European Commission

Executive Summary of 2nd Survey of Schools: ICT in Education

Objective 2:

Model for a 'highly equipped and connected classroom'

EXECUTIVE SUMMARY

A study prepared for the European Commission

DG Communications Networks, Content & Technology by:

Deloitte. Ipsos Ipsos MORI

Digital Single Market

This study was carried out for the European Commission by

Deloitte.

Ipsos MORI

Internal identification
Contract number: 30-CE-0819210/00-33
SMART number 2015/0071

DISCLAIMER

By the European Commission, Directorate-General of Communications Networks, Content & Technology.

The information and views set out in this publication are those of the author(s) and do not necessarily reflect the official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this study. Neither the Commission nor any person acting on the Commission's behalf may be held responsible for the use which may be made of the information contained therein.

ISBN 978-92-79-99683-2
doi: 10.2759/225159

Luxembourg: Publications Office of the European Union, 2019

Summary of results and policy recommendations

The current report follows the **Digital Education Action Plan's** call to provide more data and evidence regarding digitisation in education and digital technologies in learning. The Digital Education Action Plan was adopted in January 2018 and set out how education and training systems can make better use of innovation and digital technology and support the development of relevant digital competences needed for life and work in an age of rapid digital change (European Commission, 2018)[1].

The **2nd Survey of Schools: ICT in Education** has two objectives:

1) **Objective 1: Benchmark progress in ICT in schools -** to provide detailed and up-to-date information related to access, use and attitudes towards the use of technology in education by surveying head teachers, teachers, students and parents covering the EU28, Norway, Iceland and Turkey;

2) **Objective 2: Model for a 'highly equipped and connected classroom' -** to define a conceptual model for a 'highly equipped and connected classroom' (HECC), presenting three scenarios to describe different levels of a HECC and to estimate the overall costs to equip and connect an average EU classroom with advanced components of the HECC model.

Two separate reports are published concurrently, focusing on each of the two study objectives of the '2nd Survey of Schools: ICT in Education'. The current publication refers to the **second objective** of the study, to develop a **model for a 'highly equipped and connected classroom'**. The findings on the **first study objective** ('ICT in Education: Benchmarking progress in ICT in schools') are reported in the separate publication[2].

The report is structured around the following tasks:

- Design of the conceptual model for a 'highly equipped and connected classroom' (HECC),
- Definition of three scenarios assessing what constitutes an entry level, an advanced and a cutting-edge level scenario of a HECC, and
- Estimation of the costs to equip and connect an average EU classroom with advanced components of the HECC.

Design of the conceptual model

The HECC model builds upon and complements other frameworks concerning the use of digitial technologies in education. More precisely, the HECC conceptual model of this study is based on four dimensions, covering:

- **Digital technology equipment** referring to a large number of technologies that are used in educational settings for learning and teaching purposes including both physical technologies (i.e. hardware) and educational software and services,
- **Network requirements** covering bandwidth and latency of the network providing the foundation for successful education technology implementations,

[1] European Commission. (2018a). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Digital Education Action Plan. COM(2018) 22.

[2] European Commission (2019). 2nd Survey of Schools: ICT in Education – Objective 1: Benchmark progress in ICT in schools. Luxembourg: European Commission. doi: 10.2759/23401.

- **Professional development of teachers** referring to the teachers' continuing professional development (CPD) which focuses on teachers' capacity building for the effective use of digital technologies in teaching, learning and assessment practices, through rapid learning cycles, fast feedback, continual reflection, collaborative coaching and other methodologies and
- **Access to digital content** reflecting the curricular requirements (i.e. different level of complexity, accuracy, correctness, authenticity, life connections, inter-disciplinary) necessary to ensure digital content's greater incorporation into the classroom and use by teachers and students.

These four dimensions are commonly outlined by numerous other studies. Moreover, the adopted HECC model also complements the European Framework for Digitally Competent Educational Organisations (**DigCompOrg**) which provides a comprehensive and generic conceptual framework that reflects on all aspects of the process of systematically integrating digital learning in educational organisations from all education sectors.

Based on desk research of existing sources, a set of categories, sub-categories and items for each of these four dimensions is proposed. These categories, sub-categories and items were discussed during stakeholder consultations with experts in the field and serve as the basis for the estimation of the average total costs to equip an average EU classroom with advanced components of the HECC.

Three scenarios were identified to describe different levels of a HECC: (i) an **entry level**; (ii) an **advanced level**; and (iii) a **cutting-edge level**. The proposed scenarios provide a general reference framework allowing the subsequent estimation of costs for the advanced level.

The developed HECC model is a **progressive model**, which implies that one school might start off with the entry level scenario in order to equip and connect a classroom, then progress to the advanced scenario and finally upgrade the classroom to the cutting-edge level scenario in order to exploit the opportunities provided by digital teaching and learning to the fullest extent. In turn, other schools could start off already with the advanced level scenario as an entry point and then eventually upgrade their classrooms to the cutting-edge level.

Opting for the most advanced cutting-edge level of a HECC might not always be feasible due to different **budget considerations** as well as **individual pedagogical and technical requirements**. As such, schools often need to trade-off between different decision criteria, including affordability, requirements and benefits that a digital classroom yields. Given that identifying different levels of a HECC is an under-studied area in the available literature, the developed scenarios aim at supporting schools in implementing one level of a HECC depending on individual needs and requirements. Thus, the three different levels represent a **continuum** of what a HECC could entail, with **multiple conceivable scenarios in between the three levels**.

In particular, a **top-down approach** was deployed to define the three levels of a HECC. As a first step, the items that form the cutting-edge HECC scenario were determined, given that the largest evidence base, in terms of available case studies and previous research, is available to describe the ultimate categories, sub-categories and items that a cutting-edge level of a HECC would need to fulfil.

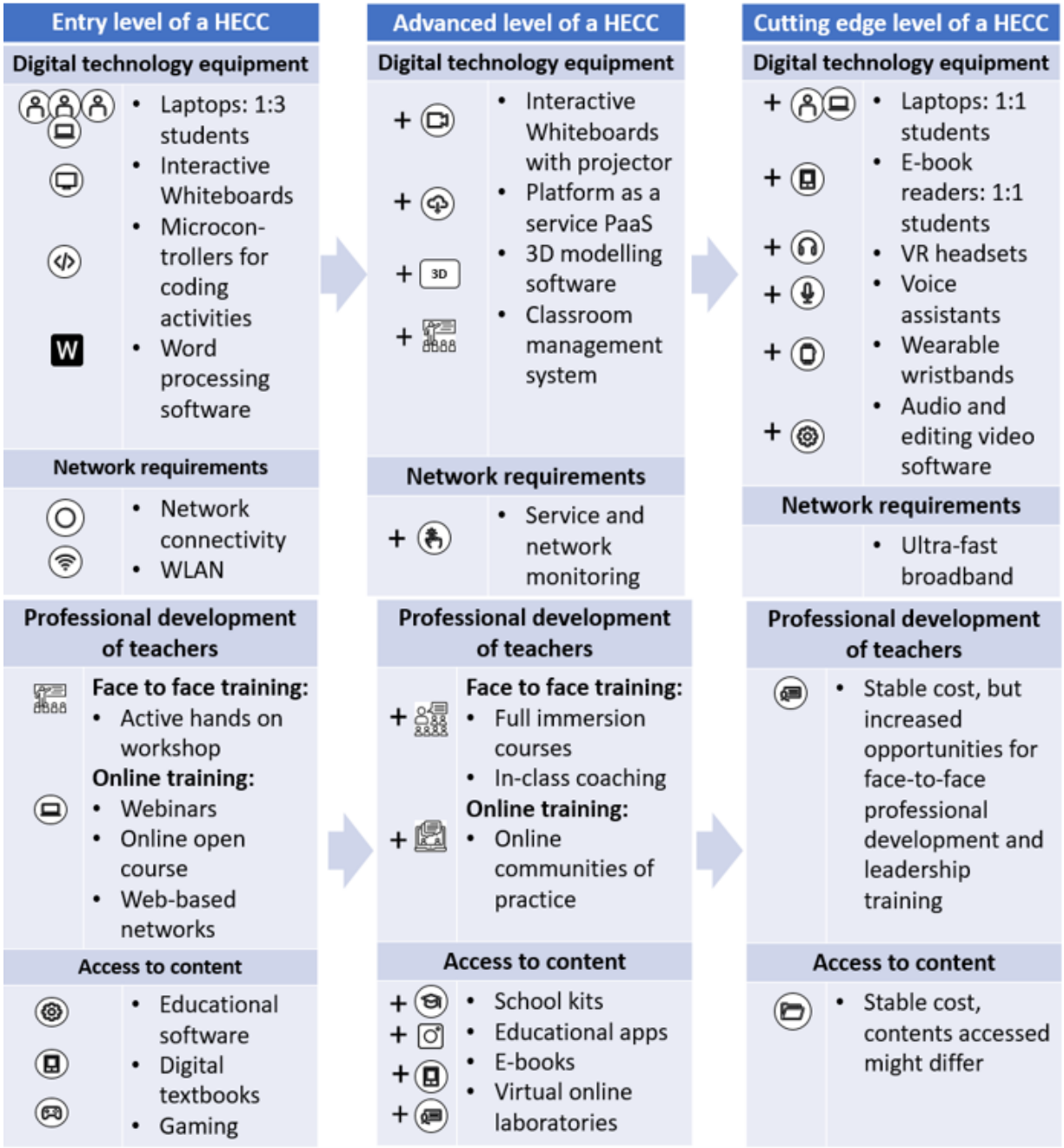
The **entry level scenario** of a HECC mainly outlines the **minimum and essential** components of a highly equipped and connected classroom. It contains essential digital technology equipment, including a limited number of components related to teachers' professional development and access to digital contents, as well as minimum network requirements needed for a functioning HECC.

The **advanced scenario** of a HECC, in turn, builds upon and **further advances** the entry level scenario, while paving the way to the cutting-edge level scenario. Differently from the entry-level, the advanced scenario entails more advanced digital equipment

(e.g. 3D printers and modelling software, interactive tables), as well as a greater number of teachers' professional development activities (e.g. full immersion courses, in-class-coaching) and access to paid-for contents (e.g. makers kits, educational apps, virtual laboratories).

Finally, the **cutting-edge level scenario** of a HECC involves the ultimate categories, sub-categories and items of a highly equipped and connected classroom. This scenario further advances categories, sub-categories and items in the advanced scenario, particularly in relation to broadband connectivity (e.g. ultra-fast broadband, Virtual Private Network), a greater variety of digital equipment available to teachers and students (e.g. e-books, wristbands, audio and video software), increased opportunities for face-to-face professional development for teachers (e.g. twilight training sections, mentored action research) and leadership training.

The figure below gives a brief overview of the content of the various HECC levels across the four dimensions. Please note that the advanced level also contains the elements of the entry level and accordingly the cutting-edge level contains the elements of both advanced and entry levels.


Entry level of a HECC
Digital technology equipment
• Laptops: 1:3 students
• Interactive Whiteboards
• Microcon-trollers for coding activities
• Word processing software
Network requirements
• Network connectivity
• WLAN
Professional development of teachers
Face to face training:
• Active hands on workshop
Online training:
• Webinars
• Online open course
• Web-based networks
Access to content
• Educational software
• Digital textbooks
• Gaming
Advanced level of a HECC
Digital technology equipment
• Interactive Whiteboards with projector
• Platform as a service PaaS
• 3D modelling software
• Classroom management system
Network requirements
• Service and network monitoring
Professional development of teachers
Face to face training:
• Full immersion courses
• In-class coaching
Online training:
• Online communities of practice
Access to content
• School kits
• Educational apps
• E-books
• Virtual online laboratories
Cutting edge level of a HECC
Digital technology equipment
• Laptops: 1:1 students
• E-book readers: 1:1 students
• VR headsets
• Voice assistants
• Wearable wristbands
• Audio and editing video software
Network requirements
• Ultra-fast broadband
Professional development of teachers
• Stable cost, but increased opportunities for face-to-face professional development and leadership training
Access to content
• Stable cost, contents accessed might differ

The application of the HECC model for primary education

The three above-mentioned HECC scenarios have been built and defined based on the assumption of a classroom part of **ISCED 2** (lower secondary) education level. The distinction between primary and secondary schools varies significantly between EU Member States. In several countries in Europe (e.g. Nordic countries, Croatia, Czech Republic, Hungary, Poland), a 'single structure education' is in place and primary and lower secondary education are integrated. This integration is also reflected in the curriculum. In addition, across Europe (e.g. Italy, Spain, etc.), a school institution often includes (even in the same building or campus) primary and lower secondary levels (i.e. ISCED 1 and 2). As a consequence, the integration of primary and secondary education levels strongly impacts on the HECC four dimensions, in particular for those HECC items that apply at school (rather than a classroom) level (e.g. 3D printer, broadband connectivity, etc.). However, based on evidence from the literature and inspired by existing experiences (e.g. Future Classroom Lab), the three HECC scenarios previously described (referred to ISCED level 2) embed features that can be extended and applied across both primary (ISCED 1) and secondary education level (ISCED 2 and 3). In particular, main conditions related to dimension 1 (digital technology equipment), dimension 2 (network requirements) and dimension 3 (professional development of teachers) are common among primary and secondary education, while main differences apply in dimension 4 concerning the type of contents accessed and used by teachers and students in primary and secondary levels.

Estimation of the costs to equip and connect an average EU classroom with advanced components of the HECC

The ultimate goal of this report is to estimate the **costs for equipping and connecting an average EU classroom with advanced components of the HECC model**. The cost estimation is based on a combination of desk research, market data collection as well as stakeholder consultation with national Ministries and experts.

The results show that the **average cost per student per year** to equip and connect an average EU classroom at ISCED level 2 with advanced components of the HECC model is in the range of **224 EUR – 536 EUR**. This cost range includes costs for digital technology equipment (91 EUR – 150 EUR per student per year), network requirements (48 – 226 EUR per student per year), professional development of teachers (55 EUR – 110 EUR per student per year) and costs for access to content (30 EUR – 50 EUR per student per year). It is important to note that setting up the physical infrastructure in terms of high-capacity networks (e.g. fibre networks) is not included in this overall figure.

The cost estimation has been performed by taking the assumption that students were supplied with devices by their schools, usually at not cost to the learners or their families. One alternative model which is growing interest in, but which is not detailed in this report, is the Bring-Your-Own-Device (**BYOD**) **policy / strategy** which relies on the prevalence of learner-owned devices and where students use the mobile devices they already own. The decision to introduce BYOD to schools in Europe is overall mainly driven by a combination of social, economic, educational and technological factors which vary strongly from country to country and according to the particular contexts in which individual schools operate.

Overall, the present calculation should only serve as an orientation to the approximate costs arising from equipping schools with a HECC, but would always need to be adapted to local conditions and needs of a specific school. Moreover, this cost approximation only represents an EU average and does not consider differences in price across countries.

Key role of the EU for fostering highly equipped and connected classrooms

Even though responsibility for education lies with Member States, the European Union has an important role to play in scaling up innovation in EU Member States' education

systems. Consequently, the European Commission adopted the **Digital Education Action Plan** in January 2018 (European Commission, 2018) and is currently following up on the 11 actions included in the Action Plan which are structured in three priority themes, including (1) making better **use** of **digital technology** for teaching and learning; (2) developing the **digital competences and skills** needed for living and working in an age of digital transformation; and (3) improving education through **better data analysis and foresight**.

There are also several **EU funding programs** available for digital education projects in the current multifinancial annual framework running from 2014 to 2020 which complement national efforts (such as Erasmus+, European Social Funds, European Regional Development Fund, Horizon 2020, Wifi4EU through CEF, etc.). For instance, education and training is one of the eleven priorities for cohesion policy in 2014-2020 ("thematic objective 10").

There is a clear need for digital education to be further supported by the **new Multiannual Financial Framework** (2021-2027) in addition to national and regional investments as well as cooperations between private and public stakeholders. The high cost estimates reported in the study provide a clear signal to funding programmes such as the **European Social Fund** (ESF) and the **European Regional Development Fund** (ERDF) to continue supporting activities which help to modernise education and training systems, including investments in educational infrastructure. The new proposed **Research and Innovation programme** (Horizon Europe) will play a crucial role in spurring new innovation in education and also scaling up innovation activities to facilitate market entry and diffusion of innovations through large-scale piloting.

Erasmus+ including the many successfully established tools for exchanging **best practices** and **peer learning** (e.g. through tools as eTwinning, School Education Gateway, Teacher Academy, SELFIE) will need to be further scaled up to facilitate **teachers' professional development**.

The cost estimation also shows that particularly costs for **network requirements** form a significant part of the overall cost figure. Costs for setting up the physical infrastructure in terms of high-capacity networks (e.g. fibre networks) outside the premises of the school (which have not been considered in the cost estimation of this study) will have to be born on top of those reported costs. In this respect, as part of the next long-term EU budget, the European Commission proposed to renew the **Connecting Europe Facility** (CEF). The future Connected Europe Facility Programme aims to support access to Gigabit connectivity for socio-economic drivers including schools with a view to maximising their positive spill-over effects on the wider economy and society.

Moreover, the proposed **Digital Europe Programme** has been designed to support the digital transformation of the public sector and of areas of public interest by improving their digital capacities. For Digital Education, this opens up opportunities for supporting the deployment of digital capacities in schools (i.e. equipment, technologies, digital content) as well as innovative and effective teaching and learning practices at European level that have already been proven successful in smaller scale pilots.

Finally, investing in high-quality education pays long-term dividends for the European economy and for the overall prosperity of European societies. Innovation in education systems have a great potential to significantly improve learning outcomes, enhance equity and improve efficiency. Given the high overall costs to equip and connect an average EU classroom with advanced components of the HECC model, the **European Union**, **Member States**, **regions** and **municipalities** as well as **industry** and **civil society organisations** must make a concerted and coordinated effort to allow the European education sector to stay ahead of technological change.

European Commission

Executive summary of 2nd Survey of Schools: ICT in Education - Objective 2: Model for a 'highly equipped and connected classroom'

Luxembourg, Publications Office of the European Union

2019 – 10 pages

ISBN 978-92-79-99683-2
doi: 10.2759/225159

KK-02-19-086-EN-N

doi: 10.2759/225159

ISBN 978-92-79-99683-2