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PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

**Opening up Education:
Innovative teaching and learning for all through new Technologies and Open
Educational Resources**

{SWD(2013) 341 final}

Technology and Open Educational Resources as opportunities to reshape EU education

This Communication sets out a European agenda for stimulating high-quality, innovative ways of learning and teaching through new technologies and digital content. 'Opening up education' proposes actions towards more open learning environments to deliver education of higher quality and efficacy and thus contributing to the Europe 2020 goals of boosting EU competitiveness and growth through better skilled workforce and more employment. It contributes to the EU headline targets for reducing early school leaving and increasing tertiary or equivalent attainment¹ and builds on the recent initiatives 'Rethinking Education'², 'European Higher Education in the World'³ as well as the flagship initiative Digital Agenda⁴.

It proposes actions at EU and national levels, notably:

- helping learning institutions, teachers and learners to acquire digital skills and learning methods
- supporting development and availability of open educational resources
- connecting classrooms and deploying digital devices and content
- mobilizing all stakeholders (teachers, learners, families, economic and social partners) to change the role of digital technologies at education institutions

Even though the key for success depends foremost on Member States, the EU also has a role to play. It can promote best practices and support exchanges across Member States. It can deliver benefits from economies of scale and interoperability, thus avoiding fragmentation. It can support the deployment and availability of digital technology and content through financial support, public-private partnerships and recommendations.

EU education is failing to keep pace with the digital society and economy...

Digital technologies are fully embedded in the way people interact, work and trade; yet they are not being fully exploited in education and training systems across Europe. A recent study⁵ on the state of digital provision in schools in the Union revealed that 63% of nine year olds do not study at a 'highly digitally-equipped school' (with appropriate equipment, fast broadband and high 'connectivity'). While 70% of teachers in the EU recognize the importance of training in digital-supported ways of teaching and learning, only 20-25% of students are taught by digitally confident and supportive teachers. Most teachers use Information and Communication Technologies (ICT) mainly to prepare their teaching, rather than to work with students during lessons⁶.

Today's learners expect more personalization, collaboration and better links between formal and informal learning much of it being possible through digital-supported learning. However, between 50% and 80% of students in the EU never use digital textbooks, exercise software, broadcasts/podcasts, simulations or learning games. The EU lacks a critical mass of good quality educational content and applications in specific subjects and multiple languages as well as connected devices for all students and teachers. A new digital divide in the EU, between those who have access to innovative, technology-based education and those who do not, is on the rise as a consequence of this fragmentation of approaches and of markets.

¹ 2012/C 70/05

² COM(2012)669

³ COM(2013)499

⁴ COM(2010)245

⁵ See http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=1800

⁶ See accompanying Staff Working Document for all data and evidence used in this Communication

The EU also risks lagging behind other regions of the world. The USA and some Asian countries are investing in ICT-based strategies to reshape education and training. They are transforming, modernizing and internationalising education systems with tangible effects in schools and universities on access to and cost of education, on teaching practices and their worldwide reputation or branding. A case in point is that much of the supply of digital content comes from players outside Europe, including from educational institutions offering their courses globally through Massive Open Online Courses (MOOCs).

...and yet technology provides the opportunity to increase efficiency and equity in education.

The potential benefits of the digital revolution in education are multiple: individuals can easily seek and acquire knowledge from sources other than their teachers⁷ and institutions, often for free; new groups of learners can be reached because learning is no longer confined to specific classroom timetables or methods and can be personalised; new education providers emerge; teachers may easily share and create content with colleagues and learners from different countries; and a much wider range of educational resources can be accessed. Open technologies allow *All individuals to learn, Anywhere, Anytime, through Any device, with the support of Anyone.*

Most importantly, education and knowledge are able to travel far more easily across borders greatly increasing the value of and potential for international cooperation. Thanks to Open Educational Resources (OER)⁸, and namely MOOCs, teachers and education institutions can now reach thousands of learners from all five continents simultaneously, showcasing that language is not always a barrier. Cooperation is enhanced by allowing learners, educators, researchers and institutions to create, share and discuss content with peers from all over the world.

In addition to broadening access to education, wider use of new technology and open educational resources can contribute to alleviating costs for educational institutions and for students, especially among disadvantaged groups. This equity impact requires, however, sustained investment in educational infrastructures and human resources.

Open technologies provide the opportunity for Europe to attract new talent, equip citizens with relevant skills, promote science and research and fuel innovation, productivity, employment and growth. Europe should act now providing the right policy framework and a stimulus to introduce innovative learning and teaching practices in schools, universities, vocational education and training (VET) and adult learning institutions. The EU policy framework (the Open Method of Coordination in Education and Training 2020) and EU programmes (particularly Erasmus+, Horizon 2020 and the Structural and Investment Funds) can provide incentives and create framework conditions for this to happen. This can help all Member States and regions, particularly those less developed, to also benefit from quality education, and improve their growth potential, thus maintaining economic and social convergence.

The actions proposed in this document will be supported by the EU as mentioned above and reflect the results of consultation with a broad range of stakeholders which took place since summer 2012. The results and detailed evidence base are also presented in a Staff Working Document (SWD) that provides an analysis of the current situation in Member States with significant differences among them, highlights best practices, and analyses the main obstacles at EU level impeding the introduction of innovation in education through digital content and technologies. What is at stake obviously varies between different learning sectors (i.e.

⁷ The word teachers is used as meaning 'teachers, trainers, professors and other educators from all educational levels and sectors'

⁸ OER are learning resources that are usable, adaptable to specific learning needs, and shareable freely.

compulsory education, higher education, vocational education and training and adult education) and non-formal and informal learning.

1. Open Learning Environments: opportunities to innovate for organisations, teachers and learners

1.1 Innovative organisations

Education and training institutions need to review their organisational strategies...

All educational institutions need to improve their capacity to adapt, promote innovation and exploit the potential of technologies and digital content. In effect, however, institutional strategies tend to oppose openness to education that ICT provides. In school education and VET, restrictive regulations on curricula and assessment practices impede the full exploitation of technology-enabled approaches to teaching and learning. In higher education other factors such as inflexible funding and governance structures, compounded by restrictions on budgetary resources, inhibit change. In adult learning too, ICT offers huge potential for structural change: a survey carried out in Finland⁹ shows that only 41% of respondent organisations in Finnish industry had used online learning in their 2012 staff training. Yet using ICT in training can reduce costs and increase flexibility in terms of time and space.

Only if educational institutions change the framework conditions in which they operate will they grasp the opportunities that ICT provides. Open learning environments require the leaders of educational institutions to play an active role by: providing a strategic vision; transforming siloed institutions into connected learning communities and rewarding professionals for innovative teaching approaches. Leadership has to be accompanied by organisational change and institutional development plans. Educational institutions should consider assessing how fit and ready they are to use ICT and reviewing their organisational and business models if necessary. This implies, for example assessing what efficiency gains can be made by digitising back-offices, whether ICT is safely integrated as can be done via the eSafety label for schools¹⁰ or, whether learning and teaching are digitally supported. It may also require a review of whether it is the institution's vocation to transmit knowledge and/or to certify its acquisition.

The appearance of disruptive innovation like MOOCs has the potential to transform higher education and create new competition and centres of excellence among universities worldwide. Even though the first Open Courseware project began in Germany, the biggest shifts are taking place in the USA. While the three main MOOC providers in the USA offer around 400 courses, with three million users worldwide, few European universities are providing MOOCs. A recent survey¹¹ shows that one third of the 200 European universities consulted were not even aware of what a MOOC is, and only one third were considering any MOOC-related initiative.

Exploiting this potential can best be achieved through strategic partnerships. One positive example is the recent launch of the European MOOC Initiative by the European Association of Distance Teaching Universities¹². Such an initiative proves that working across borders

⁹ http://www.ek.fi/ek/fi/tutkimukset_julkaisut/2013/4_huhti/henko_tiedustelu2013.pdf

¹⁰ <http://www.esafetylabel.eu/> - the eSafety label is an initiative developed by some Ministries of Education of the European Schoolnet network

¹¹ http://www.eua.be/news/13-0225/Massive_Open_Online_Courses_MOOCs_EUA_to_look_at_development_of_MOOCs_and_trends_in_innovative_learning.aspx

¹² <http://www.openuped.eu>

provides the necessary scale to generate new education solutions which would otherwise be out of reach if designed by each institution on its own.

... to stimulate innovative learning practices.

A stronger use of learning experiences, combining face-to-face and online (blended learning), can increase student's motivation and the efficacy of learning. In apprenticeship-type training, for example, technologies can be used to simulate real-life situations where learners improve their technical skills and their problem-solving abilities. Technology also allows for new ways of learning and assessing, focussing more on what the learner is capable of doing rather than on the mere acquisition of information or on what the learner is capable of repeating.

Technology makes it possible to develop new solutions for better personalised learning, by allowing teachers to have a more accurate and up-to-date follow up of each learner. Through learning analytics¹³, new and more learner-centred teaching methods can emerge since the evolution of learners who use ICT regularly can be closely monitored: teachers may know the exact learning outcomes of each individual and identify needs for additional support depending on each individual's learning style.

1.2 Innovative teachers

Teachers should be able to acquire high digital competences...

Teachers have been, over the years, constant promoters of innovation in our educational institutions. However, when considering the integration of ICT, many do not possess the necessary competences for the pedagogic use of ICT. Only seven countries¹⁴ have 30 to 50% of students at grade 4 and/or grade 8 taught by digitally confident and supportive teachers, with high access to ICT and who face low obstacles to their use at school. Studies also show that 70% of teachers in the EU would like to have professional development on ICT skills.

Initial teacher education should place a strong emphasis on digital-supported teaching methods (digital pedagogies). A joint EC-OECD survey shows that six teachers out of ten have not received any training on how to use ICT in the classroom. An urgent emphasis on digital pedagogic competences is also needed during continuing professional development to keep teachers updated. Addressing this challenge is at the heart of interests of several stakeholders who, in the context of the Grand Coalition for Digital Jobs, have already pledged to develop European MOOCs to train teachers in specific skills so as to contribute to boost their digital skills. Among others, the Commission will build further on the *European Schoolnet*¹⁵ Academy to develop and deliver large scale online professional development courses for teachers in specific areas such as maths, science and technology as well as will support a network of organisations involved in pre- and in-service training for teachers.

... to connect through strong communities of practice...

The use of educational content and OER is constrained by the difficulty in finding adequate resources for each user's specific needs: teachers tend to mainly use resources that have been recommended by other colleagues. Communities of practitioners at EU level have proven to be solid solutions for exchanging good practices and for peer support, as shown by the massive engagement of teachers in the *e-Twinning*¹⁶ platform, with more than 200.000

¹³ Learning analytics are defined as the measurement, collection, analysis and reporting of data about learners and their contexts. See <http://www.solaresearch.org/>

¹⁴ BG, EE, IE, PT, SK, SI, SE

¹⁵ Network of 30 European Ministries of Education dedicated to the innovative use of educational technology

¹⁶ <http://www.etwinning.net/>

registered users, in *SCIENTIX*, the community for science education in Europe¹⁷, and in *Open Discovery Space*¹⁸. In order to ensure that large communities of practice benefit from professional development through online resources and peer learning, the Commission will explore ways to leverage the existing networks and create new ones including the future *EPALE* (Electronic Platform for Adult Learning in Europe). Attention will also be devoted to explore the potential of collaborative work in teaching and learning in higher education, currently less developed than in research.

... and be rewarded for new teaching methods.

Teachers are influenced by the way their performance is evaluated. While performance measurement differs between countries and educational sectors, it rarely includes parameters associated with open pedagogical practices. Member States, regional authorities and education and training institutions need to revisit performance evaluation schemes to create the right stimulus for teachers to introduce and embed innovative teaching.

1.3 Innovation for learners

Learners expect to acquire the digital skills for the 21st century...

Individuals must acquire new skills for a digital world¹⁹. Although digital competences are essential for employment, today's young people lack the ability to use them creatively and critically. Being born in a digital era is not a sufficient condition for being digitally competent. Studies show that, on average, only 30% of students in the EU can be considered as digitally competent; and still 28% of students in the EU have practically no access to ICT, neither at school or at home. Only around half of initial VET students in Europe attend classes where teachers use ICT in more than 25% of the lessons. Furthermore, the low or non-existent digital skills of many adults hinder their productivity and innovation capacity at the workplace and limit their participation in society²⁰.

Through the *Grand Coalition for Digital Jobs*, the Commission is already working in partnership with industry to promote the necessary skills for ICT practitioners. However, more individuals need to acquire better digital skills and become accustomed to actively using technology to increase their job prospects. It is essential to reinforce digital skills through informal and non-formal learning and through new school curricula, where coding for example is becoming commonly used. Special attention is also needed to disadvantaged groups such as learners at risk of low achievement in e.g. science & technology or with learning difficulties.

...and have their digitally-acquired skills easily certified and recognised for further learning or work.

Learners expect their skills to be recognised by potential employers or for further learning and seek out education and training providers who can award relevant qualifications.

Assessing and certifying learners' achievements are challenges facing those who provide online education: it implies integrating online learning practices into formal curricula and finding ways to validate technology-supported learning in non-formal and informal settings. Some providers have started to offer 'open badges' certifying that a learner has completed a given course or acquired a certain skill. However, these are not yet recognised by qualifications authorities and are often unknown in the labour market.

¹⁷ <http://www.scientix.eu>

¹⁸ Open Discovery Space (www.opendiscoveryspace.eu) provides communities of practice round use of OER

¹⁹ Digital competence is one of the 8 key competences for lifelong learning (Recommendation 2006/962/EC)

²⁰ 48% of Europeans aged 16-74 have low or no ICT skills.

Validation and recognition instruments used in formal education must adapt to the emergence of a much more diversified educational offer, including new education providers and the new forms of learning made possible by technology. In parallel, new tools may need to be created both to ensure that technology-supported learning taking place outside formal education is validated and to encourage learners to become more engaged in open practices. These new tools should respect the principles set out in the Council Recommendation for the Validation of Non-formal and Informal Learning²¹ in synergy with established validation and recognition tools and contribute to the creation of a European Area for Skills and Qualifications²², the latter aiming to address the diversity of practices across Member States and promote an effective recognition across borders.

Key Transformative Actions in this Area

Through the new programmes Erasmus+ and Horizon 2020, the Commission will:

- Support educational institutions in developing new business and educational models and launch large-scale research and policy experimentations to test innovative pedagogical approaches, curriculum development and skills assessment;
- Support teachers' professional development through open online courses, following pledges made under the Grand Coalition for Digital Jobs²³, and by creating new and scaling up existing European platforms for teachers' communities of practice (e.g.: eTwinning, EPALe) to establish collaborative peer-based teaching practices across the EU;
- Explore and test, in cooperation with stakeholders and Member States, digital competence frameworks and self-assessment tools for learners, teachers and organisations;
- Explore how established and emerging tools for the validation and recognition of skills, such as 'open badges', can be tailored to the needs of learners.
- Coordinate, facilitate exchange of experiences and results achieved in national programmes between MS and provide targeted policy guidance to clusters of MS to help them to identify successful measures for meeting their challenges in view of the country specific recommendations (CSRs) under the European Semester /Europe 2020

Member States and education institutions should:

- Support innovative teaching and learning environments, including through the use of structural and investment funds (ESIFs);
- Ensure that transparency and recognition instruments for formal education are adapted to new forms of learning including validation of skills acquired online, in line with national tools in the context of the Council Recommendation for Validation of non-Formal and Informal Learning,

²¹ Council Recommendation (2012/C 398/01)

²² COM (2012)669

²³ <http://ec.europa.eu/digital-agenda/en/grand-coalition-digital-jobs-0>

- Support teachers in acquiring a high level of digital competences and adopt innovative teaching practices through flexible training, incentive schemes, revised curricula for teachers' initial education and new professional evaluation mechanisms;
- Reinforce digital skills in education and training institutions, including among disadvantaged groups, and revisit learners assessments in order to ensure that all skills acquired through digital learning can be recognised.

2. Open Educational Resources: opportunities to use open knowledge for better quality and access

Knowledge is open when it is provided through tools accessible to all citizens. OERs are important for stimulating innovative learning environments where content can be adapted by users according to their needs. Stimulating supply and demand for high-quality European OERs is essential for modernising education. Combined with traditional educational resources, OERs allow for blended forms of face-to-face and online learning. They also have the potential to reduce the costs of educational materials for students and their families as well as for public budgets when these cover the costs of educational materials.

High-quality European OER must become more visible and accessible to all citizens...

In the past decade, the supply of OERs in the world has grown exponentially. However, while there is an increasing variety of subjects, OERs are generally produced in a limited number of languages (mostly English), and used by specific education sectors (especially higher education) and specific disciplines (e.g. ICT). The use of OERs in Europe is still too fragmented and not sustained²⁴.

Efforts need to be stepped up to ensure that European content is visible and widely accessible as well as that users, learners and teachers are capable of finding resources and are assured of their high quality. For many teachers the lack of cataloguing, selection and availability of adequate quality resources is an important obstacle to the wider use of OER.

Based on the initial experience of the *e-Learning Portal* and building on the strong involvement of stakeholders, the Commission will launch, with Erasmus+ funding, a single gateway for OERs produced in Europe, federating existing platforms with advanced browsing and search features to help users find the appropriate content. In terms of quality assessment of content, the potential of peer and crowd assessment²⁵ will be explored next to other approaches to increase the visibility of high-quality OERs, and to develop quality frameworks for OER and mapping with curricula.

European education and training institutions, teachers and learners should also be encouraged to share their own educational materials freely with peers through the use of open licenses²⁶. In line with the Paris Declaration of the United Nations Educational Scientific and Cultural Organization (UNESCO)²⁷, a common European approach should allow publicly funded educational materials to be freely available for all those wishing to use them for learning or

²⁴ See outcomes public consultation in the accompanying Staff Working Document

²⁵ Crowd rating refers to ratings being attributed to available resources by their users (crowd).

²⁶ As defined by OECD: "Open licensing provides a way of controlled sharing with some rights reserved to the author. Open licenses have the benefit of introducing certainty and clarity into the process of obtaining permission to use the work of others". <http://www.oecd.org/edu/ceri/37351085.pdf>

²⁷ <http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/open-educational-resources/what-is-the-paris-oer-declaration/>

teaching. Furthermore, technical tools such as Open Quality Standards should help OER producers to raise the visibility of the quality of the creation process and the resource itself. Moreover, currently the value added tax (VAT) rate applied to digital (educational) textbooks is, in most countries, higher than the VAT rate applied to physical (educational) textbooks. A range of stakeholders urge to address this difference in rates in order to enhance the uptake of digital resources. The Commission has an on-going process and will come before the end of 2013 with the follow-up to the VAT action plan. Moreover, the 2013 European Semester recommendations also highlight that the inefficiency that is built into the design of some national tax systems (for example some reduced rates and other tax exemptions) needs to be tackled.

Finally, stakeholders involved in the provision of 'traditional' educational materials can also help to make high-quality digital content more available: textbook authors, publishers and booksellers can contribute to joint collaborative efforts to find new innovative technical solutions ensuring that high-quality resources are available to all. The complementarity of traditionally published resources and OERs, as well as freedom of choice for teachers and educators, should remain key guiding principles.

...and the rights and obligations of users of educational materials under copyright should be more transparent across borders.

The absence of clear information on authorised uses for a specific online learning material (e.g. text, images and videos) deters users²⁸. Similarly, it is difficult for authors of new content to define the usage rights and/or limitations they wish to associate with a certain resource. Promoting open licences among both communities of teachers and policy makers, as well as developing of technical tools to integrate metadata²⁹ in each resource available on the web, will increase transparency.

The EU copyright framework³⁰ includes exceptions for the use of material for teaching purposes. The implementation of these exceptions varies across Member States. Given the cross-border potential of innovative practices in using educational content, it is important to assess whether the current legal framework ensures in practice sufficient transparency and legal certainty for users. The Commission is currently carrying out a review of the EU copyright framework as announced in its Communication of 18 December 2012 on Content in the Digital Single Market.

Key Transformative Actions in this Area

The Commission will:

- Ensure that all educational materials supported by Erasmus+ are available to the public under open licenses and promote similar practices under EU programmes;
- Use the new programmes Erasmus+ and Horizon 2020 to encourage partnerships between creators of educational content (e.g. teachers, publishers, ICT companies), to increase the supply of quality OER and other digital educational materials in different languages, to develop new business models and to develop technical solutions which provide transparent information on copyrights and open licenses to users of digital educational resources;

²⁸ See public consultation: 84 % of respondents indicate the lack of a clear legal framework in this respect.

²⁹ Specific data on each resource allowing for automated classification of its content or its characteristics.

³⁰ Directive 2001/29/EC of the European Parliament and of the Council of 22 May 2001 on the harmonization of certain aspects of copyright and related rights in the information society.

- Launch with this Communication the *Open Education Europa* portal linking it to existing OER repositories in different languages and bringing learners, teachers and researchers together, so to improve the attractiveness and visibility of quality OERs produced in the EU.

Member States and education institutions should:

- Stimulate open access policies for publicly-funded educational materials;
- Encourage formal education and training institutions to include digital content, including OERs, among the recommended educational materials for learners at all educational levels and encourage the production, including through public procurement, of high-quality educational materials whose copyrights would belong to public authorities.

3. Connectivity and Innovation: partnerships for infrastructures, new products and services, and interoperability

The lack of hardware devices or the low penetration of broadband impedes the optimal use of technology, impairs the potential to use OER and educational software and compromises the 'Bring Your Own Device' principle³¹. In many places broadband exists at institutional level but not at classroom or device level, and different devices with different technical specifications (e.g. different software or brands) are currently not providing equal access to educational resources.

Enhancing local ICT infrastructure (broadband, content, tools) is still needed in some parts of Europe...

The level of infrastructures should no longer be a factor impeding innovative ways of teaching and learning. Nor should differences in availability be a cause for inequalities between citizens or different geographical areas. The infrastructure divide not only creates equity problems among learners but also erodes the potential gains from a greater participation by citizens in the economy.

Member States are investing in upgrading their national educational infrastructure (ICT, digital educational resources, broadband) but fragmentation and incoherence among EU Member States persists. On average, 93%³² of EU students access the internet at home, but only 72% have access to it at a place of education, sometimes not in the classroom. Regional disparities also persist: only 45-46% of students who use the Internet in Greece and Croatia can access it at a place of education, as opposed to more than 90% in Latvia, Lithuania and the Czech Republic³³.

Investment in infrastructures should be fostered in those regions lagging behind the rest of Europe. Structural and Investment funds should be channelled towards education and training³⁴ to enhance local ICT infrastructures and joint procurement for innovation of

³¹ According to which learners are expected to use their own computers or mobile devices to access educational materials in the classroom.

³² Eurostat, 2011 data.

³³ <http://epp.eurostat.ec.europa.eu/tgm/mapToolClosed.do?tab=map&init=1&plugin=1&language=en&pcode=tin00081&toolbox=types>

³⁴ <http://www.education.ie/en/Press-Events/Conferences/Ireland-s-Presidency-of-the-EU/Conference-21-22-May-2013/Channelling-cohesion-policy-funds-towards-education-and-training.pdf>

different contracting authorities. This would produce economies of scale, lower prices, administrative cost savings and a pooling of different skills and expertise.

... and open interoperability standards are necessary to ensure economies of scale...

Learners using different devices, including different hardware and software configurations, should not be prevented from using the same educational resources. Neither should producers of digital content see their chosen format limit the potential number of users of their resources. Interoperability and portability standards for educational resources have to be defined and ensured across devices, platforms and brands to provide a level playing field for all market players. Standards should also ensure that resources could be used across different platforms thus enhancing their effectiveness. Furthermore, such standards must remain open to avoid market dominance by any single company owning standards and able to shape the market according to its individual goals.

...so that European digital apps and digital contents markets can grow.

While worldwide investment in broadband and entrepreneurship is creating important business opportunities, the business potential for educational software and content in Europe remains largely untapped. Developments in cloud technologies and gaming, personalisation of learning and mobile devices will drive growth in the educational technology market. Encouraging growth and innovation-based entrepreneurship for a new educational ecosystem as well as mechanisms to scale solutions appropriately across education and training sectors is imperative if European companies are to be internationally competitive and create jobs.

Key Transformative Actions in this Area

Through the new programmes Erasmus+ and Horizon 2020, the Commission will:

- Promote the development of open frameworks and standards for interoperability and portability of digital educational content, applications and services, including OER, in cooperation with European standardization organisations and programmes, and develop components for an efficient educational technologies market place including the coordination of joint specifications for public procurement of innovative solutions to help the deployment of affordable devices, software and content;
- Promote research and innovation on adaptive learning technologies, learning analytics and digital games for learning, creating links with innovative entrepreneurs.

Member States and education institutions should:

- Connect every school, ideally including connectivity to individual classrooms, to broadband, upgrade their ICT equipment, and develop accessible, open national digital learning repositories using structural and investment funds by 2020.

4. A concerted effort to seize the opportunities of the digital revolution

We need an integrated approach ...

Developments in the use of ICT and digital content have varied in the Member States. Many have recognized the potential impact of technology on education and many e-learning initiatives have been launched. However, initiatives have been fragmented and isolated; investments in infrastructure were often not accompanied by efforts to increase the capacity

and motivation of teachers and learners to use it. For this reason, despite the large investments made, projects have rarely succeeded in moving from a pilot phase into mainstreaming.

Past lessons show that merely introducing technology into classrooms is not enough. Only an integrated approach, where access to digital content, ICT infrastructure, the right level of digital skills, and the right organisational strategies are secured, can generate an educational offer able to sustain innovation.

... a concerted effort by all actors ...

Triggering large-scale sustainable changes requires shared efforts and focused actions, involving and engaging all stakeholders, learners, teachers, families, school managers, educational policy makers and the local communities.

Large scale demonstrations and experimentations, engaging pupils with exciting learning opportunities inside and outside schools and involving all stakeholders, including regional and local actors, should contribute to building bridges between the education and the workplace, to produce for more flexible and effective mechanisms for integrating working and learning experiences.

Key Transformative Actions in this Area

Through the new programmes Erasmus+ and Horizon 2020, the Commission will:

- Launch a platform open to all stakeholders (teachers, learners, families, digital communities, economic and social partners, etc.) to record and benchmark the digital state of educational institutions;
- Establish a European Hub of Digitally Innovative Education institutions, showcasing and piloting innovative ICT-based pedagogical and organizational practices, complemented by a specific European Award of Digital Excellence.

Member States and education institutions should:

- Promote networks of volunteer teachers, digital communities and ICT experts in launching initiatives (such as coding courses or back-to-school programmes) and establish teachers' awards for the good pedagogical use of ICT for all educational sectors.

...and a better understanding of all opportunities that the digital revolution is yet to unfold.

Member States and other stakeholders are invited to work actively with the Commission to implement, in a systemic way and with vigour, the priorities proposed in this Agenda as part of their national education and training reforms. The Commission will follow the progress made at national level on the key challenges identified in this Communication via the annual Education and Training Monitor.

This Agenda is not an end but a starting point. In the longer term, technological change will radically affect education and research in ways that are difficult as yet to predict. Sustained effort and on-going international cooperation is required to improve our knowledge-base and take full advantage of the impact of technology on education.

By the end of 2013, the Commission will present studies on innovation in Higher Education, on the changing pedagogical landscape in Higher Education due to new modes of teaching and learning, and on the use of ICT and OER in adult learning. Furthermore, it will continue to work and cooperate with national regional and local authorities, social partners, business, students, new educational providers and other international organisations such as UNESCO, the International Council for Open and Distance Education (ICDE) and the OECD, to better

understand the implications of technology in the education world while harnessing the potential of these changes it brings.

European Commission support for better knowledge and stronger evidence-based policies

The Commission will:

- Carry out a comprehensive exercise of foresight scenarios for education in Europe 2030, in consultation with relevant actors such as ERT, EADTU, LERU, EUA and European Schoolnet on the basis of the work carried out by JRC-IPTS³⁵ and in line with the on-going FUTURIUM³⁶ project. As regards higher education, the Commission will also pursue work with the High Level Group for Modernisation of Higher Education to establish recommendations on the new modes of learning.
- Develop measuring tools and indicators to monitor more closely the integration of ICT in teaching and training institutions, and support Europe-wide quantitative surveys.
- Launch an impact assessment on the economic and social impact of an EU initiative to stimulate open access to educational materials produced with public funds.
- Exploring ways with rightholders, teaching institutions and other educational stakeholders to understand and assess the current practices and needs of sharing educational materials (including open educational resources), including those resulting from copyright and licensing regimes, multilingualism, quality assurance, etc. both in national and cross-border contexts.

³⁵ <http://ipts.jrc.ec.europa.eu/pages/EAP/eLearning.html>

³⁶ <http://ec.europa.eu/digital-agenda/futurium/>