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Digital Education Policies in Europe and Beyond

Key Design Principles for More Effective Policies

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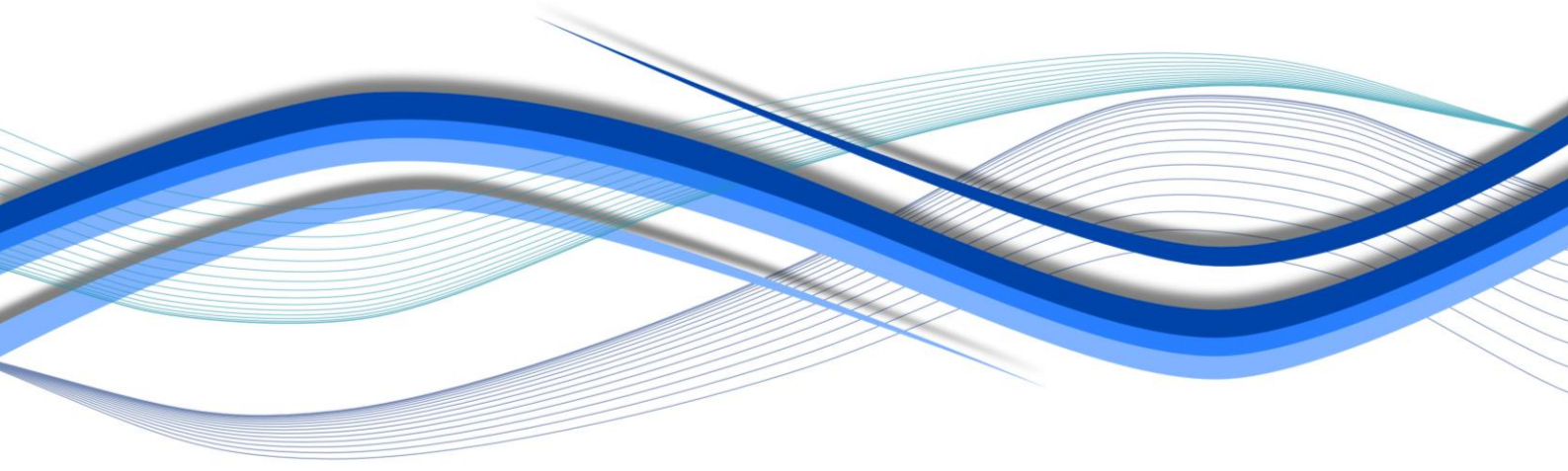

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Title: **Digital Education Policies in Europe and Beyond: Key Design Principles for More Effective Policies**

Abstract
This report offers policy-makers in digital education evidence on how, at the national or regional level, policies can be designed and implemented to foster digital-age learning. The presented findings are the result of a mixed methodological design comprising four parts: desk-research on digital education policy, the identification of national and regional policies worldwide, six in-depth case studies, and an expert workshop. The discussion of the cases identified and studied in depth leads to the formulation of eight core-guiding principles, which can serve as a reference point for policy-makers for the design and implementation of digital education policies: 1. Follow a holistic approach targeting systemic change; 2. Establish both a long-term vision and short-term achievable goals; 3. Deploy technology as a means not an end; 4. Embrace experimentation, risk-taking and failure; 5. Consider the importance and the limits of impact assessment; 6. Involve all stakeholders in a structured dialogue; 7. Let schools and teachers have a say; 8. Build up teaching competence.

Contents

Foreword

This report on policy models for the integration and innovative use of digital technologies in education aims to better understand how digital education policies are implemented in the EU and beyond, highlighting key enablers, success factors and barriers. The key findings seek to inform, guide and inspire policy-makers at all government levels (local, regional, national and international) in designing new policy initiatives, or in adapting or redesigning existing ones for the digital transformation of education.

Research by the Joint Research Centre (JRC) on Learning and Skills for the Digital Era started in 2005 with the aim of providing evidence-based policy support to the European Commission on harnessing the potential of digital technologies to innovate education and training practices and improve access to lifelong learning, and on dealing with the rise of new (digital) skills and competences needed for employment, personal development and social inclusion. More than 20 major studies have been undertaken on these issues, with more than 100 different publications.

Recent work on capacity building for the digital transformation of education and learning, and for changing requirements on skills and competences, has focused on the development of digital competence frameworks for citizens (DigComp), educators (DigCompEdu), educational organisations (DigCompOrg) and consumers (DigCompConsumers). A framework for opening up higher education institutions (OpenEdu) was also published in 2016, as well as a competence framework for entrepreneurship (EntreComp). Some of these frameworks are accompanied by (self-)assessment instruments. Additional research has been undertaken on computational thinking (CompuThink), learning analytics and massive open online courses (MOOCs) (MOOCKnowledge, MOOCs4inclusion).

More information on all our studies can be found at the JRC Science Hub: https://ec.europa.eu/jrc/en/research-topic/learning-and-skills.

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Executive Summary

Introduction

The integration and innovative use of digital technologies in education has become a policy priority across Europe. The European Union and its Member States have adopted a range of measures to support the digitalisation of education. It is also a key priority for several of the Europe 2020 Strategy flagship programmes, in particular the Agenda for New Skills and Jobs, Youth on the Move, the Digital Agenda and the Innovation Agenda. The recent Commission Communication 'School development and excellent teaching for a great start in life' highlights digital technologies as a means of enhancing learning and supporting innovation in schools. Similarly, the Renewed EU Agenda for Higher Education emphasises that technology offers new ways of structuring learning and teaching. Work towards establishing a European Education Area will also require significant, holistic and consistent integration of technology into education systems.

Traditional education systems are not best equipped to cope with the changing nature of learning, the changing demands on learners and their competences, and the need for new ways of teaching and managing complexities. Numerous studies find that system-wide educational innovation is notoriously difficult to achieve. Hence it is important for EU Member States to learn from each other, and from other countries' efforts, successes and failures, to understand better how digital education policies can be designed to trigger innovation and change in education.

This report aims to contribute to this learning process at policy level by discussing more than 40 examples of national and regional policy initiatives, and analysing six of these in depth. The underlying research work was conducted as part of the study Overview and Analysis of Policies for the Integration and Effective Use of Digital Technologies in Education (DigEduPol), conducted by CARSA in cooperation with the University of Oxford's Department of Education in 2015 and early 2016. The DigEduPol study was designed and funded by the European Commission's Joint Research Centre (JRC), Directorate B, Unit of Human Capital and Employment (JRC-B4), for the Directorate-General for Education, Youth, Sport and Culture (DG EAC).

State of the art

First-generation digital education policies, launched at the end of the last century, tended to focus on infrastructure development. Progress was measured mainly in terms of computer per student ratio and broadband access. With the Lisbon Strategy (2000) and the eLearning Action Plan (2001) the focus shifted from operational to strategic policy objectives, and from technology integration towards fostering innovation and competitiveness through the integration of digital technologies into education. At European and national levels, second-generation or 'e-learning' policies are now emerging, focused on complementary policy measures such as building up digital competences in teachers and learners. However, as the 2011 Survey on Schools (European Commission, 2013b) showed, while great strides have been made in terms of computer per student ratio and broadband access, a very high proportion of students are still taught by teachers who are not digitally confident and supportive. Apparently, strategic policy objectives have too often not translated into effective operational strategies, and the support offered to teachers has not necessarily addressed their real needs.

By now, there is consistent evidence that embedding digital technologies in education tends to have positive effects on students' learning outcomes. Evidence similarly points to the fact that the magnitude of these effects depends largely on contextual factors. Among these contextual factors, teachers' attitudes and pedagogical competences are the most important.

Supporting teachers and strengthening their capacity to meaningfully integrate digital technologies into education is hence a key priority in current — third-generation — digital education policies, i.e. policies launched after 2010. At the same time, contemporary digital education policies are aware of past shortcomings and aim to overcome these by, on the one hand, better linking systemic and operational policy levels and, on the other, combining pedagogical competence development with the provision of digital devices or resources.

While the technology focuses of current digital education policies may vary, there is unanimous concern about building teaching capacity. The crucial role of educators in supporting the integration of digital technologies into education is acknowledged throughout the literature and the more than 40 policies investigated. Furthermore, teachers' ability to integrate digital technologies meaningfully into daily teaching practice is confirmed to be a key driver of success — and the lack thereof a barrier to it — in the six cases studied in depth.

Looking at the more than 40 examples of national education policies studied in this report, initiated mostly between 2010 and 2015, there seems to be a drive towards integrating digital education more firmly into overall education and innovation policies, while specifying and loosely combining a number of specific measures at the operational policy level. More recent policy initiatives tend to follow an 'iterative' or 'organic' policy approach, initially taking the form of small-scale experiments, which upon revision and modification are then scaled up and eventually mainstreamed. In the majority of cases, evaluation and monitoring systems are in place to assess the success of the initiative and to adjust it if necessary.

The primary aim of most of the policy initiatives is to simultaneously enhance infrastructure and teaching capacity. Additionally, many promote the development or use of digital resources. In terms of infrastructure, the prevailing aspects considered are the provision of mobile devices and the necessary infrastructure to support 1:1 learning; the use of virtual learning environments, platforms, apps or tools; digital textbooks; and, in the case of policies targeting higher education or teacher training, the provision of online training opportunities and courses (such as massive online open courses (MOOCs)).

The six case studies illustrate that both top-down and bottom-up initiatives can trigger innovation in education. There is no single off-the-shelf solution to transforming education through digital technologies. Rather, policies should be responsive to the specific context of implementation. Interventions that start with an in-depth analysis of the baseline have greater chances of being effective.

Too often, policies prove not be sustainable in the long run. The analysis of the cases suggests that digital education policies are more sustainable if they are embedded in an overarching strategy, if cost savings can be made and if a governance structure is established that is responsive to implementing necessary changes while ensuring continuity over time.

Key messages

In summary, the following imperatives can be distilled from a critical analysis and appreciation of the contemporary digital education policies studied in this project:

- → Follow a holistic approach targeting systemic change.
- → Establish both a long-term vision and short-term achievable goals.
- → Deploy technology as a means not an end.
- → Embrace experimentation, risk-taking and failure.
- → Consider the importance and the limits of impact assessment.
- → Involve all stakeholders in a structured dialogue.
- → Let schools and teachers have a say.
- → Build up teaching competence.

The recent European Framework for the Digital Competence of Educators (DigCompEdu) aims to support Member States in systematically developing educators' pedagogical digital competences. Furthermore, through the SELFIE tool, the European Commission assists schools across Europe in reflecting on and developing their digital strategies to enhance teaching and learning.

1. Introduction

In a rapidly changing and interconnected world, it is essential for education systems to provide learners with adequate competencies to cope with social and professional realities in the 21st century (e.g. OECD, 2015a; Schleicher, 2015; Wiseman and Anderson, 2014). In the Information Age (Castells, 2010), knowledge-based professions require human capital that can coordinate complex challenges and adapt fluid skill sets to changing demands (e.g. OECD, 2010a, 2011). High-quality and equitable education is a key component in the acquisitions of the key competences for lifelong learning (Council of the European Union, 2006) and thus a priority across national governments and international organisations (e.g. European Commission, 2010; Fullan, 2010; Kinuthia and Marshall, 2013).

Traditional education systems are not best equipped to cope with the changing nature of learning, the changing demands on learners and their competences, and the need for new ways of teaching and managing complexities (e.g. Fullan, 2010; OECD, 2015b). This generates a need for education policy reform that is focused on ensuring the facilitation of innovative learning environments (OECD, 2015b) that can nurture the development of 21st century skills. Educational innovation, i.e. 'any dynamic change intended to add value to the educational process and resulting in measurable outcomes, be that in terms of stakeholder satisfaction or educational performance' (OECD, 2010b: 14), is required to create meaningful educational environments that match the needs of learners and teachers alike. Such large-scale educational reforms usually require facilitation at government level to develop drivers of reform, for example through legislation, policies and finance (Darling-Hammond, 2012; DfE, 2013; Hargraves et al., 2014).

National and multilateral education policy institutions in the EU have taken a leading role in this regard, resulting in a rapid increase in the development of policy frameworks and models as well as applied programmes (Bocconi et al., 2012; EU ICT Cluster, 2010). A high-level example of this realised policy response is the European Commission's framework for digitally competent educational organisations (Kampylis et al., 2015).

However, numerous studies find that system-wide educational innovation is notoriously difficult to achieve (Fullan, 2011; Luckin et al., 2012; OECD, 2015b). Innovation and change often meet vested interests, public and political opposition, routine practice and established epistemologies, each of which hampers the adoption of educational innovation (e.g. OECD, 2010b, 2015b). Innovation, too, is a slow process requiring sustained effort, which often does not overlap with policy-makers' timelines and electoral cycles (Nutley et al., 2007). Even where policy reform leads to isolated uptake, the intrinsic complexity of the education system might prevent innovation from becoming systematic and leading to sustainable behaviour change (Fullan, 2011; Kampylis et al., 2012). High-level institutional support and careful monitoring and evaluation are thus crucial to support

A structured approach to policy analysis can help establish areas and components of policies to allow the comparison and integration of different models (Fischer et al., 2006). Understanding what type of digital education policy models have applied which areas and components for what purpose can increase our understanding of common trends and established practices in using digital technologies to foster educational innovation in Europe. This understanding might then facilitate the better integration of digital education policies and programmes across European states.

This report aims to contribute to that understanding. It presents the findings of the project Overview and Analysis of Policies for the Integration and Effective Use of Digital Technologies in Education (DigEduPol), conducted by CARSA in cooperation with the University of Oxford's Department of Education in 2015 and early 2016. The DigEduPol study was designed and funded by the European Commission's Joint Research Centre, Directorate B, Unit of Human Capital and Employment (JRC-B4), for the Directorate-General for Education, Youth, Sport and Culture (DG EAC).

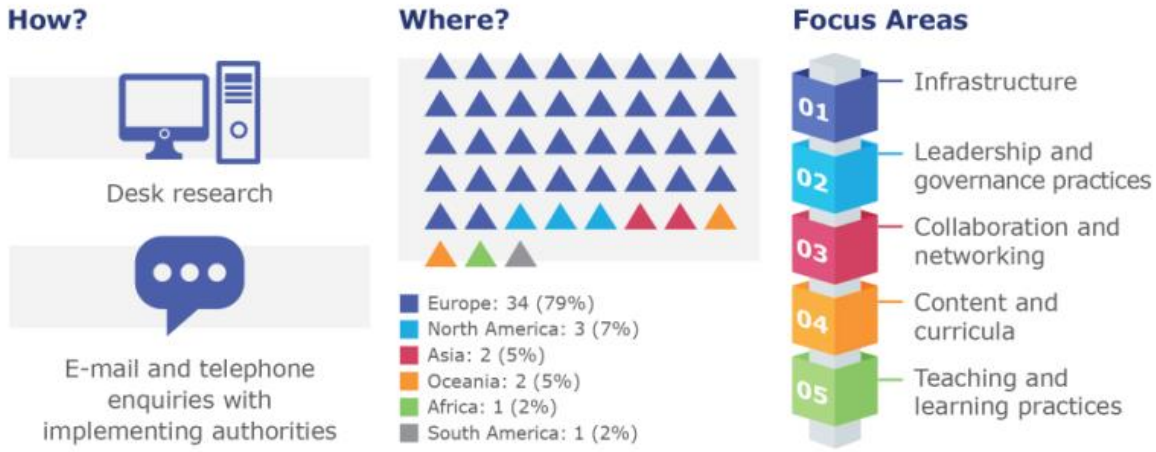
2. Methodology

The study followed a mixed-method approach, made up of a literature review, an inventory of 43 policies adopted all over the world, six in-depth case studies and an expert workshop.

2.1 Literature review

The literature review explored definitions, theories, concepts, frameworks and other elements relating to the integration and effective use of digital technologies in education. This literature review aimed to synthesise existing knowledge on the role of policies to support the integration and effective use of digital technologies in education across Europe. Its main objective was to identify commonalities and differences across policy interventions, and to identify the various levers that are used to integrate digital technologies into teaching and learning practices, so as to provide evidence on what works.

2.2 DigEduPol inventory



Based on the literature review and additional desk research, 43 digital education policies adopted in the period 2000-2016 were identified and listed in the DigEduPol inventory. The cases included addressed international, European, national, regional and local levels. For each case, information was collected on a variety of aspects, including areas focused

on, digital technologies applied, educational levels targeted, target groups, funding and business models, evaluation and monitoring mechanisms, impact areas, implementation strategies, etc. The inventory cases were reviewed against minimum requirements such as maturity level, impact evaluation level, rough geographical balance and overall quality and relevance. The main objective of the inventory was to identify suitable candidates for in-depth study. The full list of initiatives can be found in Annex 2.

2.3 Case studies

Estonia (PTP)

Ireland (DSoD)

Poland (DSP)

Australia (DER)

Canada (eCO)

Malaysia (1BN)

Of the 43 policy initiatives identified for the years 2000-2016, six national initiatives were selected for in-depth case study. The aim of the in-depth case studies was to better understand drivers and barriers, and factors for success or failure. For each policy examined, desk research was carried out along with several rounds of enquiries and a 45-minute telephone interview with a representative of the implementing authority. A short case study report (i.e. 7-8 pages) was produced for each (see Annex 3). The reports enable a deeper understanding of the design and implementation of the policies, specifically the barriers and drivers, and the policies' potential in terms of sustainability, scalability and transferability. A table summarising the key policy lessons learned and the particular insights identified is included at the beginning of the case study report.

2.4 Expert workshop

The findings of the literature review, inventory and case studies were discussed and validated by policy-makers, education experts and practitioners during a 1.5-day workshop. The workshop also sought to obtain insights into the needs of policy-makers in digital education and the potential use of the study's final outputs. The workshop included a presentation of the main findings of the study, complemented by question and answer sessions. Participants worked in two parallel groups (primary/secondary and tertiary education) to define criteria for effective digital education policy-making. Then, during a final plenary session, the groups presented the main outcomes of their work and jointly developed 11 key messages as takeaways from the expert workshop.

3. Policy and Research Background

3.1 Status quo in digital education in Europe

Between 2010 and 2013, a number of large-scale studies rigorously mapped the implementation of digital technologies in education in Europe (e.g. EU ICT Cluster, 2010; European Commission, 2011, 2013a; OECD, 2010b, 2010c, 2012). Findings from the EU ICT Cluster study (2010) show that, while Member States have progressed ICT integration in education at different paces, a number of common milestones seem to have been achieved consistently. This relates in particular to operational policies and investments in digital equipment. The aim of lowering the ratio between digital devices and number of learners has been met throughout the EU. In addition, the provision of reliable internet connections and digital teaching aids (e.g. interactive whiteboards) has seen a similar improvement (EU ICT Cluster, 2010).

The ICT in Education survey (European Commission, 2013a) compared progress on digital education in Europe between 2006 and 2011. The survey found that the number of computers per 100 students in secondary schools had doubled during this period, resulting in a technology-student ratio estimated to range between three and seven students per computer (European Commission, 2013a). More than 90% of students attended classes in an institution with broadband access (2-30 megabits per second (Mbps) on average), confirming the near ubiquity of reliable internet connections in schools. The report added that schools' use of this resource had improved as well. Most schools in the EU had some form of web presence, and used email and virtual learning environments (VLEs) to coordinate communication and administration (EU ICT Cluster, 2010). There seemed to be some variation between different types of schools in this regard, and the study found that secondary schools tended to be more likely to implement more complex digital systems, arguably reflecting more sophisticated learning needs. Both studies further identified that tablet devices and smartphones — often as part of bring your own device (BYOD) strategies — were being used in schools on a much larger scale (EU ICT Cluster, 2010; European Commission, 2013a). Portable ICT infrastructure is generally a substitute for fixed infrastructure such as desktop computers in ICT labs (European Commission, 2013a).

However, there is also evidence that these improvements in infrastructure provision have not systematically translated into the integration and routine use of digital technologies across European schools. For example, the Organisation for Economic Co-operation and Development (OECD) New Millennium Learners survey (2010c) found a significant difference between learners' use of ICT at home and in school. While home use was estimated at around 80% for cohorts of 15 year olds, less than half of these also used technology in school. According to the ICT in Education survey, 75% of teachers reported using digital technologies routinely at school. However, unpacking this headline finding, it emerged that this use was limited to creating lessons and performing administrative tasks; it did not involve integrating technologies into teaching activities. In fact, in the data collection period (late 2011) in Europe on average only 20-25% of students were taught by digitally confident and supportive teachers (European Commission, 2013a: 14).

By and large, though, all three studies hinted at an encouraging trend: inequalities in access to digital technologies — often dubbed the first digital divide — seemed to have reduced in the first decade of the 21st century. In most countries for which comparable data was available, students from disadvantaged groups had caught up in terms of

access to technology in education (EU ICT Cluster, 2010; European Commission, 2013a; OECD, 2010c).

3.2 The benefits of digital education

Experimental evidence suggests that the provision of digital technologies leads to improved learning outcomes. A meta-analysis of 77 randomised experiments by McEwan (2015) found ICT provision to be a more effective educational intervention, with an effect size of 0.15 standard deviations (SD), than, for example, teacher training (0.12 SD) or smaller learning groups within classes (0.12 SD). Kremer and colleagues' 2009 meta-analysis of 32 randomised control trials similarly identified a consistent effect of the use of digital technologies to improve pedagogy, management and accountability. Systematic reviews of more recent technologies similarly attest that these tools have a positive impact on educational outcomes. Hassler and peers' 2015 systematic review of tablet interventions, for example, found that, of 23 tablet programmes identified, 16 had led to significant learning gains, with five additional studies lacking statistical power, leaving only two studies in which a negative effect was attributed to tablets. Tamim and colleagues (2015) confirmed these findings in a rigorous systematic review and meta-analysis. The authors synthesised the results of 27 evaluations of the efficacy of tablet devices on learning outcomes. They, too, found that studies comparing tablet use contexts with no tablet use contexts reported a significant average effect size (0.23 SD).

These positive effects of digital learning technologies are consistent across a range of educational outcomes. Grgurović and peers (2013), for example, illustrate the positive impacts of ICT on language learning outcomes. The scholars' meta-analysis of 37 studies yielding 52 effect sizes showed that overall results favoured technology-supported pedagogy, with a small but positive and statistically significant effect size (0.23 SD; 0.35 SD). Studying the experimental literature on technology use in post-secondary education from 1990 to 2010, Schmid and peers (2014) conducted a meta-analysis of ICT's effects on student attainment and attitude. Synthesising 879 achievement and 181 attitude effect sizes, they find positive results for both outcome measures: achievement, 0.27 SD; attitude, 0.20 SD. Finally, Archer and colleagues (2014) conducted a tertiary meta-analysis (i.e. a meta-analysis of meta-analyses) examining the effectiveness of technology use in education. Their findings confirm the above results, highlighting the rigorous experimental evidence base for the causal link between digital technology use and educational outcomes.

However, none of the above syntheses assessed the cost-effectiveness of ICT interventions, and none of these studies focused on European countries only.

3.3 Technology cannot compensate for poor teaching

A number of large-scale studies, in terms of sample size and amount of data collected, allow for a more detailed unpacking of the aggregated effects of digital technologies on students' outcomes. The recent report *Students, Computers and Learning* (OECD, 2015a) provides an interesting example in this regard, as it takes a more nuanced view of the positive effects of ICT on education reported by the meta-analyses and systematic reviews cited above. The OECD report points out the challenges involved in trying to identify causal effects of ICT in education and the importance of contextual factors (see, for example, Higgins et al., 2012; Slavin et al., 2009). Regarding teachers' use of

technology, the study comments that 'technology can amplify great teaching, but great technology cannot replace poor teaching'[1], a summary that resonates with the evidence presented above (OECD, 2015a: 17). The report concludes by calling for the holistic integration of digital technology into education at system level.

Similarly, the EU ICT in Education survey singles out sophisticated ICT infrastructure as well as teachers' belief in their ability to effectively use ICT (European Commission, 2013a) as key factors supporting the integration of digital technology into education. Kampylis and peers' (2013: 7) assessment of what drives ICT-enabled innovations to have meaningful effects on learning identifies three main facilitators:

(i) 'pedagogy first', i.e. first deciding on a pedagogical objective and then considering a technological tool that might support its achievement;
(ii) 'teacher support and teacher autonomy'; and
(iii) 'better definitions and assessment for 21st century skills'.

In line with these findings, the OECD Schools for 21st-Century Learners study (Schleicher, 2015) identifies three key ingredients required to embed technological innovation into effective 21st century schools. Again, teachers are a central factor. Their confidence in using digital technologies in a pedagogically meaningful way and their willingness to innovate through these technologies are two of three key ingredients. The third ingredient is strong school leaders, who are assumed to establish the school-level conditions that enable the first two ingredients to flourish.

The central role of teachers in the effective use of digital technologies in education cannot be overstated. Winters (2015) illustrates how, to realise longitudinal development opportunities and to ensure successful integration of digital technologies into education, a good level of digital skills on the part of teachers is crucial. This assumption is supported by a range of empirical data highlighting the relation between teachers' professional development and digital competencies (e.g. European Commission, 2011, 2013a, 2013d; Voogt and Knezek, 2008).

Qualitative research consistently shows that teachers' confidence and attitude in using digital technologies are linked to the perceived pedagogical value of the technological tool (Huang et al., 2013; Selwyn, 2011). However, only around 50% of students in the EU are taught by a teacher who has a positive attitude about his or her ability to integrate digital technologies in a pedagogically valuable fashion into teaching activities (European Commission, 2013a). This leaves a large number of teachers, in an increasingly technologically rich educational environment, who lack the confidence to employ these tools for an educational purpose. Among those teachers currently not confident enough to apply technologies, a majority have spent or would be willing to spend their personal time on digital education training. Recent research on massive online open courses (MOOCs) indicates that teachers in fact voluntarily engage in online learning opportunities to enhance their digital pedagogical skills (Castaño-Muñoz et al., 2016). This indicates that there remains significant untapped potential for education policy-makers to unblock a major facilitator of digital education (Arjomand et al., 2013; European Commission, 2013a).

The effectiveness of teacher professional development as a mechanism to build confidence and conducive attitudes toward technology use, which then facilitate educational practice change, is firmly established (e.g. Fredriksson et al., 2008; Valiente, 2010). To encourage integration of digital technologies into teaching practice, teachers

[1] It should be noted that the study did not collect empirical data on teachers' views or performance.

require professional development opportunities that focus on technology use from a pedagogical perspective (European Commission, 2011, 2013a). Teacher training is more effective if it communicates the pedagogical value of technology, coupled with practical examples of technology-enhanced teaching strategies, and preferably linked to subject-specific and curriculum-relevant learning outcomes. This finding seems to be particularly relevant to the European context given the comparatively high level of digital competence among teachers (European Commission, 2013a).

However, what type of professional development programmes might be most effective is less well known. There seems to be some evidence that online communities present an effective professional development approach. Teachers who participate in professional development courses through online communities have been found to be more likely to apply digital technologies in their classrooms (Arjomand et al., 2013). This is in line with findings by Balanskat and Gertsch (2010), who also report that teachers prefer informal methods of ICT training. Positive evaluation findings with regard to eTwinning, an online network and community of practice that, among other things, facilitates teacher interaction and professional development related to digital technology use, similarly adds to this body of knowledge (European Commission, 2013d).

3.4 The need for an overall policy vision

From a policy point of view, two key themes emerge strongly from the literature on factors associated with successful integration of digital technologies in education and training: the need for an overall policy vision for and leadership on educational innovation; and, within such a coherent policy approach, the role of policies supporting teachers in particular.

Policy support and leadership entails the provision of an overall vision for the use of digital technologies in education, guidance for students and parents, logistical support, and teacher training (Balanskat et al., 2013; Brečko et al., 2014). The summary report on the EU ICT Cluster Education and Training 2010 programme identifies a number of key leadership characteristics (EU ICT Cluster, 2010). First, there needs to be tangible support for digital education across all educational stakeholders with sufficient decision-making authority. Second, visions for digital education should be ambitious but realistic, and they need to be accompanied by implementation plans that are compatible with existing educational reforms and administrative systems. Third, innovation leaders require support in terms of management skills to oversee the coordination of the change in educational practice that they intend to set in motion. Fourth, opportunities for collaboration and cross-linkages between like-minded individuals and institutions can sustain motivation, diffuse best practices and lead to institutional spillover effects. Fifth, the entire process of technology implementation and usage requires constant monitoring and evaluation to create rapid feedback loops and allow instant programme iteration.

The last point, on policy-relevant assessment of digital education programmes, is cited repeatedly in the literature (Condie and Munro, 2007; FELTAG, 2013; Fullan and Donnelly, 2013; Luckin et al., 2012). To ensure that the integration of digital technologies leads to organisational and practice change, insights from effective innovations need to be recorded and institutionalised. While innovations often begin with individuals or teams, organisational change is a more formal process that commonly lasts longer than the innovator's commitment to the organisation. Having adequate structures and systems in place to capture learning and diffuse effective innovations is therefore crucial (Condie and Munro, 2007). Such structures and systems need to be developed at a higher level as part of an organisation's strategic objectives (Kozma, 2008; OECD,

2010b). An example of an effective assessment tool for digital innovation has been developed by Nesta. The Innovation Index is a comprehensive assessment tool that emphasises systemic change and can be applied 'as an evaluative tool to predict the transformative power of the emerging digital innovations in the education field' (Fullan and Donnelly, 2013: 13). Similarly, the SELFIE tool[2], developed by the European Commission Joint Research Centre and recently piloted in more than 600 schools in 14 European countries, will help schools to reflect on their digital policies and practices and to further develop their strategies.

3.5 Systemic change through iterative policy design?

Recently, there has been discussion in the literature on the importance of driving systemic change and the scaling up of digital education models. Only a minority of digital innovations become embedded in teaching and learning practices (e.g. Fullan and Donnelly, 2013; Kampylis et al., 2013; Trucano, 2013), and the question of the scale and sustainability of digital innovations is intrinsically linked to discussions on barriers to the adoption of technologies. A number of studies refer in this context to the need to consider pathways for organisational and institutional change and a more iterative approach to digital education policy-making.

Kampylis and peers (2015) suggest differentiating between deep and superficial integration of digital technologies. Deep integration, according to the authors, requires a process of planning change in terms of pedagogies, technologies and organisational structures. Fullan (2011) also calls for a whole-system reform for innovative teaching and learning. In a related publication by Fullan and Donnelly (2013), this idea is developed further, and the authors explain how digital innovation is currently characterised by 'either weak or undeveloped pedagogy, or strong technology and pedagogy confined to a small number of schools' (Fullan and Donnelly, 2013: 11). Luckin and peers (2012: 63) refer to this process as 'put[ting] technology above teaching and excitement above evidence'. Arguably, what is required for digital innovations to have a transformational impact on education is to integrate technology, pedagogy and systems change knowledge (Fullan and Donnelly, 2013; Vander Ark, 2012).

Suggestions on how such systems thinking could influence policy design are provided, for example, by Brečko and peers (2014) and the recent OECD report on students, computers and learning cited above (OECD, 2015a). Both studies highlight that there is no one-size-fits-all approach to scaling up digital innovations in education. Rather, policies should be based on an iterative process of small-scale experimentation that allows for rapid feedback loops and flexible adaptation. Lessons learned from small-scale experiments could then facilitate the scaling up of successful models and the termination of ineffective initiatives. According to Brečko and peers (2014), this approach presents a more 'organic' and sustainable process for scaling up digital innovations in education, as it allows policy models to be flexible and open to adaptation in response to changes in technologies or the policy environment.

3.6 Implications for policy design

Drawing on the evidence discussed, a number of messages can be distilled to guide the design of digital education policies.

[2] https://ec.europa.eu/jrc/en/digcomporg/selfie-tool.

First of all, it is important to emphasise that there is consistent evidence that embedding digital technologies in education tends to have positive effects on student learning outcomes. However, the magnitude of these effects depends substantially on contextual factors. Among these contextual factors, teachers' attitudes and pedagogical competences are the most important. This finding is particularly significant given that, while great strides have been made in integrating digital technologies into European schools, a very high proportion of students are still taught by teachers who are not digitally confident and able to fully support their students.

From a policy point of view, supporting teachers and strengthening their capacity to meaningfully integrate digital technologies into education should thus be a key priority when implementing digital education policies. Furthermore, an overall policy vision and leadership in educational innovation are important ingredients. Within this overall vision, an iterative policy approach, based on small-scale experiments and subsequent modification and scaling up, can be used to identify the specific set of policy measures that most effectively lead to systemic change in a given policy context.

4. Trends in Digital Education Policies

4.1 Trends in Europe since 2000

Digital technology as a lever for innovation in education

In Europe, the rationale for the innovative use of digital technologies in education is based on the belief that it will support learners' competence to achieve in the knowledge economy, allowing European states to remain competitive and integrated with the global economy (Brečko et al., 2014; OECD, 2015a; Plomp et al., 2009). The Europe 2020 Strategy, for examples, cites the strategic role of E&T, highlighting digital technologies as key drivers of educational innovation (European Commission, 2010). The integration of digital technologies to support E&T received further high-level support as a major component of the European Commission's strategy for opening up and modernising E&T systems (European Commission, 2013b).

Before 2002, digital education policies tended to focus on infrastructure

Delrio and Dondi (2008) trace this high-level support for the integration of digital technologies into E&T back to the Lisbon European Council of 2000. Providing a narrative about the various EU-wide policy initiatives for digitalisation of E&T systems (e.g. eLearning Action Plan, e-Europe), the authors identify a move away from 'first-generation' policy reform and towards 'second-generation' policy reform. First-generation policies are claimed to have focused mainly on infrastructure development, such as student to computer ratios and broadband access. Content development and frameworks for learner competencies were not main objectives of these policies.

Second-generation digital education policies focus on educational innovation

In contrast, second-generation policies — which are suggested to have emerged from 2002 onwards, in reaction to the Lisbon Strategy (2000) and the eLearning Action Plan (2001) — focus on complementary policy measures such as teacher training, competence building and content development. These policies are underwritten by an increased integration of digital technologies into broader policy frameworks and the endogenous innovation of E&T systems (Delrio and Dondi, 2008). Punie and Cabrera (2005),- for instance, found that digital education policies were evolving towards a model in which 'ICT per se is losing emphasis in favour of the benefits that ICT can offer to the pressing needs of society and economy. Innovation, competitiveness and inclusion become thus main foci of ICT for learning in general' (Punie and Cabrera, 2005: 22). According to Delrio and Dondi (2008), this evolution was also recognisable in a change in terminology from 'e-learning' (computers, connectivity, competiveness) to 'educational innovation', which encompasses the integration of e-learning and ICT into the processes of endogenous innovation of E&T systems.

By 2011, all European countries had digital education policies in place

A detailed assessment of the landscape in Europe in 2011 found that all countries had formulated national policies for ICT in education, either as standalone policies or as part of a wider national ICT strategy (European Commission, 2011). The strategic emphasis of these policies, by and large, remained on fostering students' digital competence, justified by future economic benefits. Operational aspects of the policies focused mainly on

training for teachers and the provision of up-to-date technology and infrastructure for schools, with a focus on primary and secondary general education. Policy direction and vision was found to be developed largely by national administrations, while operational policy decisions were often taken in a decentralised way, allowing freedom for local administrations and schools to experiment with and shape their own policies within some top-down key parameters. The assessment also established that all European countries had some form of monitoring and evaluation system in place to investigate whether or not the implemented policies met their targeted objectives (European Commission, 2011).

Overall, the assessment found that the use of digital technologies to support teaching and learning enjoyed widespread support from national authorities in Europe. National authorities in particular aimed to incentivise increased use of digital technologies among teachers in 'core curriculum subjects'. This seems to resonate with a wider consensus that the focus on teachers' role in digital education is the most important current policy trend (EU ICT Cluster, 2010; European Commission, 2013a). Existing policies have been revised in this regard. The role of teachers in integrating digital technologies enjoys the greatest policy and research attention (e.g. Schrum et al., 2015).

However, not all schools benefited from these policies

In the past not all students have been able to benefit from these and other digital education policies. A 2011 survey found that only around 30% of students at grade 4 and around 25% at the other grades (grade 8 and 11) are in schools implementing strong policy and strong support and as much as 35% of students are in schools characterised by both weak policy and weak support (European Commission, 2013b). One of the reasons for this disappointing result can be found in the implementation gap between strategic objectives set out at national level and the operationalisation of such objectives at local level. This seems to have been a characteristic problem encountered in the era of second-generation digital education policies. For example, while at the strategic policy level teacher training was a priority, in most countries surveyed teachers' attendance at ICT training was not compulsory, leaving only 25-30% of students in the EU being taught by teachers who had to undergo explicit ICT training (European Commission, 2011).

Strategic policy objectives need to be translated into effective operational strategies

Apparently, strategic policy objectives too often did not translate into effective operational strategies, and the support offered to teachers did not necessarily address their real needs. Therefore, while the policy focus may have shifted between 2000 and 2010, and great strides were made in the provision of digital infrastructure, this progress was uneven (e.g. Eurydice, 2011; Kampylis et al., 2013; OECD, 2013). In this respect, an OECD (2010c) report warns that digital education policies that provide access to technology but fail to ensure teacher training and competences in teaching with these technologies may perpetuate the 'second digital divide', i.e. a gap between those with the competences to benefit from digital technologies and those without.

Contemporary, third-generation digital education policies …

Contemporary digital education policies are developed with an awareness of past shortcomings and aim to overcome these by, on the one hand, better linking the systemic and the operational policy levels and, on the other, combining pedagogical competence development with the provision of digital devices or resources.

… focus on building up teaching capacity …

Supporting teachers and strengthening their capacity to meaningfully integrate digital technologies into education is a key priority in current, third-generation digital education policies, i.e. policies launched after 2010. The crucial role of educators in supporting the integration of digital technologies into education is acknowledged throughout the literature and the more than 40 policies investigated. Furthermore, teachers' ability to integrate digital technologies meaningfully into daily teaching practice is confirmed to be a key driver of success — and the lack thereof a barrier to it — in the six cases studied in depth.

… combined with infrastructure measures, often in the form of mobile device provision

Many of the national policies launched between 2010 and 2015 focused on equipping students in a given school, class or age group with portable devices (e.g. laptops, netbooks, tablets or smartphones) for learning purposes. There is evidence that these so-called 1:1 learning initiatives had positive effects on teaching and learning practices, by facilitating a more student-centred educational environment (Balanskat et al., 2013). The mobility of the devices allowed students to create more learning opportunities for themselves and to approach content in a more independent manner. Teachers and students reported that the devices increased interaction and supported more personalised feedback and the development of tailored content. Finally, the strongest effects identified were increased student motivation and parental engagement.

A trend that reinforces the need to develop pedagogical skills …

At an empirical level, a recent study on the practical implementation of 'creative classrooms' (Bocconi et al., 2012), i.e. learning environments using ICT to innovate learning and teaching practices, came to the conclusion that technological programmes need to be implemented as part of a wider pedagogical framework to be effective (Bannister, 2015). The findings also indicate, however, that teachers struggle to integrate technology and meet curriculum demands at the same time, indicating a need for curriculum design that is more conducive to the use of digital technologies.

… and the need for suitable educational resources

Responding, at least partly, to this problem, a number of policy initiatives developed after 2010 focus on the provision, creation and sharing of educational resources. By now, most EU Member States have national or regional platforms or websites for school education that provide some digital content and resources aligned with corresponding curricula and learning objectives. Textbook publishers, similarly, have moved on to making their textbooks available in electronic format, complementing these with additional digital resources for teachers, students and parents.

Different pathways for capacity building in teaching

While the technology focuses of current digital education policies may vary, there is unanimous concern about building teaching capacity. However, measures to build these competences diverge and many countries combine different strategies and initiatives to offer teachers a range of professional development opportunities, which they can then choose from and combine to suit their needs. In addition to targeted face-to-face training and online courses, teacher collaboration has been shown to be an important element supporting teachers' capacity to effectively use digital technologies in teaching and learning. The European Commission's eTwinning network provides an example of how

such a policy initiative can contribute to fostering teachers' innovative use of digital technology in Europe (e.g. Vuorikari et al., 2015).

There has been a recent trend towards combining diverse specific measures under a common vision …

More recently a trend can be observed towards more diversified strategies, targeting specific elements, trends or barriers, often only loosely connected with other measures contributing to the overall policy vision. At European level, the strategic Opening Up Education initiative, for example, is complemented by operational policies and funding for policy experimentation.

In some countries, strategic policies have in the past been coupled with operational policies for their implementation. Kozma (2008) uses the case study of Finland to show how the country combined a strategic policy model, i.e. Finland's Information Society Programme (ISF, 2008), which provided an overall vision for the integration of digital technology into education in the country, with complementary operational policies on, for example, the development of Finnish language instructional materials on the internet. The majority of recent policies, however, feature a stronger emphasis on operational rather than strategic aspects.

… respecting regional differences and allocating responsibilities accordingly

Similarly, measures at national level are being combined with measures at regional level. Portugal's e-escolinha and Spain's Escuela 2.0 represent large-scale policy efforts to mainstream digital education that are accompanied by implementation measures at regional level. In Germany, the national Deutschland Digital 2015 strategy set an overall vision for the country's decentralised education system, allowing provinces to experiment with policy models to identify locally relevant approaches. The federal state of Hesse, for example, was an early adopter of including media literacy in curriculum standards and teacher training (EU ICT Cluster, 2010).

Monitoring and impact analysis are key elements of current policies

Moreover, the frequency with which evaluation and monitoring systems based on elaborate methodologies are put in place shows that policy-makers want to understand the real impact of their policies.

The following section will discuss some of these trends on the basis of 43 recent examples of digital education policies.

4.2 A snapshot of the current landscape

Many countries worldwide are concerned about improving the integration of digital technologies into education. To better understand and compare the various approaches to and strategies for promoting digital education, the study collected and briefly examined 43 interventions initiated by local, regional or national education authorities to foster the digital transformation of education. This collection of digital education policies (see Table 1 and Annex 2) is neither complete nor representative. It provides a snapshot of current progress and the state of the art, illustrating the variety and diversity of current digital education policies.

Table 1. Overview of inventory cases[3]

KlasCement	Belgium — Flanders
Online platform for Open Educational Resources (OER) with more than 67,000 registered users and more than 26,000 user-generated resources.	1998-present http://www.klascement.be/
Digital School (École Numérique)	Belgium — Wallonia
Large-scale financing programme for projects in digital education involving experimental use and upgrade of digital infrastructure in school institutions.	2011-2014 http://www.ecolenumerique.be/qa/
Repository of Digital Learning Objects (Metodický portál RVP.CZ)	Czech Republic
Collaborative online platform offering methodological support for teachers and enabling teachers to share materials and experiences.	2009-present http://rvp.cz/
User Portal Initiative (Nyt brugerportalinitiativ til den digital folkeskole)	Denmark
Unified platform providing access to a number of national ICT services in education, for students, teachers and school governance to use for learning, communication and organisation/planning purposes.	2015-present http://www.kl.dk/En-ny-skole/Nyt-brugerportalinitiativ-til-den-digitale-folkeskole-id165873/?n=1
Vejle Digital Schools (Vejle Digitale Skoler)	Denmark
Municipal strategy that includes a digital platform for digital resources, personalised learning, teacher collaboration, information provision and establishing student objectives.	2011-present http://www.vejledigitaleskoler.dk/
Start into the next generation (BYOD — Start in die nächste Generation)	Germany — Hamburg
Pilot project on the educational integration of private smartphones, tablets or laptops in class. As part of the pilot project, selected 'learning portals' are made available, which can be used independently and also in a teaching context.	2014-2016 http://www.hamburg.de/start-in-die-naechste-generation/
ProgeTiger (ProgeTiiger)	Estonia
Initiative to teach programming to students from pre-primary to vocational education, offering educational resources, teacher training, and financial support for the acquisition of programmable devices.	2012-present https://ee.ekool.eu/index_en.html
e-school (eKool)	Estonia
e-school is a school management tool/web application that offers a large online educational information environment, bringing together pupils, parents, schools and supervisory bodies.	2002-present https://e-estonia.com/component/e-school/
Digital Schools of Distinction	Ireland
This programme offers an award that primary schools can attain by demonstrating excellence in their approach to digital education. Award-winning schools are offered access to an ICT support network, a toolkit for developing an ICT plan and links with other schools.	2013-present http://www.digitalschools.ie/
Switch On	Ireland
Workshop series for schools on digital teaching. Schools are provided with information, case study material and signposting, with illustrations on the use of digital technologies and resources.	2014-present http://www.dcenr.gov.ie/communications/Lists/Publications%20Documents/National%20Digital%20Strategy%20July%202013%20compressed.pdf
National Forum	Ireland
The National Forum for the Enhancement of Teaching and Learning in Higher Education brings together stakeholders as leaders, managers and teachers, to promote and develop existing teaching and learning practices in Irish colleges.	2012-present http://www.teachingandlearning.ie/

[3] Cases studied in depth are in bold; see section 5 and Annex 3.

Internet in the classroom (Internet en el aula)	Spain
Launched in 2008, this social network remains active, currently with more than 11,500 active members. The network is open to all and also features forums, thematic groups, workshops and best practices.	2008-2009 http://internetaula.ning.com/
ICT in education certification (Certificacion en la aplicación de las TIC)	Spain — Castilla y León
Certification scheme available to all publicly funded primary and secondary schools. Organised through a call for proposals including action plans and an overview of existing resources in digital education.	2013-present http://bocyl.jcyl.es/boletines/2015/09/01/pdf/BOCYL-D-01092015-5.pdf
The Digital School (L'école numérique)	France
Large-scale initiative to boost digital literacy, connecting 500 schools and colleges by 2015. Experimentation with new forms of teaching and learning through digital technology.	2015-2017 http://www.education.gouv.fr/pid29064/ecole-numerique.html
FUN-MOOC (France Université Numérique)	France
Launched in October 2013 by the French Ministry of Higher Education and Research as the national platform for supporting online courses and MOOCs.	2013-present http://www.france-universite-numerique.fr/moocs.html
Strategy for Digital Schools (Piano Nazionale Scuola Digitale)	Italy
Launched in 2007 as a national plan to mainstream ICT in Italian classrooms and to use technology as a catalyser of innovation, aiming to induce new teaching practices, new models of school organisation, and new products and tools to support quality teaching.	2007-2011
Puntoedu	Italy
Virtual learning environment which provides, among other things, an e-tutoring system for teachers, trainers and administrative staff. Based on an active learning approach, blended learning and provision of 3,000 learning objects for teacher training and continuing professional development (CPD).	2001-present http://for.indire.it/docenti/
HiperSuli Education Programme	Hungary
Public-private partnership to promote pupils' digital competence through mobile apps and the mobile internet, also aiming to create equal opportunities for pupils in rural areas.	2015-2016 http://www.hipersuli.hu/kapcsolat
Wikiwijs teaching resources platform (Wikiwijs Leermiddelenplein)	The Netherlands
Educational platform allowing teachers to search, compare, create and share teaching materials, encouraging the production of OER. Merged with Textbooks Square in 2012, and renamed as Wikiwijs Textbooks Square.	2008-2013 https://www.wikiwijs.nl/
Teacher 24 (Leraar 24 — Video's en dossiers voor de onderwijspraktijk)	The Netherlands
Website and mobile app, providing educators with practical solutions, on the basis of instructional videos, designed by teachers and for teachers in primary, secondary, special and vocational education.	2009-2013 https://www.leraar24.nl/home.psml
Digital Competences (Digitale Kompetenzen, Informatische Grundbildung)	Austria
Pilot project in lower secondary schools, using the EDUMOODLE platform to improve students' digital competences and provide resources and training for teachers.	2012 http://www.digikomp.at/
Digi4schools (Online-Platform für E-Books und Digitale Schulbücher)	Austria
Online platform for secondary schools that makes all textbooks from all publishers included in the catalogue accessible, allowing students to create their own digital bookshelf.	2015-2017 http://www.efit21.at/
Digital School programme (Cyfrowa szkoła)	Poland
Centralised government pilot programme to promote digitalisation and ICT competences in primary and secondary schools. Follows a holistic approach combining teacher training, digital resources, infrastructure and tools for students.	2012-2015 http://www.epodreczniki.pl
Project ManEEle (Manuais Escolares Eletrónicos)	Portugal
Pilot programme in 7th grade schools (i.e. for 12-13 year olds) in Cuba and Vila Viçosa in Portugal. The project is implemented in two school clusters. Focus on customised pedagogical material and educators.	2013-2014 http://maneele.drealentejo.pt/site/index.php/pt/
Biblionet — Global Libraries Romania	Romania
Programme focusing on transforming Romanian public libraries into vibrant community hubs offering free access to information for citizens through a wide range of services and techniques.	2009-present https://irexgl.wordpress.com/category/romania/
Opening Up Slovenia	Slovenia
Multi-layered coalition promoting an open education environment aimed at innovation in teaching, interinstitutional collaboration, OER, quality of services and digital competences.	2014-present http://www.ouslovenia.net/
E-education project (E-izobraževanje)	Slovenia
National model for the training of teachers, development of e-competence standards for teachers and schools, and facilitating learning content and online services, including new communication platforms.	2009-2014 http://sio.si/

Core Curriculum for Basic Education	Finland
Emphasises the joy of learning and pupils' active role. The aim is that students will be capable of individually and collaboratively creating new knowledge using ICT.	2012-2014; reform: 2016-2017 www.ophi.fi
Shireland's Learning Gateway	United Kingdom
Virtual learning environment, focused on students (aged 11-19) from deprived areas. Supports collaboration and information exchange between and among teachers, parents and students. Includes personalised learning opportunities, e-learning and gaming resources.	2006-present www.cisco.com/web/strategy/docs/education/ShirelandsLearningGateway.pdf
National Digital Learning Arena (Nasjonal digital læringsarena, NDLA)	Norway
Platform with open educational resources covering 40 subjects in upper secondary education.	2008-present https://ndla.no/
Commission on MOOCs (MOOC-utvalget)	Norway
Commission mandated to map the development of MOOCs, to explore future possibilities and challenges, and to provide the Norwegian authorities with specific recommendations.	2013-2015 https://www.regjeringen.no/no/dokumenter/mooc-utvalgets-forste-rapport/id747921/
Virtual Campus	Switzerland
Provision of online courses aimed at undergraduate students and at mature part-time students. Setting up of e-learning competence centres (CCSPs) in all Swiss higher education institutions.	2000-2007 http://www.virtualcampus.ch/
FATIH (Fırsatları Artırma ve Teknolojiyi İyileştirme Hareketi)	Turkey
All state schools, from pre-school to high school level, will receive a total of 620,000 smart boards. Tablet computers will be distributed to 17 million students and 1 million teachers and administrators. E-books will also be made available.	2010-2015 http://fatihprojesi.meb.gov.tr
Connecting for Equality (Conectar Igualdad)	Argentina
Federal policy equipping students and teachers in secondary schools, and special education and teacher training institutes under state management, with more than 3.5 million netbooks.	2010-2013 http://www.conectarigualdad.gob.ar/
Digital Education Revolution (DER)	Australia
Funding programme allowing schools to purchase digital technologies. Accompanied by opportunities for professional development and digital resources.	2008-2015 https://docs.education.gov.au/category/deewr-program-group/digital-education-revolution
eCampusOntario.ca	Canada
Joint online platform allowing students in the province of Ontario access to high-quality, transferable online courses, while reducing course duplication among universities and colleges in Ontario.	2015-2020 https://www.ecampusontario.ca/
1BestariNet (Kementerian Pendidikan)	Malaysia
Initiative aiming to connect all of Malaysia's 10,000 public schools to an internet-based (wireless 4G) virtual learning environment, connecting 5.5 million students, 4.5 million parents and 500,000 teachers.	2011-2014 http://1bestarinet.net/
e-learning Planning Framework	New Zealand
Tool assisting teachers and schools to reflect on and evaluate their e-learning capability, also providing them with resources and services for capacity building.	2012-present http://elearning.tki.org.nz/Professional-learning/e-Learning-Planning-Framework
Third Masterplan for ICT in Education (MP3)	Singapore
National strategy promoting digital education and its use for self-directed and collaborative learning in all 362 schools in Singapore, involving industry and other service providers.	2009-2014 http://ictconnection.moe.edu.sg/masterplan-4/our-ict-journey/masterplan-3/vision-and-goals
Vodacom Mobile Education Programme	South Africa
Teacher CPD programme to improve the quality of instruction in a wide range of subjects at every level, with a focus on ICT competency and the effective use of digital resources.	2011-present http://digitalclassroom.co.za/
Florida Virtual School	United States
Largest and oldest state-funded online primary and secondary school. Recently developed partnerships with outside organisations to experiment with different approaches to delivering courses.	1997-present https://www.flvs.net/
School of One	United States — New York
ICT-enabled personalised learning programme that integrates a variety of instructional approaches, to create an individualised, targeted and student-centred learning experience.	2009-present http://www.izonenyc.org/initiatives/school-of-one/
Teacher Development with Mobile Technologies	UNESCO
UNESCO collaboration with Nokia and local partners to leverage mobile technology to build the capacity of primary school teachers in four pilot countries: Mexico, Nigeria, Pakistan and Senegal.	2012-present http://www.unesco.org/new/en/unesco/themes/icts/m4ed/teacher-development/teacher-development-with-mobile-technologies-projects-in-mexico-nigeria-pakistan-and-senegal/

4.3 Key characteristics of recent digital education policies

→ Strategic and operational policy levels are combined

The vast majority of initiatives considered have been adopted based on a clearly linked policy framework, i.e. a multi-annual strategic action plan or similar. However, the degree to which this policy background is linked to the more operational aspects of policy initiatives can vary. For example, Estonia's e-school initiative, a VLE, was adopted as part of e-estonia, a comprehensive and pioneering e-government framework managed by specifically created governance structures. Meanwhile, the Austrian initiatives DigiKomp and Digi4Schools are both linked to the efit21 strategy, a comprehensive, multi-dimensional ICT strategy linked to education, administration and infrastructure, the labour market, and society and participation.

→ Improved infrastructure and teaching capacity are primary objectives

Most initiatives have as their primary aim enhancing infrastructure and teaching capacity. Many simultaneously promote the development or use of digital resources. When considering infrastructure aspects, prevailing concerns are the provision of mobile devices and the necessary infrastructure to support 1:1 learning; the use of VLEs, platforms, apps or tools; digital textbooks; and, in the case of policies targeting higher education or teacher training, the provision of online training opportunities and courses (such as MOOCs).

Teacher support, often in the form of targeted training, is a core component of the vast majority of policies examined. In around one third of the cases, enhanced training and support for educators is the primary objective of the policy, placing the intended impacts on educators above improving technological infrastructure and access. Teacher training often builds on a combination of measures, including the provision of training materials and digital teaching resources. Often, the measures are combined to jointly support capacity building for innovation in education.

→ Multiple pathways for supporting teachers

The intensity with which teachers' capacities are built varies across policies. While some initiatives focus on providing face-to-face training for teachers, for example the Switch Digital Workshops in Ireland, others provide support by means of technological solutions. The Biblionet initiative, for example, uses only online tools to equip teachers with the required skills and digital competences. In a number of cases, digital environments are set up to make training materials and teaching resources available and encourage teachers to exchange knowledge and experiences. In some cases, for example ClassCement in Flanders, reward and/or incentive mechanisms are used to encourage teacher participation.

→ Focus on innovative teaching and learning

Many of the initiatives focus explicitly on promoting innovative teaching and learning strategies. Personalised learning, self-regulated learning and collaborative learning are addressed in almost half of the initiatives. While fostering students' digital competence is at least a secondary objective in the majority of initiatives, inclusion and equality concerns are considered only in very few cases.

→ Stakeholder involvement in policy design, implementation and monitoring

Stakeholder involvement and consultation is a significant element in the vast majority of cases. Overall, three different approaches to stakeholder involvement can be discerned, relating to the various policy stages. Stakeholder consultations are often carried out in the policy design phase, as in the case of 1BestariNet in Malaysia, where more than 200 national stakeholders were consulted for the education blueprint, or during the planning phase, for example in the case of École Numérique (France). A second way of involving stakeholders is to create specific governance structures, above all steering committees, in charge of monitoring and adjusting the policy implementation process, as was done in the Opening Up Slovenia initiative and the Digital Schools of Distinction project (Ireland). Finally, calls for proposals appear to be a popular implementation method, for example in Hamburg's Start into the Next Generation or the Wallonian École Numérique initiative.

→ Using pilots to get ready for mainstreaming

The cases collected range from experimental (e.g. piloting new pedagogical practices) to wide-scale implementation across a whole education system. In many cases, however, the wide-scale implementation was based on previous piloting. This was the case, for example, with the e-school initiative, which initially was launched as a pilot project at four Estonian schools. The New York-based School of One initiative was similarly set up as a pilot initiative.

→ Evaluation and monitoring integrated into the policy design

In the majority of cases, evaluation and monitoring systems have been set up with the aim of verifying achieved outputs, outcomes and impacts. The design of these systems can be manifold: they range from regular evaluation intervals with robust indicators to arrangements where periodical reports are created with fewer methodological elements and no interviews or case studies.

Some initiatives have multiple assessment stages with comprehensive data collection and analysis, such as the Third Masterplan for ICT in Education implemented in Singapore, which also used surveys and case studies from 12 Singapore schools. Other initiatives simply rely on progress reports supported by interviews or occasional surveys. Large-scale digital education policies are more likely to have comprehensive evaluation and monitoring schemes. There are some exceptions, including the École Numérique (France), where evaluation and monitoring mechanisms are not addressed specifically.

Policy authorities frequently engage academic institutions to carry out ex ante, interim or ex post assessments of implemented policies. Evaluation and monitoring appear to be less frequently applied when private resources make up a significant proportion of the initiative's budget, thus reducing the need for public authorities to justify their expenditures.

→ Different focus areas in primary, secondary and tertiary education

In primary education a fair proportion of policy initiatives initiatives focus on virtual learning environments and cloud computing. The main aim of these strategies is often to establish communities, networks and ecosystems at various levels, and also a means for teachers to exchange practices and for communication with parents. In secondary education, there is a strong tendency towards integrating laptops, netbooks and tablets into teaching. In a similar fashion, and unsurprisingly, MOOCs and e-learning solutions are mostly applied in tertiary education.

4.4 Key findings from the inventory

From a policy perspective, there seems to be a trend towards holistic models targeting systemic rather than infrastructure- or content-related changes. These holistic models employ multiple pathways, involving different players with dedicated operational strategies, and are supported by constant adaptation, experimentation and iteration.

The combination of strategic and operational policy levels requires a clear distribution of roles between the various implementing bodies, and the stratification of policy measures into phases. Common components include the creation of governance structures such as a steering committee, as well as calls for proposals.

About a third of the policy initiatives examined follow an 'iterative' or 'organic' policy approach, i.e. they are or were initially implemented in the form of small-scale experiments, which upon revision and modification are or were scaled up and eventually mainstreamed. Nevertheless, initiatives targeting full-scale implementation (still) prevail.

In the majority of cases, evaluation and monitoring systems are in place to assess the success of the initiative. However, the level of detail of these evaluation and monitoring systems varies significantly.

Most initiatives focus on simultaneously enhancing digital infrastructure — either through the provision of mobile digital devices or through the establishment of resource platforms and collaborative virtual environments — and building up teachers' capacity to meaningfully use digital technologies in education.

The crucial role of educators in supporting the integration of digital technologies into education is acknowledged throughout the more than 40 policies investigated. The type of training or support offered to teachers may be in the form of face-to-face training or online training, often complemented by additional digital training materials and teaching resources. In some cases, teacher support is embedded in digital platforms that serve to facilitate the exchange of teaching practices, methods and resources.

5. Six Digital Policies in Focus

To better understand how digital education policies are implemented in practice, and to gain additional insights into the barriers and drivers encountered in practice, 6 of the 43 policies discussed in section 4 have been subjected to in-depth study. Three of these policies are European (Estonia, Ireland and Poland) and three are from outside Europe (Australia, Canada and Malaysia).

The cases were selected on the basis of diversity in terms of focus areas, educational levels, geographical spread, technological solutions and impact areas. Between cases with similar profiles, those with higher levels of overall innovativeness, maturity levels and potential for transferability were given preference. The cases were deliberately selected to differ in terms of their success and effectiveness in promoting digital education.

The case studies have been developed on the basis of several rounds of desk research, direct enquiries, and telephone interviews with relevant policy-makers or coordinating personnel.

5.1 Overview

Table 2 provides an overview of the case studies, summarising their main features, their primary focus areas and the educational levels they target.

Table 2. Summary of case studies

Title/country/educational level	Summary	Key facts
ProgeTiger programme (PTP) Estonia/primary and pre-school education	PTP was launched in 2012, to improve the technological literacy and digital competences of children and students in Estonia. The project initially focused on programming, but gradually turned into a broader technology programme. The nationwide scheme targets the pre-school, primary and vocational education domains. Activities in PTP seek to develop age-appropriate digital competences, and skills relevant for a technological society. PTP consists of a number of supportive activities: integrating technology education into the curriculum, offering teachers educational resources and training opportunities, and financially supporting kindergartens and schools in acquiring programmable devices. PTP is supported and funded by the Estonian government through the Ministry of Education and Research, but implemented by the HITSA IT Education Development Centre.	• Implementation period: 2014-2016 (extended) • Budget: EUR 1 million • PTP trained 1,244 teachers; developed 15 teacher courses; supported 150 kindergartens and schools with equipment; set up eight PTP networks; and involved the participation of more than 500 students and 100 teachers in the 2015/2016 contest
Digital Schools of Distinction (DSoD) Ireland/primary education	The DSoD programme administers an accreditation that can be obtained by primary schools if they demonstrate excellence in their approach to the integration of ICT into learning and teaching. The benefits of receiving this accreditation include access to an ICT support network, a toolkit to develop an ICT plan for every school, links with other	• Implementation period: 2013-2016 (extended) • Budget: EUR 830,000 • 1,688 schools registered (more than 50% of primary schools); 271 schools awarded

	schools in Ireland and external recognition through a nationally recognised award. It is a public-private partnership launched by the Department of Education and Skills, with support from HP and Microsoft and several other education partners. Only schools that successfully complete the three-step programme receive the DSoD Award. Accredited schools also obtain a Digital School Classroom Kit, including a laptop with software and educational apps, a printer, and access to ICT in education specialists.	
Digital School programme (DSP) Poland/primary and secondary	The Digital School programme seeks to assess the best way of integrating and using ICT technologies in primary and secondary schools in Poland. It was approved by the Council of Ministers in 2012, as a centralised government pilot programme to promote digitalisation and ICT competences. While previous ICT programmes focused mainly on infrastructure, this initiative is based on a holistic approach that combines: 1) preparing teachers for teaching and documenting the educational process (e-teachers); 2) producing public digital educational resources (e-textbooks); 3) providing schools with the necessary infrastructure, especially modern didactic tools (e-schools); and 4) offering students access to modern teaching tools (e-students). The programme ran from 2012 to 2015.	• Implementation period: 2012-2015 • Budget: EUR 32 million • 424 schools were equipped with hardware; production of 62 e-textbooks and 2,500 supplementary educational resources
Digital Education Revolution (DER) Australia/secondary education	Australia's DER was a large-scale programme set up in 2007 and implemented from 2008 to 2012. The ultimate goal of the DER programme was to prepare every Australian student to live and work in the digital world. To that end, the Commonwealth of Australia committed AUD 2.4 billion (EUR 1.62 billion) to help high schools across the country integrate technology into the classroom. While most of the funding was provided at federal level, the programme was operated flexibly at implementation level, i.e. territories and schools were able to purchase a mix of devices, including netbooks, laptops, tablet devices and desktop computers. The programme targeted secondary education, including aspects related to leadership, professional development and digital resources.	• Implementation period: 2008-2012 • Budget: Approximately EUR 1.62 billion • 911,000 computers rolled out in 2,701 national schools; high-speed broadband connectivity delivered to urban and rural schools; more than 15,000 educators trained in Intel Teach Programme
eCampusOntario.ca (eCO) Ontario, Canada/tertiary education	eCO (formerly Ontario Online) is being implemented by the Ontario Online Learning Consortium (OOLC), which was established to develop Ontario into a leading province in technology-enabled education and e-learning, and to enhance post-secondary opportunities for students. OOLC's objectives are to improve collaboration among Ontario's publicly-funded colleges and universities, share best practices and resources, provide high-quality online courses, and support credit transfer between education institutions.	• Implementation period: 2014-2019 (5 years) • Budget: Approximately EUR 49 million • eCO engages 45 public-assisted colleges and universities and currently offers more than 14,300 online courses and more than 700 programmes in Ontario's post-

	In 2015, OOLC launched its main deliverable, a centralised online platform (www.eCampusOntario.ca), where post-secondary students can find and enrol in online courses and programmes offered by Ontario's colleges and universities. Colleges Ontario (CO) and the Council of Ontario Universities (COU) jointly administrate the consortium. The government of Ontario funds OOLC.	secondary institutions
1BestariNet (1BN) Malaysia/primary and secondary education	The 1BN project provides around 10,000 primary and secondary public schools in Malaysia with 4G internet access and a virtual learning platform (Frog Virtual Learning Environment). This nationwide project is based on a solution where learning, teaching, collaboration and administrative functions are integrated into a virtual learning platform. The project seeks to bridge the digital gap between rural and urban students in Malaysia. The project was launched in 2011 by the Malaysian Ministry of Education together with Exchanging Malaysia, FrogAsia, YTL Communications (technology partner) and Google.	• Implementation period: 2011-2014 • Budget: EUR 958,643 • 10,000 primary and secondary public schools targeted • Connecting schools reaching 5.5 million students, 4.5 million parents and 500,000 teachers in Malaysia

5.2 Similarities and differences

→ Different levels of comprehensiveness and specificity

The initiatives in Australia, Malaysia and Poland can be considered to be comprehensive regarding the spectrum of activities and the level of funding involved. The Irish and the Estonian initiatives are more specific as concerns the range of activities and the funding provided, whereas the Canadian initiative is procedural in approach, building on collaboration between tertiary education institutions.

→ Top-down policy design versus grassroots and collaboration initiatives

A look at the conceptual design of the initiatives reveals that the conceptual and policy design process varies across the cases analysed. The first difference occurs at the level of the actors that initiated the policies. The Estonian, Polish, Australian and Malaysian policies are grounded in a top-down policy approach and are firmly embedded within broader education strategies. In contrast, in the Irish Digital Schools of Distinction programme, a Dublin-based primary school principal was the original initiator of the scheme. The latter's experience in ICT in education work with education partners (professional teacher training, teacher networks, principals' networks, etc.) allowed him to start a dialogue and discuss his ideas before the real policy design commenced. In this case, the initiator's network was leveraged in the conceptual design phase of the initiative, which contrasts strongly with the official policy design process applied in the Malaysian and Polish cases.

While the Polish Digital School programme was grounded in broader education strategies, its OER component was pushed forward by a network of non-governmental organisations (NGOs) and educational institutions, represented by the Coalition for Open Education, which contributed to the policy design through advice on methodological, technical and legal aspects. The policy concept, however, was elaborated mainly under the guidance of

Witold Przeciechowski, who represented the Chancellery of the Prime Minister, with support from a number of education experts.

→ Centralised versus decentralised implementation structures

In terms of the degree of centralisation, the Malaysian 1BestariNet programme in particular rests on a centralised model where the Ministry of Education provided the overall framework for the large-scale initiative. The Irish, Australian and Canadian examples follow decentralised models to a greater degree. In the case of the Australian Digital Education Revolution (DER) initiative, the implementation level is highly decentralised, taking place at the regional level and implemented by various actors. With regard to the Canadian eCampusOntario.ca (eCO) initiative, the Ministry of Training, Colleges and Universities has given responsibility to key education stakeholders in Ontario, in particular to Colleges in Ontario and the Council of Ontario Universities, for the operation and implementation of the initiative through the newly created OOLC consortium.

→ Learning from past experiences

Three of the initiatives examined refer to a particular model or existing policies. In the Digital Schools of Distinction, the Green School and Active School formats provided inspiration for the policy design. In a similar manner, the Canadian eCO programme drew upon the consortium model used in Open Universities Australia, an online learning initiative offering courses from a range of Australian universities. In addition, eCO was also inspired by experiences of the US federal states' central processes to engage state universities in the development of online learning. While the link between the Polish Digital School programme and an existing model is less clear cut, the earlier initiative Turn Poland On (Włącz Polskę) also sought to promote freely accessible and openly licensed resources; however, this earlier programme was limited to Polish schools outside Poland.

→ Organisational structures for teacher support

While teachers play an important role in all initiatives, the type of support and/or training provided to them is diverse, comprising face-to-face and web-based support solutions. However, in all cases, new organisational structures are set up to support teachers.

In 1BestariNet, these are the teachers who advise school internal technology officers. In the Digital School programme, the positions of e-leaders and e-school coordinators have been established and around 40 e-coaches have been trained to increase the effectiveness of the repository. In some of the Australian territories, technology support officers (TSOs) were used to support the implementation of DER. In the state of New South Wales alone, around 600 TSOs were employed and trained with a view to ensuring the proper functioning of computer devices. In the case of Digital Schools of Distinction (Ireland), teachers receive advice from the Coordinator of Validation. Here, technological support is complementary, for example provided through a forum that is maintained by one of the partner organisations, the Computers in Education Society of Ireland (CESI), but a telephone support line for queries on the use of equipment is also operated by HP.

5.3 Transferability, scalability and sustainability potentials

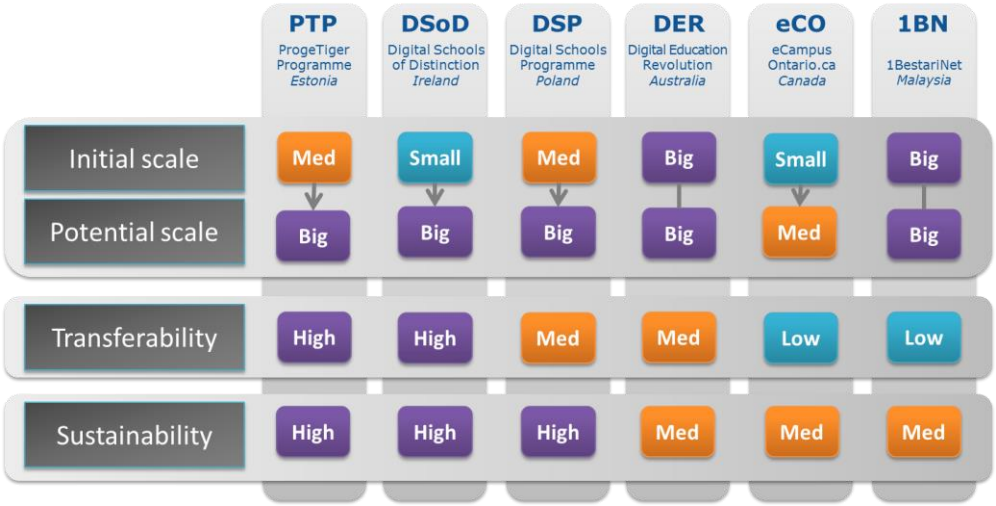


Figure 1. Comparison of transferability, scalability and sustainability potentials[4]

Overall, the selected cases were found to have a strong potential for transferability, scalability and sustainability.[5]

5.3.1 Scalability[6]

Some of the policies have been created with scale in mind. The Malaysian 1BestariNet and the Australian DER programmes followed a holistic approach, aiming from the outset to implement digital education in all schools across both countries. However, for 1BestariNet, the Ministry of Education and the implementing consortium partners will need to demonstrate their capacity to overcome the flaws noted in the auditor's report and in the Malaysian press in general, to attain this ambitious goal.

Concerning DER, the initiative's scale was quite significant from the very beginning; yet, thanks to cost savings achieved through purchasing a significant volume of equipment, even more devices were supplied to secondary schools than was originally envisaged. Similarly, in the course of the implementation of Poland's Digital School programme, outputs were already scaled up beyond original plans, for example in terms of OERs and e-textbooks generated by the initiative. Furthermore, plans to scale up the size of the initiative and also transfer it to the regional level were developed, giving the Digital School programme a high scalability potential.

Digital Schools of Distinction (Ireland), which started as small-scale experiment, is currently exploring a similar scheme for secondary education schools in Ireland, and is thus already in the process of scaling up. The ProgeTiger programme expanded its initial focus on computing skills to concentrate more on holistically fostering students' digital competences. In the case of Ontario, it is too early to conclude on scalability. However, there is growth potential as concerns the range of students, the number of courses and the intensity of collaboration efforts on courses of study and degrees.

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4 Source: CARSA

5 These assessments are in part the result of interviews with representatives from implementing authorities, while in some cases information collected by desk research also affected the assessment.

6 *Scalability* refers to the potential of policies to significantly expand or scale up the relevant activities, or to increase their intensity at the same education level or at additional education levels.

5.3.2 Transferability[7]

Given its specific geographical separation and higher socio-economic inequalities, the Malaysian 1BestariNet programme cannot easily be transferred. To a certain extent, the same applies to eCO, which relies on existing cooperation networks between universities and their joint interest in attracting students to or in a specific region. While there may be regions where a similar initiative would be feasible and also desirable, this is not a commonplace situation. In each case, the responsiveness of the policy to the specific contextual conditions, which is an advantage of its design, limits transferability.

The Digital School programme (Poland) and DER (Australia) are national strategies that can in principle be replicated by any country aiming at holistic change. However, both schemes benefited from strong political leadership and high public support and investment as necessary conditions for their design and implementation. Replicating these initiatives or some of their features would necessitate similar levels of support in terms of policy and practice, and substantial public funds.

In the case of Digital Schools of Distinction (Ireland), on the other hand, the programme has already been successfully transferred to Northern Ireland. Further replication in other countries is envisaged in the context of a European project. The ProgeTiger programme builds on communication chains, training channels and teacher networks that exist in a similar way and to a similar extent in other EU Member States, which makes the programme easily transferable.

5.3.3 Sustainability[8]

The key factors for sustainability were found to depend on:

(1) whether or not the initiative was embedded in an overarching strategy;
(2) whether or not the funding and business model included cost savings as an output; and
(3) institutional factors.

Concerning their sustainability, integration into a more comprehensive strategy appears to be an important element in the Australian, Malaysian and Polish cases.

Alongside links to overarching strategic frameworks, financing, cost-saving and institutional factors were identified as contributing to the sustainability of policy initiatives. In Ireland, for example, private financing through the initiative's technological partners, HP and Microsoft, allowed the scheme to be relaunched in 2013, when public funds were cut. This case also illustrates how an organisational structure such as a steering committee can support sustainability. The mandate and balanced composition of education partners in the steering committee ensured that decisions were supported by the key stakeholders in primary education in Ireland.

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[7] *Transferability* refers to the potential of a policy to be replicated at other governance levels, be it at regional, national or local level, in the same country or in a different country. Transferability is not a benefit in itself. A policy or scheme addressing contextual and systemic specificities can be very successful because of this responsiveness, and despite the fact that it will not be easy to transfer this scheme to a context with different characteristics.

[8] *Sustainability* refers to the potential of the policy's impact beyond the lifetime of the project, or beyond the funding cycle of the project/initiative. Criteria to assess policies' sustainability level refer mainly to financial cost, the participation of the private sector and additional measures taken to increase the longevity of the relevant policies.

5.4 Key features

5.4.1 Funding and business models

Public funding appears to be the backbone of policies that integrate digital technologies into education, given that all six case studies are publicly funded. Only in the case of Digital Schools of Distinction (Ireland) was public funding combined with a major private investment, as shown in the following table:

Table 3. Overview of funding provided

Policy initiative		Public funding (EUR)	Private funding (EUR)	Time frame
ProgeTiger programme *Estonia*	**PTP**	1,000,000	-	2014-2016
Digital Schools of Distinction *Ireland*	**DSoD**	130,000	700,000	2013-2015
Digital School programme *Poland*	**DSP**	32,000,000	-	2012-2015
Digital Education Revolution *Australia*	**DER**	1,620,000	-	2008-2012
eCampusOntario.ca *Canada*	**eCO**	49,000,000	-	2014-2019
1BestariNet *Malaysia*	**1BN**	958,643	-	2011-2014

In the case of Digital Schools of Distinction (Ireland), the heavy involvement of private funding granted sustainability to the initiative even after public spending cuts. It should be noted that in the same programme, industry partners — despite providing 85% of the programme's funding — do not dictate the design of the policy. Instead, they are given a say in decision-making, as are the Department of Education and Skills in Ireland and other education partners.

A closer look at the financing model in each case revealed interesting insights regarding the indirect participation of the private sector. For example, in the case of 1BestariNet, the technology provider contracted to build and install telecommunication towers for the project was entitled to use the towers to provide commercial internet access to surrounding communities.

5.4.2 Teacher training and professional development

Teacher training and support appears to be a core part of all the cases examined. This includes both face-to-face training and web-based support solutions. However, differences in the scope, comprehensiveness and intensity of the training provided vary across the cases. Half of the policies analysed were found to have comprehensive, often multipart, teacher training and/or support in place. These provisions often involve the introduction of specific organisational and/or personnel structures, and the establishment of e-learning repositories for teachers.

Table 4. Overview of teacher training and teacher support activities

Case study	Teacher training/support activities	Degree of teacher training
PTP *ProgeTiger programme* Estonia	- Initial and in-house training to educate instructors and assist teachers in the implementation of training activities - Creation of local PTP networks, which test training material and training programmes before incorporating them	Medium
DSoD *Digital Schools of Distinction* Ireland	- Teacher training is not a critical aspect of this initiative - Advice from the Coordinator of Validation on how to integrate technology into the classroom - Technological support to certified schools through private sector partners, i.e. general queries through a forum and a telephone support line for queries on the use of equipment	Low
DSP *Digital School programme* Poland	- Teacher training pack comprising training courses, online support materials, e-learning courses - Use of designated e-leaders, e-school coordinators and around 40 e-coaches trained to increase the effectiveness of a repository of training materials for teachers, available for teachers at the participating schools	High
DER *Digital Education Revolution* Australia	- Multiple specific features were established under DER to train, support and raise awareness among teachers - Support for teachers in curriculum activities to help them develop flexible and innovative ways of teaching in classrooms - Sensitisation fund set up to help teachers to integrate technologies into the classroom in several areas - Combination of a teaching programme by a private sector partner with training courses on how to effectively integrate digital technologies into teaching and learning activities	High
eCO *eCampusOntario.ca* Canada	- No official teacher training envisaged, but many resources, including videos, books, journals, etc., are provided for teachers through the eCampusOntario.ca portal - Creation of a support hub which supports professors, teachers and instructors in content and technical matters through a virtual space for sharing resources	Low-medium
1BN *1BestariNet* Malaysia	- Structural change by using school technology officers to advise teachers on how to use the hardware and software provided - Teacher awards to motivate and honour committed teachers who have integrated digital technologies into their teaching and learning	Medium-high

→ Multiple strategies for teacher training

Perhaps the most comprehensive teacher training component is offered in the Polish Digital School programme, as well as the Australian DER. In the case of the Digital School programme, teachers are equipped with training courses, online support materials and e-learning courses, providing a full support package.

For DER, AUD 40 million was allocated to the training of teachers and school leaders, with a focus on fostering flexible and innovative teaching. As in the case of Poland, teacher training is combined with the provision of online teaching resources, e-learning opportunities and expert advice. Furthermore, the Intel Teach programme was tied in to DER's roll-out. It trained over 15,000 teachers on how to integrate digital technologies into teaching and learning activities.

The Estonian ProgeTiger programme offers initial and in-house training. In addition, it creates local networks that test, for example, training materials and training programmes. Freely available information was compiled into training packages, offered

as face-to-face or online training. In the Canadian case, no specific training is provided. However, the initiative provides many resources, including videos, books, journals, etc., through eCO's web page. A support hub provides academic and technical support to professors, teachers and instructors through a virtual space for sharing resources.

→ Lack of evidence on the effectiveness of teacher support activities

Little can be said about the effectiveness of the teacher support provided in the initiatives. This is partly because policies dealing with both infrastructure and pedagogy tend to put more emphasis on evaluating infrastructure-related aspects and less on pedagogy and teacher training. Even where teacher training is assessed, quantitative outputs receive the most attention; for example, the emphasis might be on the number of educators trained rather than the quality of the training provided.

5.4.3 Implementation process

The implementation processes and underlying implementation strategies varied considerably between the cases examined, reflecting the specificities of each context.

Table 5. Implementation strategies

	Stakeholder consultations	Specific governance structures	Other instruments
PTP ProgeTiger programme (Estonia)	✓	✓	✓
DSoD Digital Schools of Distinction (Ireland)	✓	✓	✓
DSP Digital School programme (Poland)	✓		
DER Digital Education Revolution (Australia)		✓	✓
eCO eCampusOntario.ca (Canada)	✓	✓	
1BN 1BestariNet (Malaysia)	✓	✓	

→ Stakeholder consultation and involvement

However, some recurring strategies were found, in particular the involvement of several organisations in the programme's roll-out and stakeholder consultations (either large-scale or less structured/comprehensive consultations). In the case of Digital Schools of Distinction (Ireland), for example, the creation of an external steering committee proved to be an effective solution to the initial difficulties in the programme's implementation. This does not imply, however, that the creation of new or dedicated organisational structures always facilitates the implementation process.

5.4.4 Outputs and outcomes

Table 6. Outputs and outcomes

	Outputs	Outcomes
PTP ProgeTiger programme (Estonia)	More than 1,244 teachers trained (2013-2015), out of approximately 15,000 Estonian teachers The programme has launched around 15 teacher training courses (seven new courses were under development in 2015) Support to around 1,500 kindergartens and schools to acquire equipment (2013-2015) Active local PTP networks established in most Estonian counties to promote PTP and test activities and material More than 500 students and 100 teachers take part in PTP's student contest (2015/2016)	Approximately 80% of Estonian schools are involved in PTP activities
DSoD Digital Schools of Distinction (Ireland)	1,688 schools registered to become Digital Schools of Distinction (representing 50% of all Irish primary schools) 271 Irish primary schools were awarded Digital Schools of Distinction status (2013-2015)	80% of surveyed teachers strongly agreed that the use of ICT had a positive impact on student motivation 84% of teachers found the programme to be very valuable for their school's ICT usage to support curriculum objectives 75% of teachers confirmed the value of the programme in creating momentum in innovative and effective use of ICT tools by teachers
DSP Digital School programme (Poland)	3,000 schools applied to participate in DSP 424 schools were selected and equipped with tablets, computers and ICT equipment as part of the infrastructure component 62 e-textbooks covering 14 subjects and 2,500 supplementary educational resources (videos and other multimedia) produced	Establishment of standards for open educational resources, including e-textbooks, in the Polish education system Cost-saving measures achieved as part of the introduction of open standards
DER Digital Education Revolution (Australia)	More than 911,000 ICT devices (netbooks, laptops, desktop computers and tablets) supplied to schools (the original target was 768,000 computers) More than 15,000 educators trained through the Intel Teach Programme High-speed broadband connectivity delivered to urban and rural schools	Early indications from the Australian National Audit Office (ANAO) survey regarding the impact of the National Secondary School Computer Fund (NSSCF) on teaching and learning are positive
eCO eCampus Ontario.ca (Canada)	All the 45 publicly funded colleges and universities in Ontario decided to engage and collaborate on providing online courses and programmes eCO's online platform offers more than 14,300 online courses and over 700 programmes from Ontario's post-secondary institutions The Shared Online Course Fund, which is linked to eCO, has contributed financially to the redesign and development of more than 400 courses and 80 modules	Increased collaboration among Ontario's colleges and universities on online learning and the creation of an online platform with courses
1BN 1Bestari Net (Malaysia)	Around 9,000 primary and secondary public schools in Malaysia connected to high-speed 4G internet and a virtual learning environment (VLE) The project connects schools reaching 5.5 million children, 500,000 teachers and 4.5 million parents	Daily usage of the VLE platform stayed below expectations; usage by students ranged between 0.17% and 0.63%; teacher usage was between at least 0.57% and 4.69%; and parents had the lowest usage, with between 0.01% and 0.03% The total number of users was also below expectations; data used in the auditor's report for weeks 5-11 in September 2014 showed that only 137,237 students logged into the VLE system, with only 76,096, or 55%, using it for more than 30 minutes that week

→ Substantial differences in goal achievement

The Digital School programme (Poland), Digital Schools of Distinction (Ireland) and the Australian DER achieved their initial objectives and more. The Polish initiative equipped 424 schools with hardware — more than the expected 380 schools — and developed 62 e-textbooks and around 2,500 supplementary open educational resources. Digital Schools of Distinction (Ireland) also achieved its overall objectives, in terms of the number of participating and awarded schools.

The Australian DER exceeded its initial objective to deliver 768,000 ICT devices by providing around 911,000 computers in 2,701 schools nationwide. In addition, high-speed broadband connectivity was extended to metropolitan and regional country schools. More than 15,000 educators took part in the Intel Teach Programme to learn to integrate technology into education. The majority of both school principals and parents reported a positive effect on teaching and learning.

In the case of 1BestariNet, the auditor's report showed that the programme had not achieved its objectives in terms of concrete outputs; not all 10,000 schools were provided with high-speed internet connectivity and VLE access within 2.5 years. Daily use of the VLE platform developed in 1BestariNet stayed far below expectations, with student use ranging between 0.17% and 0.63%, while teacher use ranged between 0.57% and 4.69%.

5.5 Drivers and barriers

Each of the six initiatives is embedded in a specific social, educational and policy context. An analysis of the key drivers and barriers in each case provides interesting insights into the success factors and obstacles faced by each initiative. Both the drivers and barriers converge only on a few points, due to the significant differences between the policies examined, thus indicating a variety of possible enabling and impeding factors to be considered when implementing digital education policies. Depending on these and other contextual factors, different levels of transferability, scalability and sustainability were obtained.

5.5.1 Key drivers in policy implementation

Reflecting on the experience gained in the six cases studied in depth, some common drivers can be identified. These are discussed below.

→ Favourable environment

Policy interventions aimed at transforming education through digital technologies seem to have greater impact if they do not work in isolation. The Digital School programme, for example, benefited from the support of the Coalition for Open Education[9], while the school community in Ireland helped Digital Schools of Distinction to gain momentum.

→ Specific governance structures

Beyond mere coordination and monitoring functions, governance structures hold the project team accountable for putting an initiative into action, for implementing action

[9] A network of NGOs and educational institutions that contributed position papers and recommendations in support of open education, for example concerning advice on legal and technical conditions.

plans and for delivering results. Often implemented in the form of a steering committee, specific governance structures help coordinate and monitor the initiative, as in the cases of Digital Schools of Distinction (Ireland) and eCO.

→ Customised technological solutions

There is no single off-the-shelf solution to transforming education through digital technologies. Interventions that start with an in-depth analysis of the baseline have a greater chance of being effective. In the case of policies with a particular focus on infrastructure provision, the development of bespoke solutions is considered a key driver of success. 1BestariNet, for instance, leveraged a simple hybrid solution with cloud-based content and an open-source model combined with solid ICT infrastructure. In the case of DER, the solution was to provide access to broadband through individual computer terminals.

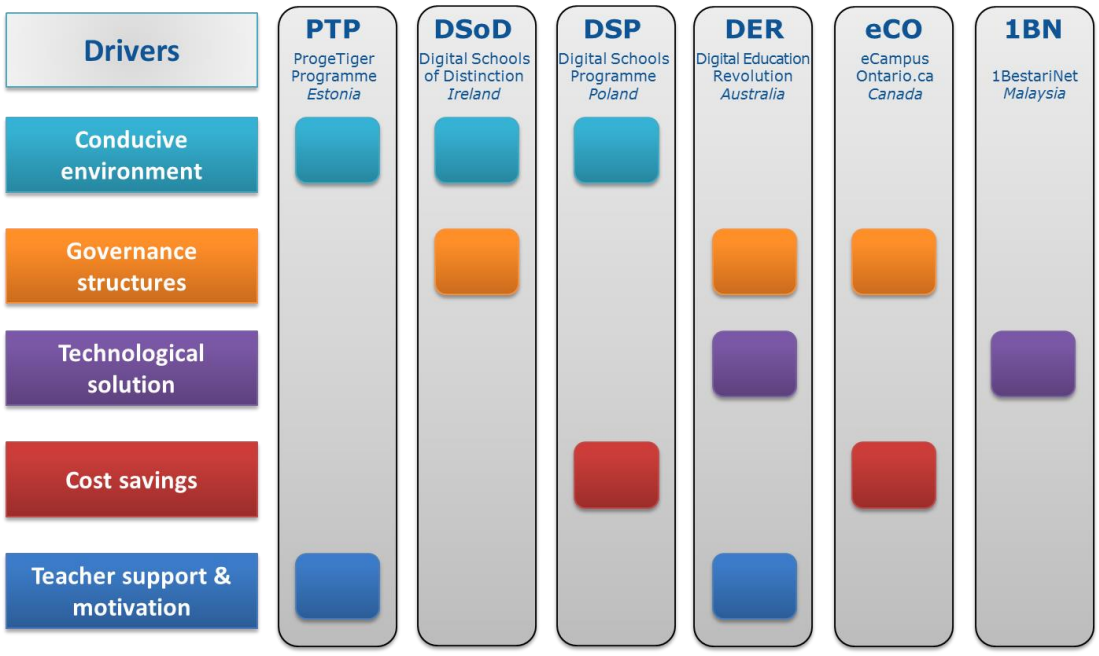
→ Cost savings

1BestariNet and DER bought their devices and equipment in bulk, which resulted in significant price drops per device.

→ Teacher motivation and support

The implementation of the ProgeTiger programme in Estonia was helped by the strong interest of the teachers involved. In the cases of 1BestariNet and DER, specific support was provided to help teachers use the technology and to help schools maintain the devices. Education changes cannot happen without the commitment and buy-in of teachers, and any intervention aimed at transforming education should consider getting teachers on board a priority.

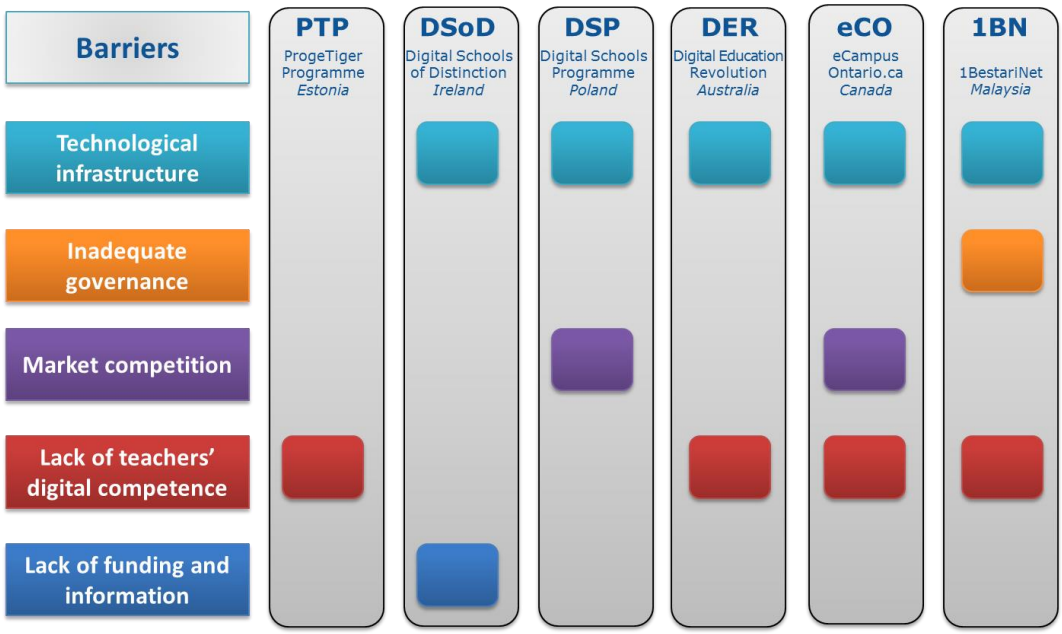
Figure 2. Common drivers in case studies examined[10]



[10] Source: CARSA.

5.5.2 Key barriers in policy implementation

Figure 3. Common barriers in case studies examined[11]



→ Inadequate technological infrastructure

Insufficient internet speed, in particular, poses a threat to leveraging the merits of technology. This was mentioned in almost all cases examined.

→ Inappropriate governance structures

As much as stakeholder involvement is an asset, a lack of buy-in from local stakeholders can jeopardise the implementation process. This became apparent in the Malaysian case, where the insufficient involvement of local authorities slowed the roll-out of the communication towers.

→ Market competition

Competition between or with stakeholders affected by the policy can pose a threat to its success. In the Polish case, opposition by publishers to the open education contents produced in the Digital School programme threatened to put a stop to this module. In the case of eCO, long-established competition between the colleges and universities involved in this collaboration project posed a threat to its success. This needed to be carefully addressed in the setting up of the project.

→ Lack of pedagogical digital competences

In several of the cases examined, teachers' lack of digital competences, and lack of their confidence in using digital technologies meaningfully in teaching, posed an obstacle to the initiatives' success. 1BestariNet found that lack of digital competence among teachers, particularly in rural areas, was an important barrier to implementation. In the case of DER, teachers reported that they lacked the time to integrate technology effectively into the classroom.

[11] Source: CARSA.

→ Lack of long-term perspective

If teachers and schools are not convinced about the long-term sustainability of the policy, they are more reluctant to collaborate. In the case of the Irish Digital Schools of Distinction initiative, for example, the government failed to provide funding and information on long-term school financing, which prevented schools from taking account of the availability of necessary resources when planning the implementation of digital school policies.

5.6 In summary: key findings from the in-depth case studies

The six case studies illustrate that both top-down and bottom-up initiatives can trigger innovation in education. There is no single off-the-shelf solution to transforming education through digital technologies. Rather, policies should be responsive to the specific context of implementation. Interventions that start with an in-depth analysis of the baseline have a greater chance of being effective.

The cases show, furthermore, that stakeholder consultation and involvement is important for implementation to be successful. Specific governance structures can help in formalising stakeholder involvement, promoting uptake and delivering results. Cost savings can deliver an additional argument for uptake.

In all cases, there was a strong emphasis on teacher capacity building, which was confirmed as an important element to ensure the policies' success. Moreover, educators' commitment and buy-in to the process proved to be important for the success of the strategies.

Having said that, it should also be noted that inadequate technological infrastructure, in particular insufficient internet speed, is still a major barrier preventing educational policies from yielding the expected results.

Too often, policies prove not be sustainable in the long run. The analysis of the cases suggests that digital education policies are more sustainable if they are embedded in an overarching strategy, if cost savings can be made and if a governance structure is established that is responsive to implementing necessary changes while ensuring continuity over time.

6. Conclusions

Based on the analysis of the 43 policies recorded in the inventory and the discussion of the six policy initiatives studied in depth, eight core policy design principles for the successful implementation of digital education policies were identified and validated through expert consultations. These key messages can serve as guiding principles when designing digital education policies.

→ Follow a holistic approach targeting systemic change

Policies that target systemic change embracing all levels have the potential to achieve transformational change by challenging the existing system or status quo. At the same time, clear goals should be defined to allow conclusions to be drawn and to learn from the implementation of systemically oriented initiatives.

→ Establish both a long-term vision and short-term achievable goals

A long-term perspective is necessary to enable education policy interventions to yield returns. Short policy cycles and changes in government priorities can lead to policy initiatives being discontinued or to the resources required to support them being reduced, thus undermining the impact of interventions. The long-term vision in education policy should, however, be complemented by short-term achievable goals. The accomplishment of these goals should be integrated into an evaluation framework defined at the start of the policy. This will make it possible both to change pathways and to identify concrete results and achievements that can be demonstrated to decision-makers and the public, to ensure continued funding and support. In addition, early consideration of sustainability, for example in the form of a sustainability plan, can increase the chances of a policy having a long-term impact.

→ Deploy technology as a means not an end

Despite the abundance of devices, online content and tools today, many classrooms struggle to make full use of digital technologies. Technology must be interwoven with a holistic approach that considers all relevant aspects, in particular pedagogical practices and training, to prevent it from being misunderstood as a standalone factor. The Commission's Digital Competence Framework for Educational Organisations (Kampylis et al., 2015) discusses the areas of institutional reform in depth and can also serve as a guide to policy reform.

→ Embrace experimentation, risk-taking and failure

Often, to be effective, digital education policies need to be tried, tested and adjusted over time, taking a more iterative approach to policy-making. Flexible policy design can allow initiatives to adapt rapidly according to the feedback received in evaluations carried out at regular intervals. Rather than fearing failure, for example in terms of not achieving the defined objectives, policy-makers in digital education should be reminded that the greatest improvements to learning are often achieved when learning from mistakes. Allowing a higher degree of experimentation and risk-taking can contribute to achieving more effective digital education policies.

→ Consider the importance and the limits of impact assessment

Impact assessment is important to identify areas that require a change in policy focus and strategy. The evaluation and monitoring mechanisms established should have a clear time frame with clear assessment levels and deliverables, include accountability benchmarks, and they should embrace recent evaluation trends and facilitate ongoing review mechanisms. However, impact assessment must acknowledge the complexity and the difficulty of attributing learning outcomes to the use of digital learning tools alone. The evaluation criteria established should therefore be multi-dimensional, concentrating also on assessing aspects and effects that are not quantifiable. Small-scale pilots can help in identifying problems and estimating large-scale outcomes.

→ Involve all stakeholders in a structured dialogue

Stakeholder consultation and involvement are important if digital education policies are to be successfully implemented. Stakeholder consultations can assist policy design, ensuring that the planned measures target the right aspects. In addition, they can help to develop stakeholder buy-in. Governance structures involving stakeholders in monitoring and refining the implementation process can help in promoting uptake and delivering results.

→ Let schools and teachers have a say

The success of digital technology use in the classroom often depends on the motivation of school leaders and educators. Designing policies that allow these actors plenty of leeway or autonomy can bring positive outcomes. The motivation of school principals, as well as of teachers, can often be decisive in driving forward the integration and use of digital technologies in schools. It is also important to allow flexibility to account for local differences. Furthermore, a bottom-up approach gives stakeholders a stronger sense of ownership, with positive effects on their motivation.

→ Build up teaching competence

Teacher training and continuing professional development are important prerequisites to ensure that digital technologies are deployed. As long as educators' pedagogical digital competences and their actual use of digital technologies in teaching practice are not mainstreamed, policy interventions in support of effective digital learning will fail to produce effects. Equipping teachers with the necessary competences to effectively use digital technologies in teaching and learning should be a priority of any digital education policy. The recent European DigCompEdu framework (Redecker, 2017) aims to support Member States in systematically developing educators' pedagogical digital competences.

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Annex 1 – List of definitions

Bring Your Own Device (BYOD)	BYOD reflects a pragmatic response to the reality that today's students are likely to have one or more internet-connected devices available to them for their exclusive personal use (smartphone, laptop, and tablet). By allowing students to use such devices for study purposes during their attendance at school (or tertiary education institution), a one-to-one (one device per student) regime can be achieved without the need for the organisation itself to make costly investments in similar devices. Adapted from: IBM www.ibm.com/mobilefirst/us/en/bring-your-own-device/byod.html
Policy	The term *policy r*efers to short- medium- or long-term interventions initiated by policy-makers in order to influence and determine decisions, actions, and behaviours for changing the status quo and achieving a goal.
Integration of digital technologies in education systems	In the context of the present study, the term *integration of digital technologies in education systems* refers to the embedding of technology as a tool to enhance teaching and learning practices in a specific content area or multidisciplinary settings. The process of integration of digital technologies in the context of education should not be led by technological developments but driven by pedagogy, following a systemic and ecological model of change (Kampylis et al., 2013; Law et al., 2015).
Innovative use of digital technologies	It refers to new ways of using and creating information and knowledge made possible by the use of digital technologies, as opposed to using them for sustaining or replicating traditional practices. This innovative use aims to add value to the educational process and achieve more comprehensive learning outcomes.
Digital competence	Digital Competence is defined broadly as the confident, critical and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society. Source: DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe http://ftp.jrc.es/EURdoc/JRC83167.pdf
Digital content	Digital content is a 'catch all' term that encompasses text-based and audio-visual resources (now in digital format) and interactive media (games/mobile apps, simulations, visualisations). Adapted from: e-ContentMag http://www.econtentmag.com/Articles/Resources/Defining-EContent/What-is-Digital-Content-79501.htm
Digital learning technologies	The expression digital learning technologies encompasses the expanding range of standalone and internet enabled devices used by teachers and/or by students in the course of their everyday teaching/learning practices, and includes the enabling software, platforms and services. Devices include computers, laptops, tablets, smartphones, cameras, wearables, projectors, smartboards, 2D, 3D printers, scanners and other peripherals. Software includes general, specialist and education-specific applications, games, 'apps' and tools generally (task-oriented and for communication). Platforms include VLE/LMS (Virtual Learning Environments/Learning Management Systems), social media, web portals and repositories. Services include broadband internet connectivity, security (passwords, privacy) and file storage and management. Synonyms: Educational Technology, ICT and education, Technology Enhanced Learning (TEL). Source: Leeds University http://www.leeds.ac.uk/educol/documents/00001862.htm
Digital technology	Any product or service that can be used to create, view, distribute, modify, store, retrieve, transmit and receive information electronically in a digital form. In this report, the term "digital technologies" is used as the most general concept, comprising – computer networks (e.g. the internet) and any online service supported by these (e.g. websites, social networks, online libraries,

	etc.), – any kind of software (e.g. programmes, apps, virtual environments, games), whether networked or installed locally; – any kind of hardware or "device" (e.g. personal computers, mobile devices, digital whiteboards), and – any kind of digital content, e.g. files, information, data.
Integration and effective use of digital learning technologies	The term *integration* is used to describe the use of digital learning technologies in a 'natural' and widespread way within and beyond the organisation boundaries for achieving its core mission and vision for a quality education. The term *effective* refers to the production of planned, desired and decisive effects by the use of digital learning technologies, for example, the ability to define and achieve more comprehensive learning outcomes that might be otherwise difficult to achieve or even unattainable without the technologies in question.
Learning Analytics	Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs. Adapted from the First International Conference on Learning Analytics. http://edutechwiki.unige.ch/en/Learning_analytics
Open Education	The term 'Open Education' has several interpretations. Openness can refer to widening access to educational opportunities and educational resources (particularly for under-represented, disadvantaged, or marginalised groups). Increasing flexibility in terms of the time, place and pace of study is also a defining characteristic of openness, aligned with ambitions to provide more personalised/individualised curricula and study options (including flexible, online education and/or more personalised / open/ customised learning support for students through use of learning analytics). Adapted from: Opensource https://opensource.com/resources/what-open-education
Open Educational Resources (OERs)	Teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. Source: UNESCO definition http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/open-educational-resources/what-are-open-educational-resources-oers/
Digital Learning Technologies and Resources (DLT&R)	Digital Learning Technologies and Resources is used to refer to the entirety of digital tools for learning and teaching including digital resources, e.g. OERs, other forms of digitised media available digitally.
Virtual Learning Environments (VLEs)	Virtual Learning Environments (VLE) are here referred to learning software solutions engaging students in interactive ways. Frequently, VLE is software delivered through hardware devices, e.g. laptops/tablets or smartphones.
Self-regulated and personalised learning	Self-regulated and personalised learning approaches refer to *the ability of a learner to prepare for his/her own learning, take the necessary steps to learn, manage and evaluate the learning and provide self-feedback and judgment, while simultaneously maintaining a high level of motivation (McLoughlin, Lee; 2010).* Digital technologies are often used to support these learning approaches, e.g. learning platforms.

Annex 2. Case inventory fact sheets

Introduction

This Annex provides a short description, on two pages, for each of the 43 digital education policy initiatives on which the analytical work and the selection of cases for in depth study is based. This inventory was drawn up on the basis of extensive desk research and direct enquiries with relevant ministries, specialised institutes and associations in the field of digital education all over Europe.

This collection of digital education policies is neither complete nor representative. Many of the initiatives listed can be considered as indicative of current progress and state of the art. However, it should be noted that it was not an aim of the study to take stock of all of the many digital policy initiatives being implemented worldwide. Rather the aim was to identify illustrative and exemplary cases.

The resulting inventory is therefore necessarily incomplete and fragmented. The cases described differ widely in focus, maturity, policy scope and impact. Taken together they illustrate the variety and diversity of current digital education policies, with an eye to inspiring policy makers and practitioners.

The information displayed is based on desk research and, in some cases, short expert interviews to complete the data publically available. Information was collected along the following categories:

- *Policy context:* Country, countries or regions in which the policy is implemented; time-frame and duration; geographical scope.
- *Pedagogical context:* Targeted education level; learning form (online, blended, face-to-face learning); digital technology & delivery channel
- *Implementation:* implementation phase; impact area; funding source and budget; implementing body and technology partners / solution provider
- *Information sources:* Related legislation or strategy document; website of the initiative
- *Policy content:* Key features; objectives; policy context and rationale
- *Strategy:* implementation strategy; roles and support (policy, industry and school-level); Teacher training (scope & method);
- *Results:* Evaluation and monitoring mechanisms; outputs; outcomes; learning outcomes; (potential) impacts

In has to be noted that, in many cases, not all of these data were available. For example, in a number of cases the implementation had not yet reached a level where results could be specified. In other cases certain information, e.g. on budget, was not publically available. In the following short descriptions only the categories for which information could be gathered are displayed.

The data presented reflects the state of the art in June 2015. Many of the initiatives are still ongoing and more updated information is available following the indicated links to data sources. The cases are listed in European protocol order.

Table of contents

ClassCement (Belgium – Flanders)

KlasCement	
Country(ies)	Belgium (Flanders)
Time-frame	1998-ongoing
Geographical scope	Regional
Education level(s)	Primary education; Secondary education
Learning form	Online media / platform
Technology focus	Cloud computing; Web 2.0
Implementation phase	Full-scale
Impact areas	Exchanging pedagogical practices (educators); Open Educational Resources (OER) development
Funding source	Flemish Ministry of Education
Implementing body	Agency for Educational Communication; Flemish Ministry of Education
Source /website	http://www.klascement.be/
Key features	In 2002 the Flemish Belgian Ministry created its own open-source portal, KlasCement, as a central access point for teachers to share learning materials. Since its creation, the portal has expanded to include over 67,000 members and 13,000 contributions. Learning resources available via the portal include articles, documents, websites and software. Because nearly all of these are freely available and non-commercial in nature, the quality of the service depends upon user-generated contributions and feedback. The government has thus developed an incentive system to encourage teacher participation. The platform is open to be used by Dutch teachers and counts as a successful example of cross-border educational collaboration.
Goals	1- to showcase best practice examples of OERs in use 2- to allow educators to share teaching practices as well as best practice examples in OER
Policy rationale	The roots of KlasCement were laid by Hans de Four, a mathematics teacher, who founded KlasCement in 1998. Since 2002 the platform received financial subsidies from EduCentrum which is financed by the Flemish Education Ministry. Since 2012 the website is an official part of the Education Communication Agency.

Strategy	The platform uses a user-driven approach combined with a an incentive system. This system is based on a points system for users, who must register in order to begin downloading resources. Users lose points for downloading materials and gain points for contributing content and for posting ratings of materials they have used. The privilege of downloading materials is revoked when a user's balance falls to zero points.
Teacher training	The platform allows teachers to share best practices as well as OERs. There is no face-to-face training of educators.
Evalu-ation	In 2009 the platform carried out a user survey. The user survey was compiled in collaboration with the Department of Educational Sciences of the University of Ghent. It was tested by the team of KlasCement and also by a dozen users of KlasCement. The research was conducted entirely digitally via the website of KlasCement itself.
Outputs	The platform has more than 67,000 registered users and has resulted in more than 26,000 user generated resources.
Outcomes	Most of the survey participants stated to use Klascement on a weekly or biweekly basis. In particular, educators at secondary education level are users of KlasCement. 80% of surveyed participants stated that the teaching material uploaded is very useful, most of all to be inspired for the preparation of course work.

Digital School (Belgium-Wallonia)

École Numérique

Country(ies)	Belgium (Wallonia)
Time-frame	2011-2014
Geographical scope	Regional
Education level(s)	Secondary education; Primary education
Learning form	Blended learning
Technology focus	Laptops, netbooks, tablets etc; Virtual learning environments
Implementation phase	Pilot
Impact areas	Enhanced technological infrastructure and access; Enhanced pedagogical quality
Funding	Public funding
Funding source	Federation de Wallonie, Ministry of Economy; Ministry of Education
Budget (Euros)	4,7 Mio.
Implementing body	Wallonian Ministry of the Economy; Wallonian Ministry of Education
Related documents	www.creativewallonia.be/service.php?module=library&action=get_file&target=200&options=|lng:fr
Source /website	http://www.ecolenumerique.be/qa/
Key features	Digital School is a large-scale financing programme implemented by the Wallonian Education Ministry. It has to date included three calls of proposals between 2011-2013 in which educational institutions had the opportunity to apply for projects in digital education involving experimental use and upgrade of digital infrastructure in school institutions. Altogether 4,7 Mio. EUR worth projects were financed incl. focus as well as infrastructure and pedagogical elements in relation to digital technology; yet the initiative is linked to an 8-year planning cycle with more than 70 Mio. financing provided. The project targets all schools incl. nursery education, primary, secondary, ordinary and specialized, social advancement education and higher education (educational category).
Goals	The project "Digital School" aims to support the emergence and swarming educational projects focusing on the innovative use of ICT (Information and Communication Technologies) as "privileged educational vector".

Policy rationale	The initiative is built on the previous initiatives, "cyberécole" and "cyberclasse" and is also linked to the ICT master plan. The masterplan seeks to implement greater use of ICT in the teaching approach throughout the educational curriculum, to energize and motivate learning by tools and approaches more in line with the reality of youth and the evolution of society and technology; create conditions so that the education system takes advantage of the digital society to support youth development and develop their skills, to contribute to improving and modernizing the functioning of the educational community by providing appropriate ICT tools, through the creation, in the context of synergies between Wallonia and the French and German-speaking Communities, an "Instruction ICT 'Resource Centre, Networks that will animate the exchange of tools and best practices transverse and / or within the different educational levels and different disciplines.
Strategy	Before the publication of the calls for proposals, the Wallonian government 33carried out a barometer to verify the technical infrastructure as well as experience in using digital media and specific pedagogical methods in the classroom. The implementation was carried out through three calls for proposals, for computer equipment, logistical support, technological and educational and creative and innovative educational settings in learning with technology. Awarded projects are accompanied by "digital schools" advisers financed by the government. These counsellors help to streamline communication and the sharing of expertise between projects, including promoting alternative uses or collecting conducted positive experiences. Institutions of compulsory education may also release a collaborator / Achievement for 4 periods / week, funded by the Wallonia-Brussels Federation, to strengthen the monitoring of the experiment.
Roles and support	The Wallonian educational authority supervises the implementation of the projects. One means of doing so is by "digital school advisers" whose role is explained in the implementation scale and strategy above.
Evalua-tion	The individual calls for proposals were evaluated and awarded; however, no larger evaluation and monitoring system was encountered.
Outputs	In the first call for projects, 28 educational projects, selected from 180 nominations submitted by schools located throughout Wallonia, benefited with funding totalling € 450,000 for computer equipment. During a second call, 72 projects were selected from 450 applicants records. The related budget was € 850,000 for computer equipment for pilot projects and € 190 000 for logistical support, technological and educational. A third call for projects was launched this June 2014 and 200 additional projects, creative and innovative will be selected benefiting from a budget of € 3.3 million for equipment, so as to "bring ICT in the classroom", motivate learning and further increase efficiency.

Repository of Digital Learning Objects (Czech Republic)

Metodický portál RVP.CZ

Country(ies)	Czech Republic
Time-frame	2009-ongoing
Geographical scope	National
Education level(s)	Primary education; Secondary education
Technology focus	Web 2.0; Web engines / online community tools (blog, social media, wiki, forum etc)
Implementation phase	Full-scale
Impact areas	Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities); Open Educational Resources (OER) development
Funding	Public funding
Funding source	European Social Fund; government funding
Budget (Euros)	EUR 2.7 million.
Implementing body	National Institute for Education (NÚV)
Technology partner	Ministry of Education, Youth and Sports
Source /website	http://rvp.cz/

Key features	The RVP.CZ portal was launched in order to provide methodological support for teachers and school governance and to facilitate the national curriculum's implementation in Czech Republic schools. The initiative seeks to promote teaching quality trough systematic support in such areas as teaching methodology, development of learning communities and training of teachers. Through the platform, which works in a Web 2.0 based environment, teachers can produce new teaching material, share it with others and inspire fellow teachers on teaching practices. Overall, the initiative consist of a content, community and educational part. The content part concerns the development of repository of digital learning resources, articles and links. The community part addresses communication channels through forums, blogs etc that enables teachers to share experiences, exchange ideas and provide feedback on portal content. The educational part is about e-learning and further education of teachers, which is linked to published materials. It is a cross-sectional educational portal targeting primary, secondary, vocational and informal education etc. It was established in 2009 by the Ministry of Education, Youth and Sports.
Goals	The project aims to contribute to the enhancement of teaching quality and to provide systematic support for teachers concerning methodology, teaching, didactics and learning through various tools and modules. The project seeks in particular to support teachers through the development of a learning community with teaching material and a communication space for sharing of experiences, exchange of ideas and involvement in the development and improvement of portal content.

Policy rationale	Prior to 2009, when the portal was launched, there was no respected website in the Czech Republic, where teachers could gather and share experiences, know-how and material, despite several attempts to set one up. In terms of the broader educational environment, the portal supports the introduction of framework educational programmes and in assisting teachers in curricular reforms and their implementation into schools.
Strategy	The creation of the digital teaching materials were initially rewarded financially, which helped facilitate the development of theoretical contributions, teaching ideas and learning materials etc during the development phase. In addition, in the creation of the web-based portal, it was decided to make a complete new system tailored to the needs, since some of the portal's modules had very specific requirements.
Roles and support	Teachers have a main role in uploading the material/links et on the portal, and thus in producing and sharing the main output of the initiative. The uploaded material on the portal is reviewed by specialists-teachers.
Teacher training	The portal and its teaching-related content and material offers systemic support for teachers. Through the portal, teachers can share their experiences and knowledge. Digifolio is a module on the portal which offers teachers the possibility of tracking their own professional development and to plan their future goals; it is used for teacher's self evaluation and to facilitate professional development. Those teachers, who do did not have access to the internet within the project, could in some parts be assisted through printed matters.
Evaluation	Today, there is no fixed system, rules or evaluation concerning the sharing of digital educational content. Yet, while one part of the portal serves as a community network, the other section is monitoring and reviewed by teacher specialists and teacher reviewers. Each of the digital learning objects are reviewed according to evaluation criteria (content accuracy, compliance with national curriculum documents, educational accuracy, typographical rules, references and copyrights). For each curriculum subject, 2-3 reviewers are available who can approve or refuse materials. The quality and copyrights of the shared material are thus monitored prior to publication. One third of all submitted objects are refused due to low quality. Registered users can comment on the objects, evaluate the quality, create collections of favourite materials and recommend materials to friends.
Outputs	All expected goals were achieved for the portal. Over 9.300 digital teaching materials and methodological contributions have been published on the methodological portal. In total, there is around 40.000 post on the portal, covering the different educational levels. Lastly, the portal has around 10.000 unique daily visits (in 2014).
Outcomes	The portal has contributed to quality improvements in primary education by applying modern technologies, which accelerate information sharing and streamline digital / innovative teaching practices. The portal has facilitated knowledge sharing between teachers, who now are better informed about news in education. The portal has also provided online tools, which support active collaboration between teachers, including content development where teachers receive feedback and thereby improve their qualifications. Lastly, the portal has enhanced teachers' use of modern technologies and the internet as well as their understanding of ICT.

User Portal Initiative (Denmark)

Nyt brugerportalinitiativ til den digital folkeskole

Country(ies)	Denmark
Time-frame	2015-onwards
Geographical scope	National
Education level(s)	Primary education; Secondary education
Learning form	Online media / platform
Technology focus	Virtual learning environment, Learning analytics tools
Implementation phase	Mainstream
Impact areas	Integrating learning communities/ecosystems through platforms (learners, educators, parents); Improve educational organisation and transparency
Funding	Public funding
Funding source	Government; Ministry of Education and others ministries; local municipalities
Implementing body	Ministry of Education; Local Government Denmark
Related documents	http://www.stil.dk/~/media/UVM/Filer/Udd/Folke/PDF14/Okt/141010%20Aftaletekst%20om%20brugerportalinitiativet.pdf
Source /website	http://www.kl.dk/En-ny-skole/Nyt-brugerportalinitiativ-til-den-digitale-folkeskole-id165873/?n=1
Key features	With the system-wide User Portal Initiative, the Danish Ministry of Education seeks to build an infrastructure to provide data and make them accessible. Specifically, the Ministry seeks to set up an Integration Platform with common digital access for students, teachers and school governance to use them and build local solutions on top of them, including for learning, communication and organization/planning purposes. The User Portal Initiative provide access to a number of national IT services in the education field, such as the: Knowledge portal (providing inspiration for learning); EMU portal (overview of knowledge, methods and tools); Materialeplatformen (national repository of learning resources); SkoDa (access to a virtual library); common objectives (national attainment targets at different steps in each subject); well-being objectives (national measurements of well-being in primary and lower secondary schools); national online tests (tools for monitoring); the final exams; accession (digitizing the application process for enrolment to education); e-Guide (guide providing information about education, jobs, business and labour, as well as offering guidance on training and job); and data warehouse (a central data warehouse and business intelligence environment that gathers data on the entire education sector, e.g. analytical results from tests and examinations). The digital initiative will take effect from the academic year 2016/17 and is the result of a common agreement between municipalities and government.

Goals	The objectives of the initiative are to set up a national cooperation platform that creates a comprehensive user experience across schools and municipalities, to achieve cost reductions through a common solution (saving time on evaluation and organization of teaching), to ensure data exchange and better use of data, to promote a data culture and make teachers curious to try.
Policy rationale	Experience shows that digital learning resources can increase motivation among students, offer teachers better opportunities to differentiate teaching and instructions and free up time for more education. Although, there are wide-ranging experiences with the use of IT in national schools in Denmark, there is a potential to further increase the speed of the digitalisation efforts in education through common efforts. Denmark is in the initial clarification phase where suppliers of learning platforms and producers of learning resources are making systems that can create data and handle data supported education. 4-5 platform vendors are providing progression data against learning objectives, including Common objectives for primary and lower secondary education. There is also more and more digital learning resources being developed by private producers focusing on integrated learning analytic elements.
Strategy	The digital initiative will take effect from the academic year 2016/17. It is the result on an agreement between municipalities and the government about a common user portal initiative. A preliminary analysis was undertaken in Autumn 2013, where the Ministry of Education, KL, Ministry of Children, Equality, Integration and Social Affairs, Ministry of Economy and Ministry of the Interior and the Digitizing Agency, worked on a strategy for digitalization and a common user portal for schools. An analysis conducted by Ramboll Management Consulting of Implementing Group, which was completed in the fall of 2014, further showed a picture of how the common user portal initiative could be created and implemented to support the future digital school. Based on the analysis, there is now an agreement between the government and municipalities on a concrete solution for the initiative. The initiative is now in open consultation where stakeholders, such as municipalities, suppliers and others, can provide their input on the design/architecture of the initiative/portal. In addition, a working group has been appointed as responsible for managing the implementation process.
Roles and support	Ramboll Management Consulting of Implementing Group had responsibility to provide an initial study of the possible design and implementation of the initiative. The government and the Kommunernes Landsforening (Local Government Denmark) establishes a common IT infrastructure and develop joint public standards, in order to ensure easy and safe access to the school's digital solutions, a sound data exchange between IT systems and healthy competition in the IT market for schools' IT solutions. In terms of the implementation of the initiative, each municipality acquires digital solutions to support communication and collaboration between teachers and parents as well as learning and wellbeing in schools. Some municipalities have today already digital solutions that meet some of the objectives of the initiative. The premise is that schools are responsible for the data and their provision. The data that they supply to the ministry/national level is also being used to learn about what works. At the start of 2016, all municipalities are required to have started an expansion of IT solutions that support digital communication, learning and wellbeing.

Vejle Digital Schools (Denmark)

Vejle Digitale Skoler

Country(ies)	Denmark (Vejle Municipality)
Time-frame	2011-ongoing
Geographical scope	Local
Education level(s)	Primary education
Learning form	Online media / platform
Technology focus	Virtual learning environment; Mobile / internet connectivity
Implementation phase	Full-scale
Impact areas	Increase the use of modern digital learning tools; Enhanced technological infrastructure and access
Funding	Mix of public/private funding
Funding source	Vejle City Council
Budget (Euros)	1676142
Implementing body	Vejle Municipality
Technology partner	KMD Education; Google Apps for Education
Related documents	http://www.vejledigitaleskoler.net/p/strategi-inspiration.html
Source /website	http://www.vejledigitaleskoler.dk/

Key features	Vejle Digital Schools is an encompassing municipal strategy for the integration of IT in education and the enhancement of IT competences among school pupils, teachers and school governance. Emanating from the project "School in Motion", it focuses on innovations in organizational and pedagogical practices and learning of technologies in local schools. The strategy is based on a technical/explorative approach that offers support and visions for digital infrastructure, digital learning resources, digital learning forms, digital communication and knowledge sharing, digital leadership, digital skills development and more broadly digital culture. The strategy have led to the development of a technological platform based on Google Apps for Education and KMD Education which collects various material on digital education and enable teachers to design the teaching schedule. Moreover, it also allows for personalising learning for each student, collaboration on teaching methods, sharing of information and the establishment of student objectives. The approach is based on BYOD where students brings computers, smartphones and devices to school.
Goals	The overall aim is to promote schools in the municipality to integrate technology to develop and implement new teaching and learning methods, in order to increase students' learning outcomes and IT competencies. It further seeks to promote the knowledge and capability of school governance and teachers to implement and use technology as well as to take into account student competences to motivate learning. In particular, through visions, action plans and funding, the strategy seeks to ensure that schools in the municipality, including the students, teachers and school governance, integrates digital teaching methods, digital content, digital communication and knowledge sharing and digital culture more broadly.

Policy rationale	The initiative emanates from the project "School in Motion" which outlines visions for primary schools concerning the need for integrating IT in the field of education and for achieving optimal learning and development conditions for students. The background for the initiative also has its basis in a general reflection by the municipality concerning the need for digital skills and digitally competent citizens.
Strategy	The strategy was developed by a working group, based on cooperation among governance and schools, which defined visions, success criteria and action plans for the seven themes on IT in education. Accordingly, the strategy was reviewed among the participating schools and relevant public stakeholders. A survey was carried out with the participating schools' management in 2011 regarding IT integration among participating schools. In 2011, Vejle municipality received input from other municipalities on strategy development and it decided on focus areas and tested infrastructure, teaching methods, communication and knowledge sharing. Based on a political decision, the strategy was approved by Vejle municipality in October 2011. During 2012, the digital infrastructure was implemented, while the BYOD concept was integrated throughout 2013 to 2015. The project will finish in December 2015, where the infrastructural and pedagogical goals are reached. Subsequently, it will be followed by a new strategy for the period 2016-2020, for which the formulation currently is being developed.
Roles and support	At school level, the representatives from the participating schools' management have formed an IT network for collaboration and sharing of best practice concerning the use of IT and digital learning forms, e.g. for differentiated and inclusive education, education planning, evaluation and resource allocation. In a more informal setting, a number of networks were created in and among schools which facilitate cooperation among leaders and teachers. As part of the network, information sessions are offered on IT tools, to help teachers use the digital tools and apps. The Learning Lab offers further implementation support for teachers.
Teacher training	Through the Learning Lab students, teachers and leaders can received information and be inspired by the opportunities offered by IT in education. Free events and workshops arranged by communication and learning experts on ICT and online media.
Evaluation	There has been an ongoing dialogue between the responsible public administration and the involved schools and Vejle Municipality has been participating in Local Government Denmark (LGDK) concerning the effects of the investments in IT infrastructure within the education area. The implemented evaluation mechanism is based on a yearly evaluation by school management of the integration of IT in education and of the progress with achieving the objectives. From an external point of view, the schools provide documentation on projects and activities on www.vejledigitaleskoler.net and also through social media.
Outputs	By 2015, around 32 schools were involved in the platform. The initiative is reaching out to 12.000 students in Vejle municipality. Vejle Digital Schools has received the Digitalisation Award 2014, among 45 nominated projects.
Outcomes	Vejle Digital Schools have led to the fulfilment of the strategy objectives: it has implemented new teaching and collaboration forms among students, changed school governance and organisational structure and induced "fresh thinking" among students and teachers. Specifically, some of the main outcomes of the initiative include the 1) installation of powerful fiber and wireless connections throughout the participating schools; 2) use of targeted education for students and a more inclusive approach; 3) introduction of BYOD and ; 4) integration and broad use of the KMD Education platform and related tools for communication and knowledge sharing; 5) better availability and use of courses aiming to develop digital competences among teachers at the participating schools, including in the shared Learning Lab; 6) development of an IT network for leaders and a number of more informal networks seeking to promote the sharing of experiences on the strategy´s themes; and 7) integration of a digital culture more broadly.

Start into the next generation (Germany, Hamburg)

BYOD - Start in die nächste Generation

Country(ies)	Germany (Hamburg)
Time-frame	2014-2016
Geographical scope	Regional
Education level(s)	Secondary education
Learning form	Blended learning
Technology focus	Laptops, netbooks, tablets etc; Cloud computing
Implementation phase	Pilot
Impact areas	Enhanced technological infrastructure and access; Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities)
Funding	Public funding
Funding source	Senatskanzlei Hamburg (senate council)
Budget (Euros)	892000 EUR
Implementing body	Behörde für Schule und Berufsbildung (school authority Hamburg); Senatskanzlei Hamburg (senate council)
Source /website	http://www.hamburg.de/start-in-die-naechste-generation/; https://www.ew.uni-hamburg.de/einrichtungen/ew1/medienpaedagogik-aesthetische-bildung/forschung/byod.html
Key features	The pilot project "start into the next generation" was jointly developed by the Senate Chancellery and school board. It is about the pedagogical and educational integration of private smartphones, tablets or laptops to class. As part of the pilot project are selected "learning portals" made available, which can be used independently and also in a teaching context. The usage is personalized and there are data protection provisions included to ensure that only the logged or can see her or his level of performance, progress, notes and learning planning. Three district schools and three high schools were selected for this purpose. There students will in future their own mobile computer use in the classroom (BYOD). Some schools start initially in selected classes and subjects. Other schools introduce it in all grades and / or for most subjects. The project involves the participation of 50 classes and 1125 pupils. In the spring to an additional 16 classes or sections with 375 pupils have started to experiment.

Goals	1- to connect the school with the living and working environment, 2- to anchor digital media in teaching and learning processes, 3- to use the didactic-methodical potential 4- to support educational requirements and 5- to understand media literacy as a key competence.
Policy rationale	The City of Hamburg can build on previous experience in using netbooks in education, for example, from a project in 2009-2010. With the current project it has extended the scope of activities to be carried out involving the use of interactive learning platforms, educational learning and materials, among other things.
Strategy	The project is implemented by launching a call for proposals on the basis of which participating schools were selected. prerequisite was next to a concept and the vote of the group consisting of teachers, parents and pupils upperclassmen.
Roles and support	The project is carried by the regional school authority. Co-operation with different learning platforms were made as well as consultations with industry.
Teacher training	Teachers have used special training opportunities. At the State Institute for Teacher Training and School Development (LI), a training package has been developed with the use of digital learning materials - be it online textbooks or special learning software - is supported.
Evaluation	The 2-year pilot foresees an evaluation by Prof. Dr. Rudolf Kammerl of the University of Hamburg, Faculty of Education. The evaluation will involve a combination of formative assessment and research-oriented learning. Among other things, it is envisaged that student teachers sit in on classes. The data are collected via: - structured interviews, - participant observation, - standardized interviews with questionnaires and - Content analytical evaluations of school materials or documentation set. The implementation of the surveys carried out in large part by trained students (Master Phase teaching degree) who undertake tasks in the context of research workshops.
Outputs	During the two-year project, up to 1,300 pupils participate, about 30 percent of children and youth of these schools. 21 schools had applied for participation in the pilot project "start in the next generation." A prerequisite was next to a concept and the vote of the group consisting of teachers, parents and pupils upperclassmen.

ProgeTiger (Estonia)

ProgeTiiger	
Country(ies)	Estonia
Time-frame	2012-ongoing
Geographical scope	National
Education level(s)	Primary education; Secondary Education
Learning form	Blended learning
Technology focus	Education software / applications
Implementation phase	Pilot
Impact areas	Improving digital literacy / competences of learners; Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities)
Funding	Public funding
Funding source	Estonian Ministry of Education and Research
Implementing body	Estonian Ministry of Education and Research
Technology partner	HITSA IT Education Development Centre
Source /website	https://ee.ekool.eu/index_en.html
Key features	The government backed education program ProgeTiiger was launched in 2012 to teach programming to students in Estonia. It was established as a measure to help students understand the basics of technological creativity and the relationships among technologies; to support teachers and tutors in technological development; to support the development of algorithmic thinking, problem solving skills and programming skills; and to achieve better learning outcomes in general. ProgeTiiger is aimed at preschool, primary and vocational education in effort to integrate technology education into curriculum, offering teachers educational resources and training opportunities, financially supporting kindergartens and schools in acquiring different programmable devices. ProgeTiger programme is supported and funded by the Estonian government through the Estonian Ministry of Education and Research.
Goals	1) Develop students' logical thinking, creativity, mathematical skills etc.; 2) demonstrate that programming can be interesting and done by anyone; 3) teach the basics of programming through practical activity; and 4) teach students to use different age-appropriate programming languages.

Policy rationale	Modern computer and information technology studies at schools should not only focus on computers and word processing programmes. More and more technology has emerged in students' lives. In order to understand the principles of technology, they need to learn more about programming and technology in general. The children become introduced to coding already at the age of seven years. For the youngest children, the teaching on coding is not only focused on programming as such: it is also addressing the logical ideas behind programming languages, such as java. Overall, it supports the idea that children early learn how to use technology in a smart way.
Strategy	The government has set a strategic objective with the Information Technology Foundation for Education (HITSA), in order to ensure a sufficient and age-appropriate digital competence among students. Digital competence is required for further studies and to succeed in society. It's sought addressed at all levels of education, by integrating the use of digital solutions into the entire process of teaching and learning.
Roles and support	The ProgeTiger programme is carried out by the HITSA IT Education Development Centre. The programme was started and funded by the Estonian Ministry of Education and Research, which participates in designing programme activities, planning resources, and preparing the annual programme action plans. The Estonian Ministry of Economic Affairs and Communications is involved in the process of preparing programme action plans and action plans related to information-sharing and popularising activities. Universities, the private sector and institutions of the third sector are involved in the development of training and methodological materials as well as in information sharing and popularising activities.
Teacher training	ProgeTiiger has set up and compiled freely available information into training packets. These packets are available for different types of learning for the teacher, so they can either go into a classroom and learn or do a 4-week e-learning. There are several different coding and programming platforms that are available and introduced. Some examples are Code Gameware, Logo, and Scratch.
Outputs	The programme was initially introduced for a small set of schools (piloting) before it became more broadly expanded across Estonia. As part of the programme, 820 teachers have been trained; 15 teachers courses are part of the training programme (7 new are being developed); and 150 kindergartens and schools have been supported in acquiring technological equipment. In addition, 8 active ProgeTiiger networks have been set up in rural districts. The ProgeTiiger student content had a participation of more than 600 students and 100 teachers.
Impacts	The pilot project believe that future workers in a growing range of industries will greatly increase their productivity if they are proficient in computer technology, including how to write code.

e-school (Estonia)

eKool	
Country(ies)	Estonia
Time-frame	2002-ongoing
Geographical scope	National
Education level(s)	Primary education; Secondary education
Learning form	Online media / platform
Technology focus	Virtual learning environment; Education software / applications
Implementation phase	Mainstream
Impact areas	Integrating learning communities/ecosystems through platforms (learners, educators, parents); Improve educational organisation and transparency
Funding source	OÜ Kriit and others; Koolitööde AS; private investors, such as Baltcap, IT GRUPP and Sten Soosaar
Implementing body	eKool / Koolitööde AS
Technology partner	eKool / Koolitööde AS; Nortal
Source /website	https://e-estonia.com/component/e-school/
Key features	e-School is a school management tool / web application that offers the largest online educational information environment in Estonia and brings together pupils, parents, schools and supervisory bodies. The internet based tool, which also comes with a mobile phone application, offers simple and easy access for stakeholders to collaborate, communicate and organize teaching/learning information. In particular, the system enable teachers to access grades, attendance information and assignments, to post homework assignments, and to evaluate the behaviour/performance of students as well as for communication with students/parents. Parents can use to tool as a way to stay involved in their children's education and to monitor their progress. Students can use the tool to check their performance, to keep track of homework and to save work/files in personal e-portfolios. Lastly, district administrators and schools receives access to school statistics and reports. e-School is owned by a private company and comes with banner space for advertising of education-related goods and services, an E-store and other services. Schools are requested to pay a monthly fee for the system, while the web application is free of charge for teachers, parents and students: the clients can however subscribe to paid services. The tool has more than 200.000 active users and 1 million grades entered daily in the web application.
Goals	The objectives of e-School are to make coursework and assignments easily accessible to students, to facilitate the work and organisation of school management and teachers, and to better involve parents in the educational process, including making them more aware of the teaching-learning process. In particular, it seeks to reduce organisation and communication overheads in school (e.g. replacing paper registers).

Policy rationale	From a policy perspective, emphasis has been on supporting high technology and internet technology in society over the last decades in Estonia. With the objective to improve the quality of Estonia´s education system through the use of ICT, Estonian schools have been allocated with ICT tools and resources. While the organisation during the early years mainly focused on providing schools with physical ICT infrastructure/hardware, it shifted focus towards increasingly supporting education initiatives. e-School was a product of the Tiger Leap Foundation and Estonian IT and telecommunication companies, and further developed in cooperation with school authorities and schools.
Strategy	Nortal, a software development company, was responsible for the creation of the platform. The platform´s website has accordingly gone through significant revision in 2010 and 2014. From a business model perspective, it was the schools, rather the districts' education departments or the Ministry of Education, which were identified as clients. The schools were however involved in the development of the platform by using available feedback channels. At school-level, the e-School team behind the platform offers user support and initial training (based on the service fees paid by schools), through a help desk and online communication tools. Furthermore, the schools' administrators helps teachers and management in the use of e-School, and provide proposals for development and improvement to the developers.
Roles and support	In 2005 the Look@World program – a collaboration project between private and public sector which had support from banks, telecoms and IT-companies - was turned into a Koolitööde AS, a private company. Private investors, such as Baltcap, IT GRUPP and Sten Soosaar became involved. In 2011, the ownership of e-School changed to OÜ Kriit and others. In terms of the platform development, Nortal, a software development company, was responsible for its creation: the platform´s website went through significant revision in 2010 and 2014. From a business model perspective, it was the schools, rather the districts' education departments or the Ministry of Education, which were identified as clients. The schools were equally involved in the development of the platform, through integrating various feedback channels. At school-level, the e-School team behind the platform offers user support and initial training (based on the service fees paid by schools), through a help desk and online communication tools. Furthermore, the schools' administrators also helps teachers and school management in the use of e-School, and provide proposals for development and improvement to the e-School team.
Teacher training	Schools pay for the platform services, which also covers initial training and development and user support. A variety of training classes are provided, both on and off-site. Each school has a contact person assigned as responsible concerning helpdesk, phone and e-mail contact with the support team. A training program is offered for e-School support staff, which provide basic information on its functions and system administration: they get further hands on experience in specific areas. The large user base also secures quick answers for questions through web based mailing lists, knowledge bases and forums. The training has over time helped teachers to become familiarised with the IT platform, although they faced difficulties during the early stages.
Outputs	E-school is now used by 85% of the Estonian schools, which means that 95% of students in each grade is using it. There are more than 200.000 daily users and 1 million grades entered daily in the web application. Around 4000 schools and 13.000 teachers uses e-School. The application is used on a regular basis by around 30 % of the population.
Outcomes	e-School has received high customer satisfaction, correlated with high up-to-date information availability by schools. The schools have become increasingly open organisations, where parents trust teachers, and also their children. Teachers have recognised that they feel more interest from parents concerning student performances and results. Furthermore, drop-out cases and the attendance ratio has been significantly improved. The platform won a European Public Sector Award in 2007. More generally, Estonia is today a leading country in terms of using school web and e-school platforms: less than 2% of Estonian students go through a normal school day without using the internet.

Digital Schools of Distinction (Ireland)

Digital Schools of Distinction	
Country(ies)	Ireland
Time-frame	2013-ongoing
Geographical scope	National
Education level(s)	Primary education
Learning form	Blended learning
Technology focus	Laptops, netbooks, tablets etc; Education software / applications
Implementation phase	Full-scale
Impact areas	Digital certification of schools, individuals (competences, learning equipment); Enhanced technological infrastructure and access
Funding	Mix of public/private funding
Funding source	Department of Education and Skills; HP Ireland; Microsoft Ireland
Budget (Euros)	2013: HP and Microsoft: 300.000 EUR; DES: 10.000 EUR; 2014/2015: HP and Microsoft: 200.00 EUR; DES: 60.000 EUR
Implementing body	Dublin West Education Centre (DWEC); Department of Education and Skills (DES); Irish Primary Principals' Network (IPPN); Irish National Teacher's Organisation (INTO); Professional Development Service for Teachers (PDST); Computer Education Society of Ireland (CESI)
Technology partner	HP Ireland, Microsoft Ireland
Source /website	http://www.digitalschools.ie/
Key features	This Digital Schools of Distinction programme is an accreditation, which primary schools can attain by demonstrating excellence in their approach to the integration of ICT in learning and teaching. The benefits of receiving this accreditation include access to an ICT support network, a toolkit to develop an ICT plan for every school, links with other schools in Ireland and external recognition through a nationally recognised award. Schools who meet the criteria will be awarded Digital Schools of Distinction status by the Department of Education. New digital schools will receive a Digital Schools Classroom Kit, which includes a laptop with software and educational apps, access to education ICT specialists and ongoing practical support and resources as part of the community of digital schools in Ireland.
Goals	Digital Schools of Distinction is a flagship programme which aims to promote, recognise and encourage excellence in the use of technology in primary schools.

Policy rationale	The initiative is embedded in the new Digital Strategy for Schools, which will be completed during 2014. The Digital Strategy for Schools provides a rationale and a Government action plan for integrating ICT into teaching, learning and assessment practices in schools over the next five years. More specifically, it sets out how resources, policies and projects can be prioritised and organised throughout the school system for the next five years.
Strategy	The programme is rolled out by a call for applications of schools seeking to attain the digital distinction award. Schools need to register on a digital platform and carry out a self-evaluation on the state of ICT technologies in education. In addition, a Steering Committee was created. The Committee is composed of the technology partners and the Department of Education and Skills as funding organisations of the programme, as well as school management organisations (IPPN), computer education specialists (CESI), but also teachers' (INTO) and teachers' professional development organisation (PDST). Rather than involving these organisations in the roll-out of the programme, their core involvement is to steer the direction of the award scheme.
Roles and support	Initiated by the Irish Department of Education and Skills, the award scheme is managed by the Dublin West Education Centre (DWEC). HP Ireland and Microsoft Ireland both support the programme financially. For the school year of 2014 a total support of 200,000 € was provided in terms of hardware, software and services.
Teacher training	One of the main components of the Digital Schools Programme is to support the work of teachers integrating technology into teaching and learning, encourage a sharing of ideas and collaborating with other schools on an ICT project. Teachers do not only receive guidelines and ongoing support by the implementing bodies of the initiative but also through effective knowledge sharing with their peer teachers.
Evalua-tion	The Department of Education and Skills carried out a survey of 300 Irish primary schools who have registered to take part in the programme in 2013 in order to identify the core challenges and needs of primary schools digital learning and teaching. The monitoring of the programme is implemented by the Steering Committee in charge of deciding any issue of relevance to the programme.
Outputs	Since the implementation in 2013, 1,688 primary schools have registered on the programme and 271 schools have been awarded DSoD status.
Outcomes	According to the survey by the Department of Education and Skills the major obstacles to integrating ICT in the classroom were access to high speed broadband, IT maintenance, support and funding. The survey results also showed the following: • 80% of surveyed teachers firmly supported the positive impact ICT use had on students' motivation; • 75% of teachers confirmed the quality of the programme in creating momentum in innovative and effective use of ICT tools by teachers; • 84% of teachers found the programme to be very valuable for their school's ICT usage to support curriculum objectives.
Impacts	The programme recognises and validates the knowledge, skills and competences of primary school teachers.

"Switch On" (Ireland)

"Switch On" digital skills workshops for teachers	
Country(ies)	Ireland
Time-frame	2014-ongoing
Geographical scope	National
Education level(s)	Secondary education
	n/a
Learning form	Face-to-face / classroom
Implementation phase	Pilot
Impact areas	Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities); Enhanced pedagogical quality
Funding	Public funding
Funding source	The Department of Communications, Energy and Natural Resources; the Department of Education and Skills
Budget (Euros)	n/a
Implementing body	Department of Communications, Energy and Natural Resources and the Department of Education and Skills
Related documents	http://www.dcenr.gov.ie/communications/Lists/Publications%20Documents/National%20Digital%20Strategy%20July%202013%20compressed.pdf
Key features	The "Switch On" workshops for teachers focuses on how second-level schools can integrate digital tools and online educational resources to improve teaching and learning. Through the workshops, the objective is to make teachers and schools aware of the potential and opportunities offered by digitalisation and digital tools in the field of education, through examples of what forward-looking educators are doing, and to encourage the teachers and schools to emulate them. Schools are provided with information and case study material and signposting, which offer illustrations on the potential of both digital technology and online resources in the education field. The workshops will also offer an opportunity for schools to share experiences on the use of technology for learning. The government initiative is part of the National Digital Strategy which is being carried out in partnership between the Department of Communications, Energy and Natural Resources and the Department of Education and Skills. The first workshops were being held in education centres in May 2014. Over 30 schools from 6 counties are more than 14.000 students were participating in the initial "Switch-On" workshops.
Goals	The key objective of the "Switch-On" workshops for teachers is to develop a dialogue with teachers and schools and to further help them in developing techniques for the use of digital tools/methods in learning, in order to make optimal use of technology in the classroom.

Policy rationale	The "Switch On" workshops for teachers is part of a government initiative under the National Digital Strategy. The National Digital Strategy consist of three stands, enterprise, education and citizens, and focuses on such aspects as supporting online trading among businesses, installing 100Mbps high-speed broadband and supporting the development of basic internet/IT skills through training.
Roles and support	The Department of Communications, Energy & Natural Resources and the Department of Education and Skills are jointly responsible for the implementation of the initiative. The Professional Development Service for Teachers (PDST) take part in the workshops, where they can discuss with teachers the range of opportunities which digitalisation offers.
Outputs	Over 30 schools from 6 counties and more than 16.000 students were participating in the initial "Switch-On" workshops.
Outcomes	The teachers have generally responded positively to the workshops. The "Switch-On" exemplar workshops have inspired second level schools in Ireland to do more with digital in the classroom and the content continues to be used in development opportunities for teachers.

National Forum (Ireland)

National Forum for the Enhancement of Teaching and Learning in Higher Education

Country(ies)	Ireland
Time-frame	2012-ongoing
Geographical scope	National
Education level(s)	Tertiary
Technology focus	Web engines / online community tools (blog, social media, wiki, forum etc)
Implementation phase	Full-scale
Impact areas	Exchanging pedagogical practices (educators); Integrating learning communities/ecosystems through platforms (learners, educators, parents)
Funding	Public funding
Funding source	Strategic Innovation Fund
Budget (Euros)	€2.700.000
Implementing body	Ministry for Education and Skills
Technology partner	AISHE, Campus Engage, REAP, LIN, NAIRTL, Facilitate,
Source /website	http://www.teachingandlearning.ie/
Key features	The National Forum brings together stakeholders as leaders, managers and teachers throughout education institutes, in order to promote and develop existing teaching and learning practices of Irish colleges. By engaging stakeholders, the forum, a key system-level infrastructure, seeks to mobile their expertise and feedback in order to find and shape best practice in education institutes. It will serve as a national platform for the academic-led enhancement of teaching and learning, linking institutional initiatives and existing networks, and drawing on the level of contact and collaboration established through previous initiatives. It will add value through providing a structure for which initiatives can be synergised and leveraged to support teaching and learning activities. The Forum's work plan seeks to carry out a comprehensive review of digital platforms and e-learning capacity in the sector and of professional development activities. It will also introduce a teaching award programme. A series of dissemination activities will be undertaken, in the form of scholarships, reports, insights, talks and events. There will be an emphasis on the identification and use of enhancement themes of strategic importance for higher education institutions. Moreover, engaged sectoral dialogues will be launched, with an aim to shape the directions of the Forum's work.

Goals	1- Championing and celebrating all those who contribute to great teaching/learning in third level education; 2- Encourage great practice, by promoting teaching examples with a strong and positive impact on learning; 3- Developing the skills and attitudes of teachers and learners; 4- Benchmarking of best practices in professional development; 5- Developing e-learning capacity; 6- Identify key enhancement themes; 7- Fostering innovation in the gradually changing environment of education.
Policy rationale	Many projects and networks for innovation in teaching and learning have been supported over recent years in the Irish higher education system. The Forum seeks to consolidate and build upon the strengths of the existing networks, and to sustain collaboration and innovation in teaching and learning through the creation of a new overarching Forum for teaching and learning development.
Strategy	The National Forum was created through a consultative process, where 39 submissions were received from a range of stakeholders in Ireland. On the background of the submissions received, a synthesis study was prepared, leading to the development of the implementation plan. The Forum also establishes informed, expert groups to use, further develop and promote the previous initiatives developed within the sector. While the Forum itself will not assume a regulatory or bureaucratic role, it will work through informing policy-making and quality assurance initiatives in teaching and learning at institutional and national levels. Specific activities that are carried out include: a: 1) review of existing teaching/learning activities; 2) identification of priority (for regularly review); 3) establishment of a national fellowship scheme; 4) establishment and management of a national grants scheme, using inputs from academic/public stakeholders; 5) comprehensive mapping of all existing academic professional development provisions; and 6) creation of a fully enabled website, bringing together teaching and learning resources and research.
Roles and support	The National Forum works under the guidance of the Board, which members are chosen to represent the different areas of expertise in teaching and learning. Designated Contacts are an integrated part of the Forum and are vital links to the institutions; they act as the first points of contact. The Forum inform the designated contacts about key developments, resources and outputs generated by the Forum; concise updates through bulletins; and opportunities and activities that may be of particular relevance. The designated contacts, in turn, are responsible for informing the Forum about practices, providing the institutions' views and to maximise the Forum's visibility. The structure of the Forum also includes an Educational developer, whose role is to develop the framework and implementation plan for professional development. The Learning Technologist guides the forum in building digital capacity. The Research Coordinator is responsible for developing research activities, including scholarships. The Forum Administrator is carrying out administrative tasks, while the Social Media and Web Experts develops the social media policy. The Forum also establishes informed, expert groups to further promote previous initiatives. The initiative is informed by good practice globally through the International Advisory Panel.
Evalu-ation	A comprehensive and independent review of the performance and impact of the National Forum is carried out in January 2016. This will determine future strategy and development, including future funding, which is contingent upon the outcome of this review.
Outcomes	Outcomes include the establishment of a national digital platform, a professional standards framework, a fellowship scheme, a national grants scheme, a national awards scheme and an annual conference, as well as the production and dissemination of research, scholarships and resources in teaching and learning. While the key outcome will be the enhancement of the quality of teaching and learning among higher education institutions in Ireland, it will also offer an advanced evidence-base for policy-making and quality assurance in teaching and learning relevant for institutional and national levels.

Internet in the classroom (Spain)

Internet en el aula - red social docente para una educación del siglo XXI

Country(ies)	Spain
Time-frame	2008-2009
Geographical scope	National
Education level(s)	Secondary education; Primary education
Learning form	Online media / platform
Technology focus	Web 2.0
Implementation phase	Full-scale
Impact areas	Exchanging pedagogical practices (educators); Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities)
Funding	Public funding
Funding source	National Institute of Educational Technologies and Teacher Training, INTEF
Implementing body	National Institute of Educational Technologies and Teacher Training, INTEF
Source /website	http://internetaula.ning.com/
Key features	The social network "Internet in the Classroom" was born in 2008 as part of the National Congress Internet in the Classroom. Once completed, the network remained active and currently has over 11,500 active members. The network is currently maintained by the National Institute of Educational Technologies and Teacher Training, INTEF. The network is open to all and it is not necessary to register to access its contents. The platform provides of diverse features incl. forums, thematic groups, workshops, which take place on a regular basis. There is also a best practice section where educators can share their tested methodologies.
Goals	1- to provide a virtual meeting point allow teachers to share best practices and educational resources in teaching with their fellow educators 2- to improve the quality of teaching by providing an interactive platform for teachers

Policy rationale	"Internet in the classroom" (Internet en el aula) is based on the strategic plan of action adopted in 2005 by the Ministries of Education and Science and Industry, Tourism and Trade (MITT), and the public company Red.es. Its purpose was to expand the use of ICT to all members of the educational community and enhance the non-discriminatory development of the Knowledge Society in education. The plan seeks to bundle combined efforts and territorial cohesion and intends to promote the exchange of experiences and initiatives among all regional governments participating.
Strategy	The social network was created as the result of the National Congress "Internet in the classroom" in 2008 which is linked to the corresponding strategic action plan.
Roles and support	From 2010 onwards the National Institute of Educational Technologies and Teacher Training, INTEF, has been in charge of the technical maintenance of the website. Meanwhile, the contents of the social network have been largely carried by the user inputs, with marginal moderation from INTEF and other educators who were involved in the setup of the platform.
Teacher training	Training of educators is ensured through the exchange of best practices as well as provision of educational resources of the educators' community participating in the website. INTEF is the teachers' training association
Outputs	By 2012 more than 11,500 registered educators are currently members of the platform; 2378 blog posts; 2097 themes classified in the principle forum; 192 groups created with internal discussions; 304 call for events; 24 webinars; 15 workshops; 1991 photos uploaded; 957 videos uploaded; 758 podcasts/audio recordings.

ICT in education certification (Spain: Castilla y León)

Certificacion en la aplicación de las TIC en Castilla y León

Country(ies)	Castilla y León, Spain
Time-frame	2013-ongoing
Geographical scope	Regional
Education level(s)	Secondary education; vocational education and training
Learning form	Blended learning
Implementation phase	Pilot
Impact areas	Digital certification of schools, individuals (competences, learning equipment); Enhanced use of existing technological infrastructure
Funding	Public funding
Funding source	Comunidad de Castilla y León, Consejería de Educación
Implementing body	Comunidad de Castilla y Leon, Consejería de Educación
Related documents	http://bocyl.jcyl.es/boletines/2015/09/01/pdf/BOCYL-D-01092015-5.pdf

Key features	The regional authorities of Castilla y Léon have launched a certification scheme in ICT technologies application available to all publicly funded schools excluding the tertiary education levels. The certification scheme is organised through a call for proposals including action plans and an overview of existing resources in digital education. The following three levels of certification are possible: a) Modality A: «First certification», or no upgrade in certification in the last 4 years. b) Modality B: «Improve the certification level», in the case that a higher level of certification is envisaged after successful certification in previous call for proposals. c) Modality C: «Renovation of existing certification level» for additional years.
Goals	1- improving quality of teaching in the Community of Castile and Leon through the application, use and use of available resources, and promoting the application of advances in the field of information society 2- quality of teaching in the region of Castilla Leon through the application, use and use of available resources, and promoting the application of advances in the information society
Policy rationale	The Castilla León regional authorities have the political will to act resolutely in search of full consolidation in Information Society as a key element in economic and social development of the region. Under this purpose, consulting and searching Educational Technologies in Education more importantly find multimedia and audiovisual resources, classroom experiences of different schools, Internet resources available.

Strategy	The implementation is carried out through calls for proposals where schools have to come up with innovative learning and teaching models/systems to be applied in their educational institutions.
Roles	Schools apply for certification schemes and are shortlisted on the basis of submitted action plans and available digital education tools.

The Digital School (France)

L'école numérique	
Country(ies)	France
Time-frame	2015-2017
Geographical scope	National
Education level(s)	Secondary education; Primary education
Learning form	Blended learning
Technology focus	Mobile / internet connectivity; Laptops, netbooks, tablets etc
Implementation phase	Pilot
Impact areas	Enhanced technological infrastructure and access; Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities)
Funding	Public funding
Funding source	French Ministry of Education
Budget (Euros)	1,000,000
Implementing body	Ministère de l'Education Nationale, de L'Enseignement Superieure et de la Recherche
Related documents	www.entreprises.gouv.fr/files/files/directions_services/secteurs-professionnels/etudes/2011_plan_france_numerique2020.pdf
Source /website	http://www.education.gouv.fr/pid29064/ecole-numerique.html
Key features	The President of the Republic has launched a large-scale initiative to boost digital literacy in France through "l'école numérique". The initiative connects 500 schools and colleges by 2015, marking the 1st stage of the digital plan for education. More than 70,000 students and 8,000 teachers will experiment, from September 2015 onwards, new forms of teaching and learning through digital technology. In line with the proposals of the academies and communities, the Presidency decided to give emphasis to the priority education colleges and integrate a large number of schools to promote school-college continuity. Five core disciplines will be subject to effective digital tools integration: French, mathematics, foreign language, history-geography and sciences. Through a call for proposals (eFran) 209 colleges, including 109 under the priority education and 337 schools, representing the diversity of territories and institutions, were selected.

Goals	1- to develop new teaching practices for the use of digital education 2- to train teachers and staff, 3- to develop accessible educational resources, 4- to finance computers or tablets. The goal is that every college student may have himself digital tools available throughout the territory. For each euro invested by a department computer equipment, the state will give one euro.
Policy rationale	The initiative is linked to France Numérque, France's overarching digital strategy touching the fields of digital economy and education.
Strategy	The implementation strategy follows a multi-level approach over a 3-year period comprising of a public consultation, a concertation day where education associations, a call for proposals (eFran) where pilot schools were selected and a 1-year piloting phase in 500 schools throughout France, accompanied by teacher trainings on the use of digital tools and teaching practices.
Roles and support	The federal government is financing 650 million and co-financing further investments by the Education Departments, i.e. regional education authorities. Pilot schools are selected through call for proposals, so-called priority schools receive make up around half of the pilot schools. The public consultation and national concertation involved a wide variety of stakeholders incl. teachers associations, parents, students.
Teacher training	Teacher receive specific training on teaching practices and tools to be applied in the pilots and beyond.
Outputs	As announced by the President of the Republic, 500 schools and colleges will be connected by 2015, marking the 1st stage of the digital plan for education. More than 70,000 students and teachers will experience 8000, next September, new forms of teaching and learning through digital technology. In line with the proposals of the academies and communities, he decided to give emphasis to colleges in priority education and integrate a large number of schools to promote school-college continuity. 209 colleges, including 109 under the priority education and 337 schools, representing the diversity of territories and institutions, were selected.500 schools and colleges by 2015.

FUN MOOC (France)

France Université Numérique (FUN)

Country(ies)	France
Time-frame	2013-ongoing
Geographical scope	National
Education level(s)	Tertiary
Learning form	Online media / platform
Technology focus	MOOCs / e-learning
Implementation phase	Full-scale
Impact areas	Enhanced technological infrastructure and access; Increase the use of modern digital learning tools
Funding	Public funding
Funding source	Ministry of Higher Education and Research (MoR)
Implementing body	Ministry of Higher Education and Research (MoR)
Technology partner	Inria; C.I.N.E.S.; RENATER
Source /website	http://www.france-universite-numerique.fr/moocs.html

Key features	FUN (France Université Numérique), recently re-named as FUN-MOOC and registered by law, was launched in October 2013 by the French Ministry of Higher Education and Research as the national platform for supporting online courses and MOOCs. The platform hosts, on a single site, digital formations, be they MOOCs to certification, or online training that can ultimately become diploma or qualifications. There are currently more than 80 courses being offered from 23 partner higher education institutions. Aimed primarily at French higher education institutions, this platform also targets European and international institutions as well as courses in foreign languages. Next to the platform, €12 million will also be devoted to developing innovative digital courses and trainings via MOOCs but also initial training curriculum for lifelong learning. The platform is one of 18 action points of a five-year national plan for the digitisation of learning and teaching.
Goals	The main objective is to create a national platform centralising the existing offer of all MOOCs made available by French Higher Education Institutions. It brings together projects of universities and French schools to give them international visibility, and allow all public access to various courses and quality anywhere in the world.

Policy rationale	The platform is embedded within the Digital Agenda for Higher Education. Through the Agenda the Ministry of Higher Education and Research (MoR) intends to put digital at the heart of his project. The Act of 22 July 2013 on higher education and research has given a decisive impetus by registering the digital as a lever of a university on the move, with a twofold objective: raising the level of knowledge and qualification in initial and continuing education and student success. The law also provided for the appointment of a vice-president in charge of digital technology in each grouping.
Strategy	The initiative launched a test phase where sixty MOOCs were identified by institutions in order to test the platform and define the interface of the platform. At the opening of the platform, 22 MOOCs are offered by ten institutions covering various areas: environmental, legal, management, and digital technology, health, science and humanities.
Roles and support	At the initiative of the Ministry of Higher Education and Research, the initiative is built around three public actors: INRIA for the deployment of the platform, CINES for the design, administration and hosting of the IT infrastructure and RENATER for the network infrastructure. What is more, experts and representatives of the teaching staff of the university community to participate in the design of the platform and the definition of functional and technical choices.
Teacher training	The initiative supports digital courses and training MOOCs targeting educators via calls for proposals.
Evalu-ation	FUN-MOOC carries out annual surveys to know their target population better. The last survey was carried out in May 2015. Nearly 8500 participants expressed their views and confirmed high interest and usefulness of this massive online course platform open to all - https://www.france-universite-numerique-mooc.fr/news/enquete-apprenants-2015/
Outputs	In July 2015 the following outputs had been generated: more than 400,000 accounts on the platform; more than one million course enrolments; 193 courses proposed during sessions, including over 138 unpublished, and 54 that have replayed up to 4 times; courses are offered by 61 institutions, including 45 higher education institutions, and 4 institutions of higher education abroad
Outcomes	According to the survey, 60% of respondents were between 25 and 60 years of age. While 56% of respondents were men, 44% were women. Respondents followed diverse activities: 61% were working, 12% retired; 11% job-seeking and 13% attending secondary/tertiary education. Users were attracted by the offered course catalogue. Interest in the subject is the main reason for registration for nine respondents out of 10. 97% of those who spoke as part of the investigation believe that the course for which they have invested the most rewarding and was 92 % believe that the presentation was attractive. Finally, 83% think they will apply what they have learned. Learners benefit when they invest a higher initial level on the subject studied. Thus, 92% are happy with what they have learned, given the time invested and 74% of users believe they have managed to clear enough time to attend classes. Learners register for more of the FUN platform MOOC: 23% of students are enrolled in more than 3 classes (against 17% in 2014). Learners are the easiest to use platform and enjoyable than the year following the introduction of new features. They still intend to follow 98% again a course on the FUN platform.

Strategy for Digital Schools (Italy)

Piano Nazionale Scuola Digitale

Country(ies)	Italy
Time-frame	2007-2011
Geographical scope	National
Education level(s)	Secondary education; Primary education
Technology focus	Digital textbooks; MOOCs / e-learning
Implementation phase	Full-scale
Impact areas	Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities); Improving digital literacy / competences of learners
Funding source	The Italian Ministry of Education, Universities and Research (MIUR)
Budget (Euros)	€30 million per year
Implementing body	The Italian Ministry of Education, Universities and Research
Key features	The Italian Strategy for Digital Schools was launched in 2007 as a national plan to mainstream ICT in Italian classrooms and to use technology as a catalyser of innovation for teaching/learning processes, aiming to induce new teaching practices, new models of school organisation, new products and tools to support quality teaching. The national plan for digital schools comprises one large-scale intervention/action seeking to fund/equip classrooms with interactive whiteboards (Piano LIM). It is supported by three pilot projects (cl@sse 2.0, scuol@, Editoria digitale) promoting experimenting and innovative settings for classrooms, new organizational settings at schools and the use of educational digital contents. The later three projects involve pilot schools, which participate on a voluntary basis, selected through open competitions. The Italian Ministry of Education, Universities and Research (MIUR) was responsible for developing the strategy, with a budget of around EUR 30 million per year.
Goals	1- to introduce ICT as part of the daily tools of classroom activities; 2- experiment new models of school organisation and of teaching; 3- support the development of new products (resource and devices).
Policy rationale	Italian schools have low ICT penetration and lags behind most OECD countries for school ICT equipment (and usage). In 2011, as an example, only around 30 % if Italian students in 8th grade used ICT as a regular instruction tool in science classes, compared to 48 % on average in an OECD country. As part of Italy's "Digital Agenda", ICT has been identified as a major source of government savings. As, a consequence, ICT is being introduced significantly in schools. This has also led to the development of the Italian Strategy for Digital Schools which is related to the following initiatives: Development of national and school information systems; Phasing out of paper-only-textbooks (e-textbook law); and Smart cities.

Strategy	The promotion of interactive whiteboards was based on a gradual/motivating approach to promote interactive teaching activities. The diffusion process has been realized in three different ways: 1) 8000 IWBs were bought through a tender notice; 2) network of schools financed by the MIUR by an invitation for tender to buy whiteboards; 3) use of European Social Fund by the schools to buy IWBs. The cl@sse 2.0 action was realised through MIUR financing for selected classrooms with a €10.000 – 20.000 grant and by the project Idea 2.0 for designing a new learning environment. Scoul@ 2.0 was implemented through an initial selection of 13 schools, which participated to a call for tender; the schools received financing of €250.000 grants from MIUR or administrative help to receive European funds. The educational digital content was implemented through the creation of guidelines for designing and implementing 20 prototypes in Educational digital contents systems; for which each prototype was related to a couple of subjects, funded by a €150.000 grant, purchased / experimented at selected schools and finally shared with all Italian schools.
Roles and support	MIUR had a key implementation role in the administration and funding support for the selected schools under the initiatives, including in helping ensuring support from the European funds. The schools were involved in the identification of needs, while the Regional Branches of the Ministry have a role in the logical/administrative support. The National Agency carried out documentation/monitoring of the process. It also had responsibility for managing the training of teachers. Companies have offered donations in order to support the process of introducing ICT in the schools. In terms of the development of educational digital contents, this was further supported by a recent law (Law 221/2012 e D.M. n.209/2013) that forces the Italian schools to use digital contents. Moreover, the MIUR is arranging a shop window integrated to an e-commerce platform to the publishers with the purpose to facilitate the choice of contents by teachers. MIUR is also cooperating with the Ministry of Economics and Finance, which now is implementing the Electronic Marketplace of Education, seeking to facilitate schools' purchases in digital learning solutions.
Teacher training	Development and management of teachers' training was carried out by the national agency INDIRE. More than 64.000 teachers were trained for the use of interactive whiteboards.
Evaluation	The Italian Ministry of Education, Universities and Research had tasked the OECD to review its plan from an international perspective and to suggest improvements; OECD's review was published in 2013 and presenting a range of recommendations on how to further improve/tailor the national strategy. Mid-term evaluations were also carried out on the actions and implementation in schools.
Outputs	More than 35.000 interactive whiteboards have been financed/purchased, which are used daily by more than 8.000 teachers and 770.000 students: 5 to 16 % of classrooms are equipped with interactive whiteboards. 416 out of 3800 proposed projects were financed for cl@sse 2.0. The cl@sse 2.0 and scuol@ actions have been involved 416 classrooms, 2.922 teachers, 8.916 students and at least 13 schools are completely digital.

Puntoedu (Italy)

Puntoedu	
Country(ies)	Italy
Time-frame	2001-ongoing
Geographical scope	National
Education level(s)	Secondary education
Learning form	Blended learning
Technology focus	Virtual learning environment
Implementation phase	Full-scale
Impact areas	Exchanging pedagogical practices (educators); Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities)
Funding	Public funding
Funding source	Italian Ministry of Education
Implementing body	National Agency for the Support of School Autonomy, ANSAS (formerly INDIRE)
Source /website	http://for.indire.it/docenti/
Key features	PuntoEdu was created upon order from the Italian Ministry of Education by ANSAS (back then Indire), the National Agency for the Support of School Autonomy, launched in 2001. The platform is a Virtual Learning Environment which serves several purposes - in this short description we focus on the educator and trainee training part which has put in place an effective e-tutoring system. Courses include initial and continuous training paths and are addressing in fact not only teachers and trainers of the Italian educational system but also teachers and trainers involved in Lifelong Learning activities and the educational administrative staff. The platform allows tutors to attend several teacher training courses, based on an active learning approach which include forum, representations of knowledge, exchange of good practices and use of learning objects. It is a learning platform, and designed to be used in a blended learning model to support teacher training and professional development. In addition, it currently contains over 3,000 learning objects which have been developed for teachers' online training by the teachers themselves. The majority of teachers' training is supported through this platform although use for professional development purposes is decreasing and teachers see PuntoEdu more as a library of resources.

Goals	The main aim is that of supporting teachers in the achievement of the following general objectives: 1- Provide the children with the instruments necessary to compare their own culture with other cultures 2- Be able to plan teaching and learning paths suitable for the children's needs and backgrounds 3- Use strategies that permit the acquisition of communicative abilities. 4- Be able to evaluate and choose approaches which enable individualised learning paths. 5- Be able to organize classroom activities which favour the gradual evolution of all four abilities.
Policy rationale	Digital technologies have been considered useful mainly for scientific or technical education until the late '90s, when the first Ministry of Education initiative Programma Nazionale delle Tecnologie Didattiche (PNTD) provided funds to purchase digital technologies (desktop computers, multimedia authoring software, projectors) for all school levels. In 2001, e-learning became a strategic asset for teacher training and professional development. The Ministry of Education charged ANSAS (at the time named INDIRE) to design a learning model and to develop an e-learning platform (PuntoEdu) to provide courses on curricular, cross-curricular subjects and teaching methodologies (Processi di Innovazione per l'Inglese e l'Informatica nella formazione della scuola primaria), training activities for new in-service teachers, (NEOASSUNTI), updates for school managers (ATA), 2 courses to support teachers in the implementation of the Education Ministry's policies and guidelines, and professional development initiatives for the use of digital technology in learning and teaching (FORTIC, DIGISCUOLA, LIM, PONTEC).
Strategy	PuntoEdu was deployed as a central platform which can be used for multiple purposes, in our case for the training of educators through an e-tutor system. The majority of teachers' training is supported through this platform although use for professional development purposes is decreasing and teachers see PuntoEdu more as a library of resources.
Teacher training	PuntoEdu is a Virtual Learning Environment (VLE) to train and support educators as well trainees.
Evaluation	There are regular assessments and reports drawn up for evaluation and monitoring.
Outputs	Since 2001 the agency has managed to serve approximately 1,000,000 students with its platform 'PuntoEdu' and a comprehensive e-tutor system. It currently contains over 3,000 learning objects which have been developed for teachers' online training by the teachers themselves (itec project info). More than 7000 teachers have been trained since.
Outcomes	On average 1 out of every 10 participants dropped out during courses about the 2003 school Reform in 2003/04 and in 2005. Since 2000, common technical issues with the platform have been replaced by issues concerned with pedagogy. This is probably because the change in attitudes towards social networks and their increasing prevalence have ensured that teachers are happier operating and finding materials within PuntoEdu.

Hipersuli Education Programme (Hungary)

HiperSuli

Country(ies)	Hungary
Time-frame	2015-2016 (12 months)
Geographical scope	National
Education level(s)	Primary education; Secondary education
Learning form	Face-to-face / classroom
Technology focus	Mobile phones / learning; Mobile / internet connectivity
Implementation phase	Pilot
Impact areas	Enhanced pedagogical quality; Digital inclusion / reversing the digital divide
Funding	Mix of public/private funding
Funding source	Telenor Hungry, Microsoft Hungry, the State Secretariat for Education Research and Development Institute (OFI) and the Digital Equal Opportunities
Budget (Euros)	n/a
Implementing body	Telenor Hungry
Technology partner	Telenor, Microsoft
Source /website	http://www.hipersuli.hu/kapcsolat

Key features	Hipersuli is an educational program created by Telenor, with the participation of a state-private-civil cooperation involving the human resources ministry, the education research and development institute (OFI), Microsoft Hungary and the foundation for equal digital opportunities. It promotes digital education through mobile apps and the mobile internet, first in 15 classes of one school in Budapest and four others in the countryside. Children involved in the program will learn the safe use of the Internet, digital devices in the classroom and help motivate the deepening of knowledge, remedial training and talent management. Hipernet will be available in nearly all Hungarian towns and villages, which means that children in the smallest communities will have access to the same learning opportunities as their peers in large cities.
Goals	The use of modern tools for learning in an enjoyable learning process will make students to become motivated to actively participate in the lessons and learn the syllabus. The programme aims to process the knowledge level individual curriculum tailored manner. It also aims to provide more efficient and more modern solution to view more teachers alike.
Policy rationale	It will promote digital education through mobile apps and the mobile internet, first in 15 classes of one school in Budapest and four others in the countryside. The training is not only to manage and secure Internet use, but the use of digital learning materials and the possibility of integrating the lessons of Internet content, the tablet can acquire the teachers.

Strategy	The Hyper-School program is designed to enable students to learn effectively and safely use the mobile Internet, get a wider view of the world and become conscious felhasználókká Internet. Initially, the Telenor Hungary tablet with Internet access around 160 allocated in the context of the Hyper-School Education Program helps schools and through the expertise of Budapest, Ercsi, Hódmezővásárhely, Törökbálint zsombói and teachers prepare for, and provides the background necessary for education activities. The program aims to teach using the latest technologies and skill development of children develop effective and enjoyable options. The participants learned, for example in the form of interactive data protection, cyber walked around the topic of bullying, acting out everyday situations deepened their knowledge of the world wide web, the use of social networking sites.
Roles and support	A pilot scheme to promote digital tools in public education has launched in Hungary. The programme, dubbed HiperSuli, is a state-private-civil cooperation involving the human resources ministry, the education research and development institute (OFI), Microsoft Hungary, Telenor Hungary and the foundation for equal digital opportunities. Microsoft will supply educational apps and teacher's control software for managing classes, while The Institute for Educational Research and Development will contribute with digital learning resources. Schools participating in the Hipersuli Education Programme
Teacher training	31 teachers participating in the programme will get a tablet and a 30-hour training course, helping them to prepare to use the state-of-the-art mobile devices in teaching. During the training, the teachers will not only learn how to use tablets and the internet safely, but they will also acquire the skills to use digital learning materials and integrate online content into their classes.
Outputs	It will promote digital education through mobile apps and the mobile internet, first in 15 classes of one school in Budapest and four others in the countryside. Project running in four rural and one in Budapest school of 360 students enjoy the Hyper School benefits.
Outcomes	The new experimental textbooks have already been completed in grades 3, 7 and 11 and will be available by the end of the year in grades 4, 8, 12, as well.
Impacts	The pilot project was very successful and KórházSuli was launched as a voluntary initiative to facilitate the education of children in long-term hospital care with technology solutions and personalized learning content.

Wikiwijs teaching resources platform (The Netherlands)

Wikiwijs Leermiddelenplein	
Country(ies)	The Netherlands
Time-frame	2008-2013
Geographical scope	National
Education level(s)	Primary education; Secondary education
Learning form	Online media / platform
Technology focus	Cloud computing: Web 2.0
Implementation phase	Full-scale
Impact areas	Exchanging pedagogical practices (educators); Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities)
Funding	Public funding
Funding source	Dutch Ministry of Education, Culture and Science
Implementing body	Dutch Ministry of Education, Culture and Science
Source /website	https://www.wikiwijs.nl/
Key features	Wikiwijs Textbooks Square is the educational platform allowing users to search compare, create and share teaching materials in the form of open and closed educational resources (OER). Wikiwijs Textbooks Square is an open and independent platform and intended for everyone involved in the selection process and the use of teaching aids in daily learning: teachers, department heads, ICT coordinators to education decision makers. The initiative comprises two main components: (1) to enables teachers to find and access resources from educational and cultural institutions; (2) The second component is open education resources ("OERs") available under creative commons licenses where the sources of those resources are the teachers themselves. The platform allows educators also create teaching materials independently and in collaboration with colleagues and share best practices. The programme was commissioned by the Ministry of Education, Culture and Science, in collaboration with the Knowledge Network and the Open University. In 2013 Wikiwijs platform Knowledge Network and the SLO Textbooks Square merged in 2013 under the name Wikiwijs Textbooks Square.
Goals	1- to encourage and facilitate the use and development of OER in education and mainstream it throughout the educational system 2- to support schools and teachers in the compilation of the best learning tools (mix) and to ensure the central availability of teaching materials.

Policy rationale	Dutch Education Minister Plasterk launched the idea for Wikiwijs Textbooks Platform in December 2008 in response to the advice of the Commission for OER in the Netherlands. The platform is linked to the Wikiwijs policy initiative, the Netherlands' national programme to mainstream OER in all educational sectors (ranging from primary education to higher education).
Strategy	The platform was launched on the believe that governmental policy was needed in order to encourage the uptake of OERs in the education sector. The initiative learned that an interface "one fits all" was not adequate and that existing OER platforms are not necessarily interested in being linked to the governmental policy initiative. By the end of the initiative in 2013 wikiwijs was merged with the SLO Textbooks Square.
Roles and support	Wikiwijs Textbooks Square is a joint initiative of the Knowledge Network, the Open University and SLO. The platform offers a mix of open and closed educational materials, information on teaching methods and professional development materials on the use and application of teaching resources.
Teacher training	The platform is a means to share teaching materials/best practices but does not foresee any additional educator's training.
Evalua-tion	The programme carried out periodical surveys as well as a final evaluation in 2013.
Outputs	The wikiwijs platform provides today over 100 000 (digital) teaching materials as well as a database of over 1400 methods, searchable and comparable.
Outcomes	By the end of the programme in 2013 more than 650,000 OER downloads and 1300 uploads occurred.

Teacher 24 (The Netherlands)

Leraar 24 - Video's en dossiers voor de onderwijspraktijk

Country(ies)	The Netherlands
Time-frame	2009-2013
Geographical scope	National
Education level(s)	Secondary education; Primary education
Learning form	Online media / platform
Technology focus	Cloud computing; Digital videos
Implementation phase	Full-scale
Impact areas	Exchanging pedagogical practices (educators); Open Educational Resources (OER) development
Funding	Public funding
Funding source	Ministry of Education, Culture and Science (Ministerie van Onderwijs, Cultuur en Wetenschap)
Budget (Euros)	n/a
Implementing body	Knowledge Network (Kennisnet), the Education Cooperative (Onderwijscoöperatie), the NTR and the Welt Institute
Technology partner	Kennisnet
Source /website	https://www.leraar24.nl/home.psml
Key features	Leraar24 is a teaching material gateway providing knowledge and information about numerous topics that match the teaching profession and other subjects. Leraar24 is designed by teachers and for teachers providing educators with an educational toolbox full of practical solutions and methods to be employed on a daily basis. The platform allows teachers to become engaged in further training activities. The special characteristic of the platform is that each theme is developed by means of informational videos together with in-depth information forms a rich dossier. The Platform focuses on primary school teachers, secondary education, special education and vocational education. Besides the website, teachers can also use the mobile apps Leraar24.
Goals	The main objective of the initiative is to help educators contributing more actively to the creation of learning and teaching material and improve the quality of teaching on the whole.

Policy rationale	Leraar24 was created in the effort of the Dutch Ministry for Education, Culture and Science to promote the development of OERs. The underlying OER national strategy is linked to the Wikiwijs policy initiative (see I-22) aiming at creating a national gateway for OERs and incentivise teachers in developing their proper OERs throughout all education levels.
Roles and support	Leraar24 started in 2009 as an initiative of the Knowledge Network (Kennisnet), the Education Cooperative (Onderwijscoöperatie), the NTR and the Welt Institute. These parties are the basis of Leraar24 and have jointly developed the concept. The Onderwijscoöperatie was responsible for the knowledge part and the relationship with teachers, NTR for the knowledge and content and Kennisnet for the technical features and deployment of the websites. The creation and development of Leraar24 was largely financed by the Ministry of Education up to 2013.
Teacher training	Rather than teacher training, teachers can learn from each other's experience, share their methods and discuss the key issues that they are concerned with on the platform.
Evalu-ation	Leraar24 carried out a study published in 2010 using web statistics questionnaires and panel discussions to provide research data. However, no evidence could be found that the initiative has regular evaluation and monitoring in place.
Outputs	According to the evaluation study of 2010 an average of twice so many unique visitors per month as in 2009 visited the portal in 2010: around 25,000.
Outcomes	According to the evaluation study the appreciation appears to have grown compared to the start of leraar24 in 2009, in particular the valuation of the videos is relatively high, whereas the one of the cases is slightly lower. More specifically, the user survey shows that a large group of teachers the videos and files Leraar24 inspiring as well as deepening and valuable. Teachers see the added value especially in pedagogical skills and personal growth (reflective competence).Some 20% of teachers think Leraar24 can help improve their own level of competence.

Digital Competences, basic education in ICT (Austria)

Digitale Kompetenzen, Informatische Grundbildung

Country(ies)	Austria
Time-frame	2012
Geographical scope	National
Education level(s)	Secondary education
Technology focus	MOOCs / e-learning; Laptops, netbooks, tablets etc
Implementation phase	Pilot
Impact areas	Improving digital literacy / competences of learners; Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities)
Funding	Public funding
Funding source	Federal Ministry of Education, Arts and Culture, teacher-training institutions, regional education authorities
Implementing body	Bundesministerium für Unterricht, Kunst und Kultur (BMUKK)
Related documents	The initiative is an integral part of the eFit21 (www.efit21.at) strategy of the BMUKK ICT division. The strategy is available here: http://www.bmukk.gv.at/schulen/efit21/index.xml
Source /website	http://www.digikomp.at/

Key features	In order to improve key competences in ICT and raise interest in STEM (science, technology, engineering, and mathematics) the Federal Ministry of Education, Arts and Culture has set up a pilot project for lower secondary schools in cooperation with the ICT inspector of Upper Austria, with the aim of encouraging student participation, using the EDUMOODLE platform and providing resources for teachers. This pilot will be the basis for further decisions on a political level.
Goals	1- To improve students' ICT skills by increasing the use of technology in schools, and particularly to develop teachers' ability to motivate students to use technology for school and particularly to develop. 2- To improve students' knowledge and skills through the definition of standards within the context of the ICT curriculum and related subjects. 3- To provide information, through the pilot project, to school administrators regarding the use of technology in all subjects within the curriculum.
Policy rationale	The drive behind this initiative is the focus on digital competence in all subjects, as featured in the eFit21 strategy. With the need to strengthen key competences, the BMUKK decided to begin with the "digital competences" initiative in cooperation with the Upper Austria regional education authority.
Strategy	As this has been an initial undertaking with representatives of various stakeholders (policy makers, head teachers, teachers, teachers' associations etc.), the Ministry will set up a political dialogue with teacher-training universities, regional education authorities and all stakeholders.

Roles and support	Federal Ministry of Education, Arts and Culture, policy makers, head teachers, teachers, teachers' associations etc.
Teacher training	Training was initially offered to teachers as part of the pilot but it is intended that teacher-training institutions will include the program in their normal curriculum. There are two steps to providing teachers with information on how to integrate the ICT competence model into their lessons. 1. A clear overall vision of information technology and its relation to mankind and society 2. Principal competences – learning target as overview
Evaluation	FI Mag. Schwarz (the ICT inspector) collected feedback through questionnaires administered to the pilot schools in order to evaluate the results, and will report on this to the stakeholders. The results are not known.
Outcomes	Very good feedback was received from teachers and students who stated that they would be interested in continuing the project. The initiative is still in its pilot stage and so no further information is available.
Impacts	The test project has been very successful in improving the technological impact on society by using technology in lower secondary education to motivate students and parents as well as to encourage teachers to improve their teaching methods. It is hoped that the pilot project will be the basis of further political decisions enabling the development of ICT competences at a political level.

Digi4schools (Austria)

Digi4schools - Online-Platform für E-Books und Digitale Schulbücher

Country(ies)	Austria
Time-frame	2015-2017
Geographical scope	National
Education level(s)	Secondary education
Learning form	Blended learning
Technology focus	Digital textbooks
Implementation phase	Pilot
Impact areas	Increase the use of modern digital learning tools; Enhanced pedagogical quality
Funding	Public funding
Funding source	Ministry of Education and Women
Budget (Euros)	850 000 for set-up phase; thereafter 106 Mio. Per year
Implementing body	Ministry of Education and Women; Ministry of Family Affairs
Related documents	http://www.efit21.at/
Source /website	http://www.bmfj.gv.at/ministerin/Aktuelles/Themen/PK-EBooks.html

Key features	In October 2015 the Austrian Ministry of Education launched Digi4schools - an online-platform for e-books and digital school books. From the school year 2016/17, digital textbooks will be included as a combined product from the catalogue of school book available to secondary schools, in addition to the print or instead of the print versions. The digital teaching material can be accessed on the digi4school.at portal directly by pupils. An access code that comes with the textbook by textbook distributors allows students to create their own digital bookshelf where they store all their digital contents. The initiative provides of the following components: 1- Crop tool: authoring tool for the development of standardized EBooks with basic functionalities. 2- Provisioning system: location eBook and for stored metadata. 3- Catalogue System: acquisition of all offers the provisioning systems and management of access codes. 4- Digital Bookshelf: user-specific and personalized management of e-book deals. The initiative will be piloted in Austrian schools from March 2016 onwards. The creation of the platform and additional contents will cost 850,000 EUR, where after the authorities foresee annual injections of 106 Mio. EUR.

Goals	1- to provide a "gradual complement to the classic teaching materials through digital media as part of the Schoolbook initiatives with the involvement of school providers" 2- to promote interactive and individualized learning and media literacy as well as digital progress 3- to reduce the weight of teaching books and prevent lasting damage
Policy rationale	efit - is Austria's digital agenda for education, arts and culture - linked to the European e-inclusion initiatives and digital agenda. The strategy aims at increasing the (1) Quality of teaching; (2) Digital competences convey; (3) Promote labour market success; (4) Increasing efficiency of management; (5) integrate society and (6) promote art and culture, in different fields in Education Quality; IT job market; Management & Infrastructure; Society & Participation and Arts & Culture.
Strategy	Implementation will be done gradually. The beta version of the "digital bookshelves" - the digital platform - result of an EU-wide tendering process for the provision of digital ancillary products - was implemented in October 2015. Further components in terms of the catalogue system, the demo version of the digital bookshelves, the publication of e-books in the school books lists, digital ordering of SBA codes and the piloting of Digi4schools in selected schools are implemented between Nov-2015 and Mar-2016.
Roles and support	The initiative is driven by the Ministry of Family Affairs and the Ministry of Education and Women. The Education Ministry published a European-wide call for tenders to create the digital gateway ("digital bookshelves"). The initiative is coordinated with publishers and digital learning platforms.
Evaluation	After the pilot phase an official evaluation will be launched in order to adapt changes to the earning platform. The evaluation will involve interviews with students and educators and a student-centred survey. The results obtained will be taken into account for the further progress of the project.
Outputs	Approximately 8.9 million textbooks are expected to be ordered annually after the gateway has been set up. The Ministry expected that in the school year 2016/17 about 50% of the offered digital textbooks are used. Overall, the Family Ministry will inject 106 million Euros per year for digital school books. 15% of these funds may be allocated to purchase teaching media of their choice. The books will be accessible for pupils of 540 high school classes in digital form in addition to the printed versions, starting with the school year 2016/17.

Digital School programme (Poland)

Cyfrowa szkoła	
Country(ies)	Poland
Time-frame	2012-2015
Geographical scope	National
Education level(s)	Primary education; Secondary education
Learning form	Blended learning
Technology focus	Digital textbooks
	Digital videos
Implementation phase	Pilot
Impact areas	Open Educational Resources (OER) development; Enhanced technological infrastructure and access
Funding	Public funding
Budget (Euros)	approx. 32 million EUR (covering 4 components): Digital textbooks: €12 million (45 million Polish zloty); supplementary educational resources: €2.5 million (11 million Polish zloty); teachers' training: €4.7 million (20 million Polish Zloty); and ICT-related equipment: €12.8 million (55 million Polish Zloty).
Implementing body	Council of Ministers / Ministry of Infrastructure / Ministry of Education / Centre for Development of Education / Centre for Citizenship Education
Technology partner	Poznan Supercomputing and Networking Centre
Source /website	http://www.epodreczniki.pl

Key features	The "Digital School" programme seeks to integrate and use ICT technologies in primary and secondary schools in Poland. It was approved by the Council of Ministers in 2012, as a centralized government pilot programme to promote digitalization and ICT competences. While previous ICT programmes focused on infrastructure, this initiative follows a holistic approach that combines: 1) preparing teachers for teaching and documenting the educational process (e-teacher); 2) producing public digital educational resources (e-textbook); 3) providing schools with the necessary infrastructure, especially modern didactic tools (e-school); and 4) offering students access to modern teaching tools (e-student).
Goals	The main objectives of the programme are to determine the best way to introduce ICT in education, in order to support learning and teaching activities and to raise ICT competences among teachers and students in primary and secondary education. Another key objective is the development of a set of open digital textbooks.
Policy rationale	The programme seeks to use a holistic and consistent approach to ensure the improvement of infrastructure and skills of students and teachers, in order to enable them to create and use digital resources. It responds to experiences with previous ICT programmes, which sought to expand infrastructure, but lacked an attention on teachers training and pedagogical use of ICT. The Digital School therefore includes open educational resources, teachers' training, platform creation, skills and infrastructure development. The Digital School programme is also the first project to promote open textbooks and open educational resources of such scale in Poland. The programme is coupled to the "National Development Strategy 2020" and "Poland 2030. The Third Wave of Modernity" concerning the promotion of digital literacy and use of ICT. It also addresses the UNESCO Paris OER Declaration and the European Commission's "Opening Up Education" initiative by emphasising open educational resources' development.

Strategy	The Digital School programme is the pilot stage, which runs from 2012 to 2015, of a long-term governmental programme in Poland. Prior to the implementation of the Digital School programme, two years of consultations and negotiations were carried out. By April 2012, the Council of Ministers approved the decree that formally approved the programme. The implementation of the content and technical design followed public procurement processes for partners. The infrastructure implementation was mainly carried out at the local school level, with loose hardware guidance. It was decided to give head teachers a key responsibility for the selection of equipment and applications, based on the programme's catalogue, with an eye to ensure that the procurement reflects the teaching needs. The first modules of the open e-textbooks were published in early October 2013 and made accessible through http://epodreczniki.pl. In terms of the future implementation and expansion of the programme, it is worth noting that the production and uploading of educational resources can take place under any given license and without the need to grant the website operator with exclusive licensee.
Roles and support	While the Ministry of National Education oversee the programme implementation, the Centre for Development of Education has responsibility for the coordination of the programme and the development of the e-teacher and e-textbooks components. Following the tender process, the Poznan Supercomputing and Networking Centre was chosen in October 2012 as the programme's technical partner with responsibility for the creation of the online platform for digital textbooks. The Ministry of Education contracted four partner institutions in mid-2012 to support Poznan Supercomputing and Networking Centre in the production of the e-textbooks and to cover different content areas. Education Group S.A (Grupa Edukacyjna) was chosen to cover early education; University of Wrocław has responsibility for humanities; Łódź University of Technology is responsible for mathematics and computer science; and Wrocław University of Environmental and Life Sciences produces content related to life sciences. The Centre for Citizenship Education (Centrum Edukacji Obywatelskiej), an NGO operating in the field of training and pedagogy and with experience in the publication of open educational resources, was given responsibility for the implementation of the e-teacher component. Finally, the Institute of Education Research was tasked to evaluate the programme.
Teacher training	There was a deliberate focus on skills, since previous ICT programs were too focused on the development of infrastructure and supply of equipment. The Digital School programme aims to support ICT in schools through a system approach that targets skills of teachers and students, open educational resources, platform creation, infrastructure and teachers training. The e-teacher component is provided through training courses, online teacher support materials and e-learning. The aforementioned repository will offer training materials for teachers, available for teachers from the participating test schools.
Evalu-ation	The Institute of Education Research is responsible for the evaluation of the programme. The project is undergoing gradual evaluation, including the digital textbooks, while the testing of resources is done through surveys, interviews, and questions. The evaluation of the first modules of the open e-textbooks, including testing of the first functionalities of the platform, has resulted in positive feedback.
Outputs	In total, over 3000 schools applied to participate in the Digital School programme, while 424 schools were selected to participate. The participating schools have received hardware in the form of tablets, computers and additional IT equipment. 62 e-textbooks covering 14 subjects have been developed, supported by around 2500 supplemental educational resources (videos and other multimedia), which are made available on the Scholaris portal under a free licence as part of the initiative.

Project ManEEle (Portugal)

	ManEEle - Manuais Escolares Eletrónicos
Country(ies)	Portugal (Cuba and Vila Viçosa)
Time-frame	2013-2014
Geographical scope	Local
Education level(s)	Secondary education
Learning form	Blended learning
Technology focus	Laptops, netbooks, tablets etc; Digital textbooks
Implementation phase	Pilot
Impact areas	Enhanced pedagogical quality; Improving digital literacy / competences of learners
Funding	Mix of public/private funding
Funding source	School Authority of Alentejo (Direção Geral dos Estabelecimentos Escolares – Direção de Serviços do Alentejo)
Implementing body	School Authority of Alentejo (Direção Geral dos Estabelecimentos Escolares – Direção de Serviços do Alentejo)
Technology partner	Microsoft Portugal; Fujitsu; Portugal Telecom; Promethean
Source /website	http://maneele.drealentejo.pt/site/index.php/pt/
Key features	The pilot project ManEEle "textbooks Electronics" is an initiative promoted by Alentejo Services Directorate of DGESTE, Ministry of Education and Science, which is being implemented in 7th grade (12-13 years old) schools in Cuba and Vila Viçosa in Portugal. The project is implemented in two school clusters. This 3-year project started in 2013 with the aim to test an alternative solution to the expanded use of digital textbooks and tablets in the classroom, through the piloting of several possibilities. The pilot involved a comprehensive analysis and assessment involving surveys and interviews with students, educators and parents. The pilot was supported by IT and educational technology providers - Microsoft, Promethean, Fujitsu and Portugal Telecom - who co-sponsored the project by providing technology. The outcomes showed that tablets and digital textbooks are valuable complements to the classroom, if accompanied by high-quality, customised pedagogical material and educators.

Goals	The initiative aims to test an alternative solution and expanded use of the electronic textbook in the classroom, through the piloting of several variables. More specifically, the project-pilot aims to: 1- Define an alternative concept of electronic textbook; 2- Adapt the teaching-learning process to the individual characteristics of each student; 3- Use advanced technologies and teaching methods in order to improve learning of students; 4- Make the process of teaching / learning more interactive and dynamic; 5- Train more competent students, technically and scientifically; 6- Secure digital content that do not rely on an internet connection; 7- Make the textbook easily upgradeable and correctable.
Policy rationale	The pilot project ManEEle "textbooks Electronics," an initiative promoted by Alentejo Service direction of DGESTE, Ministry of Education and Science, is underway in Cuba Group of Schools since the 2013-14 school year and will run until the end of the year school from 2015-16. This is a project where we aim to contribute modestly to model school the twenty-first century, an equipped school with good technological infrastructure, where the support can make a difference in a way to a more didactic consonant with how students learn today.
Strategy	Tablet Fujitsu M532 was distributed in two classrooms; in the second semester it was replaced by a different model (Fujitsu Stylistic) equipped with Windows 8 using virtual learning environments (Escola Virtual). The objective was to see whether the technology had an impact on the learning of the students as well as educator's practices.
Roles and support	The Promethean supplied pedagogical software solutions, the virtual learning environment; Microsoft and Fujitsu supplied the tablets;
Teacher training	Teachers received support from trained educators in using and improving their digital competences on the basis of the provided material.
Evaluation	Supervision and testing of pedagogical model will be monitored by the Catholic University of Portugal. The project is designed for three years, having a regular assessment distributed in 8 intervals. A final comprehensive study was performed on the topic of the impact of the use of tablets in the classroom and related innovative pedagogical tools. For the study focus groups and interviews were used.
Outputs	The project involves two classes who started seventh grade in September 2013, the Cuban Schools Group, a total of 17 teachers, 42 students and their respective parents.
Outcomes	According to the final report of the project students as well as teachers judged the pilot to be positive. Some students stated to be more motivated to go to school due to the use of tablets and application of blended learning methods. Also teachers appreciated the use of the tablets and virtual learning environment stating that it was an enrichment and inspiration to the learning and teaching experience.
Impacts	To study the impact of tablets and virtual learning environments in the classroom through an ex-ante and ex-post evaluation.

Biblionet (Romania)

Biblionet - Global Libraries Romania

Country(ies)	Romania
Time-frame	2009-ongoing
Geographical scope	National
Education level(s)	Further (adult) education and life-long learning
Technology focus	Mobile / internet connectivity
Implementation phase	Full-scale
Impact areas	Enhanced technological infrastructure and access; Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities)
Funding	Mix of public/private funding
Funding source	Bill & Melinda Gates Foundation's Global Libraries program; the Microsoft Cooperation
Implementing body	IREX
Technology partner	Association of Librarians of Romania (ANBPR), the Bill & Melinda Gates Foundation, the Ministry of Culture
Source /website	https://irexgl.wordpress.com/category/romania/
Key features	A six-year programme focusing on transforming Romanian public libraries into vibrant community hubs offering free access to information for citizens through a wide-range of services and techniques. Specifically, the programme e.g. provide libraries with new hardware, internet connectivity, an encompassing professional development system and training for librarians in technology. The initiative also seeks to enhance the capacity of the National Association of Public Libraries and Librarians (ANBPR) to advocate on behalf of libraries in public policy processes. The initiative seeks to promote government support for libraries, including equipping libraries with technology and services with a view to also enabling e-government services. The Bill & Melinda Gates Foundation provided funding for IREX, an international non-profit organisation, to implement the Biblionet programme in Romania. The partnership behind the initiative consist of ANBPR, the Bill & Melinda Gates Foundation, the Ministry of Culture, local and national governments and public libraries throughout Romania.
Goals	1- to provide more than 80 % of Romania's libraries with tech tools and internet connectivity, in order to reach out more than 600.000 first-time internet users; 2- to train 4.200 librarians in using new technology, including providing better services for library visitors; 3- to create a professional development system, based on regional hubs and modernised content; 4- to help promote ANBPR's capacity in cultivating partnerships with private and public actors; 5- and to deepen government support for libraries at local, national and European levels by the use of advocacy initiatives (annual progress letters; international dialogue with European counterparts).

Policy rationale	Despite the importance of access to information and rapid economic advances throughout the last two decades, less than 28 % of Romanians had internet access in 2009. From a policy perspective, libraries and librarians have been overlooked concerning their potential role in providing people with information, services and opportunities. Before the launch of Biblionet, local authorities were not prioritizing library funding in terms of city budget and in 2008 hundreds of Romanian libraries faced closure due to budget constraints. On this background, the Bill & Melinda Gates Foundation's Global Libraries program decided to invest in Romania in 2008.
Strategy	The implementation of the program followed a planning process that started in 2008. IREX which implemented the initiative, have collected extensive data on library use and taught librarians how to technologies and to contribute to community activities. It initially saw 12 Romanian pilot libraries provided with technology and the required skills. During spring 2009, the lessons learnt from the piloting feed into the Romanian national competition, for the first round of libraries to participate in the program. The training and equipment was rolled out in waves over the years of the implementation: the first phase focussed on establishing systems for library selection, computer procurement and basic training, including developing training and professional networking opportunities for librarians. To facilitate the implementation, training centres were set up in 41 county libraries, further supported by 170 trainers and skills workshops. In total, 4.200 librarians have been trained in IT skills and new services. Five Regional Training Centres have further been established, serving as the cornerstone of Romania's professional development system. Moreover, training courses and an online learning platform supported ongoing skills development. This will also be available after Biblionet's closeout an offered for an affordable price for libraries.
Roles and support	At county-level, 41 training centres are set up across Romania with 170 librarian-trainers providing support through e.g. workshops. The Library Association ANBPR worked with IREX to implement Biblionet activities. ANBPR were given over €500.000 by IREX to strengthen its ability to service its members and help ensure a modernisation of libraries. Biblionet has also supported ANBPR in outs outreach activities to the Romanian government, in order to raise the profile of libraries in national dialogues.
Teacher training	Training of librarians are available in person and through online tools; training courses and an online learning platform support ongoing skills development in order to support teachers. The National Training Center was established in Romania's National Library to provide another access point to quality training for the country's librarians.
Evalu-ation	The impact and success of the Biblionet program has e.g. been evaluated through an extensive pop-up survey, which was carried out in 2010 to assess user satisfaction and to identify new potential services across Romanian libraries.
Outputs	The outputs of Biblionet include the following achievements: - More than 5.3 million Romanians visited Biblionet libraries in 2013; - More than 80 % of the libraries have been provided with tech tools an internet connectivity; - 4.200 libraries trained to use the new technology; - 600.000 Romanians used internet for the first time at one of the Biblionet libraries; - 84 % of the library tech users were able to save money through free internet access and services; - 67 % of the people who searched for jobs at a library were successful; - 79 % of the students using libraries reported an improved academic performance.
Outcomes	Among the visitors who used the public libraries' services for cultural purposes, health and career assistance, around 65 % are more actively involved in their community, 81 % feels they have improved their health and 62 % are feeling more qualified to find employment.

Opening up Slovenia (Slovenia)

Opening up Slovenia	
Country(ies)	Slovenia
Time-frame	2014-ongoing
Geographical scope	National
Education level(s)	Primary education; Secondary education
Learning form	Blended learning
Technology focus	Cloud computing; Games / gamification
Implementation phase	Full-scale
Impact areas	Sustainable investment, performance and efficiency of education and training systems; Open Educational Resources (OER) development
Funding	Mix of public/private funding
Funding source	Ministry of Education, Science and Sport and educational institutions
Implementing body	Ministry of Education, Science and Sport and educational institutions
Technology partner	Knowledge 4 All Foundation Ltd - online education and computer science Jožef Stefan Institute - leading Slovenian scientific research institute VideoLectures.Net - a United Nations award-winning free and open access educational video lectures repository University of Ljubljana - the largest national higher education institutions in terms of staff and students numbers University of Maribor - the second biggest and the second oldest university in Slovenia University of Primorska - the third university in Slovenia University of Nova Gorica - an independent, research oriented and student friendly university Ministry of Education, Science and Sport - active promotion of OER since 1996 Chamber of Commerce and Industry of Slovenia The Office of the Slovenian National Commission for UNESCO OS Savsko Naselje primary school - representative of the national primary schools cluster Vrtec Trnovo kindergarten - representative of the national kindergarten cluster Slovenian Post - the national postal operator in the Republic of Slovenia
Source /website	http://www.ouslovenia.net/

Key features	OpeningupSlovenia is a multi-layered coalition aiming at developing an open education research environment aiming at achieving change in 7 key areas: (1) to transform existing educational methods into innovative, dynamic and open learning tools, (2) to restore an environment of cooperation between public, private and voluntary sectors of research in order to develop and introduce a more open education, (3) to build legal mechanisms in support of implementing open education, (4) to construct an open platform of information technologies, contents, services, pedagogical concepts and approaches, (5) to restore mechanisms for securing a high level of quality and evaluation of services, (6) to develop digital competencies within the entire educational system, and (7) to carry out concrete, cross-dimensional open education projects. This test-bed comprises of a coalition of all Slovenian universities, compulsory and vocational education institutions with technical, research and industry partners. The objective is to explore means for a fully-fledged open educational system in synergy and parallel with the formal one, develop innovative projects and apply for European Commission funds related to ICT and new aspects of open education. The Opening Up Slovenia initiative encompasses a range of research activities to further develop open and online education in line with proposals in the Commission Communication. It is building on existing good practice in Slovenia in OERs and online learning.
Goals	1- to improve Open Education institutional digital leadership; to foster research in Open Education; 2- to develop digital capability throughout the complete educational system; 3- to redesign educational services to meet a new Open by Default Service Standard; 4- to build common technology platforms for Open by Default services; 5- to remove unnecessary legislative barriers; 6- to design new pedagogical and didactic structures; 7- to collaborate with partners across public, private and voluntary sectors to help more people use Open Education.
Policy rationale	The main goal of the initiative is to follow as closely as possible and go beyond the European Commission's communication "Opening up Education", which sets out a European agenda for stimulating high-quality, innovative ways of learning and teaching through new technologies and digital content. What is more, the initiative also builds on several best practices
Strategy	The initiative works through creating new funding schemes and calls for proposals in the fields of open education. Currently, 14 projects are affiliated to the initiative. A Steering Committee was set up as overall responsible organ for the network. It comprises the initiative's coordinator as Chair, the core members' managers, the managers of each of the projects and events, and the Project Administrator. The scientific programme, funding opportunities and management of the budgets for the individual programmes and projects. In addition, there is a Strategic Advisory Council composed of external senior scientists, representatives of national and international funding agencies and industry. The Council fulfils two major roles: to provide overall strategic direction and vision and to monitor the equity and ethical stance of the network including an appeal procedure in the event of internal disputes.
Roles	The Consortium of Opening up Slovenia comprises organisations incl. Universities, vocational education and training centres, research centres and industry.
Outputs	According to estimates the initiative will affect 10.000 pre-school teachers, 15.000 basic education teachers and 7000 upper secondary education teachers with a total of 200.000 pupils.

e_education project (Slovenia)

e-izobraževanje

Country(ies)	Slovenia
Time-frame	2009-2014 (48 months)
Geographical scope	National
Education level(s)	n/a
Learning form	Blended learning
Technology focus	MOOCs / e-learning; Digital textbooks
Implementation phase	Full-scale
Impact areas	Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities); Exchanging pedagogical practices (educators)
Funding	Public funding
Funding source	Ministry of Education, Culture, Science and Sport; the European Social Fund
Budget (Euros)	n/a
Implementing body	The National Education Institute, Kopa Ltd., Institute Logik, Pia Ltd.
Source /website	http://sio.si/

Key features	The national E-Education Project (2009-2014) in Slovenia was conducted in accordance with the needs of today's society and aiming to build a path for schools to get ready for 21st century technologies and become an e-competent school. This requires schools to set up an e-learning environment, develop appropriate e-content and educate e-competent teachers. Different users in education need these competences for different purposes for example teachers need them for their work in the classroom, principles use them for school management and IT coordinators for planning. The E-education project was designed by the Ministry of Education, Science and Sports to be a national model for the training of teachers, development of e-competence standards for teachers and schools, and facilitating learning content and online services, including new communication platforms.
Goals	One of the main goals of the project is to create a standard for 'e-competence' that is applicable to teachers, school heads and IT experts. The establishment of this standard allows for the implementation of a national strategy to develop an efficient educational model for all education professionals, bringing Slovenia up to speed in terms of 21st century teaching and leadership. Further, another goal of the project is the training of teachers and development of a Standard for e-competent teachers, principals and IT coordinators. The training focuses on achieving the fundamental e-competences, which are used as a framework for digital literacy. These e-competences are supposed to be used by the teacher in the classroom, the principal in school management and IT coordinator for planning.
Policy rationale	In 2007, the government of Slovenia approved the Strategy for Development of Information Society in the Republic of Slovenia, which defined the national framework for the development of information society in Slovenia. The strategy includes providing suitable equipment for schools, developing e-content and training education professionals. To provide all that the project E-education was set with one of the main aims to educate teachers to become e-competent. One of the goals was the development of a framework for teacher e-competence.

Strategy	Implementation of seminars from the Catalogue of e-education, including training at various seminars and counselling teachers and other professionals acquire new skills and teaching work at the educational institution.As part of the training be conducted at a distance, the participants new skills during training can test it in the school or classroom. Also included is a new method of assessment, namely by showing practical experience in the application of ICT in the work of the school or with children and adolescents, which takes place live at the end of the training. Training participants upgrade their work and exchange of experience continue know communities.
Roles	The National Education Institute is responsible for implementing the project
Teacher training	The seminars mostly focus on the first level of digital literacy since they support the development of digital competencies. The seminars are based on e-competencies for 20 different subject areas. This means that all educators are enabled the most authentic e-competencies acquisition, as the content is selected according to the subject or area of teaching and working in educational institutions and as such directly transferable into practice. A diverse range of activities is organised, such as preparing new programmes and seminars, organising international conferences (e.g. SIRikt), coordinating contractors of elearning materials and tenders for small-level e-learning materials, and continuing the search and integration of new employees who want to acquire new skills and become acquainted with modern approaches to teaching, learning and school management.
Evaluation	Monitoring the development of e-learning materials that have been adopted at the invitation of the Ministry of Education and Sport and the evaluation and integration of seminars to use them in e-Education project.
Outputs	During the life time of the project 52 new seminars and 63 various workshop programmes were developed for 20 subjects/areas, and 38 self-assessment courses. There were 20.296 participants to seminars (the approximate number of teachers in Slovenia is 30.000), some of the participants participated to more than one seminar (in total there were 36.574 participations). Also 99% of educational institutions participated in the project.
Outcomes	The project E-Education and within the project the development of 6-key competencies for teachers, and development of new seminars for in-service training was very well accepted among schools, teachers and ICT coordinators. As already indicated in SITES 2006 study, teachers were interested in how to apply ICT in the education process and confirmed the interest with massive attendance to offered courses. Although the project has ended it is followed by new projects where the main aim is the development of e-textbooks, testing in pilot schools where students and teachers are trying out one to one pedagogy and infrastructure is taken care of (wireless access to the internet).
Impacts	The project was very well accepted among schools, teachers and ICT coordinators. The new projects after the E-Education ended by aiming to develop of e-textbooks and testing in pilot schools where students and teachers are trying out one to one pedagogy and infrastructure. More than 70% of principals passed the principle courses.

Core Curriculum for Basic Education (Finland)

Finnish Core Curriculum for Basic Education

Country(ies)	Finland
Time-frame	2012-2014, the new reform will start in 2016-2017
Geographical scope	National
Education level(s)	Primary education; Secondary education
Implementation phase	Mainstream
Impact areas	Enhanced pedagogical quality; Improving learning outcomes
Funding	Public funding
Funding source	Ministry of Education and Culture
Implementing body	Ministry of Education and Culture
Related documents	http://www.oph.fi/download/132551_amendments_and_additions_to_national_core_curriculum_basic_education.pdf
Source /website	www.ophi.fi

Key features	The new core curriculum emphasises the joy of learning and the pupils´ active role. The Finnish core curriculum can be understood as an extensive ecosystem, where different areas are linked to each other, as a teaching-studying-learning environment with myriad dimensions. The core curricula support teachers to understand what is the most essential in each knowledge area and how it is constructed and acquired. It provides pedagogical bases for learning like activities, structures, and methods. It also provides technological foundations for how new technological solutions can benefit education. In the new 2014 curriculum, ICT skills are an essential part of general education and civics. In basic education, they are crucial to ensure that all pupils have equal opportunities to develop their expertise, ICT skills, and media proficiency. Students are to learn skills that employ ICT in diverse and creative ways, and need to practice working with data, information, and knowledge. The aim is that students will be capable of creating new knowledge both on their and together with others, all by utilizing ICT effectively. ICT and digital learning materials are utilized in a wide range of subjects and in boundary-crossing learning. Collaborative working skills and communal modes of studying using ICTs are supported, and the tools that support each student's personal learning pathways are introduced.
Goals	The new core curriculum aims to emphasise the importance of learning environments and methods, guidance and individualisation as well as assessment as a means to support learning. To achieve as high a level of education and competence as possible for the whole population.

Policy rationale	The Finnish National Board of Education draws up the national core curricula for pre-primary education, basic education, general upper secondary education and basic education in the arts, as well as the curricula for preparatory education for immigrants and morning and afternoon activities for school children. The curricula set out the key objectives, content and policies of education. The aim is to develop the national core curricula and to coordinate them so that they create a progressive continuum in a coherent way and a strong basis for lifelong learning. Education providers and schools draw up their own local curricula based on the national curricula.
Strategy	Instruction is to be provided making use of diverse working approaches and teaching methods sensitive to pupils“ abilities and suitable for different ages and various learning assignments and situations. These are used to support and guide the learning of the entire teaching group and each individual pupil. Methods and working approaches should be chosen so as to create situations for interactive learning and working together and individually allowing pupils to develop skills that are important in terms of learning and their own future. These include thinking and problem-solving, working and interaction, self-knowledge and responsibility, participation and influencing, as well as expression and manual skills. Work must diversely promote information and communication technology and online working skills.
Roles and support	The National Core Curricula were compiled in an extensive collaboration process where the Finnish National Board of Education worked side by side with municipalities, schools and teachers, and with teacher trainers, researchers and other key stakeholders.
Teacher training	The Ministry of Education and Culture allocates in its budget a sum of money for teachers’ professional development. The National Board of Education and the Regional State Administrative Agencies distribute this allocated money. Each year the topical issues and objectives in professional development are also defined. Furthermore, subject teachers’ associations and other organisations organise in-service training.
Evalu-ation	Finnish educational curricula are designed on a multi-annual basis with the next update already under way being implemented in 2016. With every update a formal evaluation of the educational needs in line with changes over time are being assessed with experts from education including comprehensive stakeholder reviews.
Outcomes	The Finnish core curriculum can be understood as an extensive ecosystem, where different areas are linked to each other, as a teaching-studying-learning environment with myriad dimensions. It includes the very concept of knowledge itself and an understanding of the psychological basis of learning. The core curricula support teachers to understand what is the most essential in each knowledge area and how it is constructed and acquired. It provides pedagogical bases for learning like activities, structures, and methods. It also provides technological foundations for how new technological solutions can benefit education.
Impacts	The curriculum reform takes into account the social impact of globalization, climate change and environmental issues, technological change, the avalanche of information, and other changes in nature, work, and society. The growth of cultural and linguistic diversity in the country plays a central role. The new draft (2014) makes essential to consider how all these changes might impact on children’s personal growth and their learning environment throughout the complete lifespan.

Shireland's Learning Gateway (United Kingdom)

Shireland's Learning Gateway	
Country(ies)	United Kingdom
Time-frame	2006-ongoing
Geographical scope	National
Education level(s)	Secondary education
Learning form	Online media / platform
Technology focus	Virtual learning environment; MOOCs / e-learning
Implementation phase	Full-scale
Impact areas	Integrating learning communities/ecosystems through platforms (learners, educators, parents); Inclusive education, equality and non-discrimination
Funding	Public funding; partnership with Microsoft
Implementing body	Shireland Collegiate Academy
Technology partner	Microsoft
Related documents	https://cmis.sandwell.gov.uk/cmis5/Document.ashx?czJKcaeAi5tUFL1DTL2UE4zNRBcoShgo=OAafHRvqbDTvnYfUqdHH1FZ8QCFgNlUePY53i1ZMIcZuLOQm3NxlAA%3D%3D&mCTIbCubSFfXsDGW9IXnlg%3D%3D=hFflUdN3100%3D&kCx1AnS9%2FpWZQ40DXFvdEw%3D%3D=hFflUdN3100%3D&uJovDxwdjMPoYv%2BAJvYtyA%3D%3D=ctNJFf55vVA%3D&FgPlIEJYlotS%2BYGoBi5olA%3D%3D=NHdURQburHA%3D&d9Qjj0ag1Pd993jsyOJqFvmyB7X0CSQK=ctNJFf55vVA%3D&WGewmoAfeNR9xqBux0r1Q8Za60lavYmz=ctNJFf55vVA%3D&WGewmoAfeNQ16B2MHuCpMRKZMwaG1PaO=ctNJFf55vVA%3D
Source /website	www.cisco.com/web/strategy/docs/education/ShirelandsLearningGateway.pdf

Key features	Shireland's Learning Gateway introduces an e-learning platform / virtual learning environment where members of the school community have their own available resources and pages and can collaborate online. The platform supports two-way communication between home and school, including between teachers, and parents can follow their children's progress. In particular, it helps re-engage students with personalized learning opportunities, e-learning and gaming resources, which can be carried out at school, at home or in the community settings. The initiative focuses on children in the age of 11 to 19 in secondary schools among three of the most deprived wards in the country. The target group include children facing extreme personal pressures (with 40 % on the Special Educational Needs Register), families seeking asylum or economic migrants, families with low parental confidence in supporting their children, and low levels of attaint on entry. It is based on the Microsoft Learning Gateway technology. The overall solution has now been adopted by more than 100 primary and secondary schools in the UK.

Goals	The objective of Shireland's Learning Gateway is to increase opportunities for collaboration between members of the school community and to enhance personalised learning for Shireland Collegiate Academy students through supporting learning in a variety of contexts, including at school, home or in community settings.
Policy ration ale	Personalization has received much focus in UK government policy. Part of the focus concerns a closer engagement of parents in their children's education. The learning platform is considered to assist in personalized learning and in engaging parents and the wider community in the support of learning.
Strategy	The implementation of the portal has involved a process of meetings, open days, telephone surveys, development of parent "learning champions" and event "netbus" touring the Shireland area. The Learning Gateway is supported by four full-time staff at Shireland. Development is currently taking place on using the Learning Gateway through mobile service.
Roles and support	The Shireland team has developed more than 800 learning units, which are accessible through the Learning Gateway; the learning units are study boarded by teachers and then developed by the school's media teams. Shireland's Learning Gateway was developed in partnership with Microsoft. Parents are involved in the initiative, in terms of communication with parents and review of student's materials. Four full-time staff at Shireland support the Learning Gateway.
Evaluation	There is a continuous focus on assessment for learning, and all the progress and attainment data are shared with and used by pupils and their parents through individual pupil portals on the Learning Gateway. At the Shireland Collegiate Academy in Sandwell, all progress and attainment data is collected and analysed half-termly. On this background, the analysis is shared with heads of department, all staff, pupils and parents/carers in different tailored formats through the Learning Gateway platform. The spreadsheets are then converted into visual representations which then are manipulated to show progress/attainment of all pupil groups.
Outputs	The gateway has been used by as many as 130 schools both within and beyond the United Kingdom. In the assessment at age 16, the learners' General Certificate of Secondary Education for 5A-C grades has been raised from 24 to 64 percent. A 6th Form for 16 – 18 year-olds has been established since 2002 with 350 students by September. Shireland is considered as one of the highest value adding specialist schools in England.
Outcomes	Shireland has led to considerable success in raising achievement among learners. The use of Learning Gateway had significant impact on teaching styles; teachers have been able to more quickly determine which students are struggling, including providing help more rapidly. This has enabled teachers to better support learners with particular needs. Following the automated marking, pupils now also receive feedback more rapidly. The initiative has also changed teaching working practices. While many teachers leave work earlier, they tend to work from home (e.g. concerning reviewing submitted homework).

National Digital Learning Arena (Norway)

Nasjonal digital læringsarena

Country(ies)	Norway
Time-frame	2008-ongoing
Geographical scope	National
Education level(s)	Secondary education
Learning form	Online media / platform
Technology focus	MOOCs / e-learning; Digital textbooks
Implementation phase	Mainstream
Impact areas	Open Educational Resources (OER) development; Integrating learning communities/ecosystems through platforms (learners, educators, parents)
Funding	Public funding
Funding source	Ministry of Education and Research; 18 Norwegian county councils
Budget (Euros)	Around EUR 6.75 million per year
Implementing body	As a joint enterprise, NDLA is co-owned by 18 Norwegian county councils
Technology partner	Cerpus; Utdanning.no
Source /website	https://ndla.no/

Key features	The Norwegian National Digital Learning Arena (NDLA) seeks to develop open digital learning resources and open educational resources of high quality and to involve students and teachers more actively in the learning environment. Besides offering digital learning resources, NDLA provides digital tools for students, teachers and others to assist in the leaning process. The NDLA work with around 40 different subjects in upper secondary education; the subjects cover academic specializations as well as vocational education and training. The materials are freely available. NDLA is a national operation that is established as a virtual organization in 2007, but without a physical headquarter. As a joint enterprise, NDLA is co-owned by 18 Norwegian county councils.
Goals	The objective of NDLA is to develop open digital learning resources / open educational learning resources of high quality that are freely available for all - in all subjects - and to involve teachers and students from upper secondary education in active and collaborative learning processes. The long-term ambition is to provide digital learning resources within all subjects and to develop a culture of sharing within secondary education in Norway.

Policy rationale	Digital learning materials in learning offers many advantages compared to a printed textbook; it is easier to modify and update and to be personalised according to the relevant level etc. There was a call in Norway for digitally available materials, which was freely available. The NDLA sought to address this by creating a joint portal with digital learning resources targeting secondary education.
Strategy	In 2007, the responsibility for the acquisition of learning content was delegated from the state to the county level: all countries – except Oslo – are owners of the NDLA, with Hordaland county as formal judicial unit. In terms of implementation, by pooling administrative resources from available means, the need for investments in software/services is reduced. The professional and administrative support systems are available through local host organizations (such as the county councils) or cloud-based applications. NDLA encourages public tenders for digital learning resources that cover part / all of the learning targets for the relevant subjects. The contributors are for example pedagogical personnel from schools, colleges and universities, and also suppliers of technical solutions. Editorial staff carries out the editorial work for each subject. The free software is available to anyone who wishes to develop digital learning resources. Most of NDLA's content is offered under a Creative Commons license.
Roles and support	NDLA is a distributed organisation with no central administration. There are no permanent employees, but NDLA employ staff for a shorter or longer period: most of them have leave from positions in upper secondary schools. NDLA has around 100 employees – mainly teachers - throughout Norway; 35 works in full time positions and 65 in part-time positions. In terms of organization, it is led by the board, consisting of 18 members, while three selected members make up the executive committee. NDLA has a country contact in each country administration, which is responsible for linking with all upper secondary schools in the country and to promote the learning resources. The promotion of digital learning resources will be a gradual process paced by the various countries of Norway, in their capacity of being school owner, and through their joint decisions. The IT platform was initially developed by Utdanning.no and later by the company Cerpus.
Evaluation	Based on open tender process, the NDLA was evaluated by a consultancy, Rambøll Management Consulting, in 2008/2009. The content at NDLA is reviewed regularly by independent reviewers. An external user survey was carried out in 2013, which pointed out that NDLA was mainly used as a supplement to traditional textbooks and that it use was largely teacher-oriented.
Outputs	In 2014, there was learning material available for around 40 subjects in secondary education. According to Google Analytics, there was 1.431.017 visitors on ndla.no in 2010. In the subsequent years there was 2.876.541 (2011), 4.799.181 (2012) and 7.022.812 (2013) visitors.
Outcomes	In just a few years, NDLA has produces a large amount of OER and there are several thousand resources available from the portal. Students have highlighted e-lectures and tasks tailored with various levels of difficulty as the most useful services. Both teachers and students have highlighted the opportunity for developing content based on differentiation, which can help both weak and strong learners in education. According to user statistics, there has been a substantial increase in traffic on the NDLA website. In addition, the awareness among key constituents such as teachers and principals is on the rise. NDLA was nominated for the European Public Service Award (2011) and the Boldic Award (2014).
Impacts	According to the Boldic Arward, the NDLA concept, strategy and solutions can be scalable over the whole Nordic and Baltic region.

Commission on MOOCs (Norway)

MOOC-utvalget	
Country(ies)	Norway
Time-frame	2013-2015
Geographical scope	National
Education level(s)	Tertiary; Further (adult) education and life-long learning
Learning form	Online media / platform
Technology focus	MOOCs / e-learning
Implementation phase	Pilot
Impact areas	Increase the use of modern digital learning tools; Improving learning outcomes
Funding	Public funding
Implementing body	The Norwegian Government / Ministry of Education and Research
Technology partner	The Norwegian Centre for ICT in Education
Source /website	https://www.regjeringen.no/no/dokumenter/mooc-utvalgets-forste-rapport/id747921/
Key features	The Norwegian MOOC Commission was mandated by the government to map the development of MOOCs, to explore future possibilities and challenges related with MOOCs and to provide the Norwegian authorities and educational institutions with specific recommendations on the relevance of MOOCs and how it can be used and promoted. The Commission was tasked to deliver two reports, respectively an interim and final report, which followed a two-step process. The first report (deadline by end of 2013) should address the developments of MOOC at international and national levels, explain what the driving force is, which systems are used and which implications it has from a societal point of view. The second report (deadline during summer 2014) should contain more detailed information with recommendations on how MOOCs could be integrated, e.g. in higher education and further education. The Commission consist of 11 members who represent broad areas of competence. From an international perspective, it was the first national commission/expert group appointed for MOOCs.
Goals	The objectives of the Commission are to map MOOCs developments, to outline the possibilities and challenges that MOOCs offers, and to provide national authorities and education institutions with recommendations on the integration and possible use of MOOCs.

Policy rationale	ICT-supported learning has a long tradition in Norway. And MOOCs have quickly expanded throughout the last years. While the first Norwegian MOOC were offered in 2013, 7 courses were offered in 2014 and 16 in 2015. Modern technology infrastructure is currently available in most schools and HEIs in Norway. Around 7 % of enrolled students in HE takes pare in online distance studies. A information gap was found concerning the opportunities and challenges offered by MOOCs and a need for unifying ICT policy of HEIs.
Strategy	The implementation of the Commission's work was carried out through regular working meetings and expert meetings, in order to exchange views and gather data on the development and use of MOOCs, including the opportunities and challenges it offers for HEIs in Norway. The work also had to take into account the context/work of other appointed Commissions and other ongoing educational processes within higher education.
Roles and support	The Commission consists of experts from academic, public and private sectors and education institutes. The Ministry of Education and Research and the Norwegian Centre for ICT in Education have made their secretariats available for the Commission, including provided material and input relevant for the report writing. A Senior Advisor from the Ministry also contributed to the work, in particular through language corrections. A Facebook page has been created for the Commission for informative purposes; it allows the members to communicate results of the work and for receiving input. Several external experts have been invited, in order to broaden the knowledge base, and to identify specific needs/gaps.
Evalu-ation	Evaluation and monitoring mechanisms were not applied for the working of the expert group. But the group had very specific tasks described.
Outputs	The outputs of the Commission's work was two reports, respectively an interim (2013) and final report (2015) which offered recommendations on the use and possible integration of MOOCs in Norway.

Virtual Campus (Switzerland)

Campus Virtuale Svizzera, Campus Virtuel Suisse, Virtueller Campus Schweiz (SVC)

Country(ies)	Switzerland
Time-frame	2000-2007
Geographical scope	National
Education level(s)	Tertiary
Learning form	Blended learning
Technology focus	MOOCs / e-learning; Virtual learning environment
Implementation phase	Full-scale
Impact areas	Increase the use of modern digital learning tools; Enhanced pedagogical quality
Funding	Public funding; Any other forms of funding (e.g. crowdfunding, membership fee, etc.)
Funding source	Swiss Federal Council for the Promotion of Education, Research and Technology
Budget (Euros)	120-125 Mio. (Impulse and Consolidation programme)
Implementing body	Swiss universities of the Rector's Conference (CRUS); Federal Swiss Ministry for Education
Technology partner	Edutech - Centre NTE / University of Fribourg
Source /website	http://www.virtualcampus.ch/

Key features

The Swiss Virtual Campus was created in order to promote e-learning at the Swiss Institutions of Higher Education (Universities, Universities of Applied Sciences, and Swiss Federal Institutes of Technology). Unlike many foreign e-learning initiatives, Swiss Virtual Campus is aimed primarily at undergraduate students and only secondly at mature part-time students. The initiative was divided in two programmes: the Impulse Programme between 2000-2003 and the Consolidation Programme between 2004-2007. The Impulse Programme was essentially focused on the realisation of projects for the development of on-line educational modules in specific subjects; in two calls for proposals, 50 projects were selected, covering almost all educational domains in Swiss higher education institutions. The second phase (consolidation phase) built further on the gained experiences and meant a significant shift in the implementation strategy.

The main innovation has been the goal of developing elearning competence centres (CCSP) in each Swiss HEI, and reinforcing existing structures. The Consolidation Program involves four main components: (1) competence, service and production centres in each university; (2) use and maintenance of projects developed; (3) new course development and (4) services for universities and coordination.

Goals	The overall policy goals, as stated in the Research and Higher Education Message 2000-2003 of the Federal government, were to promote the cooperation between HEI, to promote innovation in pedagogical methods and to produce high-quality educational materials. Moreover, the programme aimed to contribute to modernising and improving the quality of higher education in Switzerland, to promote the development of eLearning in educational institutions and to integrate these developments into curricula at institutes of higher education using the concept of blended learning.
Policy rationale	Swiss Virtual Campus is a federal programme which was set up in the spirit of the 90s to promote the application of new technology in information and communication (NTIC). This idea was predominantly implemented using the strategy implemented by the Swiss Federal Council which encouraged the development of information and communication technology in the Swiss educational system, particularly at the level of higher education. The programme was part of the activities managed by the SUC under the University Act in order to promote cooperation and modernization of the Swiss higher education system.
Strategy	There was a significant shift in the implementation strategy, taking also into account the goal stated in the multiyear planning of Swiss universities of the Rector's Conference (CRUS) to have at least 10% of the courses supported by new educational technologies. Two calls for proposals for new projects were launched in 2004 and 2005. While the general principles were the same as in the impulse phase, the new calls entailed a number of significant changes: - the blended learning approach was officially endorsed (instead of developing completely online modules); - the CCSP of the leading house was charged with the production of the elearning modules in collaboration with the project leader and had to be integrated from the beginning in the project
Roles and support	The Swiss Virtual Campus Consolidation Programme (2004-2007) gives funding for the use and maintenance of courses of recognised quality. The Competence-, Service- and Production Centres (CCSP) will be responsible for the maintenance funds, in close collaboration with the project leader and partners. Edutech is a mandate of the Swiss Virtual Campus programme. Its role is to support the SVC in technological matters. Other activities include information and communication services, technology watch, organizing courses, etc. Edutech is hosted at Centre NTE / University of Fribourg.
Teacher training	Guidelines for educators were developed in the framework of the Swiss Virtual Campus. Educators were also involved in the creation of online courses, but no specific training is provided through the platform.
Evalu-ation	At the beginning of January 2003, the Conference Univesitaire Suisse (CUS) mandate the Centre de formation continue de l'Université de Berne (KWB) to evaluate the CVS impulse programme. A set of questions were used to structure the evaluation which took place over a period of sixteen months. Evaluation of SVC was carried out in 2008 by Professor Robin Mason of the UK Open University.
Outputs	The Swiss Virtual Campus, in the Impulse as well as the Consolidation Programme, resulted in many calls for proposals where HEIs applied for funding. While the Impulse Programme gave out 50 projects approved during 2000-2003, the Consolidation Programme worth approximately 1 Mio. EUR, 38 projects were financed in the Consolidation Programme worth approx. 9 Mio EUR, as well as 76 projects in phase for Swiss Virtual Campus projects, e.g. new development of online courses. Today a 112 online courses are hosted on the Swiss Virtual Campus.
Outcomes	The evaluation of the impulse phase showed that the programme had been successful in promoting new initiatives for the introduction of ICT in higher education and had created a favourable environment for experimenting with e-learning in higher education; moreover, specific competences were developed and many of the realised educational modules were evaluated as being innovative and of quite good quality.

FATIH (Turkey)

Fırsatları Artırma ve Teknolojiyi İyileştirme Hareketi (FATİH)

Country(ies)	Turkey
Time-frame	2010-2015 (60 months)
Geographical scope	National
Education level(s)	Secondary education; Primary education
Learning form	Face-to-face / classroom
Technology focus	Laptops, netbooks, tablets etc; Digital textbooks
Implementation phase	Pilot
Impact areas	Enhanced technological infrastructure and access; Improving digital literacy / competences of learners
Funding	Public funding
Funding source	Transportation Ministry's Universal Service Budget
Budget (Euros)	1 billion EUR (TL 3 billion)
Implementing body	Ministry of National Education
Technology partner	The pilot stage for the tablets was conducted with Samsung and General Mobile via the State Materials Office
Source /website	http://fatihprojesi.meb.gov.tr

Key features	With the initiation of the FATİH project, classes will receive smart boards, students will receive tablet computers and classes will be enriched with the use of e-books. The project has been completely designed by Turkish engineers. All state schools spanning from preschools all the way to high school level will receive a total of 620,000 smart boards, while tablet computers will be distributed to 17 million students and approximately one million teachers and administrators.
Goals	The main objective is to integrate state-of-the-art computer technology into Turkey's public education system. It is aimed to provide ICT equipment to classes in order to achieve the ICT supported teaching until the end of 2013 in related to the goals that take place in the Strategy Document of the Information Society, the Development Report, the Strategy Plan of our Ministry and The Policy Report of ICT that have described all activities of Turkey in the process of being an information society and have been formed within the scope of the e-transformation of Turkey.
Policy rationale	The goal has been declared as "Information and Communication Technologies will be one of the main instruments of the education process and it will also make teachers and students use these technologies effectively" in the Strategy of Information Society that has been prepared by the State Planning Organization (2006-2010). In this context, it has been wished that complement of the infrastructure of the information and communication technologies in the institutions in which Formal Education and Informal Education, improving competency of the students' usage of the information and communication technologies in these institutions, and development of the programs that are supported by the information and communication technologies.

Strategy	According to government plans, teachers will be able to instantly access any document around the world they may need for their class, projecting it on the interactive smart board. The project will also facilitate long-distance learning programs while encouraging a gradual transition to e-textbooks and other electronic-learning materials for each class. In the second component of the project, there will be 110 in-service training centers connected to each other through a network that covers Turkey's 81 provinces for educator training purposes, where all the participants will able to interact with each other live through teleconferencing. The last component is the establishment of a secure and appropriate network infrastructure for all the schools across the country.
Roles and support	This project is being conducted by the Ministry of National Education and supported by the Ministry of Transportation and Maritime Affairs and Communications
Teacher training	Fatih Project provided to the class hardware infrastructure aimed to provide educational guidelines and IT to harmonized teacher guide books for education effectively use skills through about 770,000 teachers for face-to-face and distance education for improvements. Various teacher trainings were organises, including Fatih Project - Preparatory Training (25 Hours): in training teachers who lack knowledge of basic IT proficiency. Therefore, a working group consisting of teachers working in the provinces "Fatih Project Preparatory Education" was created. It was concluded that in-service training given in FATIH project was insufficient. Participants stated that general information regarding the project was given during in-service training and detailed information was not given about how the tablet computers could be used.
Evaluation	An early evaluation of the project was carried out by Educational Consultancy and Research Center (EDAM) with researchers from Ondokuz Mayıs and Amasya University. Data was obtained in 4 stages: classroom visits to observe the use of tablets and laptops in the school premises, semi-structured interviews, a questionnaire developed for the whole pilot study by 20 researchers from colleges of education and semi-structured focus group meetings in each of the 44 participating cities. Participants of the study were 181 teachers and 918 students from 11 pilot schools in İzmir, Kayseri, Samsun and Yozgat provinces.
Outputs	High schools around the country have been equipped with smart boards, and 12,800 tablet PCs have been distributed in 52 schools in 17 provinces within a pilot program. Only 10 percent of the project has been implemented so far. According to data from the Education Ministry, out of the 55,224 schools that were part of the project, only 3,362 schools, or 6 percent, had the technical infrastructure for the project to be implemented. Interactive smart boards that were to be installed in 620,000 classrooms across the country could only be installed in 84,921 classrooms. However, in addition to infrastructure issues, the tenders for the purchase of smart boards and tablet PCs were marred by claims of corruption and some were cancelled by the Council of State, leading to additional delays.
Outcomes	Teachers say that the project has been put into practice at schools way too slow. In a statement, Education Minister Nabi Avcı acknowledged that there had been a delay in concluding the FATİH project; however, he said the government was determined to go ahead with it. The tablets that were delivered to some students as part of the FATİH project were to interact with the smart boards in the classrooms. This connection was to make the job of the teachers easier. But this did not turn out to be the case, as in most of the classrooms the necessary connection between the tablets and the smart boards is lacking, and so the students who have received tablets use them to play computer games rather than for educational purposes.
Impacts	One of the positive outcomes of the project is the increase of communication and collaboration especially in technical issues between teachers and students. With the integration of IBs into education, not all but most of the classrooms experienced a more joyful and audio-visual lessons as one of the most important constructive consequences of the project.

Connecting for Equality (Argentina)

Conectar Igualdad

Country(ies)	Argentina
Time-frame	2010-2013
Geographical scope	National
Education level(s)	Secondary education; Vocational education and training
Learning form	Blended learning
Technology focus	Laptops, netbooks, tablets etc; Education software / applications
Implementation phase	Full-scale
Impact areas	Digital inclusion / reversing the digital divide; Enhanced technological infrastructure and access
Funding	Public funding
Funding source	Comité Ejecutivo es presidido el Director Ejecutivo de la Administración Nacional de la Seguridad Social (ANSES)
Implementing body	Comité Ejecutivo es presidido el Director Ejecutivo de la Administración Nacional de la Seguridad Social (ANSES)
Technology partner	Huayra operating system; efatura de Gabinete de Ministros, del Ministerio de Educación y del Ministerio de Planificación Federal, Inversión Pública y Servicios
Related documents	http://scripts.minplan.gob.ar/octopus/archivos.php?file=2802
Source /website	http://www.conectarigualdad.gob.ar/

Key features	Conectar Igualdad was created in April 2010 by presidential decree to restore and enhance the public school and reduce the digital, educational and social gaps in the country. As a policy of digital inclusion at the federal level, the programme equipped students and teachers of secondary schools, special education and teacher training institutes of state management with more than 3,5 million netbooks in between 2010-2013. The programme calls for the use of netbooks at school and in the homes of pupils and teachers, thereby impacting on the daily lives of every family and the most diverse communities in Argentina. Connecting for Equality intends to work to achieve literacy in new information and communications technology (ICT), with the possibility of a democratic access to technological resources and information regardless of social group, economic or company the most geographies, rural and urban.
Goals	1- Promote equal opportunities for all young people in the country, by providing a tool to bridge the digital divide 2- Build a universal digital inclusion policy at the federal level 3- Improve teaching and learning through changing ways of working in the classroom and in school through the use of ICT 4- Promote the strengthening of teacher training for the use of ICT in the classroom

Policy rationale	The policy initiative is embedded in the "National Telecommunication Plan Argentina Connected" which defines a broad strategy to improve the ICT infrastructure, for example, by extending digital broadband connections, and improve connectivity between urban and rural parts of Argentina.
Strategy	The implementation involves the participation of several ministries and departments incl. the President's Office, the National Social Security Administration (ANSES), the Ministry of Education's Office, the Chief of the Cabinet of Ministers and the Ministry of Federal Planning Public Investment and Services.
Roles and support	This is a state policy implemented jointly by President's Office, the National Social Security Administration (ANSES), the Ministry of Education's Office, the Chief of the Cabinet of Ministers and the Ministry of Federal Planning Public Investment and Services.This is a state policy implemented jointly by President's Office, the National Social Security Administration (ANSES), the Ministry of Education's Office, the Chief of the Cabinet of Ministers and the Ministry of Federal Planning Public Investment and Services.
Teacher training	An Executive Committee was set up chaired by the National Administration of Social Security (ANSES) comprising representatives from involved institutions and departments. The body set up guidelines for implementing the programme as well as a work plan for teacher training implementation. Through Educ.ar Portal and the Ministry of National Education, provides a range of different initiatives of teacher training through its virtual platforms. Meanwhile, under the agreements established in the Federal Council of Education, each of the provincial ministries has launched classroom training programmes that cover the entire territory of the country.
Evaluation	Evaluation and monitoring is carried out through a combined study project of the Ministry of Education, the Instituto de Estudios Universitarios Universidad, the Nacional de Rosario in co-operation with education departments of regional universities. The evaluation report is comprehensive and methodologically complex.
Outputs	As a policy of digital inclusion at the federal level, Connect Equality tour the country between 2010 and 2013 3,500,000 distributing laptops to all students and teachers of secondary schools, special education and teacher training institutes of state management. Since 2010, the educ.ar portal has participated from the Ministry of Education's Office of Equal Connect program through the production of 20 thousand objects of digital learning for teachers and students, distribution and training teachers and students in the Using these through various projects and strategies.
Outcomes	Domestic production of laptops increased between 2010 and 2011 348%, going from 289,654 to 1,300,000 units produced. Of the total produced in 2011, 46% was made in the Technological Pole of Tierra del Fuego (TDF).

Digital Education Revolution (Australia)

Digital Education Revolution (DER)

Country(ies)	Australia
Time-frame	2008-2015 (84 months)
Geographical scope	National
Education level(s)	Secondary education (Years 9–12)
Learning form	Blended learning
Technology focus	Laptops, netbooks, tablets etc
Implementation phase	Full-scale
Impact areas	Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities); Enhanced technological infrastructure and access
Funding	Public funding
Funding source	Australian Government
Budget (Euros)	1.79 billion Euros
Implementing body	Australian Government
Technology partner	National Secondary School Computer Fund (NSSCF)
Related documents	http://www.federalfinancialrelations.gov.au/content/npa/education/digital_education_revolution/national_partnership.pdf
Source /website	https://docs.education.gov.au/category/deewr-program-group/digital-education-revolution

Key features	Australia's DER programme demonstrates the power of technology to transform education. The ultimate goal of the DER programme is to prepare every Australian student to live and work in the digital world. To that end, the Commonwealth of Australia committed AUD 2.4 billion over seven years to help schools across the country integrate technology into the classroom. The programme has operated flexibly and schools have been able to purchase a mix of devices, including netbooks, laptops, tablet computing devices and desktop computers as well as leadership, professional development and digital resources across all Australian education systems and sectors.
Goals	1- The ultimate goal of the DER programme is to prepare every Australian student to live and work in the digital world. 2- Deliver the benefits of ICT to rural and geographically remote schools. 3- Help teachers learn to integrate ICT into the classroom. 4- Develop online tools and resources for students, parents and teachers.
Policy rationale	This policy provides direction to schools for the use of laptops provided as part of the Laptops for Learning program. This program is funded under the Commonwealth Government's National Secondary Schools Computer Fund as part of the DER.

Strategy	The DER program aimed at taking schools from a variable base to a situation where there is equitable access to digital resources and tools. Benefits will be progressively delivered and priorities will change during the life of the program. For example, the priority early in the program will be to help equip schools most in need of computers. Later in the program the priority will shift to accessing and enabling use of digital resources and online activities in everyday learning and teaching. Another early priority will be to foster eLearning plans in schools that will ensure every school is adequately prepared to install, operate and take advantage of the digital revolution.
Roles and support	The Department of Education, Employment and Workplace Relations was given responsibility for implementing the Government's DER program policy. A comprehensive partnership agreement was put in place involving the Commonwealth (state government) and the States and Territories. The Australian Information and Communications Technology in Education (AICTEC) provided advisory services in a several areas. The National Secondary School Computer Fund provided laptops to all public high school students in Years 9-12.
Teacher training	Initially, resources for training educators on provided IT equipment were foreseen
Evaluation	Several evaluation and monitoring mechanisms incl. NSSCF Progress Reports (the source of data identified for most of the identified indicators), the Staff in Australia's Schools survey, the Schools Broadband Connectivity survey, and the SEMIS DER application and reporting data. In addition, a mid-programme review as well as a final programme review are carried out. The evaluations rely on collected qualitative data through synthesising information presented in NSSCF Progress Reports and engagement of stakeholders in interviews, workshops and focus groups across jurisdictions. The partnership document laid out performance benchmarks and indicative actions to measure progress ino each objective of the DER.
Outputs	Education authorities have reported solid progress to date in the installation of computers purchased using NSSCF funding, indicating around 268 000 computers were installed for student use in 2,701 schools nationwide. High-speed broadband connectivity has been extended to metropolitan and regional country schools. More than 15,000 educators have taken part in the Intel Teach Program to learn to integrate technology into instruction. Australia's national curriculum is being reformed to incorporate essential 21st-century skills, including digital literacy.
Outcomes	Early indications from the Australian National Audit Office (ANAO) survey of school principals regarding the impact of the NSSCF on teaching and learning are broadly positive. School principals noted some encouraging changes in students' access and use of computers, engagement, and preparation for a digital world. There is also evidence from education authorities that the NSSCF has provided a catalyst for the modernisation and integration of ICT infrastructure in the secondary schooling sector. Of the parents who responded to the survey, 72% agreed or strongly agreed that using the laptops in classes had a positive effect on their child's engagement in learning. Amidst the global financial crisis financing issues were reported which led the government to not complete all components of the programme over issues with some state territories.
Impacts	Australia's DER program, combined with a variety of state and regional initiatives, has helped the country transform its education system. The country is successfully integrating technology into classrooms across the country, and giving all students access to the 21st-century skills they need to succeed

eCampusOntario.ca (Canada)

Ontario Online - Centre of Excellence for Online Learning

Country(ies)	Canada (Ontario)
Time-frame	2015-2020
Geographical scope	Regional
Education level(s)	Tertiary; Post-secondary non-tertiary education
Learning form	Online media / platform
Digital technology & delivery channel	MOOCs / e-learning
Implementation phase	Mainstream
Impact areas	Increase the use of modern digital learning tools; Enhanced use of existing technological infrastructure
Funding	Public funding
Funding source	Government of Ontario has provided special funding; Shared Online Course Fund
Budget (Euros)	51 million EUR
Implementing body / initiator	Ontario Ministry of Education, Colleges and Universities, Ontario Online Learning Consortium (OOLC)
Source (website of the initiative)	eCampusOntario.ca

Key features	Ontario is creating a Centre of Excellence for Online Learning to give students across the province one window of access to high-quality, transferable online courses, while reducing course duplication. To launch in time for the 2015-16 school year, Ontario Online will improve collaboration between colleges and universities by minimizing duplication -- allowing students to take the same, centralized online course. The online platform will also give students the flexibility to receive high quality instruction wherever and whenever works best for them. Next to the course hub, an instruction hub comprising best practices, research and data on online teaching as well as support hub incl. academic and technical assistance to students, instructors, and institutions. eCampusOntario.ca was created as a portal for learners to find online and mostly online courses—through browsing, searching by keyword, or filtering by institution and delivery format. Course details include links to information about scheduling, tuition and fees, instructors, and information about how to get registered and to seek credit transfer. Previously identified course equivalencies are also listed where available. In addition, students can search based on a specific course they need credit for to find available online options at other institutions.
Goals	The objective is to improve collaboration between colleges and universities by minimizing duplication -- allowing students to take the same, centralized online course. The online platform will also give students the flexibility to receive high quality instruction wherever and whenever works best for them.
Policy rationale	Supporting a world-class postsecondary education system that is a leader in innovation and online learning is part of the Ontario government's economic plan to invest in people, build modern infrastructure, and support a dynamic and innovative business climate. In 2010, Ontario colleges and universities offered 18,000 online courses and had a half million online course registrations. The intention is to foster innovation, collaboration, and excellence on behalf of Ontario students.

Strategy	The new collaborative Centre of Excellence, dubbed Ontario Online, will be run by colleges and universities as an independent not-for-profit enterprise, and aims to increase options for students to learn online and allow schools to share resources and expertise in online teaching. A steering committee of representative from colleges and universities as well as online learning experts will develop a plan to create the centre. While it is being set up, $8.5-million will be available through a Shared Online Course Fund to develop or redesign "flagship courses" to be ready for launch across multiple institutions by 2015-16. In addition to the course hub, the centre will have dedicated arms for sharing knowledge between schools and for supporting students and professors in developing online learning. The initial set of resources was identified by both the college and university sectors using the following methodologies: Resources were solicited by email invitations sent to Directors of all University Teaching and Learning Centres in Ontario. Invitations were also sent to expert faculty members who attended the 2015 Learning Xchange hosted by Teaching and Learning Canada, a think tank group that met at McMaster University in July 2015. Additionally, the Educational Technology Committee (ETC) solicited input from all 24 colleges and collaborated with experts from college teaching and learning centres to curate resources selected to support faculty developing and teaching online courses.
Roles and support	Public colleges and universities will provide the courses, a newly established non-for-profit organisation will manage the platform / initiative. Ontario Online Learning Consortium (OOLC), a not-for-profit corporation whose membership is composed of all publicly-funded colleges and universities in Ontario. The OOLC is governed by a Board of Directors with leadership from two Board Chairs. Operations are headed by two Executive Directors. Funding for OOLC and the eCampusOntario initiative comes from the Government of Ontario. eCampus Ontario, the administrator of the web portal, is a non-profit collaborative centre of excellence in technology-enabled learning and is governed by a board of directors made up of senior administrators from colleges and universities, faculty experts in online learning, students and members of the public.
Teacher training	No direct training has been identified or foreseen; yet a wide variety of resources are available to assist faculty, instructors, and online learning specialists who may be designing, developing, or teaching online and blended courses. Teaching resources range from journal articles and book chapters to videos, blogs, and content modules that can be used in an instructor's own course. The goal of the eCampusOntario support hub for educators is to create a virtual space to access and share a wide variety of resources relating to online and blended learning.
Outputs	Post-secondary students will have access to a centralised, user-friendly e-learning hub that gives access to more than 13,000 online courses offered at Ontario's post-secondary institutions. This also includes access to 277 new and redesigned courses with transferable credits between participating institutions.
Outcomes	The Digital School programme has resulted in the establishment of strong open standards for educational resources in Poland - funded within its scope - including the e-textbooks. According to Śliwowski and Grodecka, the Digital School programme could be considered as a practice example, which serves as inspiration in the field of open education and educational resources. The open standards used for the educational content do not only implement the provisions of the UNESCO Declaration and the European Commission's "Opening Up Education" initiative, they also go beyond the minimal standards laid out by the UNESCO Paris Declaration on open educational resources, in terms of its scale and support for open educational resources at the national level.
Impacts	While research have been carried on the programme's impacts on learning outcomes and educational performance, little difference was yet found between the participating schools and those outside the programme. As the programme is only implemented recently - and based on long-term objectives - it is still too early to assess the wider impacts and perspectives of the programme.

1BestariNet (Malaysia)

1BestariNet - Kementerian Pendidikan

Country(ies)	Malaysia
Time-frame	2011-2014 (30 months)
Geographical scope	National
Education level(s)	Primary education Secondary education
Learning form	Online media / platform
Digital technology & delivery channel	Mobile / internet connectivity Virtual learning environment
Implementation phase	Mainstream
Impact areas	Enhanced technological infrastructure and access Digital inclusion / reversing the digital divide
Funding	Public funding
Funding source	National Ministry of Education
Budget (Euros)	€ 958.643,000 (4 billion RM)
Implementing body	Malaysian Ministry of Education (MOE)
Technology partner	Xchanging Malaysia (main partner); Frogasia; YTL Communications Sdn Bhd (technology partners); Google (authentication)
Related documents	https://www.google.be/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0CCEQFjABahUKEwj55sjKirPIAhWkSXIKHTuIDI8&url=https%3A%2F%2Fjpt.mohe.gov.my%2Fcorporate%2FPPPM%2520(PT)%2F4.%2520Executive%2520Summary%2520PPPM%25202015-2025.pdf&usg=AFQjCNEcpOxN30pU7kgvQONi4QPHgvvYgg
Source/website	http://1bestarinet.net/

Key features	1Bestarinet is aims to connect all of Malaysia's primary and secondary schools to an internet-based (wireless 4G) Virtual Learning Environment (VLE). Overall, it connects 10,000 public schools, 5.5 million students, 4.5 million parents and 500,000 teachers through Frog's VLE, a British learning technology provider. The initiative was officially implemented in 2014; however, not all of the 10,000 schools have been able to access the platform by November 2014 due to implementation delays. 1Bestarinet was awarded with the 'Cloud Adoption in School Education' at the South East Education Summit Award in 2014.
Goals	The vision of 1BestariNet is through 4G internet access and VLE to: - transform education; - bridge the digital divide between rural and urban students; - prepare the Malaysian students for the needs of the 21st century; - enhance student outcomes and learning processes.
Policy rationale	The initiative is based on the Malaysia Education Blueprint 2013-2015 seeking to better prepare Malaysia's children for the needs of the 21st century. The strategy defines 10 overarching education "shifts" with desired outcomes and indicators incl. (1) Holistic, Entrepreneurial and Balanced Graduates; (2) Talent Excellence; (3) Nation of Lifelong Learners; (4) Quality Technical and Vocational Education and Training (TVET) Graduates; (5) Financial Sustainability; (6) Empowered Governance; (7) Innovation Ecosystem; (8) Global Prominence; (9) Globalised Online Learning and (10) Transformed Higher Education Delivery.

Strategy	The Malaysian Education Blueprint was subject to a comprehensive stakeholder consultation with more than 100 stakeholder groups providing input and thousands of individuals engaged including internationally renowned experts. The on-the-ground implementation of the project was carried out by means of an open tendering process in 2011. The Economic Council estimated the implementation period of 1BestariNet at 15 years for a total of RM4.465 billion (€ 956 Mio.), rolled in three 5-year phases.
Roles and support	A number of technology providers are contracted and involved as part of the project, including YTL communications, Xchanging Malaysia, FrogAsia and Google. The contract with YTL includes the responsibility to provide devices to utilize internet access in class-rooms. YTL is deploying Google Chromebooks by Acer and Samsung in the Malaysian public schools. The Chromebooks comes with Google Apps for Education and a cloud platform tailored for collaborative web-based learning, rather than the normal Microsoft Windows programmes. The building of telecommunications towers was similarly carried out by YTL. They are built near schools and do not only provide internet access at schools, but also commercial internet connectivity through 4G broadband services to residents in the surrounding community. The VLE and customised cloud-platform is delivered and implemented by FrogAsia, chosen by YTL, which works hand-in-hand with local providers on developing the platform.
Teacher training	A group of technology officers who work in a supporting function are responsible for training and supporting teachers in the use of the online tools, and they also oversee the functioning of the VLE at school-level. The 1BestariNet project also supports digital skills and competences of teachers through an internet and cloud-based approach to delivery. The online instructional tool aims to provide a pedagogical practice that is interactive and engaging and which supports an ongoing learning workflow. Only recently, the MoE launched the 1BestariNet Teacher Awards 2015 in order to recognise, reward and further encourage the work of teachers in integrating ICT in the classroom. Given the detected lack of teachers' preparedness to apply ICT in the classroom, mostly a result of insufficient ICT training, this development could be interpreted as a step in the direction to addressing some of the pitfalls of 1Bestarinet's implementation.
Evaluation	The initiative was subject to an auditing carried out by the Finance Ministry, the Auditor General's report (2013). The report assessed the initiative on the basis of a survey of parents, educators and students. The report came to the conclusion that 1BestariNet failed to achieve its objective to provide bandwidth connectivity infrastructure and VLE to 10,000 schools within 2.5 years (until June 2014).
Outputs	In November 2014 the initiative connected close to 9000 primary and secondary public schools in Malaysia with high-speed 4G Internet access and a Virtual Learning Environment; 5.5 million children in Malaysia; 10 million potential users; 500,000 teachers and 4.5 million parents.
Outcomes	According to the online newspaper Malaysian Insider usage of the Virtual Learning Environment (VLE) by teachers, students and parents is below expectations ranging between 0.01% and 4.69% only. According to this information source, daily utilisation of the e-learning by students was found to be between 0.17% and 0.63%, while usage by teachers was from 0.57% to 4.69%. The usage of the e-learning by parents was the lowest, at between 0.01% and 0.03%. In the third series of the report released in Parliament today, the Auditor General's report attributed the low usage to lack of clear policy and monitoring, lack of exposure to the benefits of VLE as well as a lack of teaching aids, such as projectors and laptops. Data for the week of 5 to 11 September 2014 shows that only 137,237 students logged into the VLE system. Out of this number, only 76,096 or 55 per cent actually used it for more than 30 minutes that week. This averages out to about 15 students per school with the number of students who actually used the system for more than 30 minutes a week averages at 9 students per school.
Impacts	A section in the Auditor General's Report of 2013 is dedicated to the 1BestariNet initiative as referred to in the above outcomes section; however, real impacts in terms of improved quality of education are not made available, most likely as such impact assessment would need a separate impact assessment study to be carried out a few years after the end of the implementation period.

e-learning Planning Framework (New Zealand)

e-learning Planning Framework	
Country(ies)	New Zealand
Time-frame	2012-ongoing
Geographical scope	National
Education level(s)	Primary education; Secondary education
Learning form	Online media / platform
Technology focus	Web 2.0
Implementation phase	Full-scale
Impact areas	Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities); Enhanced pedagogical quality
Funding	Public funding
Implementing body	Ministry of Education
Technology partner	Te Toi Tupu consortium; Cyclone
Related documents	http://www.vln.school.nz/file/download/97323
Source /website	http://elearning.tki.org.nz/Professional-learning/e-Learning-Planning-Framework
Key features	The e-Learning Planning Framework (eLPF/MMeLPF) is a tool seeking to assist teachers and schools in New Zealand to reflect and evaluate on their e-learning capability. It is expected to enable and support regular self-review, including subsequent improvements of e-learning skills and knowledge. Specifically, the e-Learning Planning Framework provides teachers and schools with: 1) a self-review tool for evidence gathering of practice; 2) a road map for supporting e-learning capability; 3) an evaluation tool for the effectiveness of e-learning programmes; and 4) resources and services to support schools in building capability. The framework can be used to identify gaps for capabilities and thereby guide schools' decisions on resource allocation, priorities etc. A synthesis of international research and a range of e-capability frameworks form the basis of the dimensions within the eLPF/MMeLPF tool.

Goals	The eLPF/MMeLPF tool seeks to support regular self-reviews or peer reviews of e-learning skills and knowledge in order to assess existing e-learning capabilities and to identify priority areas for the further improvement of capabilities.
Policy rationale	e-Learning Planning Framework (eLPF/MMeLPF) is part of a broad range of government initiatives introduced to facilitate and support the use of digital technologies in schools. In addition to the e-Learning Planning Framework, the Ministry of Education, in its endeavours to integrate digital technologies in education for all state-funded schools and for Māori-medium kura, has rolled-out new broadband infrastructure, established the N4L Managed Network, the School Network Upgrade Project (SNUP), set up a new Connected Learning Advisory supporting schools on the use of digital technology and provided funding for laptops and operating software for teachers. The initiatives are intended to support teachers' capability and confidence with digital learning practices.
Strategy	Prior to its implementation, the 2011 draft e-Learning Planning Framework (eLPF/MMeLPF) for the English medium primary and secondary education was part of a consultation process. A separate consultation process concerning the Māori-medium schools was carried out in 2012. The feedback from stakeholders on the educational needs for an e-learning platform framework (eLPF/MMeLPF), including considerations on design, was received during 2011 and 2012.
Roles and support	The consultation process followed a three-level approach, with respect to stakeholder involvement. First, an expert group offered high-level oversight on the development and process of setting up the framework (from June 2011). Second, a focus group provided advice and feedback on the development, priority domains and use of the framework (from August 2011). Third, consultation was also carried out online and face-to-face with all interested parties, through the Virtual Learning Network (VLN) and Enabling eLearning website (from September 2011).
Evaluation	As part of the Ministry of Education´s broader e-learning PLD programme, the e-Learning Planning Framework was reviewed during 2013 (both the English and Māori medium) through the initiation of a new consultation process for interested stakeholder. It was done as a response to the 21st Century Reference Group's recommendations and the Ministry of Education´s Statement of Intent 2013 – 2017. The scope of the framework review focused on the alignment of the English and Māori-medium frameworks and an integration of digital literacy throughout the framework. The framework review in 2013 initiated another consultation process, which both involved the original framework development reference groups and stakeholders from different parts of the e-learning professional development programme.

Third Masterplan for ICT in education (Singapore)

Third Masterplan for ICT in education

Country(ies)	Singapore
Time-frame	2009-2014
Geographical scope	National
Education level(s)	Primary education; Secondary education
Learning form	Blended learning
Technology focus	Mobile / internet connectivity; Laptops, netbooks, tablets etc
Implementation phase	Mainstream
Impact areas	Increase the use of modern digital learning tools; Improve digital literacy / competences of learners
Funding	Public funding
Funding source	Ministry of Education
Implementing body	Ministry of Education, Technologies for Learning Branch, Educational Technology Division
Source /website	http://ictconnection.moe.edu.sg/masterplan-4/our-ict-journey/masterplan-3/vision-and-goals

Key features	The mp3 is a national level strategy to include ICT in education throughout all countries, covering all 362 schools in Singapore involving a wide range of actors and stakeholders – including industry and other service providers. The intent of mp3 is to transform teaching and learning in the mainstream. The key focus is on self-directed learning (SDL) and collaborative learning (CoL) through the effective use of ICT.
Goals	1. To strengthen integration of ICT in the curriculum, pedagogy and assessment to enhance learning and develop competencies for the 21st century; 2. To provide differentiated professional development that is more practice-based and models how ICT can be effectively used to help students learn better; 3. To improve the sharing of best practices and successful innovations; and 4. To enhance ICT provisions in schools to support the implementation of mp3.
Policy rationale	The Masterplans for ICT in Education drive the use of ICT in education. The underlying philosophy of the Masterplans is that education should continually anticipate the needs of the future and prepare pupils to meet those needs. The first Masterplan for ICT in Education (1997 — 2002) laid a strong foundation for schools to harness ICT, particularly in the provision of basic ICT infrastructure and in equipping teachers with a basic level of ICT integration competency, which achieved a widespread acceptance for its use in education. The second Masterplan for ICT in Education (2003 — 2008) built on this foundation to strive for an effective and pervasive use of ICT in education by, for example, strengthening the integration of ICT into the curriculum, establishing baseline ICT standards for students, and seeding innovative use of ICT among schools.

Strategy	The mp3 is a national initiative at system level, building on the mp1 (focused on equipping schools with the basic ICT infrastructure) and mp2 (focused on effective and pervasive use of ICT in education). mp3's impact spans service and process changes; the innovation capacity building of agents across all level of education system is probably the most important aspect of the mp3. All 362 schools in Singapore participate.
Roles	The mp3 is implemented in a co-operation between the Ministry of Education (MOE) and representatives from the National Institute of Education as well as the Masterplan's Project Office. The National Institute of Education is leading the evaluation and monitoring.
Teacher training	Teachers should be encouraged to widen their repertoire of ICT-mediated pedagogies, such as the use of reflection tools and knowledge-building tools, and explore the potential of educational games, multimedia editing and immersive virtual environments. Teachers' understanding of SDL and CoL could be further enhanced so that they can facilitate development of 21st century skills in their students. For example, they can help students to set learning goals and develop strategies to monitor their own progress, or to develop group process skills and facilitating collaborative meaning-making to deepen their understanding of content knowledge.
Evaluation	To monitor the progress of mp3, a 5-year longitudinal evaluation study was commissioned by MOE and a tripartite collaborative team comprising staff from the National Institute of Education and MOE's Educational Technology Division and Masterplan Project Office was established. The mp3 was subject to a baseline study in 2009 and a mid-term evaluation study published in 2013, both carried out by the National Education Institute in co-operation with the Nanyang Technological University. Both studies were undertaken by means of a survey of 8217 students and 4835 teachers, complemented by case studies of 12 schools.
Outcomes	Outcomes varied across school levels, suggesting that the nature of learning activities and students' needs could be different at different levels. For example, primary school students engaged in SDL more frequently, whereas JC students engaged in CoL more frequently. Thus, a differentiated approach might be necessary when providing support at different school levels. Students' self-reported ICT competencies show that most students have achieved baseline ICT competency but there is room for improvement; for example, in the use of reflection tools or spreadsheet programs like Microsoft Excel. More effort could be invested in sharing research findings on the pedagogical and practical applications of these tools.
Impacts	The 2011 interim evaluation study indicated some good progress in terms of mp3implementation in Singapore schools, in particularly with regard to teacher's roles in mp3 there are encouraging findings in terms of teachers' perception and practices. As a result, there is hope that in subsequent years a greater extent of good practices and enhanced understanding of self-directed (SDL) and collaborative learning (CoL) will exist among teachers. In terms of students' competencies, there are still rooms for improvement. Given progress from teachers in terms of integrating ICT into teaching and learning, improvements in students' SDL and CoL competencies with ICT use remain optimistic.

Vodacom Mobile Education Programme (South Africa)

Vodacom Mobile Education Programme

Country(ies)	South Africa
Time-frame	2011-ongoing
Geographical scope	National
Education level(s)	Secondary education
Learning form	Blended learning
Technology focus	Mobile / internet connectivity; Laptops, netbooks, tablets etc
Implementation phase	Pilot
Impact areas	Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities); Enhanced technological infrastructure and access
Funding	Mix of public/private funding
Funding source	Vodacom Foundation
Implementing body	Vodacom
Technology partner	Department of Basic Education (DBE), Microsoft, Cisco, Intel and Mindset
Source /website	http://digitalclassroom.co.za/

Key features	The Vodacom Mobile Education Programme has four components: the Vodacom Teacher Centres, the web-based Vodacom Digital Classroom education portal, the Vodacom Mobile Education Virtual Private Network and the Vodacom Mobile Education Training Programme. The Vodacom Mobile Education Programme is a nationwide teacher development initiative in South Africa to improve the quality of instruction in a wide range of subjects at every level, with particular emphasis on Mathematics, Mathematical Literacy and Physical Science in Grades 10 to 12. The teacher professional development training focuses on ICT Literacy, as well as the effective use and integration of digital content in the classroom. While the Vodacom Techer Centres, which works in close cooperation with provincial and district education officials, provide hubs for the teacher-training programme through computer classrooms and internet cafes, the web-based Vodafone Digital Classroom offers teaching materials and resources. The Virtual Private Network (VPN) has been established to connect the ICT resource centres and the participating schools and teachers to the internet, the Vodacom Digital Classroom and each other. The ICT resource centres access the network via microwave links. Vodacom collaborates with the Department of Basic education, Microsoft, Cisco, Intel and Mindset Learn to extend the reach of education with mobile technology through the Vodacom Mobile Education programme.
Goals	The programme has two objectives: 1) to use mobile technology to help the Department of Basic Education meeting its objective of ensuring that a significant number of learners have exposure to ICT; and 2) to upgrade the quality of instruction by ensuring that teachers throughout the country, both in rural and urban areas, have access to the high-quality teaching resources.

Policy rationale	The Department of Basic Education has found that South Africa has 10 000 underqualified and 20 000 unqualified teachers, who are in need of further education and training, in order to improve the quality of learning in schools. In a bid to address this need, the department has launched a nationwide training initiative to improve teachers' computer literacy. This was initially rolled out in 2011 as a Proof of Concept to one schooling district in each of South Africa's nine provinces. From early 2014, the Programme includes 40 Teacher Centres, which was further extended to 60 Teacher Centres by the end of 2014.
Strategy	Cloud computing will be used to allow teachers to access vital content, teacher-aids and resources to help deliver quality education. It uses a network of remote servers hosted on the internet to store, manage and process data, rather than a local server. All the ICT Resource Centres are connected through a virtual private network to Vodacom's head office in Midrand. This connection serves as a pipeline of information, connecting the centres, participating schools and teachers to the internet and to teacher training resources.
Roles and support	Vodacom launched its flagship Mobile Education Programme by partnering with the Department of Basic Education, Microsoft, Cisco and Mindset to empower teachers through access to ICT.
Teacher training	Each participating DBE district selects 20 schools, with four teachers per school, and identifies the learning needs of the Grade 10 to 12 teachers in these schools. The Centre for the Advancement of Science and Mathematics Education (Casme), a non-profit education development agency, provides a Mathematics and Sciences training programme that combines content knowledge and methodological and pedagogical skills, and integrates the use of ICT tools in the teaching these subjects. The programme will be hosted in the ICT resource centres and participating schools will receive a laptop with internet connectivity, an interactive whiteboard and a data projector to enable to replicate what they are learning in the classroom.
Evaluation	Trialogue was asked to support Vodacom in conducting an impact assessment and drafting a detailed case study of the mobile education programme. The evaluation was made thorough desktop review of information and a benchmarking exercise comparing the Vodacom programme to other similar projects. Monitoring and evaluation workshop with the Vodacom Foundation and its programme partners was done, which defined the 'logic model' of the programme and was followed by the design of templates and questionnaires for the site visits. Extensive stakeholder interviews were conducted, statistical analysis of school results and visited nine teacher centres (one in each province) and five schools around each centre were done. In total, seven district managers, nine centre managers, fifteen youth instructors, 45 principals and 68 teachers were interviewed. The electronic assets were viewed at each centre and school.
Outputs	A total of 40 teacher centres have been established to offer teacher development training, youth and community programmes. There have been a total of 893 schools equipped with ICT equipment. The Vodacom Foundation offers connectivity to these schools and centres, which enables them to access information. Vodacom also hosts a series of online seminars for Maths and Science teachers. Each webinar lasts for 1 hour with Maths and Science. The webinars are free for schools and centres with internet connection.
Outcomes	One of the outcomes are that rural schools is able to access to the same quality of teaching material that urban schools have and it also ensured that schools, teachers, learners and communities have access to ICT and the Internet.

Florida Virtual School (United States)

Florida Virtual School (FLVS)

Country(ies)	United States
Time-frame	1997-ongoing
Geographical scope	Regional
Education level(s)	Primary education; Secondary education
Learning form	Blended learning
Technology focus	MOOCs / e-learning; Virtual learning environment
Implementation phase	Full-scale
Impact areas	Sustainable investment, performance and efficiency of education and training systems; Improving digital literacy / competences of learners
Funding	Mix of public/private funding: Any other forms of funding (e.g. crowdfunding, membership fee, etc.)
Funding source	The school receives state tax dollars based on the number of courses students successfully complete rather than on enrolment as traditional schools do.
Budget (Euros)	155.60 million Euro
Implementing body	Board of Trustees according to Florida Statute
Source /website	https://www.flvs.net/

Key features	FLVS is the largest and oldest state-funded online school in the nation. In less than 15 years, its course enrolment has increased almost 26 times, or 2,586 percent. The FLVS is an on-line educational programme that uses the Internet to provide course instruction to students. By 2010, the number of physical students using FLVS had grown to more than 97,000. In the past few years, the school has begun forming partnerships with outside organizations in order to experiment with different approaches for delivering educational learning opportunities, for example with the University of Central Florida. FLVS provide different options: FLVS Part Time; FLVS Full Time; and FLVS Home-school Students. The different options target primary education, secondary education and kindergarten.
Goals	The main objective is to deliver a high quality, technology-based education that provides the skills and knowledge students need for success in the 21st century. The mission of the Florida Virtual School is to provide students with technology based educational opportunities to gain the knowledge and skills necessary to succeed.

Policy rationale	Florida State granted a major grant to the development of the platform in order to boost online learning at a time when the idea was still very fresh. In 2011, Florida Governor Rick Scott signed into the law the Digital Learning Now Act (2011) which requires school districts to establish virtual learning options, and authorizes customized and accelerated courses to be delivered in traditional school settings by personnel providing direct instruction through a blended virtual and physical environment. This has boosted the Florida Virtual School.
Strategy	From the moment the student becomes interested in online learning, FLVS is here to help the student and the family explore options and create an educational plan that fits the student´s unique needs. Study at any time. Learn from any place. The FLVS offers different types of courses: Part Time, Full Time, Blended Learning.
Roles and support	FLVS operates under the guidance of a gubernatorial-appointed Board of Trustees according to Florida Statute.
Teacher training	Students log into the classes, access the lessons, and work on assignments and projects. They set their own pace but must maintain active involvement to continue in the course. Florida-certified instructors are utilized, and many of them also hold national certification through the National Board of Professional Teaching Standards. In addition, all instructors have undergone an extensive interview, screening, and training process to ensure only the highest quality instructors are working with your child. Teachers guide the lessons, assess student work and provide constructive comments and grades.
Evaluation	FLVS has an ongoing process for conducting surveys of the various stakeholders it serves and uses this data to monitor organizational performance and evaluate areas for improvement. FLVS gathers feedback and data through 4 channels: annual survey of school and district personnel as well as ongoing course and teacher feedback primarily from students and secondarily from parents.
Outputs	In 2013, students completed 462,000 courses. 97 percent of students are part time at the FLVS. 1,140 educators are available every day of the week to provide instructional support to students.
Outcomes	FLVS experience has shown how valuable online learning can be for increasing opportunities, improving educational outcomes, and building self-esteem for students across Florida and around the world.

School of One (United States, New York)

School of One

Country(ies)	United States (New York)
Time-frame	2009-ongoing
Geographical scope	Local
Education level(s)	Secondary education
Learning form	Online media / platform
Technology focus	Virtual learning environment; Learning analytics tools
Implementation phase	Full-scale
Impact areas	Improving digital literacy / competences of learners; Improving learning outcomes
Funding	Mix of public/private funding
Funding source	NYC Department of Education; the US Federal Department of Education; Bill & Melinda Gates Foundation; CISCO Systems and private donations
Implementing body	New York City - Department of Education
Technology partner	iZone; New Classrooms Innovation Partners; CISCO Systems
Source /website	http://www.izonenyc.org/initiatives/school-of-one/

Key features	The initiative has the format of an ICT-enabled personalised learning programme that integrates a variety of instructional approaches, in order to create an individualised, targeted and student-centred learning experience, according to the suitable academic level for the students. Based on a mass-customisation of individual instructions on what the students should focus on, the initiative targets middle schools and math classes. Students are allocated in groups according to their skill level and learning style. On this background, they participate in a number of skill-enhancement activities, including direct instructions with teachers, online tutoring and small group work with peers. The assessment of the students are undertaken daily concerning skill development and to identify priority actions. On the basis of the assessments, a decision is made for each student regarding what to focus on for subsequent classes. The initiative provides teachers with real-time data on performances and learning: it enables teachers to better assess the suitable level of difficulty and the relevant material. It is operated mainly by the New York City Department of Education (NYC DOE). Following positive results, the concept design was initially expanded in 2010 and later set up to cover continuously more schools.
Goals	The aim of the School of One initiative is to meet the specific needs and abilities of each student through providing students with a personalised learning platform which offers effective, dynamic and targeted learning and instructions from teachers. This is intended to enable teachers to give teachers more time to focus on the quality of their education and to better prepare students for careers in the 21st century.

Policy rationale	Students enter school with completely different backgrounds and schools are facing increasingly high mobility between schools. This is particularly evident in larger cities such as New York, where schools are becoming more and more subject to fragmentation linked to immigration and urbanisation. Schools are similarly challenged on tight budgets, often leading to bigger classrooms, with implications for learning outcomes. There is also a need for improving the educational level in mathematics in the US: it is ranked well below average in mathematics according to OECD's PISA test (27th out of 34). These tendencies, together with the new opportunities offered by ICT enabled customised education, have made personalised and tailored education a solution to overcome some of the evident math problems.
Strategy	School of One was a pilot initiative that became scaled. It was initially set up as a summer school project (2009), which turned into an after-school programme, before becoming a full-year school programme focusing on middle school mathematics in selected New York schools. A design charrette was arranged in 2009 involving school governance, educators and designers in order to render possible scenarios for the program design. During year 1, the grant focussed on developing the technology platform, with a view to increase automation in the process and to ensure sufficient capacity to support a larger number of schools. During the next couple of years, it was implemented in a few selected schools, in sixth to eighth grade mathematics, while being provided with professional development and on-site support to effectively implement the platform.
Roles and support	iZone has partnered with New Classrooms Innovation Partners in providing ongoing support to teachers. iZone was set up by the NYD DOE in 2010, in order to have an dedicated support office for schools and concerning the development of personalised learning environments. New Classrooms Innovation Partners, a non-profit organisation, was founded to scale the instructional model of the School for One initiative. New Classrooms developed a new personalised learning instructional model (Teach to One) which now powers School of One schools in New York City.
Teacher training	iZone and New Classrooms Innovation Partners offers ongoing support for teachers, in order to ensure that they have the required training prior to the implementation of the program in classrooms. A program simulation is generally arranged for the teachers in Spring, which is followed up by further orientation over the summer. After the beginning of the program, communication is carried out with schools through year-long professional development and coaching sessions, and daily logistical and operational support.
Evalu-ation	The evaluation of School of One has so far mainly focused on improved test scores as the measurement of the program´s effectiveness.The initial proposed development projects for the initiative were subject to evaluation and feedback concerning further improvement of the platform, and its impacts on the students (regular periodic assessments and standardised mathematics tests are undertaken).
Outputs	It was implemented in three NYC schools during 2010-2011, to seven schools in 2012-2013 and to 15 schools during 2013-2014. Approximately 6000 students were involved by 2014 with the schools mainly located in the areas of New York City, but also Washington DC, Charlotte NC and New Jersey.
Outcomes	The New York City Department of Education´s Research and Policy Group found that participating students performed better on average compared to non-participating students, while analysing the 2010 pilot version of the platform. According to an independent assessment by the Education Development´s Center for Children and Technology, the students were found to have an average increase in the correctly answered number of test items, compared to the test scored prior to the program was launched. The Center for Technology and School Change at Teachers College, Columbia University, carried out an independent analysis, which showed that student achieved almost 1.2 years growth of math (or nearly 20 % more than the average in the US) during the 2012-2013 school year.

Teacher Development with Mobile Technologies (UNESCO)

Teacher Development with Mobile Technologies Project

Country(ies)	Mexico, Nigeria, Senegal, Pakistan
Time-frame	2012-ongoing
Geographical scope	International
Education level(s)	Primary education
Learning form	Online media / platform
Technology focus	Mobile phones / learning
Implementation phase	Pilot
Impact areas	Enhanced pedagogical quality; Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities)
Funding	Public private partnerships
Funding source	UNESCO; Nokia
Implementing body	UNESCO
Technology partner	Nokia
Source /website	http://www.unesco.org/new/en/unesco/themes/icts/m4ed/teacher-development/teacher-development-with-mobile-technologies-projects-in-mexico-nigeria-pakistan-and-senegal/

Key features	The Teacher Development with Mobile Technologies Project is launched by UNESCO in cooperation with Nokia as well as local partners to leverage mobile technology in order to build capacity of primary school teachers in four pilot countries: Mexico, Nigeria, Pakistan and Senegal. It provides classroom teachers with instruction on how to use inexpensive mobile devices as portals to both text and pedagogical advice on a large scale. The ultimate goal of this project is to support the target countries in reaching Education For All Goal 6 (Improving all aspects of the quality of education and ensuring excellence of all) through improving teacher quality in the long term. It seeks to do so through the integration of mobile technologies in national teacher professional development systems in ways that support pedagogical practice and enhance the quality of teaching. It is also related to the UNESCO Policy Guidelines on Mobile Learning, which, among others, recommend the use of subsidies for mobile data (m-rate subsidies) to promote internet access via computers in schools, libraries and household with school-aged children.
Goals	1) To enhance teachers development through the design and pilot testing of mobile phone support functions; 2) To develop short training courses, supporting resources, and interactive functions that are relevant and appropriate for the mobile phones used in the local context; 3) To provide sustainable content development by exploring the specific institutionalization mechanisms; 4) To develop a local mobile phone–based resources centre and/or portal to provide subscriptions, downloading opportunities and consultation services; 5) To explore peer coaching or mentorship programmes for selected pre-service teachers and the targeted in-service teachers.

Policy rationale	A number of mobile learning projects highlighted in the regional papers have sought to help teachers to do a difficult job better, both by supporting their day-to-day work in classrooms and by opening up new avenues for professional development. First, the availability of online content, much of it accessible via mobile devices, gives teachers and students access to a vast array of educational materials to support and supplement classroom instruction. Second, mobile phones can facilitate improved administrative communication between schools, students, teachers and parents. Third, mobile phones can enhance teachers' professional development by supporting mentoring and observation for pre-service and in-service teachers, and by allowing teachers to participate in online professional communities.
Strategy	Senegal: The implementing partners have tailored a mobile-based mathematics application developed by Nokia to match the national curriculum. The partners are now preparing and training approximately 100 teachers to use the application. The application is aiming at 8 to 11 year-old students. Pakistan: The project uses mobile technologies to deliver information and educational videos to instructors, who lack an easy access to traditional training and/or professional development. Mexico: The project supports the professional development of teachers by delivering relevant educational resources. The resources are specifically designed to increase the opportunities for language learning for indigenous students. It does so by utilizing the bilingual and multicultural pedagogical approach aligned with the national curriculum. The learning content uses "Nokia's Education Delivery" (NED) application on mobile phones. Nigeria: Participating teachers sign up for a service that sends them richly formatted messages containing education content and pedagogical advice via a platform called NokiaLife+.
Roles and support	Senegal: RESAFAD (Réseau Africain de Formation à Distance – Sénégal) and CRFPE (Centre Régionale de Formation de Personnels de l'Education de Dakar) Pakistan: UNESCO's implementation partner in Pakistan is the Federal Directorate of Education Mexico: National Pedagogical University, Secretary of Public Education Nigeria: British Council
Teacher training	Mexico: During phase 1 of the project, 10 lessons were developed, in order to be made available on the blog for teachers. Some of these 10 lessons were adapted to be used by teachers in their classrooms during the second phase of the project. Senegal: The implementation team members were specifically trained on adapting and uploading content on the Nokia Mobile Mathematics platform. They were also briefed on the project modalities and on Nokia Mobile Mathematics advantages and benefits. Nigeria: UNESCO and Nokia, in collaboration with the National Teachers Institute and the British Council, organized a training seminar for all teachers participating in the pilot project in early May 2013. All teachers were given Nokia headsets with pre-loaded SIM cards and received training on how to access and apply the service.
Evalu-ation	The evaluation process of the four pilot programmes is ongoing.

Annex 3. Case study reports

ProgeTiger Programme – Estonia

Fact box	
Targeted education level(s)	Preschool; primary education and vocational education
Target group(s)	Pupils & students, teachers
Learning and teaching methods	Multiple learning styles; Learning by playing
Digital technology & delivery channels	Education software / applications
Implementation phase	Pilot
Implementation level	Service
Impact areas	Improving digital literacy / competences of learners; Training and support of educators
Output dimensions	PTP trained 1244 teachers; developed 15 teacher courses; supported 150 kindergartens and schools with equipment; set up of 8 PTP networks; and participation of over 500 students and 100 teachers in 2015/2016 contest
Outcomes	Approx. 80 % of Estonian schools are involved in some way with PTP activities
Funding and business model	Public funding
Budget (EUR)	€1 million covering 2014-2016

Drivers	Barriers	Policy Lessons
High level of competence in IT and interest of teachers to participate	Teachers doubts concerning the relevance of learning coding in pre-school and primary education	Flexible & voluntary (non-curricular) integration of technology suitable for the EE context
Flexible approach leaving schools and teachers freedom in selecting content	English language proved to be less of a barrier than expected	Extension of programme to enhance relationship between humans and technology

Introduction

The ProgeTiger programme (CodeTiger programme; PTP) was launched in 2012, in order to promote technological literacy and digital competences of children and students, from an early age on. Initially, it focused primarily on programming; the initiative however turned into a broad technology programme.

The PTP tool targets preschool, primary and vocational education domains. The nation-wide scheme, which particularly educates pupils from the age of 7 to 19 (grades 1 to 12), uses different engaging training activities and tools targeting the relevant school-level through classroom and after-school clubs.

Activities in the PTP framework seek to develop age-appropriate digital competences of learners and skills relevant for a technological society. PTP consists of a number of supportive activities: integrating technology education into the curriculum, providing teachers with training and educational resources, and assisting kindergartens and schools in purchasing programmable devices.

PTP is supported and funded by the Estonian government through the Ministry of Education and Research, which was involved in the design of the programme. It is implemented by the HITSA IT Education Development Centre.

1. Policy Context: Background, Objectives and Rationale

PTP's background lies in Estonia's Tiger Leap Foundation (TLF) – a government sponsored organisation set up in 1996 – aiming to enhance science and technology in the field of education. TLF helped support the development of a number of IT-related initiatives in the education domain, including the shaping of the rationale behind PTP. In the early years, TLF's focus was on providing physical infrastructure and hardware at school-level. The organisation has however recently targeted education initiatives that help Estonian schools to take advantage of the deployed IT infrastructure and hardware. PTP relate to Estonian education initiatives seeking to improve digital skills. In particular, the Life-Long Learning Strategy 2020[1], which provides guidance for the direction of education policy and funding, and sets up strategical goals for digital technology. While there is no mentioning of the concept of computational thinking, the cross-curricular topic "technology and innovation" was added in the national curriculum for basic schools.[2] It seeks to develop the student into a person that is "well-disposed towards innovation and who knows how to use contemporary technologies" as well as "copes with the rapidly changing technological (…) environment".[3] PTP's origins also go back to the Digital Agenda 2020 for Estonia (section 5.2 for better ICT skills), aiming to improve digital skills for pupils in basic education and for the adult population, in order to support the country's IT sector and employment growth in general.[4]

> *"ProgeTiger offers important value for society and business and young people need to have an idea of what technology is, what it's made of, and how they can control it.*
>
> **Mari-Liis Peets, PTP *Programme Manager***

Overall, the rationale behind PTP is related to the future relevance of high-tech-based jobs and tech-savvy employers. It was felt that teaching should not just be focussed on word processing tools, but also on programming and technology in broader terms. PTP has thus been established to:

- Help children and students understand the basics of technological creativity;
- Support learning on the relationship among technologies;
- Enhance problem solving skills; and

- Achieve better learning outcomes in general.

PTP's main objective is to improve learners' technological and digital competences and to address the following 4 sub-goals:

1. Develop technological literacy by adding relevant teaching activities, methodologies and educational activities;
2. Promote the interest, skills and involvement of children and young people in engineering sciences, by increasing technological activities to encourage algorithmic thinking, problem-solving and programming skills;
3. Facilitate networking of active teachers and instructors; and
4. Support procurement of equipment for pre-schools, schools in general and vocational education with an eye to integrating different teaching methodologies and learning activities.

PTP is supported and funded by the government through the Ministry of Education and Research. The programme is implemented by the IT Education Development Centre of the Estonian Information Technology Foundation for Education (HITSA)[5]. HITSA took over PTP from TLF in 2013. TLF, the Estonian Education and Research Network EENet and the Estonian Information Technology Foundation were consolidated under HITSA in 2013. HITSA cooperates with organisations and institutions on programmes and projects to promote digital technologies in education organisations.

1.1 Educational Scope: Learning and Teaching Methods

The nation-wide programme targets learners in pre-school, primary and vocational education, in particular the age group from 7 to 19 years old (grades 1 to 12).

The PTP approach is based on a combination of three thematic fields: engineering sciences (informatics, programming, robotics and electronics), design and technology (3D technology, drawing, multimedia and animation) and information and communications technology (computer science and digital communication) that are integrated into the teaching and learning of different subjects and extracurricular activities. The aim of these activities are to develop competences, as laid out in (1) the International Society for Technology in Education's Standards for Students; (2) the Digital Competence Framework (DIGCOMP) report prepared by the European Commission's Joint Research Centre; (3) the national curriculum for general education; and (4) the Standards for Technological Literacy.[6]

At the primary education level, a cross-curricular theme, "Technology and Innovation" has been integrated, requiring educators to apply technology in subject teaching.[7] While it calls for teachers to use technology in the teaching of subjects, it does not decide on a specific technology, or how it should be used, but instead gives teachers autonomy to decide. There are also optional curricula opportunities in subjects linked to technology education (e.g. programming, robotics, 3D graphics, computer science, informatics etc.), which schools can add to school programmes. In addition, it provides extra-curricular activities and voluntary initiatives for kindergartens and schools (coding clubs, robotics etc.).

PTP offers flexibility in terms of teaching and learning activities: the learning environment involves classroom settings and after-school clubs.[8] The programme seeks to integrate a broad range of technological solutions in teaching activities, which are carried out in an

engaging way. PTP supports the principles linked to "Huvitav Kool" (Interesting School), since it seeks to make learning more playful, interesting and diversified for learners.[9]

The format of teaching, however, varies depending on the students' age and digital proficiency level, following basic, intermediate and advanced levels. At the basic level, learners need systematic guidance and are educated through learning activities and tools involving learning software (MSWLogo, Scratch, LEGO WeDo), interactive tools, computer games (KODU Game Lab), mobile applications etc.. The aim of these activities is to generate interest and promote creativity, logic and fantasy. Learners understand how to search for information, do creative works (e.g. videos and animations) and to make or use models or simple robots.

At the intermediate level, learners are expected to understand technology and be able to independently complete tasks, but need some guidance. In comparison with the basic level, learning material is expanded with e.g. LEGO Mindstorms and MIT App Inventory. Using technology tools together with group work, inquiry learning, active learning and homework, the aim is to make learners capable of designing and implementing simple products, such as games, apps, animations or objects. Learners at the advanced level are expected to be creative and solve complex problems with technology. Examples of learning material are minicomputers and microcontrollers, Python and codeacademy.com (JavaScript, HTML/CSS, jQuery).

1.2 Core Activities & Main Components

The PTP programme's target groups are:

- *Learners:* developing digital and technology competences according to age and raising interest in technology by promotional activities;
- *Teachers and instructors:* assisting educators by providing teaching and learning materials, methodologies and training opportunities to facilitate teaching in related subjects (electives, clubs) as well as supporting teacher networks; and
- *Pre-school, general and vocational education:* supporting procurement of equipment and devices.

PTP activities are centred on the integration of technology into the curriculum; preparing training and educational material for teachers; and supporting educational institutions in acquiring equipment (including programmable devices). In a nutshell, PTP consists of 5 core activities and components:

- *Learning materials:* Material is developed, translated and adapted – free of charge under a Creative Commons license – and includes learning material for subjects at all levels, methodological guidelines and examples of ways to integrate technology in education;
- *Training:* teachers, instructors and instructors who assist in the implementation of technology-related activities are trained (e.g. through initial training and in-house training) in the fields of technology, tools for teaching and learning and how to organise elective subjects or after-school activities;
- *Network activities:* coordination of networks of contact persons from

> *"The objective should not be to encourage all students to become a programmer (…), they do not all have to attend a university degree on IT. Instead, we put emphasis on teaching children and students about the logic and relationships behind technology."*
>
> **Mari-Liis Peets, PTP Programme Manager**

educational institutions and schools that are engaged in PTP related activities, who act as instructors for the training programme, multipliers facilitating the information and dissemination at the regional level;

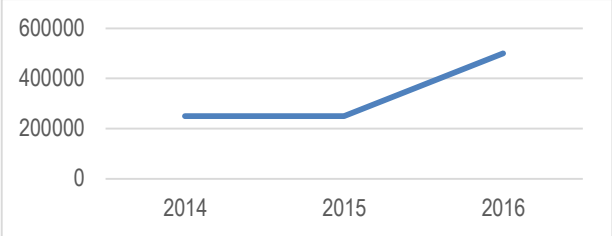
- *Procurement:* supporting kindergartens and schools in acquiring equipment relevant for the implementation of PTP´s teaching activities (including robotics kits, sensors, minicomputers, microcontrollers, Kano, 3D printers); and
- *Information sharing:* production of dissemination material targeted at the wider public, information material for target groups and student events and contents in order to develop digital technological competences.

The training of volunteering teachers is a core activity of PTP and requires extra attention. Teachers are supported in numerous ways, including by a variety of tools and resources that can be used in teaching or in after school hobby clubs. Teachers can access relevant resources and training materials directly on http://progeesimesedsammud.weebly.com. PTP has developed and compiled existing information, which is freely accessible, in training packages. The packages are tailored to different types of learning and are offered as part of classroom learning or an e-learning course.

1.3. Funding and Business Model(s)

PTP is funded by the state budget through the Ministry of Education and Research. HITSA is the recipient of the funding. PTP received around €70.000 from the Ministry in the first year, earmarked for the development of course material and specialised training for teachers. [10] For 2014 and 2015, the budget was 147pprox.. €250.000. The budget was doubled for 2016 due to conceptual changes requiring a need for more training and learning material, to mainstream technological literacy.[11] There is also co-funding from the schools, which contribute to the whole budget of PTP. This however only applies to the support scheme related to purchasing equipment. Other activities, such as training, learning material, raising awareness, are fully financed by the state budget.

Figure 1: Funding for PTP during 2014- 2016



Volunteering teachers also support the development of training and teaching materials that are available freely through a Creative Commons License. The private sector and educational associations contribute to the creation of the methodological and training material, including information sharing and dissemination, which help contain the need for public funding.

2. Policy and Conceptual Design

PTP was started by the Estonian Ministry of Education and Research, which is involved in the shaping of programme activities and action plans as well as resource planning. The policy concept was initially designed to address the value of programming, which was the early focus of PTP, and technology for society, business and young people in Estonia.

The development of the programme has roots in the government-sponsored TLF, which contributed to PTP's policy and conceptual design.[12] Furthermore, policy-makers involved in the design and implementation of the programme had to find their own and distinctive way of launching PTP, since there was no existing education initiatives or case studies in the field of programming to learn from. [13] There is therefore a unique policy concept

behind PTP. The design for example took into account the autonomy that teachers and schools have with respect to curriculum, teaching activities and tools, the high level of IT knowledge among teachers as well as the level of IT infrastructure deployment at school-level in Estonia.

2.1. Implementation Process

In terms of putting PTP into practice, the implementation was structured around the following steps: developing, translating, updating and adapting learning material and examples for teachers; training instructors and teachers; supporting the programme network's actions; facilitating the procurement of technological equipment; and sharing and disseminating activities. During the implementation process, it is important to distinguish between the initial phase where PTP was setup as a coding programme and the later phase where it was re-framed into a technology programme.

Initially, the emphasis was on preparing and training teachers, since teachers' acceptance and confidence in IT and programming would determine the use and integration of the PTP-related activities in Estonian education. During the first piloting e-course in autumn 2012, around 30 teachers from primary schools signed up, in order to learn more about the technology and methodology relevant for educating pupils to do basic programming. The training of teachers continued throughout 2013.[14] From 2012, it became clear that PTP should not only focus on programming. Its focus and scale was broadened to cover technology, the logic behind technology and how it can be used more broadly.[15]

By the end of 2012, initial educational materials had been developed for all school levels, and the process has since been ongoing. PTP was launched as a piloting programme where a limited set of schools (20 schools) participated, before being made available more broadly to all schools in Estonia (around 550 schools). PTP clubs for middle school and selected courses for high schools were also offered since 2013.[16]

PTP networks directed at teachers from different fields were created to support the implementation of the programme. The networks are involved in the development and testing of new material and training programmes. If the material or content receives positive feedback from the networks, HITSA will start developing it. There are more than 100 persons involved in the networks. Most counties in Estonia have their own teacher network, which works with the programme at local-level. Communication between HITSA and the networks, and among the networks themselves, is carried out via Facebook and e-mail.

HITSA's IT education Development Centre implements PTP. It has responsibility for: 1) promotion and information services for target groups (heads of schools and teachers); 2) development of training and learning material; 3) support to educational technologists; 4) preparation of methodology and methods relevant for the integration of technology in curriculum; and 5) organisation of seminars, conferences and contests.[17]

The Ministry of Education and Research initiated PTP and is involved in the design of activities, preparation of programme action plans and planning of resources. While the Ministry of Economic Affairs and Communications also participates in the process of developing programme action plans, e.g. related to information sharing, the Ministry of Education and Research

"From being a programming initiative, it turned into a broader technology programme that not only focusses on programming, but also on other technologies, competences etc., including robotics, 3D technology, electronics and other aspects that are important in today's digital world."

Mari-Liis Peets, PTP Programme Manager

approves the action plans and the reports linked to their implementation. The Ministry of Education and Research also has the responsibility for identifying the roles and activities of the different partners involved in PTP. In this context, the implementation has been supported by the private sector and universities through the development of methodological material and training as well as participation in dissemination activities.

2.2 Digital Technologies and Delivery Channels

PTP integrates different learning software, interactive tools, computer games and mobile applications in the teaching and learning activities. In addition to computers, tablets and phones, the implementation of PTP requires education institutions to acquire and use such technological equipment as robotics kits and sensors, microcontrollers and minicomputers, Kano, 3D printers and so forth. The Ministry of Education and Research and HITSA supports schools in this matter, through public procurement and advice on devices.

Within the framework of the programme, PTP integrates learning material and graphic programming languages as MSW Logo, KoDu Game Lab, Scratch, LEGO WeDO, LEGO Brainstorms, MIT App Inventor. Codeacademy.com is used as a source for teaching and learning activities on programming languages and interfaces such as JavaScript, HTML/CSS, jQuery and Pyhton. Teachers can integrate e-labs and different software to create animations and to learn about mathematics, music, physics, biology, 3D graphics, robotics as well as to develop apps, web-pages and games etc.

2.3 Main Drivers

As a small country with a well-developed IT-infrastructure and a broad use of digital technologies in the education field, Estonia had a good point of departure for introducing a policy initiative like PTP. Estonian teachers are generally very informed and open to digital technologies as well as willing to develop their skills in this field. HITSA experienced a strong interest by teachers in participating in its training sessions and a general understanding among teachers of the importance of developing digital skills.

At school-level, PTP has been introduced widely; after three years of implementation, more than half of the Estonian schools are doing something related to PTP. Taking into account that there is no direct reference to either programming or specific technologies in the national curriculum for basic education, PTP is supported by a flexible approach, where schools and teachers can decide on what to integrate in the school curriculum, and how to do it. PTP has been well received by children, to whom it feels natural to engage with content and tools based on digital technologies. Around 80 % of children in Estonia own their own device, which has helped them work with programmable devices, games, apps and various software.[18]

2.4 Main Barriers

HITSA and the Ministry of Education and Research faced a diverse set of challenges for the implementation of PTP. One of the key challenges has been to explain target groups why the provided training activities, tools and content related to technology and coding are actually important. While teachers generally were positive towards PTP and the integration of digital technologies in the education realm, some teachers questioned the relevance and asked why they should start teaching coding. One of the reasons for their reluctance to integrate coding into teaching activities stems from the need to learn new programming languages. The work related to explaining schools and teachers about

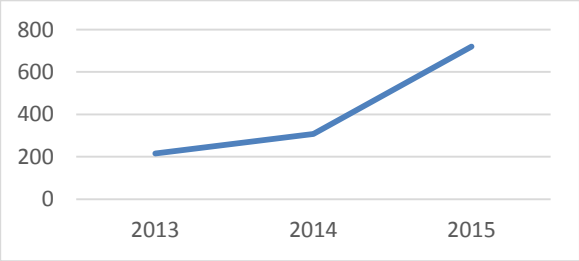
the relevance of PTP is a long process, which is still ongoing.

In the early stages, it was also expected that there would be a language barrier with the English programming information, since teachers would be able to read Estonian easier and quicker. Therefore, it was initially decided to translate material from Codeacademy into Estonian. However, it was much less of a barrier than initially expected, since teaching environments in Estonia are quite familiar with English. Children for example start to learn English already in first grade.

3. Results Achieved

Approx. 80 % of Estonian schools are involved in PTP activities. HITSA trained 1244 teachers from 2013 to 2015 (out of around 15.000 Estonian teachers). PTP has introduced around 15 teacher training courses and 7 new courses were under development in 2015. Around 150 kindergartens and schools were supported in acquiring equipment during 2013-2015. Active local PTP networks have also been established in most counties, including eight in rural districts. Furthermore, the PTP student contest had a participation of over 500 students and 100 teacher so far in the ongoing contest for 2015/2016 (616 students were involved in 2014/2015). [19]

Figure 2: Teachers trained per year



According to Mari-Lis Peets, project manager at HITSA, it is still too early to determine the overall success of PTP, taking into account that the programme only started in 2012. PTP emphasises technology, programming and robotics – from a young age – and it requires time before outcomes can be observed, e.g. on career paths or on the productivity of workers. The effect on the IT workforce of training the youngest participants in PTP is only expected to show in 15-20 years. In the long-term, it is further expected that PTP can help increase productivity of workers in a wide range of industries, by developing skills in technology and coding as well as skills coupled to problem-solving, creativity and collaboration.

Until now, no studies or evaluations have been carried out to assess PTP. However, HITSA has recently initiated research and analysis of the programme, with an eye to exploring how it functions, and how it can be improved. The participating schools and kindergartens are asked if PTP helps them and how: the aim is to use the findings to identify which new activities are required to support the target groups. Monitoring is ensured as part of the public procurement and training process. Based on the contracts with schools, HITSA is required to ask schools for feedback on how they used the acquired equipment and devices in the learning context: schools should provide proof (typically through blogs and videos by students and teachers) on the use. In terms of teacher training, there is a system in place in which teachers around 6 months after finalising a course are asked, if and how they implemented content and what they learnt from the course.

4. Sustainability, Scalability and Transferability

In terms of creating a well-functioning and long-term sustainable programme, much emphasis has been given to ensure that teachers possess the required skills, that they are supported through material and courses and that they understand the benefits of PTP. In addition to training courses, different promotional and information sharing activities are carried out through the PTP framework to explain to schools and teachers the importance of digital skills, technology and programming.

These activities include seminars, conferences and articles explaining what PTP activities consist of, how PTP can be integrated and how it can help schools and teachers.

Reflecting on the policy implementation process, PTP may provide evidence on how stakeholder cooperation – based on common goals – can be established in order to improve young people's digital literacy.[20] This cooperation involves ministries, HITSA, universities and the private sector, who in different ways contribute to the running of PTP. In addition, PTP networks were set up to ensure the running of the programme at county-level, to promote and scale up PTP and to ensure that the activities and materials provided are linked to the actual needs of schools and teachers.

5. Perspectives and Policy Lessons Learned

Globally, PTP is not the only national initiative focussing on the teaching of programming. However, PTP is unique in the sense that it already targets children from a young age in pre-school and primary school, whereas most other initiatives target secondary education. While some countries have programming or computational thinking as a compulsory part of the curriculum, Estonia has integrated technology and programming in a more flexible and voluntary way, where schools and teacher decide on which technologies to use and how to integrate them. PTP is therefore based on a policy concept that is very adapted to the Estonian context, which for example takes into account the high level of digital skills among teachers and the autonomy schools and teachers have on curricula and teaching activities. This is exemplified through the many optional programmes that PTP offers.

During the implementation of PTP, it was decided to turn it into a broader technology-based programme, rather than primarily focusing on programming. It was stressed that the aim was not to primarily develop app developers or push everyone towards a university degree in IT. Instead, the objective was to support a smarter relationship between people and technology, focused on helping students understand technology and the opportunities it offers. While programming is still emphasised, this revision of the initiative has facilitated a broader coverage of technologies, content and tools, and thus more choice, seen from the perspective of schools and teachers.

Further information

http://hitsa.ee/it-education/educational-programmes/progetiger

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Digital Schools of Distinction – Ireland

Fact box	
Targeted education level(s)	Primary education
Target group(s)	School governance; pupils & students; educators & trainers
Learning and teaching methods	Self-regulated learning; Multiple learning styles
Digital technology & delivery channels	Laptops, netbooks, tablets etc.; Education software / applications
Implementation phase	Full-scale
Impact level	Service
Impact areas	Digital certification of schools, individuals; Enhanced technological infrastructure and access
Output dimensions	1688 schools registered (more than 50% of primary schools); 271 schools awarded
Outcomes	80% of teachers strongly agreed that the use of ICT had a positive impact on student motivation; 84% of teachers found the programme to be very valuable for their school's ICT usage to support curriculum objectives
Funding and business model	Mix of public/private funding
Budget (EUR)	2013: €300,000 – HP, Microsoft; DES: €10,000; 2014: €200,000 – HP, Microsoft; DES: €60,000; 2015: €200,000 – HP, Microsoft; DES: €60,000

Drivers	Barriers	Policy Lessons
Composition and function of Steering Committee to ensure balanced representation	Lack of long-term strategy supporting schools in their ICT development for learning & teaching	Strengthen the role of the Steering Committee making it sole decision-making organ
Industry involvement beneficial for momentum and publicity	Inadequate school funding prevents benefits of technologies to be properly embraced	Rewarding teachers' engagement in integrating ICT

Introduction

The Digital Schools of Distinction (DSoD) programme aims at promoting, recognising and encouraging excellence in the use of technology in primary schools in Ireland. The programme is implemented through calls for applications in which schools lay down evidence for their approach and available infrastructure to scale up technology in the classroom.

Upon a bottom-up initiative and after having run as in similar form between 2006 and 2008, the scheme was re-launched as a flagship programme by the Department of Education and Skills in 2013. The re-launch was set within preparations for Ireland's Strategy for Digital Schools for 2015-2020. The strategy provides a rationale and a government action plan as in how ICT can better integrated into teaching, learning and assessment practices in Irish schools.[1]

The programme is administered by the Dublin West Education Centre (DWEC). The programme is supported in its implementation and financing by HP Ireland and Microsoft Ireland which provide hardware, software and services in support of the schools' ICT solutions. The implementation is overseen by a Steering Committee including several education partners, incl. teachers' professional development organisation (PDST), principals' association, etc.

1. Policy context: Background, Objectives and Rationale

Digital Schools of Distinction (DSoD) is a certification primary schools can obtain in return for proven excellence in integrating technology for the benefit of learning and teaching in school premises. Once certified, schools have access to an ICT support network, a toolkit to develop a school-specific ICT plan, links with other schools in Ireland and external recognition through a national award.

The main objective of the programme is to promote, recognise and encourage excellence in the use of technology in primary schools. The scheme's intention is to drive forward the role of primary schools' management in scaling up technology integration in teaching and learning which frequently lack behind the engagement of individual teachers.[2]

The initiative is embedded within the Irish Digital Strategy for Schools 2015-2020. The strategy provides a rationale and a government action plan to integrate ICT into teaching, learning and assessment practices in Irish schools. It lays out a strategy of how the ICT Policy Unit of the Department of Education and Skills intends to harness the potential of digital technologies for learning and teaching in schools in four key themes: (1) Teaching, Learning and Assessment Using ICT, (2) Teacher Professional Learning, (3) Leadership, Research and Policy and (4) ICT Infrastructure.

1.1 Educational Scope: Learning and Teaching Methods

The programme is addressed to primary education schools targeting a diverse audience. Next to teachers and pupils, school governance is equally targeted, since the strategic planning and application to become certified as a digital school of distinction is filed by them.

The initiative is not limited to any specific disciplines applying a cross-disciplinary, holistic approach. The degree to which subject-specific contents are encouraged depends on whether concerned schools have specific arrangements in place. In other words, subject-specific focus areas put in place in certain schools tend to be further reinforced, if existing.

In practice, blended learning forms are encouraged to stronger extends, while a mix of different teaching and learning

methods are supported. However, it appears that self-regulated learning is emphasised to more extend than other teaching and learning methods.

With regard to teacher training, one of the primary components of the scheme is to provide support to the work of teachers integrating technology into teaching and learning, and to encourage the exchange of ideas and collaboration with other schools on ICT projects. Teachers do not only receive guidelines and ongoing support by the implementing bodies of the initiative but also through effective knowledge sharing with their peer teachers. In practice, knowledge exchange is facilitated by the DSoD network comprising all Steering Committee members as well as individual schools and teachers. Information exchange within the network uses various channels, e.g. the DSoD website, social media tools, direct e-mail, etc.

1.2 Core Activities and Main Components

The certification is implemented through a call for applications. Schools wishing to obtain the certification must follow the three steps of the programme:

1. School registration
2. Self-evaluation against established criteria
3. Validation

Interested schools register for the programme on the initiative's website [3] where they create a password protected school profile. The profile includes contact details as well as the information presented in step 2: the school's self-evaluation.

In the self-evaluation, the concerned school measures its current ICT implementation status by evaluating its performance against five established headings: (1) Leadership and vision ensuring that ICY is coordinated and managed accordingly; (2) ICT integration in the curriculum: (3) School ICT culture – demonstrating that ICT affects teaching and learning as well as behavioural aspects of learners; (4) Continuing professional development – laying down evidence for a strong commitment to provide training opportunities as well as general support for educators; (5) Resources and infrastructure – supporting particular learning environments and demonstrating plans for ICT development.

Each of the five criteria is assessed against 46 criteria of which 15 are essential criteria. The essential criteria vary in their scope, yet the main focus is put on the integration of technology with the school curriculum and on teaching and learning. Criteria cover the schools' vision, the anchoring of ICT in the schools' curriculum, but also the installation and use of technology in the classroom, for example broadband access, and ICT-related mechanisms available in the concerned schools, e.g. to inform teachers of professional development courses in ICT.

After submission of the self-evaluation the application is validated by means of a two-hour on-site inspection. The inspection is carried out by Department of Education approved programme validators. They meet the school principle, visit the classrooms and assess the school's application. Based on the inspection a School Validation Report is produced and submitted to the Digital Schools of Distinction Steering Committee, for review and adjudication. The committee determines whether the school meets the criteria of the programme and accepts or rejects the application. Feedback, guidance and support are granted to rejected schools with the objective to reapply for validation.

Table 1: Assessment criteria per heading

Heading	Total criteria	Essential criteria
ICTs	14	3

integration		
School ICT Culture	9	4
Professional Development	7	1
Resources & Infrastructure	7	2
ICTs integration	9	5
Total	**46**	**15**

1.3 Funding and Business Model(s)

Digital Schools of Distinction is delivered through a public private partnership in association with HP and Microsoft in Ireland. While the government finances the validation of the programme in terms of on-site visits where accredited validators assess the applications, the majority of funds are provided by HP and Microsoft. Next to general funding of the programme, HP and Microsoft both provide technological tools in terms of hardware, software and service solutions.

For the school year of 2013 €300,000 were provided altogether by both technological partners, while a total support of €200,000 was made available for each, 2014 and 2015. Meanwhile, DES provided €10,000 in 2013 and €60,000 for each year, 2014 and 2015.

2. Policy and Conceptual Design

The idea for the Digital Schools Award Scheme arose as a perceived need in Robert O'Leary's work as a School Principal, teacher, consultant and lecturer in 2004. According to his observations, only around 5% of schools were doing excellent work integrating technology effectively for learning and teaching, while the majority of schools made very little use of ICT or performed rather average. However, not only the schools themselves but also inconsistencies and the lack of a centralised, strategic approach explain the wide spectrum of schools' ICT use and performance.[4]

"The Department of Education and Skills was the last party to hear from the scheme and approve it"

Robert O'Leary, instigator of DsOD

As a result, the Digital Schools of Distinction programme was created with a view to design a programme with the following characteristics:

1. To highlight and reward initiative and success ongoing in many schools in order to reward and encourage further initiative of those school principals and educators making effective use of technology in schools. In addition, support for educators in integrating technology in teaching was to be up-scaled.

2. To provide a framework, a starting point and a series of targets to be met by schools. The main idea was to allow schools to advance their use of ICT in schools and move to the next stage of their respective development.

3. To obtain a clearer understanding and resolve uncertainties of the role of ICT in education in Irish schools. For many schools it was not clear whether ICT in education was about teaching children computer skills or rather about integrating resources for the purpose of teaching and learning.

The Digital Schools of Distinction scheme was inspired by the Green School or Active School scheme which is applied in different countries in Europe. The programme is similar in its rationale as well as in some of its operational features, e.g. it provides schools with a framework and defines objectives to advance to a next stage, etc. Unlike Digital Schools of Distinction, Green Schools aims at raising the environmental awareness of schools.

2.1 Implementation Process

The award scheme is a bottom-up initiative driven by Robert O'Leary, the School Principal of Sacred Heart Senior National

School in Killinarden, Tallaght, Dublin. Given O'Leary's deep involvement in the design and delivery of pre-service, in-service and postgraduate training courses as well as in promoting the use of ICTs in primary education, a network with key education partners was already intact. This network was fully leveraged in discussions with the education partners prior to the launch of the initiative – among those were Irish National Teachers Organisation (INTO); Irish Primary Principals Network (IPPN); Computer Education Society of Ireland (CESI) –and Professional Development Service for Teachers (PDST) – which were very supportive of O'Leary's idea.

When presenting the idea to the Department of Education and Skills (DES), the support of the abovementioned education partners as well as the willingness to coordinate the programme by the Dublin West Education Centre (DWEC) was already guaranteed. Hence, the DES was the last party to join and approve the initiative.

Meanwhile, the co-operation with Hewlett Packard Ireland was set up as a result of a more informal encounter at an ICT showcase event of O'Leary's primary school. At the event the Head of Education of HP Ireland indicated that HP would be interested in contributing to the second incarnation of Digital Schools of Distinction. Upon the initiative of HP also Microsoft joined the initiative with the idea to have a software company support the initiative.

All these above parties are today represented in the Steering Committee of the initiative which played a vital role in the operationalisation and implementation of the initiative. The Steering Committee met around six times in order to discuss various aspects e.g. regarding the detailed programming and implementation. The most important issues discussed concerned the assessment criteria to be established, what a validation process may look like and what tangible rewards schools may receive.

Digital Schools of Distinction involves stakeholders in education and technology providers directly during the implementation of the project. While technology providers do not only provide hardware and software, but also services accordingly, e.g. access to an ICT advisory service is provided through HP [5]. The initiative involves several education partners, all of whom are represented on the Steering Committee. These include principal associations, teacher network and computer specialists organisations. Apart from the Dublin West Education Centre (DWEC) acting as coordinator of the project, the involvement of these partners in the project consists mainly in monitoring the implementation and making decisions in relation to the project. However, a support forum to respond to requests from DSoD accredited and registered schools is run by CESI[6], while the position of Coordinator of Validations supports schools on individual level.[7]

> *"Industry involvement has given the scheme a great deal of momentum and facilitated to reach publicity"*
>
> **Robert O'Leary, instigator of DsOD**

First launched in 2006 without the involvement of industry, the scheme did not last longer than a couple of years. The second incarnation of Digital Schools of Distinction was launched with participation of industry. Hence, the dimension of including technological rewards provided by these technological partners was added at a later stage. Next to software and hardware, a brief survey to identify the core challenges of schools in integrating technology in the classroom revealed that a support structure for schools needed to be provided.[8]

The scheme was careful to design a scheme which would build on existing

structures rather than duplicating operational structures. Since PDST and INTO both provide a good share of teacher trainings annually to primary school teachers, teacher professional training was not a focus area of the initiative.

After these adaptations were undertaken Digital Schools of Distinction was officially re-launched in 2013. The new scheme was conducted under the Minister for Education and Skills, Mr. Ruairi Quinn.

2.2 Digital Technologies and Delivery Channels

The digital technologies applied in the Digital Schools of Distinction programme are related to the software, hardware and services provided by the technological partners, referred to as the Digital Schools Classroom Kit. The kit comprises HP hardware incl. pads, netbooks or desktop computers which have educational software (Office 365) and apps by Microsoft pre-installed. Further, HP provides a HP wireless Printer and years of free printing to accredited schools. Next to the provided hardware and software, ICT related services are supplied by technological partners; among others, access to ICT education experts.

2.3 Main Drivers

The key drivers for the creation and implementation of Digital Schools of Distinction consider its prior launch in 2006 as well as experiences gained in the course of its second incarnation in 2013. The primary driver is linked to the composition and functionality of the Steering Committee. The priority was to achieve a fair balance of different stakeholders (education partners) to be represented: Next to the DES, the coordinating organisation (DWEC) and technology partners, this concerned above all school management organisations (IPPN), computer education specialists (CESI), but also teachers' (INTO), the teachers' professional development organisation (PDST). The Steering Committee was anchored as the sole organ for decisions concerning the implementation of the programme. This meant that any decision in need of discussion according to one of the Steering Committee members would be raised and approved by the Committee.

The second key driver is related to the industry involvement of the initiative. As noted earlier, HP and Microsoft Ireland finance the majority of the initiative and are also involved in the roll-out of the programme as technology providers. While it remains questionable whether the DES would have scaled up financing, if HP and Microsoft were not involved, Robert O´Leary is convinced that the involvement of industry has allowed the initiative to advance at a faster pace with regard to the implementation of the initiative.

Industry's involvement was also beneficial for the marketing and publicity of the initiative. Both technology partners were able to leverage their internal PR infrastructure which helped to disseminate information to a wider audience, for example through local media, resulting in good publicity overall. Without the PR resources the steering committee would have needed to take over. Most likely this would have resulted in much less activity and less publicity. Moreover, the ceremonies to award new schools were used as an additional marketing tool. They involved speeches of many cabinet members, including the Irish prime minister at a number of occasions, and CEOs of Hewlett Packard and Microsoft.

This ensured local media coverage and helped promote the initiative further.

A third, more subtle driver concerns the school community involvement and awareness raising character of the initiative. Since the programme strives to make everybody at school aware of the potential of the technology, including teachers and principals, the Board of Management as well as the parents, a certain momentum and pressure is put on school management, particularly on those schools that have not been very proactive in this regard. An award in the vicinity of a given school, for example, often leads to enquiries from other parents to the respective school's management to explore what would need to be done in order to become an accredited school.

2.4 Main Barriers

Despite the existence of digital strategies for ICT in education (e.g. Digital Strategy for Schools of the DES) in Ireland, implementing organisations are concerned about the lack of a long-term strategy supporting schools in their ICT development for learning and teaching.[9] In other words, what is missing is not the vision but a reliable action plan. The Digital Strategy for Schools, for example, states that adequate funding will be provided to schools; yet there is no timescale and no indication of the resources allocated to schools to scale up their use in technology. The lack of knowledge of schools as in "when" and "how much" is an impediment for many schools to adopt a more strategic approach to digital technology use in education.[10]

A second major obstacle is inadequate funding of schools, since it is very difficult to embrace the benefits of technology without sufficient financing.[11] The recent recession saw significant cuts for school funding with technology in schools being dropped from the government's order of priorities. These cuts did not only involve cuts for general school funding but also had consequences for human resources, Above all, this concerns cuts for middle management at schools: many special duties posts no longer exist, while other positions for middle management were phased out with retirement. A suitable example would be to cut the position of ICT coordinator at schools, a middle management staff member who would be appointed to develop the schools' use of ICT at school. According to school management, the cuts in middle management staff have seen the number of ICT coordinators at school drop significantly.[12] According to the instigator of the initiative, the lack of ICT coordinators as well as technical support in schools are both perceived to be impediments to the use and development of technology in Irish schools.

A third obstacle which is closely related to the lack of financing of schools is inadequate broadband infrastructure in schools. As a result, even though teachers are knowledgeable of ICT and eager to integrate it more in their classrooms, they cannot make full use of digital tools in the classroom.

3. Results Achieved

The programme seeks to primarily achieve impacts in the fields of Digital certification of schools, individuals (competences, learning equipment), i.e. the purpose is to foster and advance the integration of digital technologies in teaching and learning at primary schools. Secondly, the initiative seeks impacts in the field of IT equipment available to schools, in terms of Enhanced technological infrastructure and access. The

> *"The excellent work of teachers in schools everywhere in Europe needs to be recognized and rewarded"*
>
> **Robert O'Leary, instigator of DsOD**

infrastructure tools are provided by the technological partners of the initiative, HP and Microsoft.

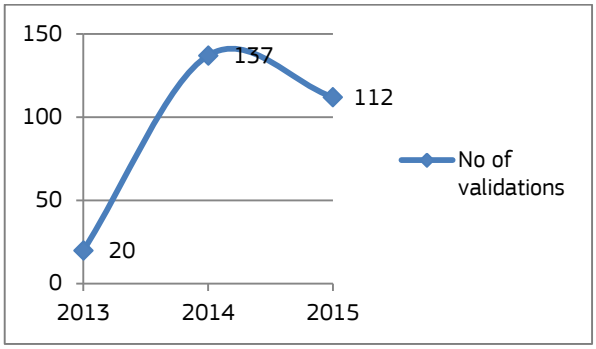
While the scheme is supportive of a variety of technological tools and teaching methods to be applied in schools, the criteria and framework provided by the initiative has certainly provided more clarity, targets and what is possible for teachers and school principals who want to move their school forward in using ICT at school. It would be reasonable to assume that this would lead to more effective learning and more effective teaching in classrooms. However, it is difficult to quantify these assumptions because every school is very different starting from a different level of know-how and experience.

The significant uptake of the scheme since its launch in September 2013 may mean that a considerable share of schools approach ICT more strategically today. Approximately 50% of all Irish primary schools registered to become digital schools of distinction, while more than 10% of schools have been certified until today. Unless more financing is provided to schools to overcome the mentioned barriers (lack of broadband, lack of financing and middle management staff), the upper limit for new registrations is likely to be near its end.

As regards evaluation and monitoring mechanisms, the Steering Committee is charged with overseeing the implementation of the scheme. It will keep track of schools' applications, review the assessment criteria as available technology advances and approve the validators' reports. However, no specific impact assessments of the accreditation scheme are foreseen for the initiative.

Before the beginning of the second school year in 2014/2015 a survey with responses from the 300 registered Irish primary schools was conducted.[13] The objective was to identify the core challenges and needs of primary schools' use of technology for learning and teaching. According to the survey, the major obstacles to integrating ICT in the classroom were access to high speed broadband, IT maintenance, support and funding.

Figure 2: Number of certifications 2013-2015



Source: Digital Schools of Distinction

After the first implemented semester the survey results showed the following:

- 80% of surveyed teachers firmly supported the positive impact ICT use had on students' motivation
- 75% of teachers confirmed the quality of the programme in creating momentum in innovative and effective use of ICT tools by teachers
- 84% of teachers found the programme to be very valuable for their school's ICT usage to support curriculum objectives.

4. Sustainability, Scalability and Transferability

The initiative combines sustainable features with proven, high levels of scalability and transferability.

Considering the recent cuts in school funding in Ireland, a major sustainable factor of Digital Schools of Distinction is its business and financial model. As a public private partnership Digital Schools of Distinction is financed to large extents by the two technological partners Hewlett Packard and Microsoft which do not only provide general programme funding but also software and hardware tools to

awarded schools. Meanwhile, the support of the Department of Education and Skills concerns mainly the validation of the scheme which is carried out by approved validators, which is only a small part of the scheme's overall budget.

Furthermore, the role of the Steering Committee is important for the scheme's sustainability. Its mandate and balanced composition of education partners to determine the overall course of the scheme and make decisions accordingly allows for well-balanced decisions and rapid mechanisms to adapt, for example, the assessment criteria to developments in rapidly changing technologies in education.

Digital Schools of Distinction has served as a transferable model at regional as well as European level. The scheme was successfully launched in Northern Ireland in 2015. At European level, Digital Schools of Europe, an Erasmus + project, was set up in 2015 which explores the possibility to implement a similar programme to Digital Schools of Distinction in other European countries. The idea for the project emerged, as the Committee had received numerous requests about how to implement a similar scheme in other European countries. Although the programme is anchored within the specific educational setting of Ireland, one can say that there are no major impediments to transfer the programme to other jurisdictions. Even though this project is at an early stage, indications already are that the partners involved are very keen to begin discussions at local level and have stated emphatically that the benefits of such a scheme are evident and appropriate to their context.

5. Perspectives and Policy Lessons Learned

Since a similar version of the scheme had been implemented back in 2006 during a period of 2 years, one important lesson can be learnt regarding the role of the Steering Committee charged with overseeing the implementation of the programme. During the first incarnation of the scheme a government minister made a decision of greater impact about the scheme without referring to the Steering Committee. In summary, this decision changed the purpose of the scheme and the scheme fell apart. This is why the instigator and education partners ensured that the central role of the Steering Committee was fully endorsed and supported by the DES for the second incarnation of the scheme.[14] Consequently, the Committee was established as the sole decision-making organ meaning that unless a decision is discussed and approved by the Steering Committee, it will not be implemented in the context of Digital Schools of Distinction.

A second lesson learnt is to reward the outstanding work and engagement of teachers in integrating digital technologies at school in many places in Europe. They initiate impressive initiatives and projects with limited financial means, often without external assistance. Where things start to fall down is at the level of school management where cohesive action is required. Even though teachers are moving forward in many regards, schools are not moving as quickly. Digital Schools of Distinction attempts to close this gap: to allow schools to move forward and to guide them along that process.

The success of the initiative depends to large extends on general school funding, e.g. to develop their technological infrastructure. It is difficult for the DSoD scheme to be assessed on the uptake and success of the scheme, if school financing does not allow to keep pace with technological progress that children are used to in their homes. While accredited

schools receive effective support, technological equipment provided through DSoD cannot replace public funding. In other words, a certain degree of infrastructure and strategic planning is mandatory to be successful in integrating digital technologies for learning and teaching.

In the context of Digital Schools of Europe, the core advice given to other countries interested in setting up a similar scheme lies in the three following elements: (1) Creation of a representative Steering Committee; (2) a user-friendly website and (3) a validation team assessing the school premises through on-site visits.

A couple of challenges remain and will be addressed in the future. One is the question of how long a school can retain its award status before re-applying, and the second one is the feasibility of implementing a similar scheme in secondary education.

Further information

http://www.digitalschools.ie/

[1] Department of Education and Skills (2014). Digital Strategy for Schools. Available at: https://www.education.ie/en/Publications/Policy-Reports/ Digital -Strategy-for-Schools-2015-2020.pdf

[2] Interview with Robert O'Leary, instigator and visionary of Digital Schools of Distinction, 19 January 2016.

[3] Retrieved on 27 January 2015. Available at: http://www.digitalschools.ie/

[4] Interview with Robert O'Leary, instigator and visionary of Digital Schools of Distinction, 19 January 2016.

[5] For example, HP maintains a help line dealing with technical issues which schools may have relating to the technologies they are using and also wifi issues. HP also offers initial support to schools who are considering becoming a Digital School of Distinction.

[6] The forum for Irish teachers is hosted by the Computers in Education Society of Ireland (CESI) - www.cesi.ie. This forum is monitored by the Chief Validator on behalf of Dublin West Education Centre.

[7] The Coordinator of Validations is supported by the Department of Education and Dublin West Education Centre. He/she regularly deals with individual schools queries on the following topics: Leadership and Vision issues relating to digital technologies; Using digital technologies to support the National Curriculum; Developing an ICT Culture in the school; Continual Professional Development offered to schools relating to Digital Technology usage; and ICT Advice on Resources and Infrastructure. This can be ongoing to schools who already have DSoD status as well as for schools in the process of becoming a Digital School of Distinction.

[8] This survey refers to the survey of schools registered to become DSoD in 2013. The results of this survey is detailed in more depth in the section *Results achieved (expected or actual outcomes).*

[9] Robert O'Leary (2015). Presentation *Technology in education: Tutor, Tool, Tutee*. Available at: http://www.ippn.ie/index.php?option=com_mtree&task=att_download&link_id=4904&cf_id=24

[10] Interview with Robert O'Leary, instigator and visionary of Digital *Schools* of Distinction, 19 January 2016.

[11] Robert O'Leary (2013). Digital Schools of Distinction. In: Leadership+ - The professional voice of principals. Available at: http://www.ippn.ie/index.php?option=com_mtree&task =att_download&link_id=4672&cf_id=24

[12] Robert O'Leary (2013). Digital Schools of Distinction. In: Leadership+ - The professional voice of principals. Available at: http://www.ippn.ie/index.php?option=com_mtree&task =att_download&link_id=4672&cf_id=24; Interview with Robert O'Leary, instigator and visionary of Digital Schools of Distinction, 19 January 2016.

[13] Retrieved on January 27, 2015. Available at: https://www.scoilnet.ie/scoilnet/news/article/news/detail/News/digital-schools-of-distinction/

[14] Robert O'Leary (2013). Digital Schools of Distinction. In: Leadership+ - The professional voice of principals. Available at: http://www.ippn.ie/index.php?option=com_mtree&task =att_download&link_id=4672&cf_id=24

Digital School Programme – Poland

Fact box	
Targeted education level(s)	Primary education; secondary education
Target group(s)	Pupils and students; Teachers & trainers; Other vulnerable groups (e.g. poor, rural)
Learning and teaching methods	Multiple learning styles
Digital technology & delivery channels	Digital textbooks; Digital videos
Implementation phase	Pilot
Implementation level	Service
Impact areas	Open Educational Resources development; Enhanced technological infrastructure
Output dimensions	424 schools were equipped by hardware; production of 62 e-textbooks and 2500 supplementary educational resources
Outcomes	Establishment of strong open standards for educational resources, including e-textbooks
Funding and business model	Public funding
Budget (EUR)	€12 million for e-textbooks; €2.5 million for supplementary educational resources; €4.7 for training; and €12.8 million for ICT equipment

Drivers	Barriers	Policy Lessons
Community of educators and organisations favourable to open education contents	Lack of distinction between federal & regional policy causing overlaps of educational activities	Clearer definition of the legal and technical status of e-textbooks beneficial
Cost-saving incentives as a result of open contents and e-textbook solutions	Copyright concerns of commercial publishing industry in Poland	Raise effectiveness of teacher training courses by focusing on innovative digital teaching methods

Introduction

The "Digital School" programme ("Cyfrowa szkoła", DSP) seeks to find the best way of introducing ICT technologies in primary and secondary education in Poland. As a centralised government pilot programme – and one of the largest government sponsored open education programmes – it follows a holistic approach to enhance ICT competences.

The Ministry of National Education oversees the programme and the Centre for Development of Education is responsible for its coordination. From a policy perspective, the programme is linked to the "National Development Strategy 2020" concerning the promotion of ICT and digital literacy. It also addresses the UNESCO Paris OER Declaration and the European Commission's "Opening Up Education" initiative by emphasising the development of open educational resources.

Previous attempts to integrate ICT in education in Poland had often been focused on equipment. DSP, however, goes beyond a simple focus on infrastructure by emphasising a system approach that includes 4 components: producing digital educational resources (e-textbook); providing infrastructure (e-school); preparing teachers (e-teacher), and facilitating access to new didactic tools (e-student).

From 2012 to 2015, the programme has produced 62 e-textbooks covering 14 subjects, around 2500 supplementary open educational resources and the repository database with available resources and content.

1. Policy Context: Background, Objectives and Rationale

DSP was adopted in April 2012 through a resolution[1] from the Council of Ministers of Poland. The programme was given the official title: "The governmental programme for the development of pupils' and teachers' competences with regard to the use of information-communication technologies – Digital School". DSP, which runs from 2012 to 2013, is the pilot stage of the "Digital School" initiative (2012 to 2015).[2]

The main objectives of DSP are to determine the best way to introduce ICT technologies in education, in order to support learning and teaching activities and to raise ICT competences among teachers and students in primary and secondary education. Another key objective is the development of a set of open digital textbooks.

From a policy strategy perspective, DSP is expected to help achieve the objectives of the "National Development Strategy 2020" and the long-term development strategy "Poland 2030. The Third Wave of Modernity", which outlines opportunities, trends, challenges and objectives related to digital literacy, access to internet and the use of ICT in all sectors of Poland.[3]

The programme differs in two regards from preceding ICT policies in the education domain. First, rather than simply emphasising equipment or infrastructure in education (which often was the case for previous initiatives) it combines a range of mutually supportive components, addressing infrastructure, teachers' training, open educational resources and didactic tools. It was felt that the implementation of earlier ICT-related initiatives was hampered by a lack of attention to training and skills. Second, instead of simply providing ICT equipment to schools, it also seeks to deliver it directly to students.[4]

DSP is the first project to promote open textbooks and open educational resources of such scale in Poland. While an earlier initiative, "Turn Poland on" ("Włącz Polskę"), also sought to promote freely accessible and openly licensed resources, it

was limited to Polish schools abroad.[5] In terms of the international policy context, DSP is related to the UNESCO Paris OER Declaration of 2012 and the European Commission's "Opening Up Education" initiative, which were launched with a view to promote the development of open educational resources and means to support it. In this context, DSP can be viewed as an early realisation of the provisions on open educational resources.[6]

Digital textbooks have experienced a rapid growth in Poland and the Ministry of Education is expected to continue its policy direction of supporting the development of open educational resources. The Ministry has declared its intention to further increase spending levels on digital textbooks and it has planned, subject to the successful implementation and evaluation of the pilot programme, to extend the programme to cover more regions and levels of the education system in Poland.

1.1 Educational Scope: Learning and Teaching Methods

In terms of educational scope, DSP targets educators and learners at two levels of education: primary and secondary education. Infrastructure development and teachers' training is addressed only for primary schools, while e-textbooks also cover secondary education. The initiative's development of open educational resources targets the subjects early education, polish language, history, biology, geography, physics, chemistry, math, informatics, computer classes, education for safety and civics.

DSP does not specify specific teaching and learning activities to be used at school-level. However, the modern didactic (educational/teaching) tools and e-textbooks are designed to enable more dynamic teaching/learning practices, for example through increased teamwork, informal learning, self-learning and individual learning-styles. In addition, they support the teachers to carry out interactive lessons or using the flipped classroom approach. While the e-books for the youngest pupils for example include puzzles, the e-books for older students integrate virtual learning, experiments, interactive tasks etc.[7]

1.2 Core Activities & Main Components

Overall, DSP consists of four supportive segments[8] that are implemented during the pilot stage:

1) Rolling-out infrastructure and modern didactic tools at schools (e-school);
2) Developing public digital educational resources and providing access to free and open e-textbooks (e-textbook);
3) Supporting teachers in teaching pupils, communicating with students and parents and documenting the teaching process through ICT (e-teacher);
4) Providing students with access to modern didactic tools / teaching aids (e-student).

In terms of infrastructure development, the initiative is aligned with the broader government policy goals of expanding ICT throughout different sectors and building up ICT literacy in Poland. In this respect, DSP aims to equip 380 schools with hardware, computers and IT-room equipment. Teachers are given autonomy to decide on the equipment and applications, based on the available options from the programme catalogue, in order to better take into account the needs of participating schools. In addition, efforts to provide and scale up infrastructure are linked to work of the Ministry of Infrastructure, which separately has been putting telecommunication and internet connections in place throughout Poland,

including at school grounds (part of the EU Digital Agenda 2020 implementation).

Second, as a crucial part of the programme, the e-textbook component provides funding for a set of 18 textbooks (later increased to 64) covering the core curricula for 14 subjects for grades 1-12. A tailored technology platform is being developed for the publication of the textbooks, which offers a set of simple digital content that can be used on computers or mobile devices. The e-textbook component has a duration of 3-years and aims to create e-textbooks under a Creative Commons Attribution License (or a similar free license). This allows teachers and students to use the resources without fees in a non-exclusive and unlimited manner.

The e-textbook component is also focused on developing supplementary educational resources: in total around 2500 educational resources (such as videos and other multimedia) have been made available. The open publication education portal, Scholaris[9], is used for the publication of the supplementary educational content, and will be re-designed as part of the process. The Center for Development of Education manages the nation-wide portal/repository (launched in 2005), which gives access to items is made available under a Creative Commons license. The e-textbook component furthermore seeks to develop ICT tools for schools management.

Third, the e-teacher component is focused on the training of teachers, which is provided through e-learning, face-to-face meetings, and online teacher support materials. Teacher training is typically based on peer learning activity groups. The aforementioned repository will offer training materials for teachers, available for teachers from the participating test schools. E-leaders, e-school coordinators and around 40 e-coaches will be trained to facilitate this process. There will also be arranged regional conferences serving as platforms for exchange of experiences and good practices.

Finally, the fourth component, e-student, seeks to provide ICT equipment directly to students. Tablets and computers are offered to students at participating schools. Students at the risk of exclusion are in particular targeted through DSP. This component, among other elements of the initiative, distinguishes DSP from previous policy initiatives, which mainly were focused on offering infrastructure for schools, rather than to the students themselves.

1.3 Funding and Business Model(s)

DSP is covered by public funding sources. In addition to funds from public budgets (i.e. from the Ministry of Education), funds were also obtained from the 2014-2020 European funding programmes for Poland to support the programme's full-scale deployment. While DSP ran from 2012 to 2013, the training of teachers and preparation of e-textbooks finished in 2015 as part of an EU project and funding.

The e-textbook component has a budget of 166 pprox.. €12 million (45 million Polish zloty), partly from government and EU funding.[10] Approx. €2.5 million (11 million Polish zloty) have been allocated for the production of 2500 supplemental educational resources. The narrative behind funding the developments of open educational resources and open e-textbooks are to some extent linked to cost-savings for public budgets: the Ministry of Education hopes to facilitate a better allocation of funds with the new investments. Following the provisions from the Operational Programme "Human Capital", the Ministry of Education will provide free access for all to the educational resources. From a commercial perspective, this might allow publishers to develop educational resources – in accordance with the government objectives

for teaching and learning – through the open education platform.

The budget for teacher training is around €4.7 million (20 million Polish Zloty). Participating schools receive a subsidy of 80 % when they invest in infrastructure and equipment for school use. The involved schools were allowed to spend up to 167 pprox.. €50.000 (200.000 Polish Zloty) on ICT-related equipment. In total, the budget for his segment is €12.8 million (55 million Polish Zloty).

The infrastructure investments are provided by the Ministry of Infrastructure, which had funds available through financial means acquired from planned allotments for UMTS network use. The Ministry was willing to use funds from the concession fees towards the development of broadband access and the purchase of broadband-compatible mobile devices for primary schools (targeting students in the first classes). This was carried out as a separate activity from DSP.

The Ministry of Education has confirmed the continuation of the programme until 2020, covering all components in all regions in Poland. Further intervention in school digitisation will for example be done in regions, based on the Digital School recommendations in the format of regional programmes funded with UE funds.

2. Policy and Conceptual Design

DSP is based on a holistic approach, combining equipment, content, platforms and innovative methods of learning.

The policy concept behind DSP was elaborated under the guidance of Witold Przeciechowski, who represented the Chancellery of the Prime Minister. A number of experts, such as Piotr Pacewicz and Alicja Pacewicz (Centre for Citizenship Education), Jarosław Lipszyc (Modern Poland Foundation) and Alek Tarkowski (Creative Commons Polska), contributed to the programme's conceptual development and design.

The e-textbook component within DSP was initially proposed to the Prime Minister's Office by a network of NGOs and educational institutions, such as the Modern Poland Foundation, Creative Commons Poland and the Centre for Civic Education. These organisations are all part of the Coalition for Open Education that aims to enhance the use of open education throughout Poland. The Prime Minister's Office also participated in the drafting phase.[11]

The Coalition for Open Education's contribution to the development of the policy design was based on position papers and recommendations on e-textbooks, including advice on methodological, technical, financial and legal matters, as well as a petition (signed by 3000 people) to support free textbooks for the Prime Minister and the Cabinet.

The concept was frequently revised throughout the early stages of the programme; the revision for example focussed on the much-debated requirement to publish the educational materials created within the programme. Although, the condition was removed during initial interdepartmental consultations, it was later included, with support of the Ministry of Regional Development, in the approved version of the programme.

2.1 Implementation Process

Prior to the implementation of DSP, two years of consultations and negotiations were carried out. By April 2012, the Council of Ministers approved the decree that formally approved the programme. The implementation process followed the below project timelines[12]:

- April 2012: formal approval of DSP by the Council of Ministers;

- April 2012 – August 2013: piloting of equipment and teacher training components;
- April 2012 – September 2013: piloting of e-textbook;
- October 2012: the Poznan Supercomputing and Networking Centre was selected as the technical solution provider of the online platform for e-textbooks;
- November 2012: selection of partner institutions by the Centre for Development of Education to create e-textbooks;
- September 2013: presentation of the pilot version of the online platform, including a small content set, which received positive feedback;
- September 2014: release date of the initial set of textbooks (early education, natural sciences, humanities);
- September 2015: release date of the 18 e-textbooks.

Overall, while the Ministry of National Education oversee the programme implementation, the Centre for Development of Education however has responsibility for the coordination of the programme and the development of the e-teacher and e-textbooks components. The implementation of the content and technical design followed public procurement processes for partners.

Following the tender process, the Poznan Supercomputing and Networking Centre was chosen in October 2012 as the programme's technical partner with responsibility for the creation of the online platform for digital textbooks. The Ministry of Education contracted four partner institutions in mid-2012 to support Poznan Supercomputing and Networking Centre in the production of the e-textbooks and to cover different content areas. Education Group S.A (Grupa Edukacyjna) was chosen to cover early education; University of Wrocław has responsibility for humanities; Łódź University of Technology is responsible for mathematics and computer science; and Wrocław University of Environmental and Life Sciences produces content related to life sciences.

The first modules of the open e-textbooks were published in early October 2013 and made accessible through http://epodreczniki.pl. In terms of the future implementation and expansion of the programme, it is worth noting that the production and uploading of educational resources can take place under any given license and without the need to grant the website operator with exclusive licensee. Having produced 62 e-textbooks, further work is planned at the central level to produce new e-textbooks.

The infrastructure implementation was mainly carried out at the local school level, with loose hardware guidance. While the Ministry of Education and the Centre for Development of Education offers advice and tries to support schools in buying sound IT equipment, it was decided to give head teachers a key responsibility for the selection of equipment and applications, based on the programme's catalogue, with an eye to ensuring that the procurement reflects the teaching needs.

The Centre for Citizenship Education (Centrum Edukacji Obywatelskiej), an NGO operating in the field of training and pedagogy and with experience in the publication of open educational resources, was given responsibility for the implementation of the e-teacher component. Finally, the Institute of Education Research was tasked to evaluate the programme.

2.2 Digital Technologies and Delivery Channels

DSP introduces and enables several digital technologies to support teaching and

learning activities among the participating schools in Poland. Starting with IT infrastructure, the emphasis is on hardware in the form of tablets and computers (for students) and IT equipment. This is further supported by the Ministry of Infrastructure's activities to improve telecommunication and internet connectivity for schools, which is outside the scope of DSP.

As regards the development of open educational resources, the main outputs are digital videos, various other multimedia resources and in particular digital textbooks. The e-textbooks are delivered and made available on the tailored technology platform http://epodreczniki.pl – developed by the Poznan Supercomputing and Networking Centre – and based on Connexions Software and HTML5 as content publication standard. The publishing content will be adapted for computer interface, mobile formats and printing as well as being accessible for both registered and anonymous users. The platform also offers curricula information, lesson plans and guidelines for teachers. The technical concept of the platform takes into account:

- support for diverse applications and users (a multi-platform approach);
- scalability in terms of users, digital resources and educational services;
- various on- and offline modes of working among users;
- ability to generate various versions of e-textbooks and accessibility to different functions;
- continuous maintenance of the used technology, infrastructure, security and the process of production, control and integration of software.[13]

2.3 Main Drivers

According to a study[14] by Śliwowski and Grodecka, the large-scale governmental programme was enabled by conducive government policies and a community of activists, educators and organizations calling for open projects in education. The programme, including investments in e-textbooks, had a potential to introduce cost-saving measures and thereby offered an opportunity for public authorities to allocate resources differently. A broad community of educators and organisations also supported the development of open education and e-textbooks. As explained previously, the Coalition for Open Education, a network of NGOs and educational institutions, contributed with position papers and recommendations in support of open education, for example concerning advice on legal and technical conditions.

The programme also experienced strong interest from schools to participate in the programme. In total, more than 3000 primary schools applied to take part. The programme offered an opportunity for schools to integrate and expand existing IT infrastructure and equipment. The support at school-level also comprised the engagement of heads of school, in terms of a willingness to supervise and guide the integration of digital technologies. The implementing authorities also experienced interest from teachers – covering many different subjects – to attend training on how to integrate and use digital technologies in education. This was also the case for students, who similarly have displayed a strong interest to attend lessons supported by digital technologies.

2.4 Main Barriers

Endeavours to promote digitalisation of schools in Poland had to take into account the lack of distinction between centralised and regional undertakings, which had often led to overlaps between educational

activities, and thereby complicated implementation processes. The implementation also had to take into account a shortage of fast internet connections and effective computer networks at school-level, discouraging teachers from using IT equipment for teaching and learning purposes as well as becoming acquainted with digital technologies. This was further complicated by a limited accessibility to administrative and technical computer support functions, including access to support and training activities for teachers.

Another main barrier relates to the commercial publishing industry. Publishers in the field of education typically produce and publish standard textbooks for the education system in Poland, based on the accreditation by the Ministry of Education. The idea to promote open educational resources and standards – through a national programme – faced criticism from commercial publishers. According to the publishing industry, a public initiative to support open digital resources could potentially introduce a state monopoly and violate the rules of fair competition.

The Polish publishers, with support from the Federation of European Publishers and the International Publishers Association, submitted a letter of complaint to the European Commission, against the use of public e-textbooks. The European Commission however backed the Polish government in their endeavours to support and use e-textbooks. The European Commission argued that digital technologies constitute a source of transformation in public sectors and for the functioning of economic market activities, and that teaching systems therefore unavoidably are challenged by emerging technologies.[15]

3. Results Achieved

In total, over 3000 schools applied to participate in DSP. Following the Ministry of Education's evaluation, 424 schools were selected, which was higher than the initially expected 380 participating schools. The selected schools have been equipped with hardware – such as tablets and computers for pupils and IT-room equipment – during the pilot stage.

62 e-textbooks covering 14 subjects have been developed, offering a total of 5195 lessons for grades 1-12. In addition, around 2500 supplemental educational resources (videos and other multimedia) were produced and published on the Scholaris portal under a free licence as part of the initiative.

The initiative was expected to introduce cost-saving measures. For example, in 2012, 170pprox.. €30 million (128 million Polish Zloty) was spent from the public budget on standard textbooks in education. In comparison, the expected cost was around €10 million (43 million Zloty) for the development of 18 open e-textbooks.[16]

The Institute of Education Research is responsible for the evaluation of the programme. The project is undergoing gradual evaluation, including the digital textbooks, while the testing of resources is done through surveys, interviews, and questions. The evaluation of the first modules of the open e-textbooks, including testing of the first functionalities of the platform, has resulted in positive feedback.

4. Sustainability, Scalability and Transferability

DSP is based on a holistic approach to education reform and integration of ICT, which combines the promotion of open educational resources with the delivery of infrastructure and IT equipment, creation of an education platform, modern teaching aids and teachers' training. The programme offers insights into how open educational resources can be supported from a policy strategy perspective, including possible accompanying measures

to support it, such as the emphasis on ICT-competent teachers and focus on the individual needs of schools.

According to Śliwowski and Grodecka [17] DSP could be viewed as a best practice example, serving as inspiration in the field of open educational resources. The open standards used for the educational content do not only implement the provisions of the UNESCO Declaration and the European Commission's "Opening Up Education" initiative, they also go beyond the minimal standards laid out by the UNESCO Paris Declaration on open educational resources, in terms of its scale and support for open educational resources at the national level.

In addition, the new free and accessible infrastructure of the open educational resource component provides scalable opportunities for commercial use. DSP was however only recently implemented, and it is still uncertain how the uptake of commercial resources will develop in the future.

5. Perspectives and Policy Lessons Learned

According to the Coalition for Open Education, DSP would benefit from a clearer definition of the legal and technical status of the e-textbooks, in order to better assess the potential for re-using content.[18] It is felt that the legal conditions could be improved to support the accessibility of the programme content. A lack of information was for example found for the compliance with the license Attribution Creative Commons Attribution. According to Mr. Krupa, Head of Unit at the Quality of Education Department at the Ministry of National Education in Poland, it was found that in order to achieve more effectiveness of teachers' training courses should be based on innovative methods of teaching supported by ICT (e.g. flipped classroom and others).[19]

While research has been carried on the programme's impact on learning outcomes and educational performance, little difference was yet found between the participating schools and those outside the programme. As the programme is only implemented recently – and based on long-term objectives – it is still too early to assess the wider impacts and perspectives.

Further information

http://www.epodreczniki.pl

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http://legislacja.rcl.gov.pl/lista/3/projekt/23941/katalog/23961

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[13] ibid.

[14] Śliwowski, K. & Grodecka, K. 2013. Open Educational Resources in Poland – Challenges and Opportunities. See: http://iite.unesco.org/pics/publications/en/files/3214727.pdf. Retrieved on 04.01.2016.

[15] http://centrumcyfrowe.pl/english/digital-school-e-textbooks-programme-a-year-and-a-half-later/

[16] Śliwowski, K. & Grodecka, K. 2013. Open Educational Resources in Poland – Challenges and Opportunities. See: http://iite.unesco.org/pics/publications/en/files/3214727.pdf. Retrieved on 04.01.2016.

[17] Ibid.

[18] Ibid.

[19] Interview with Janusz Krupa, Head of Unit at the Quality of Education Department at the Ministry for National Education, 22 January 2016.

Digital Education Revolution – Australia

Fact box	
Targeted education level(s)	Secondary education
Target group(s)	Students from Year 9 (14-15 years) to Year 12 (17-18 years) and their teachers
Learning and teaching methods	Multiple learning styles
Digital technology & delivery channels	Internet connectivity; Virtual learning environment
Implementation phase	Mainstream
Impact level	Systemic
Impact areas	Enhanced training and support of educators (use of digital tools; improved digital skills; attitude towards ICT; knowledge of existing e-learning capabilities)
Output dimensions	911.000 computers rolled out in 2,701 national schools. High-speed broadband connectivity delivered to urban and rural schools. More than 15,000 educators trained in Intel Teach Programme.
Outcomes	Early indications from the Australian National Audit Office (ANAO) survey regarding the impact of the National Secondary School Computer Fund (NSSCF) on teaching and learning are positive.
Funding and business model	Public funding
Budget (EUR)	Approx. 1.62 billion EUR (2.4 billion AUD)

Drivers	Barriers	Policy Lessons
Broadband via individual computer terminals helped students adapt fast to technologies	**Teacher capability and teaching practice in using digital technologies**	**Provide training to teachers & curriculum support before roll-out of laptops**
High funds led to economies of scale and considerable cost-savings per unit	**Set-up and maintenance of technical equipment, particularly in rural area**	**Sustainability needs to be considered before embarking on a similar model in another country**

Introduction

As a response to an increasingly digital and technologically driven society, the Australian government initiated a 7-year programme "Digital Education Revolution" (DER), aiming at equipping students with the tools and skills needed for the "digital future". The programme created a unique partnership between all State and Territory governments as well as the catholic and independent schools with a budget of 2.4 billion AUD (174pprox.. 1.62 billion EUR). [1]

The programme was announced as one of the top three priorities by the Australian Labour Party for the 2007 federal elections being launched immediately after the electorate victory in 2008. The Department of Education, Employment and Workplace Relations (DEEWR) was appointed as overarching coordinator. However, thanks to DER's decentralised and highly collaborative character, the states and territories were able to choose their own models upon agreement with DEEWR.

DER targets the entire Australian secondary school student population from Year 9 to 12 (14 to 18 years old) and their teachers. It seeks to prepare the students for the digital future by providing ICT devices to every student of the target group, support deployment of high-speed broadband connectivity, increase online curriculum resources and develop interactive virtual platforms for teachers, students and parents.

1. Policy context: Background, Objectives and Rationale

Attempts to harness the advantages of digital technologies to improve learning outcomes and enriching the learning experience were made prior to the launch of DER by the Australian government and school societies. At the federal level, three Joint Ministerial Statements on ICT in Australian education and training were presented between 1999 and 2008. The territories and regional administrations also previously invested in infrastructure, online educational resources and teacher training. Despite ample progress on the topic, previous efforts did not achieve an equally spread digital transformation in the classroom. Indeed, only a small percentage of schools enjoyed ICT benefits before 2008 when the average computer to student ratio in the country was 1:5.[2]

The Digital Education Revolution programme was initially presented in an election campaign of the Australian Labour Party prior to the Federal Elections in 2007. At that time, the Labour Party opposition declared the education reform as one of its top three priorities. The Digital Education Revolution promised to boost Australian investment in education and improve the quality of education outcomes. As a result, the third Joint Ministerial Statement 2008-2011 acknowledged the importance of ICT in education and committed to a "national partnership to share resources and expertise, recognising the importance of innovation and experimentation".[3]

> *"We will turn ever secondary school into a digital school within four years".*
>
> **Kevin Rudd, Australian Labour Party, 2007**

The election commitment soon became an unprecedented programme bringing together the Commonwealth, States and Territories' governments and organisations from independent and Catholic education in one programme, thus establishing a new future-oriented vision for Australian education. The programme aimed at achieving quick and large-scale integration of ICT in the classrooms of senior secondary students from Year 9 (age 14-15) to Year 12 (age 17-18) and their teachers. Three objectives were:

- To change the traditional way of teaching and learning in four strands

(infrastructure, leadership, teacher capability and learning resources);

- To supply every student in Year 9-12 with the tools needed to adapt to modern ways of learning;
- To build a solid foundation for effective delivery of a consistent online curriculum and provide stimulating and challenging learning resources for students.

In concrete actions, the objectives were implemented by providing computer equipment and high-speed cost-effective broadband connections to schools as well as easy access to online educational resources and web platforms for communication with parents.

1.1 Educational Scope: Learning and Teaching Methods

The Digital Education Revolution envisaged transforming traditional education by digital means. The deployment of digital technologies aims to adopt a student-centric teaching and learning approach, with a focus on personalised and peer-to-peer learning. Additionally, and equally important, is the shift from a teacher-to-student knowledge stream to rather collaborative and explorative teaching and learning methods, in which the teacher is not an exclusive source of knowledge anymore.[4]

The programme is targeted at secondary school students and teachers. Digital tools and electronic books are expected to be used by both teachers and students. Whereas students are equipped with digital devices and have access to open educational resources online, teachers and school leaders benefit from alternative and interactive ways of teaching, integrating digital tools and resources in the classrooms.

The interactive platforms also allow parents to monitor the progress of their children and to engage in virtual communication with teachers. These platforms also grant ´anywhere-anytime´ access to education material and lesson plans to the students.

1.2 Core Activities: Main components and intended impacts

The programme includes five main components:[5]

The *National Secondary Schools Computer Fund (NSSSCF)* was put in charge of the infrastructure provision. It supplied, installed and maintained the ICT infrastructure needed for digital education. The overwhelming share of the total budget came from the National Secondary School Computer Fund (2.2 billion AUD). Initial audit was agreed by all stakeholders to identify the schools most lagging behind in achieving a "1 computer per 2 students" ratio. Additionally, education authorities were equipped with an additional 1.1 billion AUD for schools to accomplish and maintain a 1:1 computer-student ratio.

Supporting the Australian Curriculum Online (SACOL) is a programme developed under DER to support teachers in curriculum activities and to help develop flexible and innovative ways of teaching in classrooms. Furthermore, SACOL was equipped with extra material needed to teach main and, in particular, secondary subjects, e.g. geography, arts and languages.

The *Information and Communications Technology (ICT) Innovation Fund* was set up to sensitise teachers in integrating technologies into the classroom through four activities: (1) *Teaching Teachers for the Future* focusing on integrating ICT into daily classroom activities; (2) Online Teacher Toolkit ICT in everyday learning compiling new and existing online teaching resources; (3) *Anywhere, Anytime Teacher Professional Learning* foreseeing safe virtual environments for teachers to progress on their ICT preparation and (4) *Leading ICT in Learning project* ensuring

an expert advice and tools for teachers to enhance ICT integration in the classrooms.

The *National Schools Interoperability Program (NSIP)* focused on the provision of technical advice and support in the framework of technical interoperability. Meanwhile, the *Australian Curriculum Connect* was established to support the implementation of the Australian curriculum by enabling the use, sharing and discovery of digital resources aligned with the new Australian Curriculum.

In addition to the above components, the Digital Education Revolution envisaged four priorities that support the national vision of 21st century education:

Infrastructure: sustainable access to digital teaching and learning resources, high-speed network for entire learning spaces supporting flexible learning possibilities, learning platforms for communication between teachers, parents and students and monitoring of learning processes and interoperability allowing exchange and sharing of data.

Learning Resources: Software and digital learning resources, instruments that ensure a safe and secure sharing of knowledge and interaction, a common national model for content supply and an integrated approach for managing copyright and IP.

Teacher capability: Training and development of teachers, teaching models that will reap the benefits of the digital resources, while transferring good practices between the stakeholders involved.

Leadership: a well-elaborated plan for schools including training support, ICT integration strategy and community engagement in the use of ICT. [6]

1.3 Funding and Business Model(s)

The DER programme is based on public funding derived from three main sources. The *National Secondary Schools Computer Fund* (NSSCF) accounts for the greatest share of provided funding. 1.4 billion AUD was spent on the acquisition of ICT equipment, while an additional $807 million AUD was allocated to cover the installation, maintenance and technical support. [7] The fund provided 2500 AUD per computer (1000 for installation and 1500 for maintenance). As the fund was operated flexibly, schools were free in their choice of ICT equipment; the purchases ranged from desktop computers to netbooks, laptops and tablets.

To achieve the main objectives, the ICT infrastructure provided primarily was accompanied by internet connectivity in schools. Therefore, the *High Speed Broadband to Schools* initiative supplied 100 million AUD, ensuring high-speed internet in all of Australia's schools.

Last but not least, 40 million AUD were provided for the training of teachers and school leaders, in order to support their professional development in applying ICT tools in the classroom.

2. Policy and Conceptual Design

In the Adelaide Declaration of 1999, education ministers at all levels developed a vision for Australian students to "be confident, creative and productive users of new technologies, particularly information and communication technologies". [8] Based on the Adelaide Declaration, the Commonwealth together with the States and Territories´ Governments ratified an Action Plan "Learning in an Online World", acknowledging the potential of ICT to revolutionise learning processes.

With the Joint Ministerial Statement on ICT in Australian Education and training in 2008-2011, the education ministers agreed to build a national partnership to integrate digital technologies and to stimulate new ways of teaching and learning. This vision has been translated into concrete commitments to ensure ICT equipment for

all secondary schools. This was done by creating the NSSCF, installing broadband bandwidth, developing online curriculum content, ensuring access to content and by developing interactive platforms for parents' interaction.

Aiming to achieve the national vision of preparing students, teachers and parents for effective and efficient use of ICT in 21st century learning, DER includes not only actions related to ICT but also considers teachers and school leaders' development, different approaches in educational processes, resource management and outreach to the general public.

2.1 Implementation Process

Given the aspiration of the Australian Government to include all school networks over the entire country in the programme, the involvement and cooperation of stakeholders was unprecedented. The National Partnership Agreement was signed by Department of Education, Employment and Workplace Relations (DEEWR), all State and Territory governments and Block Grant Authorities (Catholic and independent schools). DEEWR was appointed as the coordinator of the programme. Overall, the implementation process was based on four priorities: infrastructure, learning resources, teacher capability and leadership.[9]

Infrastructure: Provision of the ICT infrastructure by the NSSCF and provision of connectivity by High Speed Broadband to Schools Initiative. As a starting point, DEEWR conducted a survey targeted to the schools most in need in order to calculate the adequate funding to be provided. The education authorities were equipped with the tools to collect the necessary data for each and every school in their State or Territory. Based on the survey outcomes devices were provided for schools in need during the first year of DER and the ratio 1:2 was gradually reached.

In the beginning of 2009, right after the supply of ICT infrastructure in needy schools, the initiative provided fibre connections for schools. At this stage, it also started supplying additional ICT infrastructure to all schools. The stage also included the establishment of local area networks and interoperability of ICT systems. This enabled and boosted the development of interactive virtual spaces for students, teachers and parents.

Learning Resources: The second strand funded by NSSCF started by mid-2008 once all needy schools had acquired the necessary ICT infrastructure. It started with the creation of a pool of online resources for schools and continued during two years with a focus on new content for priority areas and online access to the national curriculum.

Teacher capability and Leadership development received 40 million AUD and were implemented through training that promoted the integration of digital technologies in curricula and classrooms. Over 15.000 teachers have undergone training within the "Intel Teach Program" and one ICT development centre was established. Despite the student-centric nature of DER, technological competence of the teachers was essential to the successful implementation of the programme.

2.2 Digital Technologies and Delivery Channels

The Digital Education Revolution equips every student with an ICT device. Thanks to the flexible nature of the DER, each school could choose the device they found more appropriate for their teaching methods, selecting from a desktop computer, a netbook, laptop or tablet. A certain amount of schools have opted for desktop computers per couple of student, stressing the collaborative and interactive approach for the use of digital technologies for educational purposes. The majority of

schools however chose one laptop per student, based on the arguments that students will develop a deeper sense of responsibility and have the possibility to access the necessary material outside of school. For example, New South Wales students were supplied with Lenovo small Idea and ThinkPads. It is also worth mentioning that all the devices included the necessary education software and electronic books. [10]

In order to make the best use of the provided hardware and software, over 9000 schools were connected to the national High Speed Broadband network at the speed up to 100 Mb per second. The combination of ICT devices and High Broad Band connectivity allowed students to access online content such as open educational resources at any possible time and place. Connectivity also greatly contributed to the web platform that was set up to boost the communication between teachers and parents on the progress of their kids.

2.3 Main Drivers

Aiming at turning every school into a digital school, the programme focused on providing ICT devices to every student along with high-speed broadband to every school in Australia. Using broadband through individual computer terminals helped students to adapt faster to the provided digital technologies. It also allowed every student to access online content, lessons plans and other learning material at anytime and anywhere.

Moreover, the use of the national broadband network provided access to online curriculum content with increased quantity and quality of open educational resources. The NSSCF funding reserved over 800 million AUD for the maintenance of delivered ICT devices, what equals to an average of 1500 AUD for updates and maintenance of each computer.

The high amounts of funds provided by the programme allowed for an effective use of economies of scales. This led to a significant decrease in hardware costs tied to the implementation of the programme. In the case of the programme's implementation in New South Wales the resulting price drop was from $800 to $500 per device. Thanks to these savings, more devices could be purchased and also additional funding became available for professional learning. [11] In NSW a relationship with a device manufacturer was established allowing the authorities to influence certain characteristics of the computer, e.g. making it more robust for student use.

Another key driver determining the success of the programme was the support and mentoring of the teachers. Over 15.000 teachers received Intel Teach Training. In addition, an ICT development centre was established. Despite the student-centric nature of DER, technological competence of the teachers was essential to the successful implementation of the programme, incl. in its post-implementation phase.

2.4 Main Barriers

While the DER was in some regards a successful programme in integrating ICT into teaching and learning, teacher capability and teaching practice have been highlighted as 'unfinished business' by some concerned stakeholders. [12] However, the reasons for these obstacles cannot necessarily be deducted to a lack of finances but rather to the lack of available time to develop their abilities in effectively integrating ICT into their teaching practices. [13] Another study on the impact of the DER stated that despite teachers' general digital competence more support for teachers was needed to make use of technology as a learning tool, thus ensuring students' motivation and engagement. [14]

A second barrier of the programme lies in its origins as part of the Australian Labour Party's electorate programme leading to a considerable dilution of DER following a change in government from 2010 onwards. The incoming Liberal/National coalition preferred a more devolved approach to school education generally, via Australian state and territory governments. Consequently, the implementation of the DER was brought to a close and largely resulted in a once-only funding programme supplying computers to all Australian schools, meeting the so-called one-to-one target of a computer per student by 2010/11. Ongoing funding was not appropriated by the federal government and responsibility for maintenance and/or replacement computers fell to the states and territories, or the independent school system. This also coincided with a shift towards BYOD and other approaches to the provision of digital technology in schools.[15]

Insights obtained from the implementation of the DER in New South Wales show that additional barriers in the implementation were related to the set-up and maintenance of technical equipment. This involves the timely repair of devices to ensure that every child has a device at hand, but also the installation and maintenance of a wireless network across rural NSW has proven to be difficult. Since there is no local support centre in these rural areas, defect devices were limited to be repaired through trouble shooting.[16] In addition, connectivity problems in the classroom incl. the extension of bandwidth were reported to be a problem in the course of DER's implementation.[17]

3. Results Achieved

There is a general consensus that the programme was successful as it achieved its initial goals. The main commitment of the Federal Labour Government was to provide personal access to online information at every secondary school in grades 9 to 12. The output of the 2.2 billion AUD investment amounted to over 911.000 ICT devices supplied to schools by 2012, considerably exceeding the original target of 786.000 computers.[18] These devices included netbooks, laptops, desk computers and tablets. Moreover, provided funding was also channelled into high speed broadband connections, installation, maintenance and support of the ICT infrastructure. Finally, Intel trained over 15.000 teachers in the framework of the "Intel Teach Program" on how to effectively integrate digital technologies into teaching and learning activities.

Overall students engaged in digital ways of learning in line with the digital reality of the 21st century. Teachers that have received ICT development trainings devised a student-centric approach of learning. In many cases, the traditional way of teacher-to-student knowledge stream was replaced with an approach where the information is rather built and shared via blogs, social networking and other digital forms. In other words, the programme also allowed upgrading the traditional curriculum to contemporary resources and activities.

DER courses were made available anytime and anywhere. Moreover, the digitalisation and connectivity allowed for access to up-to-date data, while traditional textbooks often become outdated after few years. Finally, parents have been encouraged to embrace the use of the digital technologies by investing in the ICT devices for the kids and participate in the web platforms set up for the interaction with teachers and monitoring of children´s results.

The DER programme was subject to a mid-term review and final national audit which was accompanied by additional evaluations at territorial implementation level.[19] In the case of New South Wales (NSW), three evaluation reports were carried out involving surveys of students and teachers in grades 9-11.

Sustainability, Scalability and Transferability

While the programme was undoubtedly successful in achieving its goals and truly succeeded in digitalising secondary schools in Australia, the question on how sustainable the DER is in the long run has been raised from the very beginning in 2008. ICT and computers have a relatively short life cycle, meaning that more funding is needed to sustain the ambitious 1:1 computer-student ratio. The policy initiative foresaw the possibility of schools to reapply for grants to upgrade their ICT infrastructure every four years. In fact, many schools opted for re-application. [20] Given an expected increase in the importance of digital devices and technologies at school, potential ways to ensure funding in the long term will need to be considered ever more.

Potential solutions will likely require a change in mentality among education authorities as well as parents. Governments need to shift from the perception of seeing the provision of ICT as an additional or in some case luxurious activity to an approach where ICT infrastructure is embedded at the core of the entire school operation. Secondly, parents should be encouraged to contribute to the purchase of ICT infrastructure for their children.[21]

DER may serve as a good model for countries with federal and confederal models; autonomy is centralised at regional level and schools can chose devices according to their needs.[22]

5. Perspectives and Policy Lessons Learned

Given that the DER programme received much attention of press and academia, it can be considered a fertile ground for policy lessons learnt, at the level of federal planning and coordination as well as territorial implementation. Although the mid-term evaluation pointed out a number of deficiencies in the roll-out of the programme, it appears that there were very few changes to the original design of the programme.[23]

At the federal level, the provision of the ICT infrastructure, as the number one priority, was wide in take-up and size but also fast in the rollout with significant savings due to the large scale of delivered devices. However, in some cases this has created a disproportion between the physical provision of the ICT tools and development of the leadership and teacher capability strands. The outcome was that some schools did not use the provided devices at their full capacity.[24] Equally, the implementation of DER in NSW noted that one of the main policy lessons learnt is to provide training to teachers and curriculum support material before deployment of laptops to students. In the case of NSW, 600 Technology Support Officers (TSO) needed to be hired and trained in a short time frame. This posed problems for administrative capacities, as also procedures, manuals, etc. needed to be developed.

A second policy lesson learnt relates to the effective collaboration between different levels of governance in education, in this case the Commonwealth federal coordination and more decentralised implementation. The interplay of the authorities can be considered a success. The initiative succeeded in reaching and developing educational infrastructure of the most remote and lagging schools. In the meantime, it empowered schools that had already a high computer-student ratio and connectivity.

Next to taking into account training needs of school teachers, the example of DER could serve as a showcase highlighting the need to integrate sustainability issues into the policy's design from the beginning. According to the authorities responsible for DER's implementation in NSW, sustainability needs to be considered before embarking on a similar model in

another country. Key questions to be answered include issues related to a potential replacement of the wireless network, future financing of the delivered devices' maintenance and Technology Support Officers (TSO).

Last but not least, DER brought up questions regarding parental involvement in the provision of technology. While the mid-term evaluation of DER suggested a stronger involvement of parents in contributing to the cost of a device and, more generally, in engaging parents in their children´s education including trough effective use of new technologies experiences from DER's implementation in NSW, suggested that Bring Your Own Device (BYOD) approaches need to be increasingly considered. However, cases where a family cannot afford to purchase a device would also need to be addressed in these scenarios.[25]

Further information

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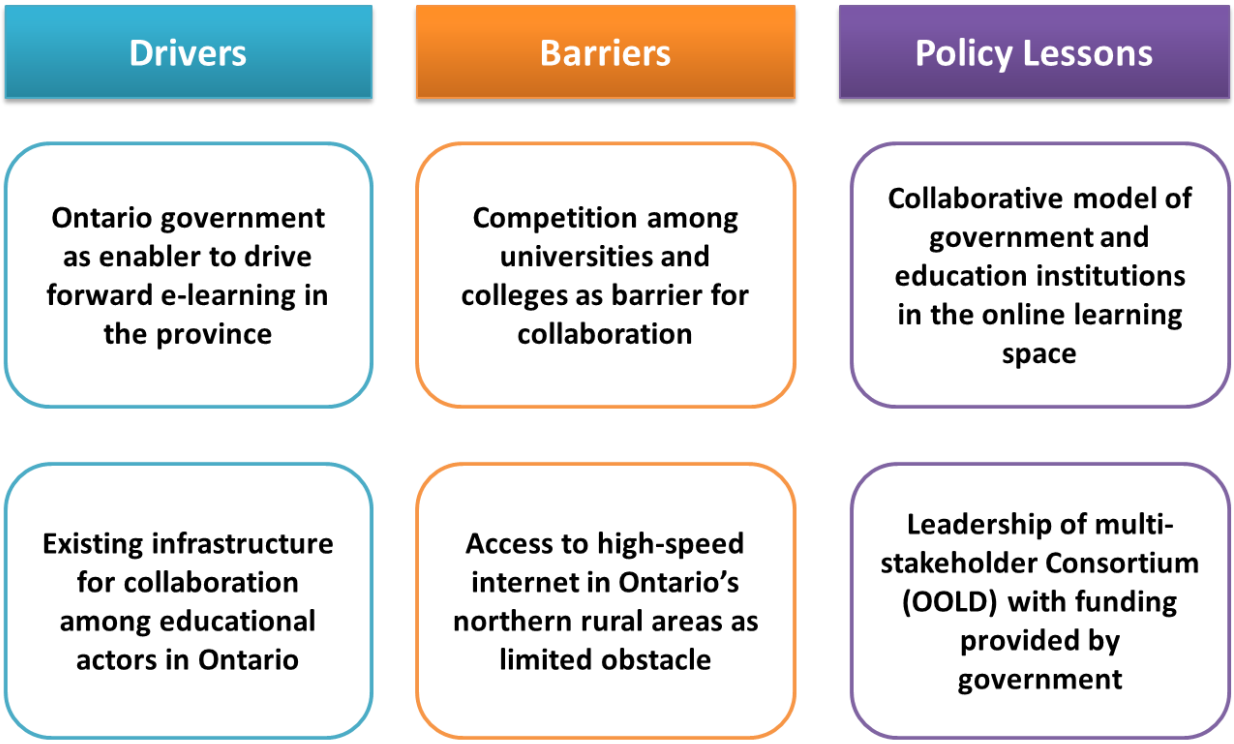
eCampusOntario.ca – Canada

Fact box	
Targeted education level(s)	Post-secondary education
Target group(s)	HE students; Teachers & trainers
Learning and teaching methods	Collaborative learning
Digital technology & delivery channels	MOOCs / e-learning; Online platform
Implementation phase	Mainstream
Impact level	Service
Impact areas	Increase the use of modern digital learning tools; Enhanced use of existing technological infrastructure
Output dimensions	eCO engages 45 public-assisted colleges and universities and currently offers over 14,300 online courses and over 700 programmes from Ontario´s post-secondary institutions
Outcomes	Increased collaboration among colleges and universities in Ontario and the creation of an online platform with courses
Funding and business model	Public funding
Budget (EUR)	Around €49 million over 5 years



Introduction

eCampusOntario (formerly 'Ontario Online'[1]) (eCO) is the primary face of the Ontario Online Learning Consortium (OOLC)[2], which was established to make Ontario province (Canada) a leader in technology-enabled education and e-learning as well as to enhance post-secondary opportunities for students.

After a consultation process with education stakeholders, the Ministry of Training, Colleges and Universities (MTCU) announced in 2014 its intention to setup OOLC. The consortium's objectives are to: improve collaboration among Ontario's public-funded colleges and universities; share best practices and resources; provide high-quality online courses; and support credit transfer between education institutions. In 2015, OOLC launched its main deliverable, a centralised online platform, www.eCampusOntario.ca, where post-secondary students can find and enrol to online courses and programmes offered by Ontario´s colleges and universities.

OOLC will continue to explore new areas for collaboration, in order to add value for members of the organisation and students in Ontario. The consortium is jointly administrated by Colleges Ontario (CO) and Council of Ontario Universities (COU). The implementation and operation of OOLC is funded by the government of Ontario through MTCU, which also contributed to the design of the consortium.

1. Policy context: Background, Objectives and Rationale

Ontario has a tradition of supporting access to post-secondary education, e-learning and distance learning. The popularity of post-secondary education and online courses among students has increased significantly during the last decade in Ontario. The strong underpinnings in e-learning have helped facilitate eCO and thereby broadened post-secondary opportunities.

Due to the economic recession in 2008, the enrolment to post-secondary education however declined. Two major challenges were in need of a policy response. First, students faced increasing difficulties to pay the tuition fees for classes. Second, the cost structures of colleges and universities came under pressure because of a declining student enrolment. With an eye to ensuring the sustainability of colleges and universities, MTCU consulted with education institutions to explore policy options for the promotion of e-learning in Ontario.

Ontario´s Differentiation Policy Framework for Post-Secondary Education Policy[3] (2013) highlights post-secondary education as central to Ontario's economic performance and for the social and economic benefits of its citizens. The Ontario government's economic plans further outline objectives to invest in people and students, to create a modern infrastructure, and to ensure support for the business climate. [4] Supporting the post-secondary education system and online learning was considered a means to achieve these objectives. In the 2015 budget, the government outlined eCO as key for strengthening the province´s social and economic growth.[5]

The rationale with eCO is to build upon existing strengths in Ontario's education landscape, in order to strengthen the province´s foundations in distance and e-learning education. Specifically, eCO seeks to achieve the following objectives[6]:

- improve colleges' and universities' collaboration on the sharing of best practice, research and online courses as well as through minimising duplication of work;
- create a one-window online platform where students can directly access online courses offered by the different education providers; and

– facilitate credit transfer between education providers.

MTCU does not only want to emphasise the wide offer of eCO's online courses; it is expected in broader terms to promote research activity and improved access to high-quality online education. Over time, it is further envisaged that eCO will lead to the evolution of technology-enabled learning in higher education, productivity gains through cooperation, innovation, and raise Ontario's profile in the online learning domain, both nationally and internationally.[7]

1.1 Educational Scope: Learning and Teaching methods

The educational scope of eCO is targeted towards learners at the level of post-secondary education. The platform offers more than 14,300 online courses and over 700 programmes to post-secondary students, covering a wide range of disciplines, including cross-disciplinary subjects such as business management, engineering, and social sciences. eCO also helps overcome geographical, social or financial barriers for students as assignments are completed outside of the classroom; enrolled students receive the necessary information and resources through online means, which they otherwise would have received on-site at the campus ground. In other words, eCO provides students with flexibility to access courses when and where it is most convenient for them.

"The web portal builds on the province's strong foundation in e-learning and distance education and allows institutions to collaborate, share best practices and online resources, and offer state-of-the-art courses that are recognized for credit across multiple institutions."

Reza Moridi, Minister of Training, Colleges and Universities

The participating colleges and universities in eCO preserve their autonomy to decide on teaching and learning activities, including quality standards. The courses are designed and taught by professors from participating colleges and universities: a committee of representatives from the involved colleges and universities coordinates the courses and related administrative aspects. The courses and programmes are envisaged to integrate technological tools, effective online-pedagogy and provide technology-enhanced learning for students. Classes are intended to be equipped with video and audio capabilities for real time communication as well as text chat, presentation functions and application sharing.

1.2 Core Activities: Impact and Focus Areas

From an organisational view, OOLC represents the legal entity and corporation behind eCO and it works as a collaborative, non-for profit, and membership consortium. All Ontario´s public-funded colleges and universities decided willingly to become members of OOLC where they cooperate with stakeholders from Ontario's education landscape. eCampusOntario (i.e. eCO) is the descriptive and student-friendly brand under which OOLC operates. While OOLC's governance and operation structure has evolved over time, its key functions have remained broadly constant, being based on three linked hubs (following the initially conceived structure)[8]:

– *Course hub*: delivering centralised online courses;

– *Knowledge hub*: supporting the development and sharing of best practice, research, data, analysis; and

– *Support hub*: providing academic and technical support to educators through a virtual space for sharing resources.

eCO's main activity relates to its online platform. While online courses and programmes were previously offered

individually by colleges and universities through their own channels, the intention of eCO is to offer a one-window access to all accredited courses and programmes. The website was only recently launched, and is expected to grow in terms of functionality, courses and programmes, support and resources.[9] The platform will help students to search for and enrol in (mostly) online courses and programmes. The platform offers search and filtering functionality as well as information about registration, tuition and fees, credit transfer etc. Students who are new to post-secondary education or online learning are also targeted by the website, which provides support and information to learners on basic study skills, mathematics, writing and information, on financial support etc. The website includes the below elements:

- a searchable online catalogue of provided online courses;
- credit transformation information;
- resources on how to design and deliver online courses; and
- technical and academic support for users.

Another core activity of eCO, is the facilitation of collaboration between Ontario's colleges, universities and education stakeholders in focus areas where it adds value. Besides the online platform, these areas concern: joint cooperation on offering centralised and transferable online courses and programmes; leveraging on technologies to promote innovation in the evolution of teaching; offering academic and technical support for institutions, instructors and students; undertaking innovative research and knowledge mobilisation to provide evidence that can inform best practices in technology-enabled and online pedagogy; and sharing of online resources such as journal activities, book chapters, blogs, videos, and content modules.

The Ministry's Shared Online Couse Fund is a separate but highly linked activity to eCO that provides funding for redesigning and developing online courses and modules. Approx. 400 courses and 80 modules have been developed or redesigned as part of the funding and are made available on the online platform.[10]

1.3 Funding and Business Model(s)

eCO is based on public funding from the Ontario government. In early 2014, MTCU announced its commitment to provide eCO with 186 pprox.. €29 million (42 million dollars) for a period of three years. MTCU later expanded the funding commitment to around €49 million (72 million dollars), covering a period of five years, to support the creation and operation of eCO. [11] Around €0.7 million (1 million dollars) was dedicated to the facilitation of key preparation activities for the incorporation of OOLC.

Following the Guidelines for the Shared Online Course Fund, a linked activity to eCO, over €6 million ($9.5 million dollars) was made available by MTCU to develop and redesign ´flagship courses´ for Ontario's colleges and universities from 2015-16 onwards. The amount was later increased to over €7 million ($11 million dollars).[12] MTCU has thus funded the creation and operation of OOLC, its online platform and the redesign and development of online courses. The evaluation and selection of courses for funding is administered by CO and COU, on behalf of colleges and universities. Only courses that is are selected by the sector-level evaluation committee are allocated with funding.

"By improving collaboration between our colleges and universities and giving students more choice in courses, we are continuing to transform our post-secondary education system into a worldwide leader in innovation."

Brad Duguid, former Minister of Training, Colleges and Universities

2. Policy and Conceptual Design

The intention to set up eCO (then 'Ontario Online') was first announced in the 2010 Ontario Speech from the Throne by the former Premier of Ontario, Dalton McGuinty.[13] The statement outlined an idea to create a new entity to enhance online learning, but did not provide very specific information on the entity's design or funding. A special advisor was appointed to assess and prepare policy recommendations for Ontario's post-secondary sector; a final report was submitted in spring 2011 providing the outline and realisation of the initiative.

"One of the greatest strengths of this initiative is its collaborative, member-driven development. I'm extremely proud that all 45 publicly-assisted colleges and universities in Ontario have actively engaged in this project, and have contributed to its success."

Catherine Newell-Kelly, Executive Director, OOLC

eCO went through an extensive consultation process with working sessions (38 in total) engaging stakeholders from the post-secondary education sector, academic institutions, and students on how to set up the entity. Input was also received from private sector providers of online learning technologies and from experts in distance and online education.

The university and college sector felt that it was important to move proactively and influence the shaping of the new entity, to avoid setting up a body with few links – or in direct competition – with existing and well-established educational actors in Ontario. [14] The colleges and universities did not feel a need to duplicate work with an entirely new degree, credential or funding body: it preferred a solution where CO and COU would lead the work. Initially, the universities worked independently on providing input on the new entity. Only when it became clear that MTCU wanted colleges involved, universities and colleges started cooperating.

In summer 2011, MTCU released the discussion paper "Strengthening Ontario's Centres of Creativity, Innovation and Knowledge", outlining visions for the transformation of post-secondary education. In 2012 and 2013, roundtable discussions were held to address the paper´s themes: MTCU decided on this background to set up a new consortium, led by CO and COU, and put collaboration mechanisms in place for colleges and universities on online learning. Based on a joint letter in 2013, CO and COU committed to cooperate with the MTCU to create a joint vision for eCO, to share practices, resources and research, and to drive forward online learning in Ontario.

Overall, eCO's conceptual model was informed by MTCU´s research and position papers as well as recommendations from education stakeholders, such as CO, COU, Contact North, Canadian Federation of Students – Ontario, and Ontario Under-graduate Student Alliance. The conceptual model drew on evidence from the consortium approach used in the Australian education initiative, Open Universities Australia, and from US states´ experiences with central processes to engage state universities. At the end of 2013, a memo was published by MTCU that laid out the conceptual model for the proposed scope of activity and governance structure of eCO and the Guidelines for the Shared Course Fund.

2.1 Implementation Process

Through MTCU, the Ontario government oversees eCO´s implementation. Since MTCU funds eCO, it can incentivise the work of the organisation; there is for example a detailed agreement in place concerning how OOLC's resources are spent. MTCU is however not able to control OOLC as it is owned and operated by colleges and universities through CO and COU and incorporated as a not-for-profit corporation. OOLC acts as the steering committee, which facilities collaboration

among members, manages the online platform, and has responsibility for developing the implementation plans and business plans.

All publicly assisted colleges and universities in Ontario, including stakeholders such as CO, COU, Contact North and Ontario Council on Articulation and Transfer, participate as members of OOLC. The members jointly contribute and decide on eCO´s focus areas and the implementation of agreed projects. Each college and university appoints a voting member to represent them in OOLC, and the voting member makes the key decisions regarding implementation, delegation and so forth. While OOLC is governed by a board of directors under the leadership of two board chairs, the operations are led by two executive directors. The board consists of faculty experts in online learning, senior administrators from the college and university sector, students and members of the public.

Wired Solutions was awarded and contracted in May 2015, following a competitive procurement process, to develop the web-based platform. As lead developers, Wired Solutions cooperates with OOLC´s project team to create the web-based application from the ground-up.[15] The first phase of eCO's online portal was launched by October 2015. The intention is that the portal will continue to be improved and expanded, in terms of functionality, personalisation and student services as well as adding more extensive course and programme information. The initial range of selected courses mainly concerns courses of a foundational and introductory character. From an implementation perspective, the aim is to first integrate courses into the platform, that would later offer a potential for scaling up. Lastly, so far there is no direct training foreseen for teachers in eCO. The website however provides several resources, including journal articles, books, blogs, videos and content modules, for teachers, instructors and e-learning specialists.

2.2 Digital technologies and delivery channels

The online platform provides a new web presence for the consortium's members and helps to set up a single point of access for: course delivery and institutions' offerings; consolidated shared services; web-based e-learning support; open curriculum materials; and research activities. While eCO offers online courses and programmes to students, no advanced digital technologies are required for accessing the platform. It is only necessary for students to have internet access, computer, video camera and microphone.

Wired Solutions – the developer of the website application, used a customised approach to create the platform, based on the three activity hubs: Knowledge Hub (support for the needs of faculty members and institutions); Course Hub (support for students); and Support Hub (tools, services and technology for user groups). The website also integrates social network platforms, to help share ideas and interactions. Overall, the portal consist of the following core features:

- Data Exchange API: retrieving course data and popularising portal with data in real-time and on demand;
- WCAG 2.0 Level AA Compliance: enabling mobile browsing functionality, including touch-screen and swipe navigation;
- Role-based security model: account functionality based on a role-based model, defining accessible areas for users;
- Integration support: the platforms allows for third part e-learning tools and is designed for scalability; and

– Custom Content Management: supporting editing of institution-specific data and updating of web pages.

2.3 Main Drivers

While CO and COU had a steering role during eCO's initial design phase, the Ontario government acted as a mover by making resources available to promote online learning in the province. MTCU had a willingness to invest in eCO as it was considered as a means to improve post-secondary education opportunities – also for students who would normally not attend college or university, reduce cost and inefficiency and to drive forward innovation and growth. Without government funding it would have been difficult – if not impossible – to come up with an initiative of such scale, including convincing colleges and universities to self-finance its development.

The existing infrastructure for collaboration among educational actors in Ontario also served as an enabler for eCO. For example, through COU, an organisation that has existed for 189 pprox.. 50 years, universities have been cooperating on joint decision-making and engagement with the government in Ontario. CO has provided a similar platform for colleges. These organisations, among others, have contributed to building up universities and colleges' working relationships over time.

Ontario province has significant experience with the use of online courses and digital education. In 2010, Ontario's colleges and universities offered around 18.000 online courses with 189 pprox.. 500,000 online course registrations. The popularity of post-secondary education also increased during the last decade in Ontario. Compared to 2002-2003, there was a surge of around 43% (representing 170.000 new students) in 2014-2015. [16] According to Peter Gooch, Senior Director for Policy and Analysis at COU, eCO can also be considered as a response from colleges and universities to an increased demand from students for online learning. [17] All of Ontario's publicly funded colleges and universities decided to join OOLC, highlighting a willingness to collaborate in areas where it adds value for them.

2.4 Main Barriers

One of the main challenges faced by OOLC concern ensuring collaboration between colleges and universities on online learning courses and resources. While universities in Ontario have a history of cooperating in some areas (the same applies to colleges), they are basically competitors, seeking to attract the same students to enrol in courses. In this context, creating a virtual space for course offerings makes competition even more direct. However, by starting with the creation of the online platform, OOLC began with an area where colleges and universities saw obvious advantages and where they could make quick gains in marketing and student enrolment. It is expected to be more difficult to make members cooperate in other domains; yet it may be a challenge to move forward and find new areas and services as well as new revenue models to collaborate. OOLC is also required to find a balance between stakeholder interests. Colleges and universities are part of two very different sectors in terms of mandates and approaches, e.g. on degrees, quality assurance, credit recognition etc. The provision of credit transfer of online courses must also take into account the authority of institutions to accept credits, including freedom to design and offer courses.

A second barrier can be related to the diverse set of interests among faculty members, i.e. professors and teaching staff. Some faculty members were very familiar with the deployment of digital education and keen to integrate online learning further. Others were reluctant and

worried that they could lose control of their work conditions and on student enrolment. From the perspective of teachers, online learning presents new requirements for the pedagogical format, and requires teachers to be able to leverage on technologies.[18]

OOLC's challenges have mainly been operational so far, concerning agreeing on definitions and technology. To a limited extent, access to high-speed internet in Ontario's northern rural areas was also a hurdle for the rollout, since reliable connections are a prerequisite for following online courses. Government support through the organisation Contact North, which aims to promote online and distance learning in northern communities, and funding of 190 pprox.. €24 million (33 million dollars) for internet infrastructure over the past decade, has sought to address this problem.[19]

3. Results Achieved (Expected or Actual outcomes)

eCO's main deliverable, the online platform, currently contains a database with over 14.300 courses and 700 programmes to post-secondary students.[20] The portal makes it easier for students to find and compare courses and programmes, which is likely to increase competition among universities and colleges in Ontario. If course and programme providers want to stand out in an increasingly crowded online learning space, they need to provide students with a positive learning experience, which is likely to increase quality over time. In terms of involvement, all 45 public-funded colleges and universities decided to participate in OOLC, which also included some key stakeholders from Ontario´s education domain. In addition, the Shared Online Course Fund, a linked activity to eCO, has contributed to the redesign and development of more than 400 courses and 80 modules.

Table 2: Overview of outcomes

Courses on online platform	Over 14.300
Programmes on online platform	Over 700
Redesigned and developed online courses / modules	Over 400 / 80

OOLC has only been operating as a consortium in short period and the eCO online platform was just launched in October 2015. It is therefore still too early to assess the broader impacts and outcomes of eCO. While assessments and evaluations are expected at a later stage, the organisation works under an agreement with MTCU that requires deliverables to be achieved and demonstrated as a prerequisite for funding. OOLC is in the process of integrating data analytics dashboards with detailed data on the number of students who engage with the portal. The board of eCO is currently also developing a longer 3-4 years' plan, which aims to identify areas where the organisation can focus and add new value for its members in the future. Part of this discussion concerns how to measure progress.

4. Sustainability, Scalability and Transferability

The existing collaboration infrastructure among colleges and universities in Ontario, together with a solid experience with online learning has been an important enabler for the functioning of eCO. These two factors should be taken into account in terms of transferability. The aptitude of OOLC to find and agree on new areas where the organisation can promote online learning in the future, subject to the willingness of its college and university members, will determine its long-term sustainability. The online platform, the major deliverable, brought clear advantages for colleges and universities in terms of marketing and enrolment. It will however be more demanding to find a consensus regarding other potential areas for collaboration.

From a scalability perspective, since the consortium includes all Ontario's public-funded colleges and universities, eCO started off with a big scale in terms of collaboration in the regional context. It can be questioned if MTCU would have funded eCO to the same extent if only a few institutions (such as those most advanced with and willing to promote online learning) participated. OOLC is currently exploring new opportunities where it can add value. eCO offers a potential to improve the collaborative delivery of courses and programmes. Colleges and universities often lack resources to match the preferences requested by students and there are challenges for classes with low enrolment. In this context, eCO may have a role to play in developing courses where universities or colleges work together to provide different parts of a programme. OOLC's work on integrating data analytics for the online platform might also yield valuable information concerning what students search for and where gaps exist. There might also be a greater role for eCO concerning the identification and measuring of learning outcomes.[21]

5. Perspectives and Policy Lessons Learned

In general, the tertiary education system in Ontario is divided between universities (degree-level) and colleges (more occupational-focused). eCO is therefore an unusual initiative in the sense that universities and colleges cooperate very closely. So far, the approach and culture of OOLC's work has been focused on identifying and understanding the differences and similarities that exist between the two sectors, and among colleges and universities themselves, and try to find areas of added value.

eCO offers insights into how a framework can be established where the government and education institutions cooperate on mutual goals in the online learning space. While OOLC, including its college and university members, leads the work, the government contributes to the framework through resources and objectives. This framework is further supported by the Shared Online Course Fund, which is a separate – but strongly linked – activity of MTCU to provide funding for colleges and universities to develop online courses and programmes. The advancement of online learning in Ontario thus rests on a holistic and multifaceted approach, which includes support for the collaboration and sharing of resources and best practices, an online platform and the development of online courses and programmes.

Further information

https://www.ecampusontario.ca

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1 'Ontario Online' was rebranded to 'eCampusOntario' at the request by the members of OOLC in April 2015.

2 The terms OOLC and eCO are used interchangeably: while they broadly refer to the same, OOLC is the legal entity and organisation behind the consortium and eCO is the student-friendly brand under which it operates.

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[21] ibid.

1BestariNet – Malaysia

Fact box	
Targeted education level(s)	Primary and secondary education
Target group(s)	Pupils & students; teachers & trainers; parents
Learning and teaching methods	Multiple learning styles; Personalised learning
Digital technology & delivery channels	Mobile / internet connectivity; Virtual learning environment
Implementation phase	Mainstream
Impact level	Systemic
Impact areas	Enhanced technological infrastructure and access; Digital inclusion / reversing the digital divide
Output dimensions	Around 9000 primary and secondary public schools in Malaysia connected to high-speed 4G Internet and Virtual Learning Environment. The project connects 5.5 million children, 500,000 teachers & 4.5 million parents.
Outcomes	Usage of the Virtual Learning Environment (VLE) stayed below expectations between 0.01% and 4.69%.
Funding and business model	Public funding
Budget (EUR)	€ 958.643,000 (4 billion RM)

Drivers	Barriers	Policy Lessons
Holistic approach to cost-effective implemention of educational reform	Lack of digital literacy of teachers and students, particularly in rural areas	Minimum internet speed to run VLE in rural areas needs to be considered
Use of IT officers to provide support and mentoring to teachers	Slow roll-out of telecommunication towers due to legal problems with local authorities	Adequate integration of local authorities during implementation process needed

Introduction

1BestariNet connects all primary and secondary schools in Malaysia to an internet-based Virtual Learning Environment (VLE) and provides high-speed internet access (4G). The nation-wide policy initiative seeks to integrate digital technologies in education and to improve the digital skills of Malaysian pupils and students.

The initiative is based on the Malaysia Education Blueprint 2013-2015, [1] a major review of the education system in Malaysia. The Malaysian Ministry of Education (MOE) is the responsible implementing body behind the 1BestariNet initiative. The key partners during the delivery of the project are YLT Communications Sdn Bhd (telecommunication), Xchanging Malaysia (delivery partner), FrogAsia (technology provider), and Google (Chromebooks).

The comprehensive policy initiative connects 10,000 public schools, 5.5 million students, 4.5 million parents and 500,000 teachers in Malaysia. It seeks to unite pupils, teachers, school governance and parents to allow these actors to interact and collaborate through AsiaFrog´s VLE. From the platform, the students and teachers can for example access teaching content, exercises and view their marks, while parents can keep track of their children´s school activities.

The policy design phase occurred during 2011 and 2014 and the project was officially implemented in 2014. However, not all 10.000 schools have yet been connected to the virtual learning platform due to implementation delays, for example related to IT infrastructure development.

1. Policy context: Background, Objectives and Rationale

Based on the review of the Malaysian education sector, involving an extensive consultation process with education experts, teachers, parents, students, and principals, the government decided to undertake a major reform. The overall objectives of the 1BestariNet project are through 4G internet access and VLE to:

- transform education;
- bridge the digital divide between rural and urban students;
- prepare Malaysian students for the needs of the 21st century;
- enhance student outcomes and learning processes.

More specific objectives were set up for most target groups involving schools, students, teachers and parents. For schools, the cloud-based delivery helps save costs in terms of servicing and updating separate services which before was common practice. While teachers are better able to share best practices and track the progress of students, students benefit from a wider access to content and technology. Lastly, the project is meant to support communication between schools and teachers, while enabling virtual interaction between teachers.

> *"Our goal, and the purpose of the education system, is to equip our students holistically to allow them to succeed in the 21st century, with all of the opportunities and challenges that this new era presents."*
>
> **Muhyiddin Yassin, Deputy Prime Minister of Malaysia and Minister *of Education***

1.1 Educational Scope: Learning and Teaching methods

The 1BestariNet initiative targets primary and secondary public schools. The target age-group is between 7 to 17 years (19 for some schools). There are several target groups benefiting from the project, including learners in primary and secondary schools, teachers, principals, and parents.

Whereas students get access to content and exercises, teachers and principals benefit from a wider integration of learning and organisational resources, lesson plans, and possibilities for sharing best-practices. Parents benefit from access to progress monitoring of their children and online interaction with teachers.

The group of technology officers who work in a supporting function are responsible for training and supporting teachers in the use of the online tools. They are also overseeing the functioning of the VLE at school-level.

1.2 Core Activities: Main components and intended impacts

The approach behind 1BestariNet is based on a virtual learning platform and internet access (4G) to content and web-based learning. The platform is not just a source of information or a set of data, but a holistic approach to learning and knowledge distribution. The 1BestariNet is based on a mixed pedagogical approach which combines ICT/technology and traditional teaching methods.

1BestariNet seeks to encourage educators to implement curriculum and pedagogical approaches that value the use of ICT and technologies.

The project focuses on the use of ICT, including the development of digital competences, through the students' use of the virtual learning environment, in class and in preparation for classes. The use of multimedia resources provides opportunities for improving learning outcomes and cognitive abilities as well as interactivity and self-assessment in learning.

The objective is for teachers and students alike to make regular use of the FrogAsia platform through Chromebooks in order to achieve the learning objectives. A set of Chromebooks can be booked by the teacher for a specified period and then used in the classrooms.

The Chromebooks and learning platform are integrated in several ways. The platform is designed to provide content, for example documents, graphics and videos, which are shared by the teachers. Being a medium of information, the VLE is in particular integrated during the preparation for classes, where students can find and study the content and exercises they need for particular classes. The learning platform is available at any time and from anywhere using the user´s ID. Teachers can assign lessons, tests and mark students through the online tool, while students are able to submit their homework and get access to their grades.

The 1BestariNet project also aims at encouraging digital skills and competences of teachers through an internet and cloud-based approach to delivery. The online instructional tool seeks to provide a pedagogical practice that is interactive and engaging and which supports an ongoing learning process. The VLE enables a learning environment where teachers can manage their lesson(s) outside the classroom through online content and interaction. The online teaching management is coupled with informational retrieval and knowledge exchange, and includes functions such as personalised learning plans, tests, learning material and interaction with learners.

The policy initiative also foresees a changing role of teachers. Previously serving primarily as information providers, they now increasingly facilitate the students' critical thinking skills and practical know-how in evaluating and using information sources.

1.3 Funding and Business Model(s)

1Bestarinet is based on public funding from the government with a total contribution of 195pprox.. RM4.465 billion (€ 956 Mio.). A number of technology providers are

contracted and involved as part of the project, including YTL Communications, Xchanging Malaysia, FrogAsia and Google.

YTL was selected for 1BestariNet as part of the tender process. The contract includes the responsibility to provide devices to for internet access in classrooms. YTL is deploying Google Chromebooks by Acer and Samsung in the Malaysian public schools. The Chromebooks come with Google Apps for Education and a cloud platform for collaborative web-based learning, rather than the normal Microsoft Windows programmes.

YTL is also responsible for the building of telecommunication towers. These are built near schools and do not only provide internet access at schools, but also commercial internet connectivity through 4G broadband services to residents in the surrounding community.

"One of the problems we faced from the start was to have the teachers prepared for the technologies we intended to use".

Mr. Teoh Boon Hai, Ministry of Education, Malaysia

The VLE and customised cloud platform is delivered and implemented by FrogAsia, chosen by YTL, which works hand-in-hand with local providers and organisations in Malaysia on developing the platform. The cloud-based delivery of content revokes the needs to service and update 10.000 separate servers located at each public school, previously a standard practice. The solution achieves cost savings and makes delivery and servicing less time-consuming.

2. Policy and Conceptual Design

The Malaysian government and the Ministry of Education started with a vision – in terms of educational goals – and on this basis determined the policy and conceptual design of 1Bestarinet. The vision was also a reaction to address increased expectations for learning and teaching along with changing demand for digital and technology relevant skills. Although significant investments had been made in ICT for the education sector, it was considered that students and teachers did not sufficiently exploit the advantages of ICT for learning and teaching. [2] In addition, there was a significant gap between the degree to which ICT was integrated in urban and rural schools.

Against this background, it was decided that the education reform had to improve the way ICT is used in schools and provide equal access to technologies, platforms and content for all students and teachers, regardless of location. The project was given the name 1BestariNet (in Malay, *bestari* means *smart*). It entailed the design and implementation of a cloud-based learning platform based on internet access for all through 4G internet and VLE.

At a broader level, the vision derives from the Malaysian Education Blueprint which outlines a long-term, systemic strategy to transform education in Malaysia. The strategy consists of three waves to achieve a major education transformation in Malaysia. The first wave concerns improving support systems, including the roll out of 1Bestarinet to integrate ICT, and raising standards for teaching, teachers and coaching. The second wave focusses on accelerating system improvements by consolidating gains made during the first wave, e.g. addressing enhancing teacher training and support, competency and performance based progression, new curricula, more support for groups with specific needs etc. The third and last wave targets operational flexibility, increasing school-based management, school structure review and the creation of a peer-led culture etc.

2.1 Implementation Process

Following the initial conceptual design, a stakeholder consultation process was undertaken to assess the challenges and

needs over a period of one year. More than 50.000 people participated in interviews, roundtable discussions, focus groups and surveys. Following the consultation, technology needs and solutions were identified.

The solutions were related to connectivity, a learning platform and access to computers, which were supplied by YTL telecommunication services, FrogAsia´s VLE and Google Chromebooks. This holistic approach to integrating IT in the learning environment was seen as the preferred solution for developing ICT and 21st Century relevant skills and bridging the gap between urban and rural areas.

The on-the-ground implementation of the project was carried out by means of an open tendering process in 2011. The Economic Council estimated the implementation period of 1BestariNet at 15 years for a total of RM4.465 billion (€ 956 Mio.) to be rolled in three 5-year phases.

2.2 Digital technologies and delivery channels

The 1BestariNet project equips schools in Malaysia with high-speed internet connectivity through 4G WiFi internet. To facilitate internet access, the objective is that each school is provided with a tower structure, called 1BestariNet Receiver Integrated Systems, on the school ground, providing WiFi and 4G internet access. The towers are erected across the country to facilitate the installation of 4G network radios. They are connected to WiFi and provide 4G internet access throughout the school. The tower/receiver is supposed to provide a bandwidth between 2 – 10 Mbps. Some schools can however only access internet through satellite dish receivers offering slower connections.

YTL provides schools with Chromebooks placed in labs in a way that enable teachers to book and bring a set of laptops for a class to be used during a specific period. Chromebooks are therefore not provided to each student in schools. These Chromebooks are set up using the cloud platform, rather than standard programmes such as the Microsoft Office package. The Google Chromebooks offer a fast, simple and low cost computer.

The VLE platform, FrogAsia, provides virtual access to students and teachers for content, homework, tests, assessments and grades as well as relevant resources. The objective was to have the content available at any time and at any location. In addition, through the platform, teachers, students and parents can interact. Whereas students and teachers can collaborate on content and exercises through chats and threads, there is also an option for parents to communicate and share feedback with teachers. Teachers and principals can similarly share best practice examples.

2.3 Main Drivers

A hybrid solution was chosen with cloud-based content in an open-source model, complemented with Chromebooks, and combined with a solid IT infrastructure. The approach was deemed to be a cost effective way to approach the education reform. The decision to use a cloud-based and open-source approach and combine it with Chromebooks brought several advantages in terms of implementation. Given the scale of the project, and the fact that approximately 10.000 public schools are involved, a streamlined approach based on cloud/online content helped ensure a faster deployment on the ground.[3]

The nation-wide integrated platform and IT infrastructure also offers the advantage of knowing and detecting more easily potential problems. While being connected to the cloud-based VLE, each school still has local servers and assigned technology officers available to offer IT support in case of problems.

Another key driver for the success of the project is the use of technology/IT officers providing support and mentoring for the teachers. [4] Since the approach requires technologically competent teachers, who are willing to implement new teaching methods, the support of technology officers and their integration into the model was essential. This approach was therefore a way to address the lack of IT skills among Malaysian teachers, although the process of upgrading IT skills is a long-term goal. The cloud-based software solution from FrogAsia, which is simple compared to more complex IT systems, also facilitates the training of teachers.

2.4 Main Barriers

The transformation from a conventional way of teaching towards a learning environment integrating online tools and VLE has been a key barrier for the successful implementation of 1BestariNet. The project involved new requirements for teaching and learning, implying extra training and superior qualification of teachers. The restricted roll-out of the project in many regions is closely linked to the lack of digital competence among teachers and students. [5] The lack of experience and IT competencies among rural teachers has further enhanced this problem in a number of regions.

Another key barrier encountered during the implementation process was the lack of involvement and communication with local authorities concerning the building of the telecommunication towers in the proximity of schools which are required to provide 4G internet access. [6] During this process, the Ministry of Education and YTL had failed to obtain clearance with a number of local authorities in the building of the towers which led to significant delays in the implementation. A number of pre-cautionary steps were however taken by the government, to reduce radiation. Relevant energy agencies and experts were consulted to establish requirements and to achieve a high degree of safety with the telecommunication towers.

A number of rural schools had to settle for a lower internet speed through the access to satellite dish receivers, rather than the 4G connectivity facilitated by the 1BestariNet Receiver Integrated Systems. This made connections unreliable and difficult to work with, in particular as FrogAsia requires a fast connection to load properly due to its many features and widgets.

3. Results Achieved

1BestariNet set out as a landmark education project connecting 10,000 primary and secondary public schools in Malaysia with high-speed 4G Internet access and a Virtual Learning Environment. Overall, the objective was to connect 5.5 million children in Malaysia and 10 million potential users incl. 500,000 teachers and 4.5 million parents. However, the overall outcomes of the project did not meet its high expectations.

Rather than an in-depth impact evaluation report, a 5-page evaluation section on 1BestariNet's implementation was included in the Auditor General's Report from 2013. The report came to the conclusion that 1BestariNet failed to achieve its objective to provide bandwidth connectivity infrastructure and VLE to 10,000 schools within 2.5 years (until June 2014).

Moreover, the report maintained that the project's implementation was subject to additional weaknesses. In particular, the listed weaknesses included, a lower usage of the VLE provided than expected by students, teachers as well as parents. Daily utilisation of the VLE by students ranged between 0.17% and 0.63%, while usage by teachers was at least between 0.57% and 4.69%. According to the report, parents' use of the platform was by far the lowest, between 0.01% and 0.03%. The total number of users was also below expectations. Data used in the report for

the week of 5 – 11 September 2014 showed that only 137,237 students logged into the VLE system with only 76,096 or 55 % using it for more than 30 minutes that week.

According to the Auditor's General Report the low usage of the VLE can mainly be attributed the to the lack of clear policy and monitoring, lack of exposure to the benefits of VLE as well as a lack of digital devices for teaching, such as projectors and laptops.

While the government defended the low VLE user rates as being "quite common for newly implemented ICT projects", several newspapers and Members of Parliament in Malaysia remain critical of the real value created by an initiative whose educational technologies are used little by learners and teachers at present.

4. Sustainability, Scalability and Transferability

As a systemic policy initiative firmly embedded into a long-term strategy with several initiatives implemented in parallel to achieve defined objectives, 1Bestarinet has the potential to be a sustainable policy initiative. Since the interim assessment by the Auditor's Report revealed flaws in the roll-out of the initiative, the sustainable value of the initiative would depend on the authorities' and contractor's capacity to address remaining challenges. Only recently, the MoE launched the *1BestariNet Teacher Awards 2015* in order to recognise, reward and further encourage the work of teachers in integrating ICT in the classroom[7]. Given the detected lack of teachers' preparedness to apply ICT in the classroom, mostly a result of insufficient ICT training[8], this development could be interpreted as a step in the direction to addressing some of the pitfalls of 1Bestarinet's implementation.

1Bestarinet has received considerable international attention as a large-scale, multi-dimensional policy initiative. The geographic location of the country with territorial division into the economically more developed Malaysian peninsula, the remote, less developed island of Borneo and numerous other islands is a rather a distinct setting. However, for countries with a similar geographical and economic divide as Malaysia, 1Bestarinet may offer a good starting point and several lessons learnt. One example would be the need for better coordination with local authorities, e.g. for the building of the telecommunication towers.

5. Perspectives and Policy Lessons Learned

As outlined, the VLE platform is still underutilised in Malaysian classrooms at this stage following the first wave of implementation. A number of policy and technological issues are behind the implementation obstacles.

From a policy perspective, and given the scale of the nation-wide initiative and the top-down approach used with a shared VLE solution for all Malaysian primary and secondary public schools, the failure to fully integrate local communities during the implementation process should be noted. This problem is in particular highlighted with the slow roll out of the telecommunications towers, which are required as part of the solution, and where the Ministry of Education and YLT failed to obtain a clearance with a number of regions, in particular in rural areas.

The technology used also requires a fast internet connection and infrastructural investments. Many schools in rural areas are however only provided with internet speeds of around 2 Mbps, which is too low to fully exploit the benefits of the VLE platform, in particular once all Chromebooks in classes are used at the same time. Delays with loading content, such as educational videos and ´heavy´ webpages, cause the students to lose interest and teachers to feel more insecure about the use of the technology.

Although training was provided for teachers and technology officers integrated to support them, the training has still been outlined as too limited to fully qualify teachers for the use of the online tools.[9] This in particular concerns the VLE platform used, which resulted in teachers and students becoming less interested in using the platform and less aware of the advantages it offers. The Ministry of Education realizes that extra support is needed for schools that have less advanced user levels of ICT, due to skill shortages and IT infrastructure. The Ministry has sought to address this issue through providing more incentives for teachers with strong IT qualifications to transfer between schools.

The initiative is, as previously mentioned, part of a long-term project consisting of three waves during a period of around 15 years. This implies that improvements in educational outcomes cannot yet be fully assessed, and the impact can only be determined in the medium to long-term, once teachers and students have become more familiar with the technologies used and the benefits they offer.

Awards

'Cloud Adoption in School Education' at the South East Education Summit Award in 2014.

Further information

http://1bestarinet.net/
http://www.frogasia.com/v3/1bestarinet/
http://www.ytlcomms.my/EN/education.aspx

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[3] Interview with Mr. Teoh Boon Hai - Principal Assistant Director of the Department of Education Technology, Malaysian Ministry of Education

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