. However, the term hardly appears in any of the subject groups (including Arts) in other countries (e.g. in Wallonia, Lower Saxony, Denmark, France, Netherlands, and Poland). Little difference may be noted between primary and secondary school curricula, in relation to how frequently the terms appear, with 0.68 relative appearances of the terms (creativity, innovation and synonyms) in primary school and 0.69 in secondary schools.[12]

11 Due to the vast number of school subjects and to the differences between countries, subjects were clustered into eight subject groups, namely: Arts, ICT, Languages, Mathematics, Natural Sciences, Physical Education, Social Sciences and Other.

12 Analysis refers to the analysis of curricula directly referring to school subjects and excluding any general and cross curricular document.

ICT is rarely mentioned in connection with Creativity. Sometimes ICT is referred to indirectly in the curricula using expressions like 'computer', 'new media' and 'media competence' and referred to as a tool to be used throughout the teaching and learning process. In terms of ICT as a subject, there is no overall clear pattern, or relationship with creativity. In several countries ICT is seen as cross curricular issue and included in general introductory documents (e.g. Wales, England, Northern Ireland, France, and Luxembourg) where it is sometimes linked to Creativity, while in other countries and regions dedicated regional plans and programmes are referred to which are in place to promote the use of ICT in schools in general.

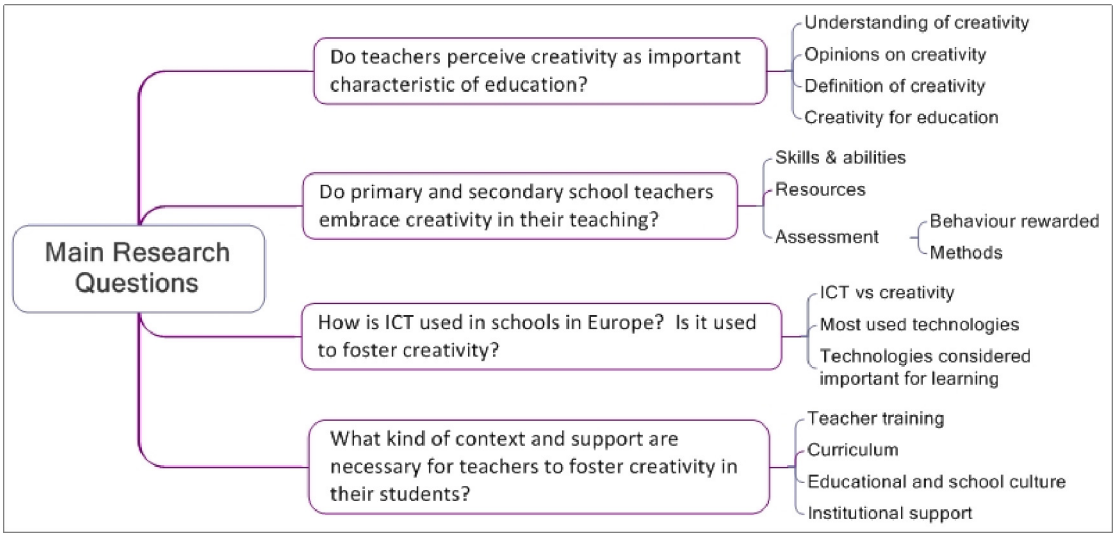
This analysis shows that *creativity* is referred to in school curricula in all countries and is already part of the educational political discourse in most European countries. Nonetheless, it is important to bear in mind that national curricula serve different purposes in different countries. In some countries they are statutory, formal and prescriptive; in others they only constitute a general framework to be filled with content and further refined by the schools themselves. The legal status of school curricula varies between countries, which poses further limitations to their direct comparison. In many countries, national school curricula are supplemented or re-interpreted by regional, local, school and teacher / class curricula or schemes of work. In addition, although the terms and synonyms occur in official documents, this is no guarantee that practice in schools will coincide with official intentions, even if statutory. Conversely, low appearance of the search terms in policy documents does not mean that creativity and innovation are not present in the country. In some countries, the curricula is less prescriptive than in other countries, and hence, the low appearance of the terms creativity and innovation is because they are written in a way to allow teachers to be freer in choosing how they want to teach, hence allowing them to be creative and innovative.

2.4 What the teachers say

There is widespread consensus among different educational stakeholders that understanding teachers' perceptions of creativity and their current teaching practices is essential for any development of policy lines on creativity and innovation for education in Europe. Therefore, as part of the ICEAC project, a specific consultation in the form of an online survey was arranged to reach classroom teachers in the European countries. This survey was carried out in collaboration between IPTS and European Schoolnet and resulted in a brochure containing an overview of the preliminary results (Cachia, et al., 2009) and a more detailed report on the survey results, considering only respondents who teach in compulsory education (Cachia & Ferrari, 2010). The online consultation aimed to explore the perceptions of teachers in Europe about creativity for learning and their reflections on their own teaching practices. Particular emphasis was given to ICT, so as to get a better understanding of current ICT practices and the potential of ICT applications for fostering creativity in students. In addition, the conditions necessary for the nurturing of creativity at schools have also been analysed. The main research questions are presented in Figure 2.

As a consequence of the scope of the study, this report focuses on compulsory schools (ISCED levels 1 and 2) in the 27 Member States of the European Union. A total of 7,659 responses (see Table 3) were analysed. It is important to mention that the results are not representative of the European teaching population as a whole. Results show that teachers in our survey have an encompassing view of creativity. Teachers' opinions on creativity in education are stronger than their practices. Almost all the surveyed teachers believed that creativity could be applied to every domain of knowledge (98%) and that creativity could be applied to every school subject (96%). The majority of the teachers surveyed were active in promoting creativity in their teaching, with three quarters of the respondents sustaining

Figure 2: Research questions for Teacher Survey



that thinking skills were developed (83%), and that active and participative learning (80%) and learning how to learn (73%) took place. However, less than half of the respondents claimed that play (46%) and multi-disciplinary work (41%), which are as instrumental for creative learning, took place in their classrooms. This implies that there is a lot of room for improvement in the way creativity is fostered in schools. While more training is required on how creativity could be fostered at school, we argue that creative practices should be institutionalised. Creative practices are often not allocated enough time and space because of other educational priorities.

The way creativity should be assessed is often not addressed in educational objectives and policies. Our data shows that only half the respondents (50%) agree that creativity can be assessed. Formal testing remains the predominant way of assessing students in Europe (76%), although other methods of evaluation have also been observed. Innovative ways of assessment, such as portfolios and allowing students to test and give each other feedback, are still under used. More effort should be dedicated to encouraging teachers to combine different methods of assessment, including self and peer assessment by students.

Table 3: Demographic data

		N = 7,659	
		#	%
Gender			
	Female	5,848	77.2
	Male	1,727	22.8
	Total	**7,566**	**100%**
Age			
	Under 25	91	1.2
	26-35	1,519	19.9%
	36-45	2,723	35.7%
	46-55	2,653	34.7%
	55+	649	8.5%
	Total	**7,635**	**100%**

There is clear evidence that the vast majority of teachers agree that ICT has improved their teaching (85%) and that it could be used to enhance creativity (91%). Although usage of ICT remains largely related to more traditional technologies, there is a gradual shift to new tools. The technologies that teachers agreed were important for learning may be divided into three main clusters: conventional technologies, interactive technologies and more social technologies. The first cluster is the most popular with teachers and the last cluster is the least popular. This suggests that the potential of social technologies for learning is still unclear for the teachers surveyed.

Teachers tend to combine different resources in their teaching, with more than two-thirds claiming to use various modes of ICT. Opportunities brought about by ICT, especially social computing applications, could be instrumental in enabling teachers to create their own material and resources and share them with their fellow teachers. Despite wide access to the Internet across Europe, only a quarter of the respondents claimed that the quality of ICT in their schools was excellent. This suggests that while access to ICT is an important focus for policies, ensuring that the ICT provided is of good quality and continuously maintained is equally important.

Developments in pedagogy training should be addressing more specific needs arising from our societies. More than half the teachers in this survey (58%) claim that they have not received any teacher training on how to use ICT in the classroom. There is a strong need to provide basic ICT training and also digital competence training so that teachers become confident and critical users of ICT. In terms of creativity, training should focus on eradicating recurrent myths about creativity and on offering a direct link with educational practices, enabling teachers to reflect on the activities that take place in the classroom and discern which of them are more likely to encourage creativity.

2.5 What the educational stakeholders say

Another part of the ICEAC project was to gather insights into creativity and innovation in education through in-depth interviews with education experts from different fields of education, namely: academia, teacher training institutions, inspectorate boards, curricula development agencies and Ministries of Education (Banaji, et al., 2010b). This work was conducted by Futurelab, in collaboration with the Institute of Education, London. The main objective of this study was to identify enablers and barriers for creative learning and innovative teaching throughout EU27. Though education systems are very diverse in the EU27, our analysis of the interviews shows a series of common trends.

Experts made various references to instances where different factors in education are connected. For instances, changes in curricula will not be effective unless changes in assessment take place. They also suggested that school curricula should be inspiring and flexible documents. These documents were harshly criticised for not allowing space and time for teachers and learners to think, imagine, create and deviate from what is prescribed.

Educational institutions are in many cases resilient to change. Education in Europe has a strong ethos of control, discipline and often favours hierarchical relationships. This contributes to an environment which stimulates conformity and discourages divergence, thus hindering potential for creative learning and innovative teaching. Constraints also arise from the way that school space is organised architecturally.

Several interviewees recognise that traditional methods are still common in many countries. Frontal teaching, teacher-centred interactions and chalk and talk continue to be widespread educational practices. Pockets of innovations have been observed but the challenge is to sustain and upscale them. Moreover, in many countries,

strong emphasis on traditional assessment methods, based on memorisation and strong emphasis on knowledge acquisition is limiting creative potential. How to assess and monitor learners' performance and progress remains a delicate area of disagreement between teachers, parents, students and policy-makers.

ICT facilities are available in many countries but more training is needed. While provision of ICT tools is widespread, there is an urgent need to provide training on how these tools could be instrumental in fostering creative learning and innovative teaching. Interviewees claim that interactive white boards (IWBs) and projectors are often used for frontal teaching, leaving to one side their interactive potential. The most innovative usage of ICT that the experts observed is when students were allowed time and space to explore ICT tools. Too many teachers assume that they need to be more competent than their students in order to use technologies in class, whereas interviewed experts do not think this is the case, as teachers could work in partnership with their students.

A shift in the culture and mindset of teachers and other educational actors is needed: a debate leading to consensus on the importance of creativity in education in which both parents and students are involved is important. Also, ITT and CPD are essential for a change in teachers' mentality and practices. Teachers need training to keep up-to-date with innovative teaching practices. They also require more hands-on training which would allow them to put their knowledge into practice once they are in the classroom.

2.6 What the cases say

In order to learn from examples of good practices, a small study was launched in which ten good practices as regards creative learning and innovative teaching in the EU27 were identified and analysed (Banaji, et al., 2010a). These are listed in Table 4.

From the analysis of the good practices, we can observe that creativity is understood as collaborative and individual, distinctly linked to cross-curricular practices but also embedded in the skills of specific subjects and disciplines. Teachers involved in these projects were able to appreciate the spill-over effects of creativity on learning. It was observed that motivation of teachers and students was one of the major factors for success or failure of projects. A major recommendation of this report is that summative testing, unrealistic staff targets and fact-based, overloaded curricula need to be thoroughly revised because they are systemic barriers to teacher motivation. Summative testing, as opposed to diagnostic and formative assessment, aims to judge –and grade– pupils'

Table 4: Selection of good practices

	Good Practice	Country
1	FUNecole®	Cyprus
2	Summative Project	Denmark
3	Open Air Classrooms	Estonia
4	Digital storytelling – Historia do Dia	Portugal
5	Can we "see" the Sound?	Greece
6	Value in the Valley	The Netherlands
7	Authors and Poets	Malta and UK-Scotland
8	Project Maths	Ireland
9	Swedkin	Sweden
10	Queensferry High School Cross-curricular Projects	UK-Scotland

achievements at the end of a programme of work, instead of analyzing students' progress (NACCCE, 1999).

The analysis of the success stories in the examples of good practice gives rise to important recommendations. There is ample space for more innovative and creative learning for students even when their schools have limited resources. More physical and mental space to develop innovative ways of delivering the curriculum is required by teachers. Assessment which takes into account not only the final product but also the creative process should be integrated in formal education objectives. As we have learnt from these good practices, there are various initiatives which describe how creativity and innovation are practiced in education. However, more effort needs to be addressed to fixing time-tabling and allowing more space for imagination and interaction with different tools and resources across different school levels.

3 Major results for creative learning and innovative teaching

This chapter brings together the results of the main areas identified and developed during the study that should be considered by policy makers. It must be acknowledged that even though each topic is described as a stand-alone issue, these topics are highly intertwined: curricula and assessment both have considerable impact on actual pedagogic practices, which also depend on resources and deployment of ICT, teachers' skills and training, and the overall educational culture in the country and at school.

3.1 Framing of creativity in curricula

Results from this study demonstrate that despite the diversity of curricula in Europe, when it comes to nurturing creativity and innovation, some cross-cutting aspects could be improved. In the literature review, it has been argued that offering learners the right chances to develop their cognitive and creative potential should be a priority in the design of school curricula, because, as Runco (1990) affirms, the thinking capability of children at all levels is significantly influenced by the opportunities they are given. Adopting a democratic definition of creativity, referred to in the literature as "little c" (Beghetto, 2005; Sharp, 2004) in education is fundamental, recognizing the potential of all students to be or to become creative (Esquivel, 1995).

In this study, creativity is understood by both teachers and educational stakeholders as beneficial for education. It is mentioned in all the curricula analysed. A high majority of teachers believe that **creativity plays an important role in the curriculum**. Teachers in Italy and Latvia, United Kingdom and Cyprus (72%) were the ones who agreed most, or strongly agreed with this statement. Some cases, where **creativity is infrequently mentioned in the curricula, but is nonetheless very present in schools,** have also been observed. A case in point is the Netherlands. In the curricula analysis for this country, we found that the number of times the term creativity was mentioned was one of the lowest when compared to EU27. In contrast, experts' consultation and data from the survey show that creativity is highly practiced in schools in the Netherlands. When asked what activities take place during their lessons, the teachers in the Netherlands (92%) were the ones who were most engaged in activities which are understood to foster creativity. The discrepancy in the data could be interpreted in terms of the status of the curricula in this country. Schools are free to choose how they are run and how the curriculum is interpreted. There is a distinction between 'what do children learn?' and 'how do they learn?' The latter is the responsibility of schools. Results from this study show that creative learning is often taken into account in the way they implement this responsibility. It is important to highlight that **what is specified in the curricula is not necessarily reflected in practice.**

While the presence of creativity in European curricula cannot be contested, the **definition of creativity is often inconsistent** and, as various education stakeholders reiterated, there is neither consensus nor guidance on how to actually develop creativity in practice. In the school curricula analysed for this study, the term *creativity* is often used broadly. In some cases, it is considered as a required skill which should be encouraged and developed, as for instance, 'creative thinking' or 'creative problem solving', as well as an integral part of the learning process to help children and young people to become successful learners, confident individuals, responsible citizens and effective contributors. In other cases, it is used more narrowly, in relation to Arts subjects, more linked to 'artistic' creativity.

Similarly, while most teachers believe that creativity can be fostered in all school subjects, they seem less convinced that it is not the preserve of the arts alone. Almost all the surveyed teachers believed that creativity could be applied to every domain of knowledge and that creativity could be applied to every school subject. However, a lower percentage agreement was observed to the statement that creativity is not restricted to visual arts, music, drama and artistic performance. In some countries, like for instance the Czech Republic, creativity is still associated with the Arts, while in others, like for instance Denmark, it has gradually been de-linked from the Arts and is now considered to be a cross-curricular skill. Irrespective of the different situations in these countries, in the curricula analysis, the relative occurrence of creativity, innovation and their synonyms was highest in relation to Arts subjects in both countries.

Another barrier for creativity in education identified by stakeholders was that in most curricula, **subjects are still addressed separately** and are hardly ever connected with each other. As discussed in the literature review, the division of school time in subjects does not allow for the promotion of several skills, such as learning to learn and thinking skills. Setting aside some time for a holistic view of knowledge and for the development of skills that are not subject-specific is a way of ensuring that creativity is promoted in all curricular areas, across different subjects because creativity is not subject-related. In addition, as highlighted by the Robinson Report, we should try to aim for a balance between the different subjects in the curriculum so as to allow every student to develop his/her abilities in every possible field (NACCCE, 1999).

Balance is also needed in relation to the amount of content teachers are expected to cover during a school year. Too much content could be detrimental to the development of creative activities in the classroom, as it does not allow space for other activities which allow the development of deep understanding and transversal skills (Craft, 2005; NACCCE, 1999). More than half the teachers for 15 out of the 27 Member States[13] think they have to cover too much content (with Malta, Estonia and Bulgaria ranking highest). Education experts claim that **curricula overloaded with content** do not allow time and space for flexibility, risk or innovation.

Various educational stakeholders also highlighted that, while the curricula in their countries clearly define what teachers should teach, they rarely specify how it should be taught. Interviewees also contend that although the curricula explicitly mention that creativity is important, it is still often up to the teacher and to other school stakeholders to nurture creativity and discern when it takes place. Data from our survey suggests that education in Europe is still perceived as a disciplinary institution and disciplined behaviour tends to be preferred in schools, in contrast to play and risk-taking.

Many countries are currently undergoing curricula reforms towards more competence-based approaches. In various countries, different stakeholders (varying from teachers to children and parents) are being consulted about curricula revision, for instance by engaging them in the debates on how learning can be broadened and enhanced. An example is the project 'How Good is Our School?' in Scotland.[14] This kind of feedback mechanism between Ministries, teachers, students, parents and other educational stakeholders is considered beneficial as it promotes debate and reflection on a shared understanding of quality and vision of education.

In such reforms, it may be observed that countries are placing new emphasis on the importance of developing creativity and innovation

13 These are Bulgaria, Cyprus, Estonia, Finland, France, Germany, Ireland, Latvia, Luxembourg, Malta, Portugal, Romania, Slovakia, Slovenia, and Spain.

14 http://www.hmie.gov.uk/documents/publication/hgiosjte3.pdf

within the curriculum. For instance, priority is given to individualisation and personalisation in the Czech Republic, time is allocated for creative classroom projects and multidisciplinary teaching in Greece and there is a shift from a teacher-centred curriculum to a learner-centred one in Hungary. In Scotland creativity in learning is at the heart of the new curricula promoting four core capacities, namely success as learners; confidence as individuals (in a wide range of contexts); effectiveness as contributors; and responsibility as citizens. Similarly, Wales is promoting creative approaches which can be initiated by children through *learning by doing, active involvement* and *experiential learning*. The new national curricula in Slovakia and Greece specifically require teachers to think about creativity and prepare for it.

Education stakeholders suggested that **more effort should be addressed in incorporating new cross-curricular skills** in the reformed curricula. Many curricula still fall short of addressing skills needed for today's societies, such as digital competence and multicultural learning. As suggested by one of the Scottish interviewees, creativity should be embedded in the thinking behind and approaches to education policies and national visions. Curricula and other educational policy documents need to raise awareness of the benefits not only of creativity for learning, but also of linking teaching practices and methods with creative outcomes.

As curricula and education policy documents are not always easily accessible, **a common European modular framework could enable a coherent view** of what European educational policies state. Such a framework could be part of a portal where each Ministry could easily upload their most recent curricula according to specified sections (e.g., General Introduction, section by subject, division between school levels, etc.). In this way, all European curricula could be made available from one single site. Eurydice already provides detailed and updated 'National summary sheets' on education systems in Europe and ongoing reforms'.[15] However, it is still not possible to access the original texts of EU27 curricula on a common open repository, even though these documents are essential for any country review on education.

The **legal status of curricula, and how often they are updated or changed** are also important details to be taken into account when conducting cross-curricular analysis. It is often the case that such data is not provided within curricula. It is often difficult for any educator or researcher from another country to understand the remit of a curriculum. In addition, some countries have practical manuals and guidelines for curricular implementation which are heavily used by teachers, who rely more on them than the actual curriculum text. This, however, is not mentioned in the curricula.

Finally, **curricula cannot be effective if there are no supportive structures**. No matter how well creativity is framed, if teachers are not trained on how to allow creative approaches from learners, to identify creativity when it happens and to take into account transversal competences in their assessment, things will remain unchanged.

3.2 Pedagogic practice and assessment for creativity

As shown by the literature, some pedagogies and assessment methods tend to foster creativity while others tend to inhibit it (Craft, 2005; NACCCE, 1999; Runco, 2003). Furthermore, assessment arose throughout the study as a major issue which affects school practice and culture, as it is **both an enabler and a barrier for creative learning and innovative teaching**. This puts the teachers in a key role in developing their pupils' creative learning through innovative teaching in the daily classroom practice. In general, teachers

15 http://eacea.ec.europa.eu/education/eurydice/eurybase_en.php#description

seem to be positive for fostering and valuing creativity.

A majority of teachers surveyed in the study (95%) believed that creativity is a fundamental skill that should be developed at school. However, only 70% believed that creativity could be taught and only 50% thought it could be assessed. Also expert consultations supported the view that **positive attitudes towards creativity do not necessarily transfer to actual teaching and assessment practices**. The study results show that though schools in Europe use different methods for evaluating their students, nonetheless a **preference for conventional assessment and testing prevails**. It has been recognized, for example, by the Joint progress report on E&T 2010 (Council of the European Union, 2010) that most current assessment methods have a strong emphasis on knowledge and recall and do not sufficiently capture the crucial dimension of key competences as regards skills and attitudes.

Though classroom **pedagogies are typically not regulated, they are still influenced by educational policies**. According to data from Eurydice (2009), schools in all EU countries have full autonomy in choosing teaching methods, and full or limited autonomy for setting internal assessment criteria and systems for pupils. Expert interviews in the study also confirmed this. Therefore, although the teachers do not necessarily have a say in determining the content of compulsory curricula, they have freedom in daily education activities, such as choice of teaching methods and textbooks, groupings of pupils for learning activities and internal assessment. However, expert consultation revealed that in many countries external national examinations play a major role, and **secondary schools especially often gear their teaching and assessment to prepare pupils for the national examinations**. Furthermore, expert consultations suggest that even though curricula and schools may invite teachers to implement creative approaches for learning, they often do not provide guidance about how to take it into account in assessment, and the **national assessment systems do not take creativity directly into account.**

Many interviews suggest that **teachers often revert to "default" teaching styles**, because they lack the skills and especially the confidence to implement new learning methods and approaches, which could support creativity more. Based both on the expert interviews and teacher survey, most countries seem to deploy largely traditional teacher-centred learning methods with uni-directional knowledge transfer. 86% of survey respondents claimed that "teacher explaining" was an activity which often or always took place in class. Combined with the finding that 79% of respondents often or always fostered "discipline" in their students, the survey results support the view that the conventional ways of teacher-centred teaching still prevail in teaching practice. Also teaching resources used in teaching are mostly the traditional ones, books, notebooks etc. However, as raised in some interviews: you **can be creative with any resources, or use new resources in a very traditional way**. The latter is confirmed by the ICT Test Bed project, which found that ICT is often used by teachers to support existing pedagogies and traditional practices (Somekh, 2007).

Summative assessment prevails in most of the countries as the main type of assessment in the classroom. When asked how they assess their students, 76% of the teachers who responded to the survey claimed that they often or always use formal tests for assessment. However, experts from many countries also described **advances in implementing formative assessment practices** and different forms of assessment through presentations, group work, portfolios etc. The teacher survey revealed that a good share of teachers assess pupils in ways which give more room for considering creativity (in addition to the formal tests), such as assessing students without giving them a mark (63%), asking students to reflect on their own learning and progress (56%), using portfolios (39%) and asking students to test each other and give each other feedback (31%).

In general, experts suggested that **traditional testing was more common at the secondary school level, while formative assessment was more common in primary schools.** There are however exceptions: for example, assessment across all levels in Austrian schools is currently formative.

Although the traditional approaches dominate, other types of learning approaches are also exercised in school classrooms that can support creativity in different ways. In terms of activities in the classroom, the great majority of teachers surveyed claim to encourage always or often learning activities which are likely to allow students to be creative, such as developing thinking skills (73%), active and participative learning (80%) and learning how to learn (73%). Teachers in primary schools (81%) were more likely to foster such activities than teachers in secondary schools (74%). In general, the study showed that **pedagogic practices vary greatly between schools and also between different teachers**. However, the expert interviews support the perception that there is a general trend towards **more varied and active pedagogic practices at primary than secondary school level**. Many interviewees suggested that this could be due to the pressure on teachers and learners alike from the centralised and often knowledge-focused testing and grading system in secondary schools.

The literature reviewed in the study gives several examples of how **specific teaching, learning and assessment formats can enable creativity**, such as giving value to creativity and engagement, and supporting student-centred approaches and creative processes. The teacher survey showed that many **teachers aim to foster skills and abilities that can be seen to enable creativity** in pupils: ability to think (96%), communication skills (91%), ability to learn (90%), motivation (89%) and curiosity (86%) amongst others. **Teachers also aim to reward behaviours that foster a creative attitude.** Survey respondents claimed that they often or always reward behaviours such as motivation (91%), ability to come up with something new (89%), ability to connect issues learnt in one subject with topics in other subjects (87%), curiosity and exploration (89%), and imagination (87%). However, traditional values such as effort (94%) and knowledge (93%) still scored the highest among those rewarded by teachers. Again, teachers in primary schools (92%) were more proactive in fostering skills and abilities connected to creativity than secondary school teachers (81%). As an example of the difference in promoting creativity-related skills at primary and secondary level, 63% of primary school teachers who responded to the survey claimed to always or often foster critical thinking, while the respective figure for secondary school teachers was only 47%.

Assessment was often mentioned as a barrier for changing learning approaches and objectives – as a workshop participant put it, you cannot "teach students how to run and then test how they jump". Experts consulted in the study suggested that national examinations were often felt to be used as accountability tools that measure the quality of schools and teachers, and therefore preparing for them becomes more important than variety of learning provided for students. Therefore, although in theory teachers have freedom to select pedagogic approaches, in practice they feel pressured by the performative school culture aimed at achieving content objectives within tight timetables. Expert interviews revealed that **teachers very often lack time and support in class,** which is crucial to better consider the needs of individual learners, active learning methods and creativity. The interviewees often mentioned that "creative students are harder to handle", which again pressures teachers to encourage convergence and discipline in learning methods and assessment, rather than divergence.

Experts in practically all countries also mentioned **resistance to changing traditional educational assessment systems**. Grades and

summative assessment are often considered by parents, teachers, and even students as the important and concrete way of giving feedback about learning. Divergent thinking, which is the essence of creativity, is often not encouraged, especially at secondary school level. Furthermore, experts mentioned that the parents are not necessarily supportive of new learning approaches that they are not familiar with. Many interviews highlight that the reigning attitude to schooling is "acquiring a factual body of knowledge and testing it through tests and exams". This is expected by the majority of policy makers, parents, teachers, head teachers, and pupils alike. However, it is also important to mention that international comparative studies like TIMSS and PISA also have an important influence on the policy debate and general discussion on assessment. At national levels, these studies play an important role in policymaking related to assessment.

The expert interviews brought up several concrete examples of how creativity is fostered in pedagogic practices at schools. For example, some Finnish schools use methods such as "touch and feel, see images and talk, show your ideas and discuss, use symbols and language so that all children have an equal chance to learn". In Estonia, open air classes seem to be frequent in schools. There were also several concrete examples where assessment takes account of creativity and even invites it, both in summative and formative assessment contexts (as an example, see the box on 'Denmark: compulsory summative project'). For example, in Wales there are schools where pupils share their learning outcomes and objectives; peer and self assessment, where pupils get to know how they are doing in school and what concretely they need to do to improve.[16] Many countries also mentioned problem-solving tasks where assessment takes into account not only the final outcome but the process as well. For example, in science subjects, it is possible to evaluate the strategies a student employs when trying to solve a specific problem and reward a logically consistent approach even if the final result is incorrect.

Denmark: compulsory summative project	
Participants and objective	Framework provided by the National Ministry of Education for secondary schools to use cross-curricular projects as a part of final assessment at lower secondary school. Applied across Denmark.
Age of pupils	Secondary school – 15 years old
Activities	- The project work takes place over the course of a single week of intensive data collection, technology use and collaboration starting on Monday and ending on Friday - During these projects students can use materials or technology to produce new knowledge, innovative solutions to problems or an innovative product with real-world applications - Pupils receive input from teachers in different subject areas and across disciplines while being supported by the class tutor throughout
Potential for creativity	- An internationally viable method of incorporating and assessing creative learning within the more common frameworks of end of school examinations. - The carefully structured week gives opportunities for innovation, creativity, skills assessment and new knowledge - The method allows for teachers to assess both process and product and for students with non-traditional backgrounds

16 See for example the website http://www.excellencegateway.org.uk/page.aspx?o=protocolskillswheel

3.3 Teachers' skills development

Our study has found strong evidence that teacher training needs major improvements. Training has been recognised as a key element in the Lisbon agenda for the creation of an effective 'knowledge triangle' of education, research and innovation (Council of the European Union, 2010). As this study's literature review revealed, teachers have the potential to enhance or inhibit the creative potential of their students. Teachers' behaviour and attitudes are largely dependent on their skills and experience and the support they receive for their work. **Teacher training is thus one of the most important areas**, where more effort is needed.

More than three-quarters of the teachers (77%) surveyed have undergone Initial Teacher Training (ITT). **Countries vary considerably when it comes to provision of training on creativity and innovation.** Education experts insist that **not all existing teacher training emphasises pedagogic practice.** Indeed, only 23% claim to have learnt how to teach during ITT.

New requirements for teaching, such as ICT and other cross-curricular competencies like creativity and innovation, have not up until recently been taken into account in ITT. However, according to education experts, while in some countries creativity, innovation and ICT are now taken into account in ITT, in general, they are more likely to be covered in CPD courses. In some countries, they are not covered at all. In other countries, new Masters Degrees are emerging to train teachers in these specific areas. Less than half (44%) of the teachers surveyed claim they have received training on creativity. Nine out of 10 respondents (90%) would like to receive such training. On the other hand, more than half of the teachers (57%) claimed they had received training in innovative pedagogies. As the education experts reiterated, inappropriate training often leads to situations where new teachers are not prepared for classroom reality. While enhancing CDP in these cross-curricular competences is fundamental, **the need to integrate such cross-curricular competences in ITT** is a major step that has yet to be taken in European education.

Data in our study shows that **training on creativity had an impact on how teachers conceptualised it**. Respondents who stated that creativity was not covered in their training hold more biased and negative views of creativity. In comparison, those who had received training on creativity were more positive on the applicability of creativity in every domain of knowledge and the belief that creativity is a fundamental skill to be developed in school. It is of utmost importance that educational actors have **clear vision, awareness and understanding of creative processes** and how they can be enhanced and evaluated, as has already been suggested in the section on assessment. This implies that while the majority of teachers have clear notions of creativity in education, there is still ample space for improvement in the way teachers attempt to nurture creativity in their teaching, highlighting the need for more focused and hands-on training to extirpate deep-rooted myths on creativity.

The interviews revealed that traditional teaching methods are still predominant in most countries. At the same time, the analysis of best practices shows that there are pockets of innovation. Hence, we are faced with the challenge to sustain and upscale such sporadic efforts. Training in various countries remains fragmented and there is no common framework which ensures that teacher training is centralised and covers all the required expertise needed by teachers. Differences in approaches regarding teacher training should be analysed at a European level, promoting good practices from leading countries and providing support in the countries where it is needed.

Various experts highlighted the need for teacher training which provides **more practical guidance and less theory**. An interesting suggestion in the final workshop of this study

for enhancing teacher training methods was that teachers should be trained to teach other teachers, so that training is continuous. It was suggested that training should not be limited to institutional training but also include exchanges between teachers on an international level. In fact, according to these experts, **more training opportunities should be given to teachers to be mobile across countries**, which would allow expertise to be exchanged and applied in different national contexts. Training could be provided not only onsite, but also online. These results are supported by the OECD Talis survey (OECD, 2009), which found that the types of professional development considered to have most impact by teachers surveyed were "individual and collaborative research", "qualification programmes", and "informal dialogue to improve teaching". Education conferences and seminars were considered as having the least impact.

More than half teachers in this study (58%) had not received any training on how to use ICT in the classroom. The OECD Talis survey found that, currently, 68-70% of teachers in the EU (depending on their subject) would like to have professional development on ICT skills for learning (European Commission, 2010c). This is important, because, data from this study shows that teachers who had received ICT training were more likely to select interactive and social computing applications as technologies important for learning. This suggests that teacher training has positive impact on the take-up of new technologies by teachers. In countries where provision of ICT training is available, **little effort seems to be devoted to creative pedagogy with ICT**. This suggests that the potential of ICT to enable educational change towards an innovative and creative school environment is far from fully exploited.

Experts in this study claim that while a large number of teachers are ICT literate, only few of them are able to use ICT for teaching across the curriculum in innovative ways. The impact of ICT use on students is highly dependent on the teaching approaches adopted (Law, Pelgrum, & Plomp, 2008). There is a **need for pedagogic training which empowers teachers with the required ICT skills** to enable their students to become digitally competent, and to guide them towards more exploratory interaction with ICT tools through which creative and innovative practices may be fostered. Rapid changes characteristic of ICT tools mean that policies and systems dealing with **pedagogic training focused on ICT should be modular,** taking into account the development of enhanced and new ICT tools and applications. This training should ensure that teachers are able to transfer their knowledge across different subjects, and also to align their knowledge with students' real and future needs.

Although CPD training it is not compulsory in many EU27 countries, 87% of the teachers surveyed have attended such training. This is in line with the results of OECD Talis survey (OECD, 2009), which found that on average, 89% of the lower secondary school teachers surveyed in 23 countries in 2007-2008 had engaged in professional development activities during the preceding 18 months. Experts in this study highlighted the fact that not all teachers would like to have CDP, but those who do, would like to have better training opportunities. Again, the Talis survey confirms this; its results reveal that more than half the teachers surveyed identified a need for more professional development than they had actually received (OECD, 2009). Interviews suggest that teachers attending CPD courses are often the self-selected group of highly motivated and driven teachers. **Encouraging teachers of all ages to engage in life-long learning activities is a priority** which needs to be addressed.

In some countries, courses on creativity and ICT are perceived as *luxury* courses and hence, **little funding** is dedicated to them. This suggests there is still an implicit understanding that some subjects are more important than others. This misconception leads to an underestimation of the potential of creativity in other domains of

knowledge. Time seems to be another important factor when it comes to teacher training. In some countries, teachers are required to attend training in their free time due to tight schedules imposed by the curricula and the school syllabus. In other countries, training is provided only few days before the scholastic year, for instance, five days per year. Most teachers and education experts emphasized that **more time should be allocated for teacher training and professional development**.

Last but not least, teachers need to feel they are treated with respect in order to be able to develop professionally. Data from this study shows that in various countries **the teaching career is often underestimated**, especially as regards the relationship between the time dedicated to the job (for instance, for teacher training, preparing lessons or marking students' work) and the low salaries and recognition received by teachers in some countries. Expert interviews suggest that in some countries, teachers are so poorly paid that they typically need to have two jobs, which makes it impossible for them to dedicate extra time to developing new learning approaches or to participate in training outside school working hours. Furthermore, teachers often get blamed in the press etc, which reduces their motivation to carry out additional work to develop pedagogic practices. The **lack of career prospects** is considered a barrier for better educational outcomes and a major reason for not undertaking teacher training programmes.

3.4 ICT and digital media

Over the past decade there have been various efforts in Europe to provide **access to technology**, especially in schools. The literature suggests that technology is endowed with the potential to innovate education (Blandow & Dyrenfurth, 1994; Ruiz i Tarrago, 1993). According to the education experts consulted in the study, although insufficient availability of computers is still a problem in some countries, the majority of European schools are equipped with PCs, interactive whiteboards (IWBs) and Internet connections. In some countries, technology laboratories, laptops and wide-area networks through which pupils and teachers may interact are also available.

However, when it comes to the **quality of ICT in schools**, the results show that there is ample space for improvement. More than half of the teachers' surveyed disagree or strongly disagree (57%) that the quality of ICT in their school is excellent. Some education experts allege that due to pressure from the European Union, their countries have bought various technology tools, however, a good number of teachers still do not know how to use them. Hence, they simply use them as an extension of traditional tools. IWBs are often used as a replacement for blackboards and PowerPoint presentations to replicate what is written in a text book. The hefty cost of IWBs and the way they are used has prompted various respondents to question their relevance for innovative teaching, their importance in various education agendas and the lack of teacher training on how to use such new tools. It is important that strategies are sought to evaluate the use of new technology, so as to ensure that such tools contribute to personalising learning by enabling students and teachers to do creative and innovative things and to ensure that they do not simply replace traditional tools.

Teachers' proficiency in using technology is indeed one of the major concerns related to how technology can enable creative learning and innovative teaching. The majority of teachers in our survey contend that technology has improved their teaching (85%) and that ICT can be used to enhance creativity (91%). Here it is important to highlight that survey respondents of this study were all equipped with at least basic ICT skills, as the survey was conducted online. However, the interviewees observed that in some countries teachers are uncomfortable and reluctant to show their lack of expertise in using technologies for fear that this will compromise their authority in class. It

is worrying that the STEPS study (Balanskat, 2009), for example, found that only 56% of primary school teachers rate themselves as very or fairly confident in using ICT, such as PowerPoint, to create a presentation with text and images.

Enabling interaction between teachers and outside experts, such as artists, technicians, and graphic designers could lead to interesting projects through which both teachers and students could use technology to learn in more innovative and creative ways. An example is the project Digital Storytelling: Historia Do Dia undertaken in Portugal (see following box). Teachers use stories to conduct a range of imaginative literacy activities with their students, encouraging them to model their own digital stories or to podcast stories for other children.

Teachers in our survey mostly use the Internet to access information to update their knowledge for use in lessons, prepare handouts and material and search for teaching material. Less than half the teachers surveyed agree that mobiles, digital games and social technologies (such as social networking sites, podcast, bookmarking and tagging sites) are important for learning. According to the education experts, a **good number of teachers would prefer tailor-made resources,** designed more specifically for the tasks they would like to achieve with their students, as most teachers confess that they do not have the time or the ability to investigate the different modes of specific technological tools.

Various education experts remarked that despite the increase in the numbers of computers in schools, **hands-on access for pupils remains low**. Indeed, only half the teachers (53%) declared they let their students use a wide range of technologies to learn (videos, mobiles, cameras, educational software, etc). A good proportion of teachers in Europe still prefer to stay in control of the technologies used in the classroom. Allowing students to play with the tools can enhance pupils' motivation to think, understand, learn and conceptualise in innovative ways as has been observed in the Greek good practice: *Can we "see" the sound?* covered in this project (see box in the next page). Through the combination of different subjects, pupils were engaged in identifying commonalities and patterns through unusual and out-of-the-box thought processes through subjects like music, physics, mathematics and ICT. Education inspectors claim that the nicest lessons they have attended were the ones in which students were allowed to use the technology.

Research clearly demonstrates that if we want children to be creative with technology, they have to be taught or led to understand both basic and innovative usage of tools. When students are not provided with adequate understanding of the affordances of technologies, there is a high probability that they will replicate familiar forms and ideas using the new tools, as opposed to using the new tools to explore new connections and different ways of fashioning things (Loveless, 2008).

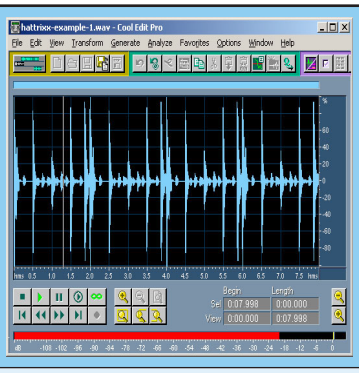
Portugal: Digital Storytelling: Historia Do Dia	
Objective	Collaboration between digital technicians and educators to prepare and publish a new digitally broadcast story in Portuguese and in English every day
Age of pupils	Primary School – 7-10
Potential	- Simple but innovative and highly imaginative - Collaboration between authors, illustrators and educators in a digital environment
Barriers	- Creative use of the site as a resource is large dependent on the innovative ideas of the individual teachers
Website	http://www.historiadodia.pt/pt/index.aspx

Interviewees referred to a wide array of examples, in which teachers are innovative with technology and willing to allow their students to explore new ideas with different tools. Almost two-thirds of our respondents (59%) to the survey, maintain they have found relevant support for combining ICT and creativity, and examples of how this has been done, through contact with other teachers/colleagues. While computers are still not as commonly used for mainstream subjects, the use of Google Maps in Geography was an example mentioned by various respondents, which shows that things are slowly shifting. Other more innovative practices mentioned include: use of mobile phones in class for finding maps, facts and locations and for capturing data outside the class; allowing students to build their own computer games and share them with classmates; and mobile devices used to measure things like lung capacity and oxygen in the air for biology or geography.

Another recommendation that emerges from our analysis is that, when it comes to technology, **more space for informal interaction between teachers and students**, where they can learn from each other without being limited to curricula content, is needed. It is unfortunate that in many schools in Europe these spaces of 'flow' (Csikszentmihalyi, 1996), where students and teachers are totally engaged in a process of combining previous knowledge and techniques with creating something new is rare and in many cases perceived as a waste of time.

Lack of technical support, sporadic maintenance of software and hardware and slow connection speeds are some of the **major barriers** to ICT take-up mentioned by both teachers and education stakeholders. For instance, in some countries poor connections restrict what students and teachers can access online. More than three quarters of the teachers surveyed (78%) claim they need more technical support. Language is also another major barrier. Most off-the-shelf digital products are in English, and hence, not all teachers are able to use them. As a result, schools are not interested in buying the equipment. Interviewees also mentioned that teachers are often not compensated for the extra time they need to integrate ICT in their teaching.

In the final workshop of this project, the need for a **European online resource and sharing platform** was highlighted, where European teachers can share learning resources in different languages and where the results of academic research on education could be posted, so as

Greece: Can we "see" the sound?	
Objective	To provide pupils with the support and the tools to liberate their creative potential and imagination. Using computer-based recording and editing of sounds, the project offered new learning opportunities in the teaching of music, physics and mathematics
Age of pupils	10-12 year olds
Potential	- Clear pedagogical vision inspired by Montessori Method. This method assumes that children need to be involved through a range of communication styles and sensory stimuli which go beyond the textual or verbal dimensions, usually favoured in schooling - Hands-on activities, aimed at the creation of simple hand-crafted instruments, and in the use of sounds and music to introduce pupils to complex topics in physics and science
Barriers	- Cost of technology
Website	Nil

to address the current gap between academic research and school practice. Unless teachers are involved in research themselves, it is highly unlikely they will come across academic research findings. On the other hand, the knowledge of hands-on practitioners is very important for education researchers. Creating such a link between research and practice would indeed benefit both parties. It is important to highlight that there are already various initiatives and projects which are already filling some of the gaps. For example, the European eLearning portal (elearningeuropa.info) provides some of the desired functionalities, but does not provide specific support for linking practitioners in the classroom practitioners with those developing projects and research results for them. eTwinning (www.etwinning.net), on the other hand, links together classroom practitioners through different learning and school projects and the Learning Resource Exchange (http://lre.eun.org) already provides a portal for finding resources.

As mentioned by some of the education experts, **one can be creative and innovative with any resources**. Replacing traditional tools with technologies does not automatically lead to creativity or innovation. Combining technology tools with existing ones will allow more space for experimentation for both the teachers and the students. Currently, various European schools use Moodle, wikis, blogs and most schools have their own homepage where they share information about their schools. The study data shows that almost three-quarters of teachers (72%) use the Internet to download teaching material though textbooks remain the number one resource used in classrooms (85%). Teachers in Bulgaria and Lithuania were the mostly likely to use textbooks, whereas teachers in the United Kingdom were the least likely to do so. Experts also mentioned that in some schools in their countries various technologies were replacing some textbooks. Their only concern was that the textbooks that are still being used are often already dated and this is why teachers spend a lot of time looking for digital resources to supplement the available books. According to some experts, some books are out-of-date before they are published.

In some countries, a good number of schools have developed their own digital systems to manage communication with parents, assessment and homework for students and also support such as material and resources for teachers. The Tiger Leap Foundation in Estonia is an example.[17] In the UK, collaboration between universities, government and a private software company has led to a training resource bank which all teachers can use to share resources. According to experts, these kinds of platforms already exist at national levels, but they are often used only by young teachers. **Encouraging teachers of all ages to make use of such tools** is fundamental in the current context of technological change. These technologies are based on notions of networking which allow teachers to develop collaborative forms of learning. They could also pass these on to their students.

3.5 Political and cultural context for learning and teaching

The cultural context for education can be very different in different places. It is affected by the economic, social and political development and history of a country or region. Overall context includes the regulations and cultural framework for schools, which then create their own local cultures and traditional practices for teachers and learners. These **cultures affect which types of learning are considered valuable and encouraged, which types of teaching are expected and supported and whether people and schools are open-minded about trying and developing different ways of learning and teaching**. Therefore, although the main actors in the classroom are teachers and learners, they are affected by policies, traditions, and cultures, which are created and maintained partly by

17 www.tiigrihüpe.ee

people outside the class, such as school leaders, national policymakers and pupils' parents.

The context can affect practices for creativity either negatively or positively. The expert consulted repeatedly pointed out that **there is a need to change educational stakeholders' existing culture and perceptions so that they value creativity in learning practices and objectives more**. Inevitably, changing the culture and ethos at schools and at different levels of educational actors will take time. Strategic leadership at schools and in decision making at regional and national levels is very important for promoting and supporting this change. The STEPS (Balanskat, 2009) survey of European Ministries of Education found that **national policies usually aim to improve infrastructure and teachers' digital competence, but are less frequently focused on the supply of digital learning resources, pedagogical reform or leadership**. The experts interviewed also suggested that decision makers do not interact sufficiently with the suggestions from educational research, nor do they take them into account, even when they come from their own educational support institutions. Furthermore, it was suggested that the **regulations do not always help schools to collaborate and share** when developing educational approaches. As one interviewee said: "Government encourages a competitive and target-setting culture rather than collaboration between schools, which puts them in opposition, not mutually reinforcing."

When considering teaching content, interviewees suggested that the **culture of education in many countries emphasizes the role of grading and marks, and learning single correct solutions**. Furthermore, cultural and contextual pressures makes teachers very concerned about giving students, parents and stakeholders evidence of how they get results. This requires having 'publishable' results at any point, which might not be possible with creative learning methods and risk-taking processes where developing learning results requires iterations. Additionally, other 'cultural' aspects often contradict in practice the factors recognized as enabling creativity in learning and teaching. Especially, the jump from primary school to secondary school seems to make a difference to the expectations of both pupils and parents. As put by an interviewee: "It can be quite difficult to introduce more active and creative teaching methodologies at secondary level. People tend to feel that it's all very fine at primary, but you're down to the serious business now!"

The culture and context for education seem to be more often mentioned as limiting factors than as enablers for developing creativity in learning and teaching. However, some interviewees cited the **2009 European Year of Creativity and Innovation** as an example of an effective policy measure. This was claimed to have **had a visible effect in their country in raising political awareness and commitment for creativity and reforms in education**. It is also a good example of how European level activities can benefit the independent national educational systems. Awareness raising campaigns and specific networking initiatives during the European Year were said to have created connections and annual events that are expected to promote the development of creative and innovative practices at schools in the coming years. An important aspect of developing and changing culture is the promotion of dialogue between all the stakeholders involved, in order to reduce the misunderstandings and resistance to new learning objectives and teaching approaches.

Some **specific cultural barriers** were mentioned in the interviews: strong fear of failure in front of others; pupils to memorising specific answers; a view that learning must require sacrifice and cannot be fun; learning and solitary work, as opposed to collaboration, amongst others. Some interviewees identified as a major barrier the fact that **many teachers are used to working in isolation and are not willing to open up their practices** to others or to develop new ones in collaboration with others. Online networks of teachers were considered useful for supporting teachers to adopt new practices and

learn, but only a few interviewees said that many teachers participated in these activities in their country.

Many interviewees suggested that changing existing cultures and practices is a necessity, which is often difficult to accomplish. **Parents can be very traditional and suspicious about changes in teaching and assessment: they expect their children to learn and get grades the way they did.** Teachers and pupils can themselves be resistant to change. They can be unwilling to consider innovation, preferring to continue with traditional knowledge transfer practices, which are also simpler to implement for both parties and require less work and thought. Furthermore, politicians and teachers' unions are not necessarily in favour of changes to the established systems. An interviewee mentioned that while there is often commitment to change at the highest decision-making levels, problems can arise with the middle-level decision makers.

The school culture as a working environment for both teachers and students is decisive in the development and implementation of educational practices. It is affected by the overall educational culture and context, but can vary greatly depending on the leadership, openness and general 'spirit' of the school. In many countries, schools have strong or partial autonomy in issues that allow them to develop the quality of education. This was raised often by the experts consulted and is also supported by Eurydice (2009). However, the experts revealed that in some countries, strong school autonomy was seen as a barrier for creativity, while in other countries, high central regulation was considered as a barrier. Autonomy makes it difficult to ensure awareness and implementation of new approaches in all the autonomous units, but on the other hand central management also has plenty of inertia for change because of the size of the system.

The school culture was studied by asking the teachers surveyed about their perceptions of their school. Some discrepancies between how teachers claim to foster creativity and innovation and how the school culture addresses creative learning and innovative teaching were observed. When asked about factors valued in their school environments, 73% of teachers believe that creativity is fostered at their school, but only 57% agree that the school fosters divergent thinking and other thinking skills. Moreover, 80% of teachers surveyed think that the schools they work for foster discipline and 78% said the schools reward effort/perseverance. The teachers perceived that the following activities were least encouraged at school: student initiatives (55%), mix of academic work and play (51%), and risk-taking (35%). These activities, however, are the ones that have been recognized as encouraging creativity in the literature. This shows that teachers' classroom practice is not necessarily aligned with the culture they experience as their working context. For example, 96% of the teachers surveyed said they foster pupils' ability to think, and critical thinking skills (83%) in their own classroom practice. This suggests that more dialogue, and participation in decision making at schools might be beneficial for all, as teachers seem to be more open to and interested in fostering creativity-related skills than they feel is supported by the school context.

School leadership is important for enabling teachers to implement practices that can promote creativity. For example, the experts consulted mentioned that practices have been established in some schools for developing personal learning plans for pupils, dedicating school-wide time for cross-curricular work etc. Furthermore, the opportunities provided for teachers to develop their skills and to acquire knowledge about, and support for, implementing new learning and teaching approaches are very important. The SITES study (Law, et al., 2008) found that the most important school-level factors contributing to the development of 21st century skills, including creativity, were the principal's vision for ICT use to support lifelong

learning, technical support for ICT use and the principal's priority for leadership development. STEPS (Balanskat, 2009) found that reliable technical and inspiring pedagogical support for teachers is often missing.

It is worth noting that some expert interviews suggest that the teachers with most interest in innovation and changing pedagogic methods are those who already have some years of experience of teaching practice after their initial training. They have knowledge of the system and the interest in challenging it, and correctly timed and targeted training and support could result in productive and sustainable innovations in teaching practice. They could become a great resource for enhancing creativity and innovative teaching approaches, as Eurydice data shows that currently the most strongly represented age groups of teachers in primary education are 30-39 year olds and 40-49 year olds. Their experience and ideas would be very valuable in developing school practices and culture. Shared decision-making followed up with professional collaboration were also found by SITES (Law, et al., 2008) to be positive predictors of pedagogical ICT use at schools.

In order to encourage teachers to develop innovative teaching approaches, the school culture and leadership needs to support and appreciate their efforts. The fact that many teachers feel alone in their efforts is reflected in the survey by the 74% of respondents who said they need more institutional support, and the 36% who agreed strongly with the statement. Furthermore, the interviews revealed that there may be little incentive for teachers to develop innovations in schools. Teachers get nothing for teaching better, improving their pedagogic practice etc. They may have personal satisfaction from the additional work they have done, but no systemic reward. This is also supported by the OECD TALIS survey of 23 countries, where three-quarters of teachers reported that they would receive no recognition for improving the quality of their teaching or for being more innovative in their teaching (OECD, 2009).

Interviews brought up examples of how the existing culture and contexts, and beliefs about them, can be at odds with the objectives for developing creative learning and innovative teaching: "In a recent study on Creative and Cultural Education in England, many teachers overtly revealed they felt that their innovative practices and creative teaching was somehow problematic. One teacher interviewed repeatedly referred to the fact that 'One day Ofsted will catch up with her' for doing creative things with children, sharing her belief that she would then be in trouble." Another expert interviewed said that they have evidence of teachers not really believing that they have the permission of the authorities to do interesting, active, child-centred and creative activities with students. However, expert interviews did also bring up effective examples of school leadership and support for teachers. For example, in Slovenia they use different forums for approaching and recruiting teachers who then become champions for creativity or ICT in their schools. Some interviews (e.g. Hungary, Estonia) mention pedagogic advisors, centres and support organisations at national level, which aim to support curriculum implementation and pedagogic practices at schools. Some countries also regularly develop guides and gather examples of best practices which they publish to schools in order to support teachers and give practical examples of how to implement new curricula and new learning approaches. The Irish good practice example shows a national project that supports creativity in a specific subject (in this case, mathematics).

Republic of Ireland: Project Maths		
Participants and objective	NCCA (National Council for Curriculum and Assessment) provides schools with support and advice on innovation in maths learning, from September 2010 onwards all schools in Ireland will implement the project	
Age of pupils	Secondary school	
Activities	- Providing lesson plans and guidelines which place great emphasis on understanding of mathematical concepts by relating mathematics to everyday experience - The project offers a range of tools, resources and support to teachers	
Potential for creativity	- Creativity in mathematics is not easy to define and operationalise. Project Maths tackles this issue by encouraging teachers and learners to "rephrase" the language of mathematics, often abstract and de-contextualised, in original and creative way	
Website	http://www.projectmaths.ie/default.asp	

4 Policy options and recommendations

This chapter summarises the options and recommendations for policy makers at different educational levels: local, regional, national and European, highlighting opportunities for collaboration and support. Five major areas for improvement are identified, as described in Figure 3.

4.1 Curricula

- Curricula and learning objectives should provide a definition of creativity which is consistent and takes into account the broad nature of creativity in all curricular areas and across different subjects. Networking at European level could help in finding effective solutions to conceptualise and operationalise creativity and in exchanging best practices.

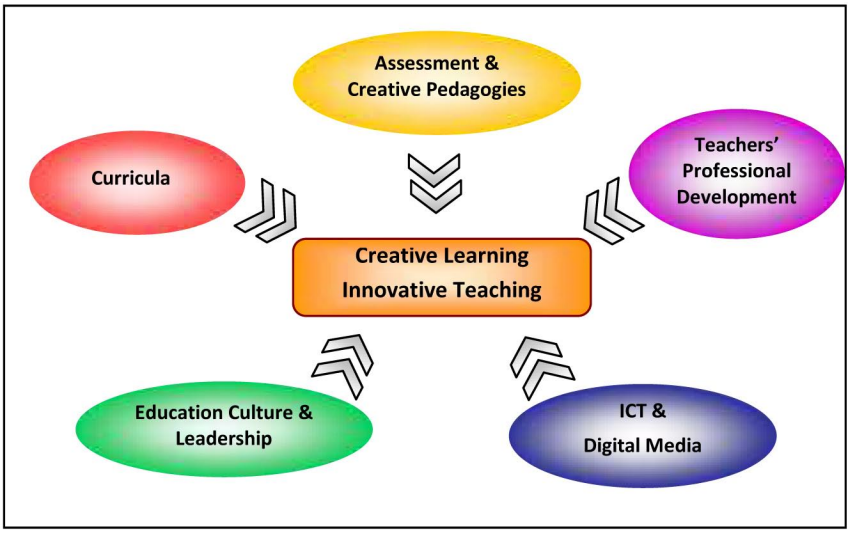
- National or regional curriculum development bodies should ensure that current curricula provide sufficient flexibility and time and space for creativity and innovation in learning objectives.

- Curricula content should be regularly reviewed and updated, taking into account the changing learning needs. Current revisions should take into account transversal, cross-curricular, intercultural and digital competences as key competences for society and economy in the 21st century.

- Documents about learning objectives should be complemented by providing teachers with guidance documents on how to develop creativity in practice. These documents need to raise awareness of the link between teaching practices and creative outcomes, making it clear that creativity and innovation are not subject-related and can be fostered in all students.

- Revision of curricula should be developed and consulted with different educational stakeholders, as well as with relevant

Figure 3: Policy areas that need to be addressed in order to support creativity and innovation at schools



public and private organisations. Feedback mechanisms and piloting approaches should be used in the take-up phase in order to develop a shared understanding of quality and vision.

- Member States should aim to provide all regulatory and educational guidance documents with a clear and comparable structure and make them available online, for the benefit of educational actors within the country as well as for interested experts and researchers from other countries. These documents could be linked to the Eurydice database which would then provide an extensive and updated picture of EU27 educational policies for all decision makers to study and find best practices in creative learning and innovative teaching.

4.2 Assessment and support for creative pedagogies

- National education authorities should ensure that curriculum reforms are accompanied by the revision of central and national exams, and of the principles for school inspections and quality assessment. Changes in learning objectives cannot be implemented in practice if assessment for pupils and schools remains the same.

- A more formative type of assessment of students and pupils should be used as a tool for teachers and learners to understand what needs to be improved, which skills need to be developed and what cognitive areas are to be fostered.

- When introducing new elements to the curriculum, such as the move towards more competence-based approaches, attention should be paid to providing guidance and best practices for assessing the new learning objectives in ways which focus not only on the final outcome but also on the creative and innovative learning processes. This is a common challenge for many countries and European collaboration could enhance the chances of finding effective solutions.

- Specific measures should be taken to raise awareness about creative and innovative approaches in assessment practices for policy makers, head teachers, teachers, parents and pupils themselves. Effective approaches and events from the European Year of Creativity and Innovation could be renewed regularly, for example in European or national theme weeks on innovative learning and assessment approaches for transversal skills and creativity.

- Decision makers should allocate investment to improving the quality of learning and teaching at schools. Large class sizes have been a major problem and now when the number of young pupils is falling in most of the countries, this opportunity should be used to improve the conditions for creative learning and innovative teaching, rather than reducing school budget.

- Traditional practices seem to be most deeply rooted at secondary level. Member States and European co-operation activities should enable secondary schools to develop and transform their practices to incorporate more critical thinking, creativity, collaboration and other key competences for the 21st century. National assessment practices play a key role in guiding their transformation.

4.3 Teacher education and professional development

- Teacher training programmes should provide all prospective teachers with guided development of classroom teaching practice as part of their initial training. Hands-on experience with guidance is crucial to prepare new teachers to face the reality of

the classroom and to develop innovative and creative teaching methods.

- Member States should develop guidelines for creative learning and innovative teaching in teacher training and benefit from European-level networking when doing it. ITT programmes should cover a variety of learning-centred pedagogies and assessment approaches, in particular creativity and innovation as cross-curricular competences, as well as embedding digital competence and tools in all learning.

- Information about relevant online networks and collaboration opportunities, such as eTwinning,[18] should be highlighted and incorporated as part of teacher training, in order to help teachers to participate and learn informally from their peers. Training opportunities should be provided to allow teachers to be mobile within and across countries and to have more exchanges between teachers of different nationalities about innovative learning practices.

- Funding should be targeted at specific teacher training needs in different teacher groups. CPD courses should be provided free of charge for teachers of all ages to engage in lifelong learning and updating skills which are crucial for creative learning and innovative teaching. CPD should be defined as part of teachers' work tasks with time allocated for courses, and participation should be systematically supported and incentivised.

- Both personal and pedagogic digital competence need to become a priority in both ITT and CPD, because lack of ICT skills and understanding of its benefits is a major obstacle for many teachers. Modular training, which takes into account rapid technological development, is needed. Teachers should be able to teach their students to become digitally competent and also guide them towards more exploratory interaction with ICT, in which students can express their creativity and innovation with technologies.

- In those countries where the teaching profession is not valued, national and regional educational authorities should develop a strategy to make the teaching career as more attractive.

4.4 ICT and digital media

- More research and data gathering is needed at national and European levels in order to assess the status and level of technology use by teachers. For developing educational strategies, it is important to study whether technologies and tools are used effectively for creative learning and innovative teaching and what the barriers are.

- Authorities responsible for technology investment should establish a system to regularly review technology maintenance and internet connections. Lack of technical support has also been recognized as a major barrier for efficient ICT use for learning and teaching.

- Teachers across the spectrum should receive more support in integrating technology into their teaching in creative and innovative ways. A national learning resource centre would provide access to tailor-made digital learning resources in local languages and also facilitate the exchange of teacher-created resources and peer discussion platforms.

- Establishing a common European-level portal for providing a link and meeting place between research and education practitioners at national and international levels would enhance educational research, new teaching

18 http://www.etwinning.net/

practice implementation, and related decision making. This portal should also link with national learning resource portals and provide integrated search functions for learning resources in all languages.

- Technologies could be used to support interaction between teachers, pupils and parents. Online platforms could provide parents access to pupils' learning materials and tasks, which would help them to understand new learning approaches and support their children at home with their schoolwork. At the same time, this would reduce parents' need for traditional grades as a means of knowing how their children are progressing at school.

4.5 Educational culture and leadership

- Educational authorities should develop a holistic strategy for revising school education. This should take into account new curricula, new assessment and new teaching and learning practices and digital tools and media for creativity and innovation at all levels of compulsory schooling. National representatives should consider the possible benefits of European-level collaboration and exchanges when developing their strategies.

- The implementation approach for changes in schools should be realistic, combining well-established useful elements from traditional approaches (e.g. having some exams with grades) with new ones such as embedding the ability to solve problems, divergent thinking etc, to the systematic assessment practices during the school career. Implementation should be supported by systematic networking and dialogue between all stakeholders, including classroom teachers and parents.

- All school leaders should participate in training on strategic leadership for school development towards transforming learning and teaching. They should be aware of the objectives of curriculum revisions and the importance of technologies in supporting creative learning and innovative teaching.

- School leaders should encourage school cultures that nurture creativity and innovation, by making visible the development of good practices for creative learning and innovative teaching and rewarding these. National and international collaboration could be encouraged by rewarding sharing and networking activities in schools' assessment and inspection systems.

- Specific attention should be paid to training, salary incentives, new types of work profiles or other models to encourage interested senior teachers to become champions in developing and sharing innovative learning approaches for the benefit of all schools and teachers and setting a new culture.

- Schools should encourage collaborative projects between pupils from different countries through the opportunities offered by ICT, for instance through eTwinning. Fostering intercultural dialogue and cross-curricular skills could enhance creative learning and facilitate more innovative projects across Europe.

5 Conclusions

In this study, we set out to explore how creativity and innovation are conceptualised and practiced in obligatory schooling in the EU27. We analysed explicit attempts to deal with creativity and innovation in the Member States' learning objectives and the level of creative learning and innovative teaching taking place in schools, according to teachers and educational experts. Finally, we also looked at existing examples of good practice in creative and innovative teaching in Europe.

Research and literature in the field suggest that creativity should be conceptualised as a skill, which everyone can develop, and therefore, which can be fostered or inhibited in education. In this study, creativity is understood as a product or process that shows a balance of originality and value. Creative learning is therefore learning that involves understanding and new awareness, which allows the learner to go beyond notional acquisition. Innovative teaching is the process leading to creative learning, and the implementation of new methods, tools and content which could benefit learners and their creative potential.

Education stakeholders consulted in this study emphasise the importance of creativity and innovation for modernising and improving education. There are various practices and projects which aim to foster creative learning and innovative teaching in various countries taking place. However, there is ample room for improvement: in some places, such practices and projects still do not exist, and where they do, they need to be sustained and upscaled. This study has identified five main areas where major improvements are called for: i.e. curricula, pedagogies and assessment, teacher training, ICT and digital media, educational culture and leadership.

In terms of **curricula**, the analysis shows that in more than half European curricula, the terms 'creativity' and 'innovation' and their synonyms are relatively frequently mentioned. The term 'creativity' is often used as a broad objective and is generally linked to Arts subjects, but the study has also found instances where it is referred to as a skill, which should be encouraged, and as an integral part of the learning process. It has also been observed that creativity is more linked to the ability to produce something original, and less to the ability to produce something of value. The study highlights the need for learning objectives which address knowledge in a more holistic way and encourage development of competences which are not subject-specific. Effort should be made to integrate more cross-curricular skills, vital in our societies, such as digital competence, collaboration skills and intercultural understanding. Creativity and innovation should be embedded in the thinking behind and approach to education policies and national visions and they should be promoted in all curricular areas and across different subjects.

This report shows that no matter how excellent a curriculum is, it will be ineffective if there are no supportive structures that enable its implementation. There is a need for education policies which not only raise awareness of the benefits of creativity for learning, but also link teaching practices and methods with creative processes and outcomes. Though there are some reformed curricula and specific guidance documents provided for curricula implementation, few Member States specifically address how creativity and innovation should be developed in practice and how it could be addressed in education. Moreover, curricula should be more holistic and concise. Overloaded content curricula restrict opportunities for active and exploratory learning and informal interaction

between teachers and students, which are important for a creative learning environment.

While **pedagogic practices** vary greatly between schools across the EU27, in general, teachers tend to have a highly positive view of the importance of fostering and valuing creativity and innovation. However, positive attitudes towards creativity do not necessarily transfer to the actual teaching and assessment needed for creative learning. Most of the teachers surveyed claim they encourage learning activities which are likely to allow students to be creative. They also claim they foster skills and abilities that enable creativity and innovation. Primary teachers were more likely to promote creative learning skills and abilities than secondary teachers.

Conventional teacher-centred methods, frontal teaching and chalk and talk still prevail in the good majority of schools in the EU27. Repetition, copying of factual information and rote learning remain common in many schools. While teachers' lack of skills and confidence is one of the main reasons for such practices, other factors, namely tight timetables, overloaded curricula, lack of support in the classroom, too many pupils per teacher and a school culture that does not support new methods were also highlighted. Teachers are very often isolated and lack support and hence prefer to encourage convergence and discipline instead of divergence, because it is easier to handle in class.

Assessment comes up throughout the study as a major issue that affects school practice and culture, as it is both an enabler and a barrier for creative learning and innovative teaching. Though schools in the EU27 do in fact deploy different methods for evaluating their students, nonetheless, there is still a preference for conventional testing. Grades and summative assessment constitute the main type of assessment in most Member States. This is especially the case in secondary schools, which are often more focused on preparing students for national exams. There is also resistance to changing traditional assessment practices, mainly because parents, teachers, and even students still consider grades as an important and concrete way of giving feedback about learning and of benchmarking students' performance. Furthermore, in many EU27 countries, traditional national examinations are used as a tool to measure the quality of schools and teachers. This suggests that unless central examinations are revised, teachers will not be motivated to change their learning practices.

However, a slow shift to more versatile ways of assessing students, such as assessment through presentations, group work, peer feedback and portfolios, amongst others, can be noted. Promoting a range of assessment methods which measure not only end results but also support creative learning processes is important. The study highlights a strong link between fostering a creative and innovative school culture and changing assessment tools and the reward processes for creative learning.

In order to develop creative learning approaches, it is crucial that **teacher training** prepares new teachers to become reflective practitioners, able to discern how a teaching method or activity can stifle or trigger creativity in their students. This study revealed that only a quarter of the teachers surveyed claim to have learnt how to teach during ITT. Training in various countries remains fragmented and there is a strong need for more practical guidance which teachers can apply in the classroom. Furthermore, new requirements for teaching, such as ICT and other cross-curricular competences, like creativity and innovation, are not sufficiently covered in ITT.

Encouraging teachers of all ages to engage in life-long learning activities, like for instance CDP, should be a priority at both European and Member State level. The study showed that training on creativity had an impact on teachers' conceptualisation of creativity. This highlights the importance of embedding a clear vision, awareness and understanding of the creative and innovative process into teacher training

approaches. This study also argues for providing different types of training, including informal learning with peers. Exchange between teachers on an international level provides opportunities for teachers to learn from each other and exchange and adapt expertise and knowledge to their own working context. Results from the best practices also show that enabling interaction between teachers and outside experts could be highly beneficial in terms of learning in an innovative and creative way. The potential of the internet as a space where training could take place should not be underestimated and existing European networking activities such as eTwinning should be more effectively promoted and used by all schools and teachers.

The potential of **technologies** for creative learning and innovative teaching cannot be ignored. Although the teachers surveyed are technology conversant and use the internet extensively in their work, they still claim to need more training in ICT. Technology tools are far from fully exploited for creative learning and innovative teaching in the classroom. The potential of social technologies and media for education remains untapped. Research is needed on how teachers appropriate new technologies, in order to help them use technologies for pedagogical purposes more efficiently and innovatively. Despite the increase in the numbers of computers in schools, our survey shows that hands-on access for pupils remains limited. Allowing pupils to play with and explore new tools could enhance their motivation to think, understand, learn and conceptualise in creative ways. Initiative shown by students, which are closely linked to risk-taking and divergent thinking, especially in the use of technology, should be taken in to account in assessment.

There is a need for **personal and pedagogical digital competence for both teachers and students.** The potential of new technologies for creative learning and innovative teaching cannot be exploited unless teachers' proficiency in using ICT and the quality of ICT in schools is improved, software in different languages is provided and more space for information interaction between teachers and students is allowed. This study shows that teacher training in ICT had positive impact on the take-up of new technologies by teachers. However, in many countries where provision of ICT training is available, not enough effort seems to be devoted to using ICT for creative and innovative pedagogies. There is a strong need for pedagogic training which empowers teachers with the required ICT skills so that they can help their students become digitally competent, and also guide them towards more exploratory and creative interaction with ICT tools. This study calls for modular pedagogic training which takes into account the rapid development of ICT tools and applications and which ensures that teachers are able to transfer their knowledge across different subjects, and also aligns their knowledge with students' real and future needs.

The cultural context and leadership for education is built on several levels and is reflected in regulations, school leadership and general cultural attitudes. These interlocking cultures affect which type of learning is considered valuable and encouraged, which types of teaching are expected and supported and whether people and schools are open to trying and developing different ways of learning and teaching. This study also clearly shows that major changes are needed in the overall educational culture of people outside the classroom, such as school leaders, national policymakers and parents. Awareness campaigns, networking initiatives and dialogue between all stakeholders involved have been shown to have a positive effect in promoting the development of creativity and innovation in schools. The 2009 European Year of Creativity and Innovation had a visible effect on most of the countries studied and similar European and national awareness raising events should be organised.

The school culture as a working environment for both teachers and students is decisive for the development and implementation of creative and innovative educational practices. Though teachers perceive that creativity is often present

in their school culture, they do not see it as highly appreciated. Therefore, innovative teachers' personal classroom practices are not necessarily aligned to the culture they experience in their working contexts. This highlights the importance of school leadership and culture which support and appreciate teachers' efforts in implementing, and experimenting with, innovative practices that can promote creativity. In many schools there are few incentives for teachers to put their personal efforts and time into developing creative learning and innovative pedagogic practice.

In conclusion, the study has found extensive potential for creative learning and innovative teaching within the European school system. It also demonstrated that education is based on different interlocking structures and unless changes take place at different levels, it will not produce the desired results. Offering the right chances to develop students' creative and innovative potential and effort in reducing barriers and improving the presence of enabling factors for creativity and innovation should be a priority for schools, so as to support the shift towards a more creative and innovative education in Europe.

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Abstract

EU policies call for the strengthening of Europe's innovative capacity and the development of a creative and knowledge-intensive economy and society through reinforcing the role of education and training in the knowledge triangle and focusing school curricula on creativity, innovation and entrepreneurship. This report brings evidence to the debate on the status, barriers and enablers for creativity and innovation in compulsory schooling in Europe. It is the final report of the project: 'Creativity and Innovation in Education and Training in the EU27 (ICEAC)' carried out by IPTS in collaboration with DG Education and Culture, highlighting the main messages gathered from each phase of the study: a literature review, a survey with teachers, an analysis of curricula and of good practices, stakeholder and expert interviews, and experts workshops. Based on this empirical material, five major areas for improvement are proposed to enable more creative learning and innovative teaching in Europe: curricula, pedagogies and assessment, teacher training, ICT and digital media, and educational culture and leadership. The study highlights the need for action at both national and European level to bring about the changes required for an open and innovative European educational culture based on the creative and innovative potential of its future generation.

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