Mobile Technologies In Schools

DOCUMENT APPROVED BY THE PLENARY
SESSION OF THE SCHOOL EDUCATION COUNCIL
OF CATALONIA, 4 MARCH 2015

Generalitat de Catalunya
**Consell Escolar
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Contents

1. Introduction

[1a] The School Education Council of Catalonia, a superior body of participation of the educational community in Catalonia, has, among others, the objective of studying how to improve the way in which teaching adapts to social reality, as well as drawing up its own proposals related to the quality of teaching. In accordance with these duties, this document refers to the need to make mobile technologies compatible with teaching and learning activities by using these devices effectively in schools so that their potential is used to maximum benefit and therefore strengthens the coexistence of education and mobile technologies.

Schools must take advantage of the educational potential of smartphones while strengthening coexistence

[1b] In this document the expression "mobile technologies" is principally employed to refer to smartphones, digital devices that are easily transportable and allow one to access the Internet, that have multimedia functionalities, that can be used for a large number of activities involving processing and communication of information, that are normally the property of an individual rather than an institution and that are used according to personal criteria and under the control of the owner. However, as the study *Policy guidelines for Mobile learning* by UNESCO [1] indicates, the expression mobile technologies also includes, in addition to telephones, other devices such as tablets, e-readers, portable audio players and games consoles. The dynamic nature of technology means that this relationship is evolving in a continuous manner in terms of features and types of product, as shown by the emerging wearable devices.

[1c] The wide, fast incorporation of mobile technologies into all spheres of personal, social and economic activity means that it is necessary to redefine systems and procedures, rethink strategies, working models and business models and even create new codes of conduct and relationships. Education is not at all exempt from this. New and changing situations are presenting challenges that must be faced with a constructive attitude and future consequences and implications caused by decisions made now must be kept in mind.

[1d] The huge social presence of technology is clearly visible in the home. In general terms, within one generation, we have gone from having no IT materials to having a range of devices at our disposal: computers and laptops, tablets, mobile telephones and landlines, consoles and other digital devices, including televisions that connect to the Internet. Children and adolescents find this environment completely natural, whereas older people think it is largely oversold and need to make an effort to understand and adapt to it. Educating children about information and communication technology has become a necessity, even more so when mothers and fathers are the primary educators and the people legally responsible for the behaviour of minors.

The digital environment is quite natural for children and teenagers while for adults it requires an effort of understanding and adaptation

[1e] The infiltration of mobile technologies into society, the population's (particularly young people) generalised use of them, the power of their functionalities and the impact of the applications, as well as the proliferation of legislation and regulatory initiatives on various levels, clearly demonstrates, according to the School Education Council of Catalonia's criteria, that it is convenient to raise this matter and publicise several thoughts about it. In this sense, the initial objective of this document is to provide guidelines and things to think about that could be useful for the educational community when providing adequate and satisfactory solutions to the challenges that arise from the omnipresence of mobile technologies in schools.

The educational community must find satisfactory solutions to the challenges posed by mobile technologies

2. Digital Technology in Education

[2a]   The School Education Council of Catalonia dedicated the 12th Congress for Reflection to digital technology in the education sector. This focused on evaluating the many repercussions of digital technology that take place in almost all spheres of life and school activity. The resulting document *L'impacte i la contribució de les tecnologies digitals en l'educació (The Impact and Contribution of Digital Technology in the Field of Education)* approved unanimously by the Plenary Session of the Council [2] contains many points to consider when it comes to technology and its implications that could be useful for the educational community when faced with the urgent need to conceptualise the impact of digital mobile technologies and to come up with constructive and beneficial solutions.

[2b]   In this document, the School Education Council of Catalonia indicates that "it is a historically observed fact that the application of any new technology involves, to varying degrees, the reconstruction of social rules, institutions, the role people play and their relationships with the environment which reciprocally also changes due to the effects of technology. This has happened on a global scale with agriculture, the press, electrification and most recently with digital technology" [2] (section 12). Mobile technologies in general, and particularly applying them in terms of education and integrating them into schools, is fully involved in this dynamic, which, as a result of the aforementioned mobile technology, is being given more of a push than ever before. This is a reality that all schools and professionals from the education sector must face.

Technologies are transforming social rules, institutions, personal roles and people's relationships with their surroundings

[2c]   In this document the Council refers to the fact that "the social history of technology shows that technological development is a process that is simultaneously scientific, economic, social and cultural in that technology is an intrinsic part of society and not something external that, even if it makes an impact on society, can be segregated and measured at will" [2] (section 13). Technology and society are not separate entities; they have a symbiotic relationship that cannot be controlled externally. The fact that digital technology has been incorporated into the activity that takes place in schools is a paradigmatic example of the intrinsic relationship that exists between technology and society.

[2d] Within this context, mobile technologies constitute an increasing and more and more significant proportion of the information and communication technology in education. The incorporation of mobile phone usage into the daily life of children and adolescents is a reality that needs to be approached from several points of view in terms of school life, which range from coexistence and ethical and civic values to technical aspects, to the curriculum and lifelong learning. It must also be approached within the family, so having information, criteria and guidelines to think about, like those suggested in the document *Com t'impliques en l'educació digital dels teus fills i filles? (How Do You Get Involved in the Digital Education of Your Children?) The Guide for Families* produced by the City Council of Barcelona [3] can be of great use when thinking about the use of mobile devices, social networks and the Internet at home. Teachers that are also mothers and fathers can benefit from the themes discussed.

Mobile technologies are an increasingly significant part of ICT in education

[2e] Given the need to use this reality in the most rewarding manner for pupils, educationally speaking, when using mobile digital technologies in schools it is necessary to consider the current legislation, drawing from the premise that "all members of the school community have the right to enjoy a harmonious coexistence and the duty to facilitate it" (Article 7.1 of the Catalan Education Law [4]). It is also appropriate to highlight the role of mobile technologies in relation to the following specific principles which, according to the LEC (Ley de Enjuiciamiento Civil: Spanish Law of Civil Procedure) govern the education system: "The cultural, scientific and technical training that allows pupils to be fully integrated, both socially and professionally" (article 2c); "Preparation for permanent learning" (article 2d); "The ability to use digital systems independently and creatively" (article 2h) and "The ability to analyse and contrast all information, regardless of the medium used to relay it" (article 2i).

[2f] Over the course of the last decade, many international reports have highlighted the strategic role of digital technology in economic, social and educational development, and its fundamental role in the creation of knowledge, continuous learning and permanent training. The aforementioned report *Policy guidelines for Mobile learning* establishes a series of directives concerning the integration of mobiles into the education system, and provides examples of projects that are taking place in different countries. In this report, particular refe-

Mobile devices facilitate learning as they diffuse the boundaries between formal and non-formal education

rence is made to continuous learning: "Mobile devices facilitate learning because they eliminate the boundaries between formal and informal education. Using a mobile device, pupils can easily access additional material to study the concepts the teachers have presented in more depth." In a similar vein, on various occasions the European Commission has judged learning via mobile technologies as being one of the key competencies of the future [5] [6], and the World Bank has also made reference to the fact that pupils disconnect from the school when they are not there, highlighting the great potential mobile devices provide for learning when relating formal learning to informal learning [7].

[2g] In recent years, the Government of Catalonia has promoted a Digital Agenda [8], which sets out and pinpoints an ensemble of strategies designed to develop information and communication technology, in line with the Digital Agenda for Europe and the Horizon 2020 innovation programme. The Agenda's goal is to promote uniform, inclusive and sustainable growth of information and communication technology so that it contributes to improving the quality of life and competitiveness of citizens. In order to progress towards achieving this objective, a large and continuous educational effort is necessary, which should involve everyone that is part of the system and which will need to incorporate mobile technologies into the teaching-learning processes.

[2h] The Catalan Education Law establishes that "Schools are autonomous in terms of pedagogy, organisation and management of human resources and materials" (article 90.1). The independence the schools enjoy is aimed at "ensuring equity and excellence in terms of school" (article 90.3), therefore each educational centre can "determine the resources that it needs and define the procedures to apply to the educational programme" (article 90.2). Therefore, the schools and their employees are those that are truly responsible

It is up to educators to place digital technology and mobile devices at the service of learning

for the way in which technology is viewed for learning purposes and the direction they decide to take to integrate mobile devices pedagogically.

[2i] The regulation of the use of mobile phones within schools must respect that which has been established by Law 14/2010, of 27 May, on rights and opportunities during childhood and adolescence [9], which establishes that "Any child or adolescent has the right to be considered as a citizen, with no limitations other than those explicitly established in the law that is in force for minors, and to be a protagonist for the defence of his/her rights" (article 53.1). Indiscriminately forbidding students from using mobile technologies in centres could constitute a restriction of this right.

[2j]   Research into educational use of mobile devices is something that has only appeared recently and that schools, universities and research groups are beginning to focus on, with the aim of understanding access to them, use of them and the pedagogical opportunities which are arising thanks to mobile technologies, the organisational dynamics that emerge in the centres, the role of parents in communication, security and learning and also the impact on the connection between school and the surrounding environment. Projects like *Net Children Go Mobile* [10], *Mobile Opportunities for Children* [11] and *Menores de Edad y Conectividad Móvil en España: Tablets y Smartphones* [12] *(Minors and Mobile Connectivity in Spain: Tablets and Smartphones)* provide relevant information and prospects for the future regarding an extremely dynamic sphere and they should be a reference point that the entire educational community should use to assist with reflection on the subject.

3. Digital Competence

[3a]   As highlighted by the aforementioned document that pertains to the School Education Council of Catalonia, the ability to neatly and simply integrate digital technology into teaching-learning activities is a key element when developing the "competencies necessary for students to continue learning in an independent manner throughout life, an objective that is absolutely necessary in a society that is becoming increasingly based on knowledge. Students finishing their studies with a desire to continue learning and the capacity to do so constitutes a social and individual act that is of crucial importance" [2] (section 26).

[3b]   Articles 58 and 59 of the Catalan Education Law establish that the competencies necessary to use technology must be developed to an adequate level, both in primary education and obligatory secondary education. As a result, the Department of Education has identified the basic competencies relating to digital technology that primary and secondary school pupils must obtain [13]. The aforementioned competencies have been put into four large categories: instruments and applications, treatment of information and organisation of working and learning environments, interpersonal communication and collaboration, and good citizenship, habits, community spirit and digital identity.

During compulsory education students must develop the skills needed to use technology

[3c]   Some of the competencies that the pupils must obtain, both at primary and secondary level, are particularly relevant to correct and effective use of mobile devices. The following competencies are mentioned as an example: "select, configure and programme digital devices according to the tasks that need to be done" (digital competency 1); "use basic editing applications to edit still images, sound and moving images in order to produce digital documents" (digital competency 3); "participate in environments focusing on interpersonal communication and virtual publications in order to share information" (digital competency 7) or "act in a critical and responsible manner when using information and communication technology, considering ethical and legal aspects, safety and digital identity" (digital competency 11) [13].

[3d] The pupil obtaining digital competence is directly linked to the digital compe-
tence of the teaching staff. The skills that the pupils must achieve during their
compulsory education must be encouraged by learning activities led by teachers
that also have the aforementioned abilities. The
documents that are internally used in the cen-
tres (the educational programme, the technolo-
gies for learning and knowledge purposes plan
[known as Pla TAC in Catalonia] the organisatio-
nal and operational regulations) must promote
the use of digital technology for learning in or-

*Achieving the digital
competence of students
is related to the digital
competence of teachers*

der to ensure this competence is achieved. In this sense, staff training and advice
and support provided to the schools must have a relevant and continuous role in
the deployment of digital competence.

[3e] Gaining digital competence is favoured by the significant and encouraging lear-
ning that is made possible for pupils by using mobile technologies. In order to
encourage the teaching staff and centres to act in accordance with this, the *mS-
chools* [14] programme initiated by the Barcelona Mobile World Capital Founda-
tion (Government of Catalonia, City Council of Barcelona, Fira de Barcelona and
GSMA) gives support to innovative activities such as the design of mobile apps by
students that are aimed at providing solutions to the problems they see around
them (Mobilising IT, a subject studied in the fourth year of secondary education
[15]) or georeferencing points of interest on a collaborative map of material and
immaterial Catalan heritage (*Mobile History Map* [16]). All schools in Catalonia
are invited to take part. This programme is a relevant example of cooperation
between school and society that demonstrates many positive aspects of the edu-
cational use of mobile technologies and its impact on the development of digital
competence. It also demonstrates the motivation and commitment of students
when it comes to learning.

4. Mobile Devices and Learning

[4a]   The increase in the use of mobiles amongst adolescents is an unquestionable reality. A survey carried out by the Spanish Statistical Office regarding Spanish girls and boys aged between 10 and 15 illustrates the large presence of mobiles in this collective. Specifically speaking, at age 10, 24% of children have a mobile phone; at age 12, 64%; at age 14, 86%, and at age 15, the figure increases to 90% [17]. Data collected in Catalonia for this study for the same age range and same year indicates that 58% of children and adolescents, almost three in every five, have a mobile telephone. In addition, there are indications of a rapid increase in this percentage; therefore the possibility of educational potential stemming from technology is continuously growing, even though there are some inequalities that must be detected and attenuated as soon as possible.

[4b]   Generally speaking, the child or adolescent has a mobile device and takes it to the school because his/her parents got it for him/her and pay for it. This indicates authorisation, although implicit, to use it, and this also implies trust and encourages responsible behaviour. If we would like boys and girls to learn to be responsible, the use of digital technologies, particularly mobile technologies gives them the opportunity to be: using technology to learn is an excellent way of exercising this responsibility, which families generally agree with.

Buying smartphones for children and teenagers is an act of trust and an invitation to responsibility made by their parents

[4c]   The fact that parents get mobile devices for their children also implies a tacit acceptance of the risks and inconveniences of the aforementioned devices, even though it may be that they are not entirely conscious of them. One aspect that may be ignored by parents and tutors is that children under the age of 14 must have their consent to provide personal data to all Internet services that require user identification, such as, for example, e-mail, instant messaging or social networks (article 13 of the Regulation implemented by Organic Law 15/1999 on protection of personal data). The liability for improper use of these services by those under the age of 14 legally lies with the parents or tutors that have authorised the use. All of these realities must be taken into account by schools when making plans and implementing them.

[4d]   The potential offered by mobile devices to carry out activities related to learning is very high, since they make it possible to carry out certain specific operations that could not be carried out in another way (for example, live searches for multimedia information on any subject, or activities involving geolocalisations). They also make recordings more simple and, besides, they can be made anywhere (learning outside the classroom). Thanks to mobile devices, the majority of pupils are able to carry out simulations or do calculations, acquire live information and data, make notes quickly, consult dictionaries, see or listen to musical recordings, create and programme applications, control devices and perform other operations immediately. The challenge, educationally speaking, is to take advantage of all of the possibilities these devices offer in terms of processing information and communication, in order to naturally incorporate them into learning and academic activity.

Integrating mobile devices in learning activities is a major challenge that education faces today

[4e]   Initiatives by teaching staff and schools that focus on the use of mobile devices in the classroom are becoming more frequent and encompass projects, experiences and activities that take full advantage of the potential that these devices offer in terms of teaching and learning processes. Section 6 (Annex) of this document presents a summary of some of the centres that are an example of this trend. The *Mobile Learning Awards* prizes are evidence of the increasing scope of these activities. They are part of the *mSchools* programme which recognises successful educational experiences and work by pupils that focuses on the use of mobile devices in schools. [18]

[4f]   As mobile devices are normally the property of their users and given that this technology allows for the collection of personal information, they offer a lot of possibilities in terms of adapting to individual needs, and therefore, are useful for personalised learning processes. For example, there are apps for mobile telephones and tablets that allow you to select the level of difficulty of the texts for reading activities, according to the competencies of the user. Information can also be presented according to the style of learning: a pupil with a good visual memory and interest in maps could receive information via an interactive atlas that can be managed using a touch screen; whereas another student could think that the information was easier to understand in the form of a chart with links to informative videos and primary sources. As mobile technologies are very easy to transport and relatively accessible in terms of cost, they considerably increase the possibilities of interactive personalisation that are available to the education system.

[4g]   Mobile technologies in the classroom can simplify feedback and evaluation, because they offer immediate indications of progress to both teachers and pupils. An instantaneous interactive response allows for quick detection of difficulties in understanding, and makes going over concepts again easier. As an example, there are mathematical applications for mobile devices that help to solve problems step by step. Other applications let teachers hand out brief questionnaires to make sure that the pupils have understood a determined task, for example, reading, because they can be corrected instantly and the results can be included in an academic register if desired. Automation of certain logistical tasks such as correcting work could allow the teaching staff to dedicate more time to directly attending to the pupils. This type of app could contribute to making tasks, exams and evaluations more useful in terms of improving learning, rather than being limited to providing data for summative evaluation.

[4h]   The inclusion of text size adjustment technology, speech recognition technology, location detection and the possibility to read texts on mobile devices encourages learning amongst pupils with special educational needs. Pupils with visual impairments can use free apps that allow the camera of the mobile device to read texts out loud. Pupils with dyslexia can use re-formatted texts on digital devices with a small screen to improve speed and comprehension. All in all, the range of educational apps provided by mobile technologies for all types of educational necessities seem to only be curbed by the limitations imposed by our imagination.

Smartphones extend the possibilities for personalisation of learning and care for special needs

5. Guidelines for Policies in Schools

[5a] Mobile devices are incomparably different to any other resources that pupils have used previously or that have been available to educational centres. This is a reality that schools must bear in mind when thinking about their expectations with regards to mobile phones and other digital devices of the personal variety. The use of mobile devices requires schools to establish clear, practical guidelines that the pupils themselves partake in and can help to apply and update. The large educational potential of mobile devices needs to be used positively in educational centres. Above all, mobile devices becoming a bone of contention between pupils and teachers must be avoided. In any case, centres must be aware of the need to have an adaptable, proactive and open outlook, to acquire new knowledge and guidelines, and reflect them in their regulations on the running and organisation of the school.

Mobile devices are incomparably different from any previous educational resource

[5b] Precautions that schools take with respect to the use of mobiles must take into account the fact that over very few years a society has been created that expects immediate communication and often takes it as a given. In accordance with realities and circumstances that are out of the schools' control the latter must be sensitive to the fact that many parents could think that they or their children are in a vulnerable position if they do not have the possibility to communicate. It is up to the school, perhaps, if applicable, after agreeing with the families, to organise this possibility effectively, according to the regulations regarding coexistence established by the school.

[5c] In the framework of the educational programme, schools clarify their view and the precautions to be taken when it comes to the role of digital technology. In this sense, the School Education Council of Catalonia's assessment could be useful: "there is probably nothing that will be able to stop the majority of the student body from continuing to increase the use of technologies for leisure, learning, obtaining information and communicating" [2] (section

For students smartphones are an essential tool for social interaction and they are unwilling to live without them

25) because for the pupils the aforementioned technologies constitute "an essential tool in terms of relationships and a socially necessary instrument" [2] (section 26). Given this situation, taking a stationary outlook when it comes to education means rejecting the maximisation of the potential of mobile technologies and not facing up to the facts in a positive and determined manner, which may contribute to increasing the distance between the reality of the student body and the education system. A lack of use of technologies in the educational sphere could cause damage in personal, social and economic terms, and in the long run, it could damage the collective capacity to benefit from digital technologies in a creative manner.

[5d] Article 20 of the Catalan Education Law defines the commitment to education letter (within the framework of the educational programme of the school) as the document that outlines the objectives that are necessary to achieve the harmonious, respectful environment that is necessary for the development of educational activities and the things that each family and the school agree to commit to, based on the principles that inspire them. The aforementioned article states that the participation of families in the education of their sons and daughters must be promoted through the medium of the commitment to education letter. Therefore, this document could be used to make pupils and families aware of the regulations regarding the use of mobile devices as part of the regulations regarding coexistence at the school.

[5e] Disruptive use of mobile devices at the school could be considered as a sign of a lack of respect towards the social harmony of the school, and in this sense the organisational and operational regulations should incorporate clear provisions, in proportion with the nature of events that could range from unexpected, annoying ringtones to things like cyberbullying and the violation of one's rights to intimacy and one's own image. Cyberbullying using digital communication tools—deserves special attention due to its seriousness and its potential consequences. The Department of Education has provided the educational community with tools to help teaching staff to think about this matter with the pupils in a group format, as well as specific protocols for action for primary and secondary schools in more severe cases. Families also dispose of resources to become familiar with the concept of cyberbullying, how to detect whether their son or daughter is a victim, and how to collaborate with the school to deal with it.

[5f] Total prohibition of mobile devices in schools with the goal of avoiding potential problems goes against the curricular goals that are linked to achieving digital competence, learning in general and the capacity for lifelong learning. Knowing how to use digital devices responsibly is both part of the curriculum and a com-

petency to be acquired that the student body should not be deprived of. Aware of this reality, many schools in Catalonia are debating the use of mobile devices in the educational programme and the various documents that are used within the school in a proactive manner.

The total ban on smartphones in schools contradicts the curricular aims linked to digital competence and learning in general

[5g] Pupils, as conscious users of mobile devices, must know what they are permitted and not permitted to do, develop responsible, safe and legal guidelines with regards to behaviour, and if necessary, justify their actions. In this sense, the integration of mobile devices in schools offers a unique opportunity to provide guidance when it comes to suitable use of the devices, and to open discussions between pupils and teachers about this topic. In addition, thanks to the participation mechanisms that are established at the school, the families can be invited to take part in this dialogue and take advantage of the opportunity to get involved in joint formative activities that relate to the topic of digital technology, the opportunities it presents and its repercussions.

[5h] The exemplary nature of the teaching staff is an essential part of all successful practices. The use of mobiles on the premises of an educational centre by all members of the school community must be coherent with the principles and regulations that have been established. For this reason, regulations similar to those applied to the student body must also be adhered to by the teaching staff and other people that are on the premises of the school. The example set by the teaching staff encompasses their attitude towards technology, how they use it and the impetus that they give it.

Teachers and families should exemplify the responsible and beneficial use of mobile technologies

[5i] Digital mobile devices have become essential tools in the spheres of activities, relationships and organisations and everything seems to indicate that they will be even more essential in the future. The relationship between pupils, families, teaching staff and the educational institution, a place where technology was traditionally absent, will be unable to remain alienated from the general dynamic of change to the ways of interacting and communicating that is taking place in society. Up until recently, interactions between families, pupils and teachers were characterised by direct communication and relationships that required one to be physically present. We are now moving towards the incorporation of interactive communication driven by technology, which is becoming more and more

common [20]. Policies adopted by schools regarding mobile technologies are an expression of the professionalism of the teaching staff, the ethos of the centre and the leading role and dedication of the school community, and must aim to guarantee equity and obtain the maximum educational benefit within the framework of this new reality.

Schools must ensure fairness while achieving the maximum educational benefit of mobile technologies

6. Annex

The brief descriptions of educational projects that make the most of the potential offered by mobile devices quoted in this annex are solely there as examples. They do not constitute a full list or a representational sample of the schools in Catalonia. They have been included in this document with the aim of providing an initial glimpse of the educational potential of these devices and the opportunities that they provide to readers that are not familiar with this sector.

[6a] "Put your mobile on when you come into class" could be the motto of the Torre del Palau Secondary School, Terrassa, a centre where the pupils have access to a powerful Wi-Fi network that is both open and free, and which supports an educational programme that stimulates responsible use of digital technologies, based on the idea that common sense and responsibility are the best regulations. The aim is to achieve more personalised learning using mobile phones, starting with direct and active experience for every pupil in situations that focus on communication, such as recording themselves practicing English in an airport, using Twitter (for pupils over the age of 14) to follow and participate in current affairs, contacting people in various languages, or managing practical information for daily life through the use of simulations. At the Torre del Palau Secondary School, mobiles are used to learn by doing. One example of this is an urban route designed by the pupils to become more familiar with the industrial heritage of Terrassa. The routes designed by the students can be followed using an augmented reality mobile app that uses geolocalisation to locate and indicate points of interest that are relevant for the person that makes the consultation. Other examples of learning by doing are the creation of robots and the design of apps within the framework of the *mSchools* project.

[6b] As part of the subject "Mobilising IT" aimed at pupils in the fourth year of secondary education and promoted by the *mSchools* project, pupils from the Josep Vallverdú Secondary School in Borges Blanques are carrying out an app design collaborative project for mobile devices that also includes aspects of entrepreneurship. One of the apps they designed was aimed at promoting tourism and the economy of les Garrigues county. The application, which is available to be downloaded publicly, was chosen by the Regional Council to be presented at the Olive Oil Fair.

[6c]   Pupils at the Virolai School, Barcelona, regularly use mobile phones to take pho-
tos and record videos, or for geolocalisation activities using QR codes. This ac-
tivity has been recognised by the Zoology Museum, Barcelona. They also use
Twitter to work on poems with the pupils from a school in Valencia, to share
reading assessments and to evaluate the reading process. They also use Twitter
to follow conferences and organise simulations of scientific congresses. Within
the framework of subjects like Biology and Geology, pupils in the fourth year of
compulsory secondary education held a Biotechnology and Biomedicine Con-
gress. They prepared speeches on topics like stem cells and cell therapy, gene
therapy, cloning and transgenesis, among others. Once the speeches were given
to the other members of the class, they were circulated, along with questions
and evaluations, via a specific Twitter account, managed by the Congress Com-
munication Group, and they also took advantage of the opportunity to discuss
themes like netiquette and ethics in terms of the use of social networks.

[6d]   As well as doing projects regarding collaborative georeferencing of cultural he-
ritage, which the majority of the centres referred to in this annex also do, at the
Pons d'Icart Secondary School in Tarragona, they use mobile phones for inter-
disciplinary activities in Science and English which use augmented reality, for
example, associating multimedia information with an informative brochure. They
also use their mobiles for many purposes and situations: to determine the height
above sea level or to measure heart rates with a suitable app, and if possible, an
alternative app to the one provided by the teacher, to search and use informa-
tion to make files about chemical elements. The pupils use the app WhatsApp
in class to interact with each other, to check plans, hypotheses or results. In the
framework of a project to promote reading, a comic made with photos taken
on a mobile phone by the pupils themselves explains how to read and resolve
scientific problems.

[6e]   An activity at the El Sitjar school in Linyola consists of describing a farm animal
and drawing it. Each pupil records their voice with a mobile phone or tablet and
reads the description. The recordings are saved on the cloud using an app and
are posted on the class blog. A QR code is also generated for each animal, which
is printed out and stuck on to each drawing. All of the drawings are used to
make a mural for the school corridor so that pupils from other classes can read
the code associated to each animal with their mobile phone and listen to the
recorded description.

[6f]   The Rel School in Barcelona is a special co-operative school. With support from
the Municipal Agency of Information Technology and the Municipal Agency of
Education, the Rel School is carrying out an intelligent urban gardening project,

Smart Hort. (Smart Allotment). Using a mobile telephone or a tablet, pupils take measurements of variables such as light, temperature or the degree of humidity of the land where there are plants growing, they add water when it is necessary, they observe the allotment with the camera and detect the presence of animals in the allotment using movement sensors. Pupils use Scratch to create programmes that analyse the data provided by the sensors that have been built into the allotment, control what is happening in the garden and generate the necessary responses. The Smart Hort (Smart Allotment) initiative is a comprehensive example of an educational project, social inclusion and work that involves both cooperation and participation.

[6g]   At the Garbí Pere Vergés schools, in Badalona and Esplugues de Llobregat, each pupil has an iPad tablet as a primary work tool that he/she uses in almost all areas. In Experimental Sciences, they use the tablets as simulation tools, as well as using them as a resource to document, photograph or record pieces of practical work or experiments. In language and communication they are used as a recording tool and to deliver work based on oral presentations. In the technology classroom there are robots that can be controlled using the tablets. The mathematical software GeoGebra allows you to interactively explore the connections between algebra and geometry. Using the tablet, the pupil does guided exercises, solves problems and explains the sequence of events. Other uses of mobile devices include making guides for excursions, geolocalisation activities and group projects. The tablets, a virtual learning area based on Moodle and a portfolio based on Mahra are the key elements of a technological ecosystem that progressively improves with new functionalities and uses that were not initially planned.

[6h]   Mobile technologies play a large role in the teaching and learning processes of the Sadako School in Barcelona. From the 5th year of primary school to the 3rd year of secondary school, pupils have their own tablet, which they use naturally in the classroom as part of their work. As of the fourth year of secondary school, pupils can use tablets, laptops or mobile phones, according to what they believe to be best, according to the BYOD *(Bring Your Own Device)* concept. The use of mobile devices in general, both by teachers and pupils, has caused a very notable increase in the interaction of both teachers and the school in general with the surrounding environment. These devices allow it to be possible for many of the educational processes that take place in the classroom to be shared with the families of the pupils, which encourages them to understand, share and participate more when it comes to educational processes.

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