Introducing
Tablets in Schools:

The Acer-European Schoolnet Tablet Pilot

acer

European Schoolnet

acer   European Schoolnet

Contents

Foreword

Marc Durando
Executive Director at European Schoolnet

Anja Balanskat
Senior Analyst and Project Manager at European Schoolnet

European Schoolnet has a strategic position as the network of Europe's Ministries of Education, helping teachers in schools to make effective use of ICT in teaching and learning. European Schoolnet monitors trends in emerging technology which have the potential to transform educational practices, and supports research-informed policy making.

Recent years have seen 1:1 computing initiatives gaining ground in educational settings. Teachers in Europe have begun to integrate tablets into the teaching and learning process. Empirical research and evidence are required to explore how tablets can be successfully exploited in the education process.

Having successfully implemented European research pilots in the area of 1:1 computing, European Schoolnet is at the forefront of developing new pedagogical approaches, 1:1 learning scenarios, and building teachers' digital competencies.

Building on the successful partnership developed during the Acer-European Schoolnet Netbook pilot in 2010/2011, European Schoolnet carried out a pilot on the use of tablet computers (Acer Iconia W500) to enhance teaching and learning in 2011/2012. The pilot aimed to document and develop teachers' tablet-based pedagogical practices, tablet use at school and at home, opportunities for collaboration and professional development during the pilot, and the impact of the tablet on teachers' competences.

This evaluation report provides, for the first time, research on the use of tablets by teachers in 8 European countries, and gives recommendations to educational institutions and policymakers on how to ensure the effective integration of tablets into the education process. We thank all participating schools, teachers and Ministries of Education for their commitment and dedication throughout the pilot implementation and beyond.
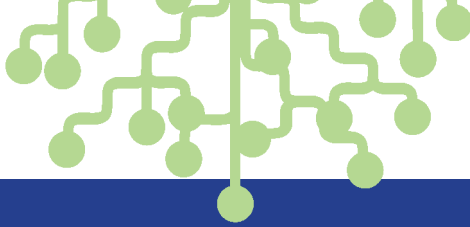
Guido Terni
EMEA Education Manager at Acer, EMEA,
(Europe, the Middle East and Africa)

Cristina Pez
EMEA Marketing Manager Commercial & Education at Acer, EMEA,
(Europe, the Middle East and Africa)

Since 2009, Acer has cooperated with European Schoolnet (EUN) in promoting innovative ways of teaching and learning through the use of technology. Acer provides support for educational development and personal growth by providing schools with access to technologies.

Physical hardware, as well as training and support for teachers, is crucial for integrating technology into everyday teaching and learning. By creating innovative and easy to use technology for the classroom, Acer helps students to explore new paths of communication, and empowers educators to keep pace with today's increasingly digitally-linked world. Acer is committed to education, and lends its support and expertise to a number of education initiatives. These project activities focus on various aspects of interaction between education and technology: STEM education, through the inGenious project; and designing the future classroom with EUN's Future Classroom Lab and the iTEC project.

During the recent Acer-European Schoolnet Tablet Pilot, Acer funded the equipment for schools and the pilot implementation activities, including a workshop for teachers to share their pilot experiences in June 2012. The pilot is part of Acer's global strategy to support Ministries of Education as they prepare schools to mainstream the use of ICT in teaching and education. The following findings from the evaluation report: "Introducing Tablets in Schools: The Acer-European Schoolnet Tablet Pilot" provide context to better understand how teachers use tablets to enhance students learning. Case studies and practical guidelines for teachers are published separately to the evaluation results.
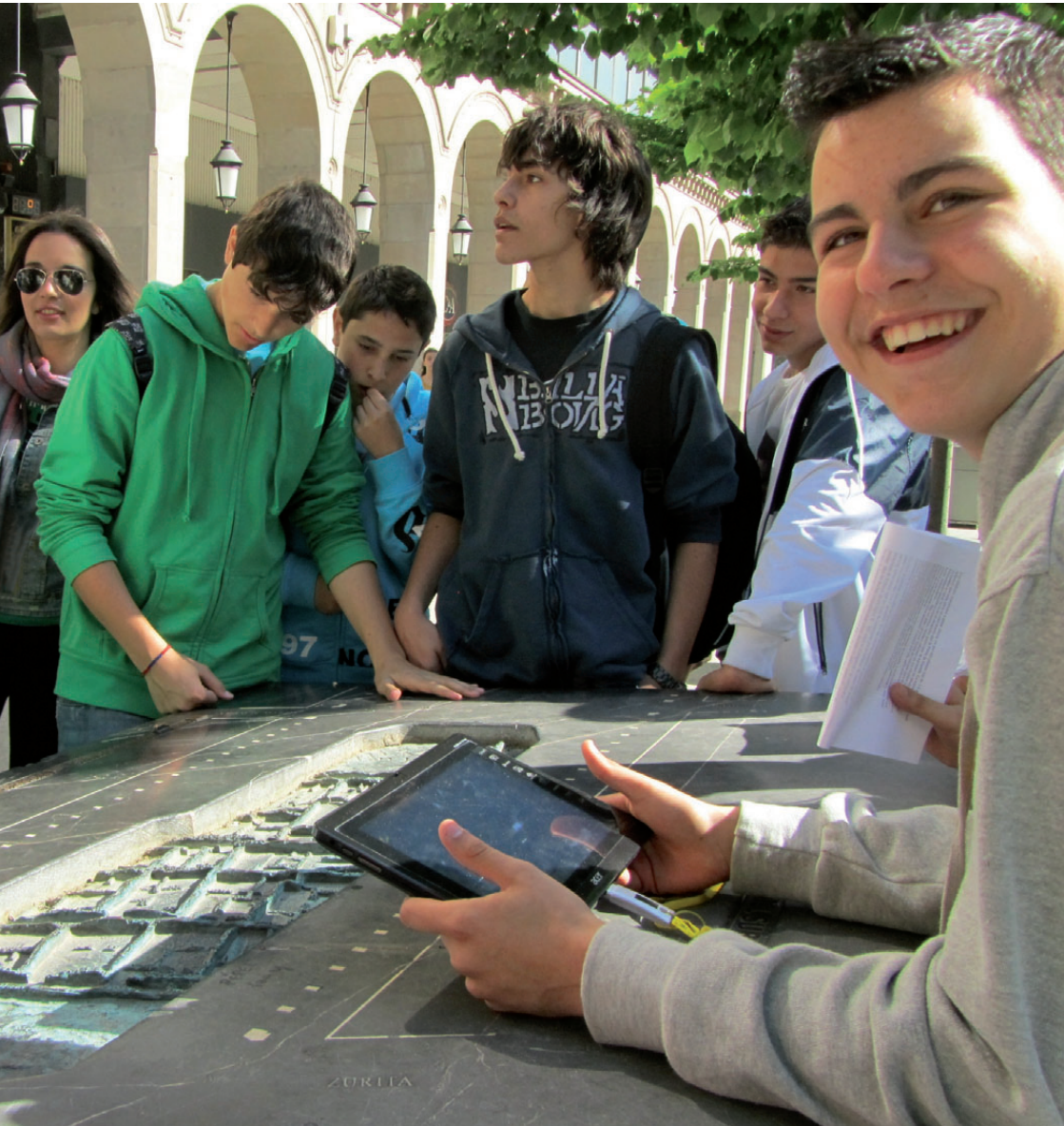
1. Executive summary

1.1. Background and objectives

Following the successful implementation of the Acer-European Schoolnet Educational Netbook Pilot in 2010/2011, Acer and European Schoolnet carried out a new pilot study in 2012 on the use of tablet devices to enhance teaching and learning practices. During this study, Acer equipped 263 teachers in 63 schools from eight European countries with Acer Iconia W500 tablet computers. The countries involved were Estonia, France, Germany, Italy, Portugal, Spain, Turkey and the United Kingdom. Additionally, 116 students received tablets as part of the pilot: one classroom set of tablets was provided to a UK school (26 tablets per class) and three classrooms were equipped with tablets (30 tablets per class) in Spain.

The objectives of the project were to gain a better understanding of teachers' use of tablets to enhance students' learning. In cases where each student in a class was provided with a tablet, the project aimed to further investigate 1:1 teaching and learning approaches. More specifically, the project aimed to:

- explore and document teachers' use of tablets in school and at home;
- identify good practices regarding the use of tablets and foster the exchange of practices between teachers;
- provide guidelines to schools considering the implementation of this technology;
- examine key factors for the successful integration of tablets in schools.

Acer funded the equipment provided to schools and the pilot implementation activities. The project was coordinated by European Schoolnet (EUN), which also carried out the evaluation of the pilot. The pilot schools received technical and pedagogical support, and guidelines in order to implement the pilot in each country. The 1:1 website (*http://1to1.eun.org*) offered possibilities for teachers to find learning resources and pedagogical scenarios, participate in a community of teachers dedicated to 1:1 pedagogy, participate in webinars, exchange teaching practices, and receive regular information about the project.

1.2. Methodology

The study included an online evaluation in order to document the teachers' use of the tablets. The aim of the online survey, which was addressed to all teachers participating in the pilot, was twofold:

1   To receive information about the teachers participating in the pilot, their experience with the use of ICT during the six months prior to the study (in school and at home), their collaboration and professional development activities with ICT, their self-estimated ICT competence, and their general attitudes towards ICT **prior to the tablet implementation**.

2   To document teachers' use of tablets in school and at home, teachers' collaboration and professional development activities with the tablet, their self-estimated competence using the tablet and the impact of the tablet on teaching and learning activities **during the pilot implementation**.

Two online questionnaires were sent to the pilot teachers: a pre-evaluation questionnaire (ICT survey) in the beginning of the pilot (February 2012), and a final questionnaire (tablet survey) at the end of the pilot (July 2012).

A large majority (approximately 80%) of the pilot teachers answered both questionnaires (ICT survey: n=216, tablet survey: n=221). Since there are major differences in the number of teachers participating in the pilot by country (e.g. 12 teachers in Spain and 65 teachers in Germany), the evaluation primarily presents the findings of the overall sample of teachers, and uses descriptive statistics to analyse the results. In a few cases, the results are presented also by country level to identify marked differences among teachers in the participating pilot countries.

1.3. Findings from the evaluation

Teachers' attitudes towards and use of ICT prior to the pilot implementation

Pilot teachers are experienced in using ICT

The majority of teachers who participated in the Acer-European Schoolnet Tablet pilot are experienced teachers with more than ten years of professional experience. Pilot teachers teach a variety of subjects in secondary schools. Almost all pilot teachers estimate that ICT is supported in their school. ICT is not new to the pilot teachers: the majority of teachers had at least 4 years of experience of using ICT to support their teaching before implementing the pilot. Half of the pilot teachers have used ICT in more than 50% of their lessons prior to the pilot implementation. The majority of pilot teachers have used a PC or laptop/netbook during the last 6 months prior to the pilot implementation. 75% of teachers have also used an interactive whiteboard and the associated software. Half of the pilot teachers have used a tablet to support their teaching in the 6 months prior to the pilot.

Pilot teachers are confident and competent in using ICT
Pilot teachers feel confident in using ICT for lesson planning, lesson delivery and administrative tasks but less so for the purposes of professional development, lesson follow up and assessment. Most of the teachers feel competent using the Internet and general ICT applications, teaching with technology (pedagogical use of ICT), and also using a specific device or technology (technology use). Fewer pilot teachers feel competent in the use of virtual learning environments, and using social networking tools.

Most pilot teachers used ICT for browsing the Internet for learning resources and performing similar ICT-based activities at home and at school
ICT-based activities of teachers at school do not differ considerably from those activities performed at home. Slightly more teachers carry out lesson preparation activities using ICT from home. In general, some ICT-based activities are carried out more frequently than other activities. Most pilot teachers use ICT for browsing the Internet in order to find learning resources. Fewer teachers use ICT for communication with parents (at school and at home).

Pilot teachers received ICT-related training every 6 to 12 months
Around half of the teachers participating in the pilot received ICT-related training every 6 to 12 months; in Internet use and general applications, pedagogical use of ICT, or device and equipment-related training. Around half of the pilot teachers engaged, on a weekly basis, in discussion relating to the development of individual students, in the exchange and discussion of teaching material or in the exchange and discussion of ICT-related issues. 40% of teachers never observed other teachers in order to provide them with feedback or participated in online communities (mailing lists, Twitter, blogs) for professional discussions with other teachers.

Pilot teachers used a variety of teaching approaches, with ICT, and without
Almost all teachers apply traditional teaching approaches on a regular basis using ICT or not, but also more than two thirds of teachers foster collaborative group work of students, or apply student-centred learning approaches with or without using ICT.

Pilot teachers have a positive attitude towards ICT and its impact
The pilot teachers are in general convinced of the positive impact of ICT. In some areas such as teaching methods, school atmosphere and student learning, the impact is estimated higher than in other areas, such as using ICT for assessment, using ICT to speed up lesson preparation and follow up of lessons, and as a means of communication between teachers, students or parents.

In addition, the tablet pilot started off on fertile ground: teachers participated voluntarily in the project, were motivated and ICT-experienced teachers, felt competent in the use of ICT in a number of professional activities, and had a positive attitude towards the impact of ICT on teachers and learners. Moreover, teachers had already access to a variety of ICT devices, mainly PCs, laptops, and interactive whiteboards. This reflects the uses, practices and positive attitudes of teachers during the pilot implementation.

Teachers' use of the tablet during the pilot implementation

Tablets used across a variety of subjects
The tablet was used in a variety of subjects, and there is no indication that the tablet is more suitable for any subject in particular. Most of the teachers used the tablet mainly for browsing and searching the Internet to collect learning material, or with a variety of applications in order to prepare presentations for lessons. This type of practice suggests that the tablets provide a set of tools and functions that can be exploited across all subjects.

Tablets mainly used for preparation of lessons and classroom-based activities
The tablets were rather used in a conventional way, mainly with students in class and for lesson planning and delivery. In other areas, such as the use of the tablet for assessment and communication, the tablets were utilised to a lesser extent. However, there is evidence of good practice in these areas from the case studies. Using ICT for assessment and communication were also the activities carried out less frequently by the pilot teachers prior to the pilot implementation, as the data from the pre-survey shows.

Teachers performed the same kind of ICT-based educational activities at school and at home, with a slight preference towards doing certain activities at school, e.g. using digital learning resources or assessing students. Browsing the Internet for learning resources and preparing presentations for lessons were the two most popular activities carried out by the teachers at school and at home.

Tablets are gradually integrated in the existing ICT environment
Tablets were the device used by most of the teachers during the pilot implementation, whereas only half of the teachers had used a tablet prior to the pilot implementation. The findings suggest that tablets are integrated gradually and used in conjunction with other ICT devices but are not yet used on a daily basis, and not yet by a majority of teachers in more than 50% of their lessons.

Tablets lead to more frequent professional development opportunities

The project implementation led to more frequent professional development opportunities for teachers. In some areas, such as the development of ICT skills or device-related training, teachers received more frequent training during the project implementation. Other areas deserve more attention in the future, such as training in the pedagogical use of tablets, training in subject-specific applications, and, most of all, training in the use of social networking tools or virtual learning environments.

Tablets as part of the ICT vision of schools and support for the exchange of teaching material

Among the most frequent collaboration activities carried out by the teachers was the exchange of teaching material with colleagues, or attending staff meetings to discuss the vision of the school on tablets. The latter indicates the e-maturity of the schools participating in the pilot, as the tablet becomes integrated in the overall ICT policy of the school. Peer learning activities, such as observing other teachers' classes and providing feedback, or engaging in joint activities with teachers from other classes, were carried out by one third of the teachers in a 1-3 month period. This type of peer-to-peer learning activity was not carried out by around half of the teachers, either as part of their general ICT practices or as part of their tablet practices. In general, time and confidence with the new device is needed to engage in these kinds of collaborative exchanges.

Informal exchanges on the use of tablets

The findings related to collaboration and professional development activities also indicate that the project was driven by the teachers in schools themselves, with support from the head teacher, and that teachers had a lot of autonomy during the project implementation. Teachers mainly used informal face-to-face discussions or informal ICT-based discussions to communicate about the use of tablets during the pilot. Fostering these informal exchanges (face-to-face or ICT-based) should be taken into consideration when designing support actions for pilots.

Teachers alternated between different teaching methods when teaching with the tablet

The pilot teachers used a variety of different teaching methods when teaching with the tablet, alternating between frontal teaching, and teaching methods supporting collaborative and individual activities with students. When looking at the ICT survey, it is evident that many teachers already used these various teaching approaches (with or without using ICT) before the pilot, and most probably applied similar approaches when teaching with the tablet. Teachers reported that they engaged students in a variety of learning activities, individual as well as collaborative, and involved them in both online as well as offline activities.

Teachers' use of digital resources vs. students' use

The majority of teachers mainly used online material (from the Internet in general or from established national/regional education sources) when teaching their students. More than one third of pilot teachers used electronic offline material. In contrast to this, the large majority of teachers mentioned that students used paper-based learning material (e.g. textbooks, printed exercise sheets) when teaching with the tablet. Half of the teachers said their students used online learning resources, and 40% mentioned subject-specific computer-based applications. Whilst around half of the teachers had previously permitted students to use online learning resources, the use of paper-based learning material still prevailed during the pilot, suggesting that students had less access to Internet-based material than the teachers (who were equipped with the tablet).

Tablets building teachers' competence

Most teachers, after having used the tablet, suggested that they had "very good" or "good" competence in general ICT skills and in device/equipment-related use. Almost half of the teachers felt they had "satisfactory" or "poor" competence in using social networking tools or virtual learning environments. The latter are also the areas where more than half of the teachers have not received professional training, neither before the project implementation nor during the project implementation, suggesting the importance of further training and associated practices on these issues.

Impact on digital competence of teachers and teaching methods

Teachers estimate an overall positive impact in a number of areas such as the development of their digital competence and their teaching methods. Teachers also know which content to use on the tablet and how to effectively integrate tablets in their teaching. There are, however, some areas where impact is not yet evident, indicating that more time and integration is needed. This is the case in relation to using the tablet to assess students' work and to improve communication with teachers, students and parents. These are also the areas where teachers used the tablets least.

Use of support services and no major barriers in the pilot implementation

The findings from the evaluation, especially in relation to implementation barriers, show that overall, teachers felt content with the tablet build, screen and keyboard. There were no major issues that hindered the use of tablets by teachers, no issues of broken tablets or insufficient Internet connection at home. Areas such as compatibility of the tablet with the existing ICT infrastructure at school, and general technical problems with the tablet are areas to watch.

The majority of pilot teachers made, on a regular basis, use of the services provided at European level. Teachers welcomed support related to finding resources (1:1 pedagogical scenarios, information on other projects and resources), but also information on project developments as part of a pilot implementation (news, updates), and writing about their tablet project experiences and challenges in the teachers' blog as part of the 1:1 community.

1.4. Recommendations based on the pilot implementation

1   The profile of teachers (motivation, attitude and confidence levels), as well as their ICT-based teaching and learning environment, should be taken into consideration when implementing a pilot where new devices will be used, in order to design appropriate support measures, and to provide guidance and training for teachers during the pilot implementation.

2   Given the mobile nature of the devices, the use of the tablet in other learning contexts, such as field work, outside the classroom (e.g. library) use, or in informal or non-formal learning environments, should be further exploited by teachers. Evidence suggests that these type of practices, where tablets are used to extend learning beyond the formal classroom context, leads to more radical transformative changes in teaching and learning practices.

3   Teachers need to be supported in the long-term to experiment with these type of activities, by providing them with scenarios and professional development activities for using tablets outside the classroom, for assessment, and as a means for effective communication between teachers, students and parents. A knowledge base on informal learning spaces could include new scenarios that expand outside classroom teaching, such as activity-based learning and project-based learning.

4   Addressing a wider range of topics in professional development would support a variety of new practices with the tablet and with ICT in general. All teachers participating in a pilot should receive training in the pedagogical use of the tablet.

5   The evaluation findings suggest a relationship between the type and frequency of professional development activities received and actual teachers' practices (as well as confidence levels in this area). Therefore, and in order to change existing practices, teachers need to be supported in those areas where change is desired via professional development activities that support such activities.

6   Teachers should be encouraged to share resources, document practice and create lesson scenarios. Moreover, true collaboration activities, such as peer learning and lesson observations, should be fostered when experimenting with new devices and tools at school as they can provide on-demand access to information. Examples from 1:1 initiatives show that teacher mentors have successfully supported these kinds of collaboration activities.

7   Teachers' general and ICT-based pedagogical practices have to be taken into consideration when implementing similar pilots in this area. Depending on the attitudes of teachers towards ICT, their teaching styles, specific support measures could be offered to teachers, taking into account their background, and to show them the variety of approaches that can be applied.

8   Giving students access to the same or similar type of devices that their teachers have (individual access to a personal device or group access), including sufficient Internet access at school, would be beneficial for teachers, not only to support and extend their classroom instruction, but also to ensure richer content and a variety of content for students to work with.

9   Support services are needed to strengthen exchanges between teachers implementing the pilot. Fostering continuous exchanges between teachers beyond the project implementation phase requires incentives for teachers so that they will continue to engage in a web community on a long term basis. Pedagogical learning scenarios are relevant for teachers, and should describe how digital devices can be used to support a plethora of learning strategies. Teachers also recognise the benefit of face-to-face exchange opportunities, such as the workshop delivered by European Schoolnet at the end of the pilot.

2. The pilot context

2.1. Background and objectives

Following the successful implementation of the Acer-European Schoolnet Educational Netbook Pilot in 2010/2011, Acer and European Schoolnet carried out a new pilot study on the use of tablet devices to enhance teaching and learning practices in 2011/2012. Acer equipped 263 teachers in 63 schools in eight European countries with Acer Iconia W500 tablet computers. Additionally, 116 students received tablets as part of the pilot: 1 classroom set of tablets was provided to a UK school (26 tablets per class), and 3 classrooms were equipped with tablets (30 tablets per class) in Spain. The objectives of the project were to gain a better understanding of teachers' use of tablets to enhance students' learning. In cases where each student per class was provided with tablets, the project aimed to further investigate 1:1 teaching and learning approaches. In detail, the project aimed to:

- explore and document teachers use of tablets in school and at home;
- identify good practices regarding the use of tablets and to foster the exchange of practices between teachers;
- provide guidelines to schools considering the implementation of this technology;
- examine key factors for the successful integration of tablets in schools.

2.2. Project organisation

Acer did not only fund the equipment provided to schools, but also the pilot implementation activities, including the organisation of activities with schools, the pedagogical coordination, the project evaluation, and the 1:1 community website. The project was coordinated and implemented at European level by European Schoolnet (EUN), which supported the schools in the following way:

- Selecting schools for participation in the pilot, in collaboration with Ministries of Education or regional coordinators;
- Setting up contracts with schools for the use of tablets;
- Providing technical support (via forum and email);
- Providing pedagogical support, training and guidance during the project implementation (online kick-off sessions, webinars, teachers' guide for implementation);
- Providing project information and exchange mechanisms for teachers on the project community website and via newsletters;
- Organising a final project workshop with teachers;
- Conducting the final evaluation (case study visits and online evaluation).

2.3. Selection of schools

The schools participating in the pilot were chosen in collaboration with national Ministries of Education or regional coordinators. Some schools had already successfully participated in the previous netbook pilot, in other cases new schools were appointed or expressed interest to participate in the project.

Table 1: Distribution of tablets per country (names of schools and person supporting the project, see Annex 1)

Country	Number of schools equipped with tablets	Number of teachers with tablets	Number of students/classes with tablets
Estonia	5	20	
France	10	40	
Germany	12	65	
Italy	10	40	
Portugal	5	20	
Spain	3	12	90 (3 classrooms)
Turkey	5	20	
UK	13	46	26 (1 classroom)
Total	63 schools	263 teachers	116 students
Total number of tablets		379	

2.4. Guidelines for schools

Based on the experience of the previous netbook pilot implementation, and evidence from research on 1:1 education initiatives, European Schoolnet provided guidelines to schools in the beginning of the project, to ensure the smooth running of the project across the eight different European countries.

European Schoolnet advised the schools to establish a **tablet team** in the school, composed of teachers using the tablet and the ICT support people at school. The idea was to work as a team in order to exchange ideas on how to use the tablet as a teaching device, discuss and solve problems, exchange methods and resources, particularly between teachers of the same subjects, or plan cross curricular collaborative projects and work with teachers from other subjects. One of the first actions suggested was to write down **pedagogical project** ideas with the tablet, and to share them with teachers of the same school, and later on publicly on the 1:1 community website on the teachers' blog. Moreover, teachers had to think about the type of support available at the school to get started with the tablets, as well as ongoing support. Further areas of reflection included: How does the tablet pilot fit in the overall ICT strategy of the school? What kind of training is needed? What kind of **training opportunities** can be planned and offered to teachers?

Furthermore, EUN recommended the appointment of one of the tablet teachers to act as the **school coordinator**, who acted as the link between the school, other tablet schools and European Schoolnet, followed closely the activities proposed at European level, but also organised meetings with teachers in the school when deemed necessary.

Apart from the pedagogical and training aspects, schools had to consider **technical requirements** e.g. determine technical support facilities, required network security and bandwidth scalability (wireless or wired), ensure the availability of storage and security spaces and compatibility with the schools management system, virtual learning environments, interactive whiteboards and other peripheral technologies.

Finally, the school had to organise **insurance** for the tablets in case of theft and damages. In schools where students had tablets, an **acceptable use policy agreement** was recommended between the school and the students and parents. This joint agreement is aimed at ensuring the safe and appropriate use of the device, and to encourage strong commitment from all stakeholders.

3.1. Objectives

The study included an online evaluation in order to document teachers' use of tablets.

The aims of the online survey, which were addressed to all teachers participating in the pilot, were twofold:

1 To receive information about the teachers participating in the pilot, their experience with the use of ICT during the previous six months in school and at home, their collaboration and professional development activities with ICT, their self-estimated ICT competence and their general attitudes towards ICT **prior to the tablet implementation**.

2 To document teachers' use of tablets in school and at home, teachers' collaboration and professional development activities with the tablet, their self-estimated competence using the tablet and the impact of the tablet on teaching and learning activities **during the pilot implementation**.

For this purpose, two online questionnaires were sent to the pilot teachers: a pre-evaluation questionnaire (ICT survey) in the beginning of the pilot (February 2012), and a final questionnaire (tablet survey) at the end of the pilot (July 2012).[1]

3.2. Underlying research questions

Teaching in a media rich learning environment?

One of the underlying questions of the research was to identify the ICT-based learning environment of the pilot teachers. Do teachers already act in a media rich environment with access to a variety of different devices and software, due to the continuous integration of ICT in schools during the last number of years?[2] One objective of the evaluation was therefore to characterise the teaching and learning environment, including the ICT infrastructure and resources that surround tablet use at the pilot schools.

• How was the tablet integrated into the existing ICT environment of pilot teachers?
• Was it replacing existing devices, or was it rather used as an additional teaching tool for the teachers?

Tablet-based pedagogical practices?

Likewise, in conducting a tablet pilot, one of the main questions was to what extent the tablets could support an efficient, flexible and mobile learning environment? Are there some teaching or learning activities for which the tablets were particularly suited in terms of functionalities and ease of use (e.g. connection to the VLE, lesson planning, creation of learning resources, collaborative learning)? As evidence shows (Fredriksson 2007, Valiente, 2010, ITU, 2009) the general attitude of teachers towards ICT influences their ICT related practices. Therefore, it sought to investigate:

• What is the attitude of the pilot teachers towards ICT?
• What kind of pedagogical practices do the pilot teachers apply, with and without ICT?
• What pedagogical practices do they follow during the tablet implementation?

---

1   The two teachers' questionnaires (ICT survey and tablet survey) can be found at: http://1to1.eun.org
2   There are now between three and seven students per computer on average in the EU; laptops, tablets and netbooks are becoming pervasive, but only in some countries. Interactive whiteboards are present in schools (over 100 students per interactive whiteboard) as well as data projectors (EUN, University of Liège, 2013.)

- In what type of educational activities do teachers engage their students?
- Is there any evidence that the tablet lends itself more suitably for certain activities than others, based on the pilot implementation?
- To what extent can tablets support the full range of formal, non-formal or informal teaching scenarios?

Methods of collaboration and professional development opportunities?

- To what extent has the project contributed to boost professional collaboration activities between teachers?
- How do teachers exchange practices and collaborate, and what was the teachers' feedback on the support services provided at European level?

Impact on competence development?

- What impact did the use of the tablet have on teachers' pedagogical and ICT competence and students' learning?
- What is the opinion of teachers on the impact of the tablet use?

3.3. Methodology

The evaluation framework from Heo & Kang (2009) was used[3] to structure both online surveys investigating teachers' use of ICT or tablets in a variety of educational settings and contexts, considering specifically the use of ICT or the tablet "in school" and "out of school", the use of ICT or the tablet for "personal purposes" or "professional purposes", as well as "individual use" or "collective use" of devices.

Some of the underlying questions for the pre-survey with teachers were:
Teachers ICT experience: How long have teachers used ICT prior to the tablet implementation? Do they feel supported in their use of ICT at school?

Use of devices and ICT-based activities (respectively at school and at home): What ICT devices have teachers mainly used in the last 6 months? What kind of ICT-based activities have they carried out? What are the underlying pedagogical approaches of teachers using ICT? What was the main purpose of their ICT use? How often have they used ICT? What kind of resources and software have they used?

Professional development and collaboration activities with ICT: How often have teachers received professional development courses during the previous year? In what areas? How often and for what kind of activities have teachers collaborated with other teachers?

Competence and confidence in using ICT: How do teachers estimate their confidence and competence for specific ICT-based activities, as well as for broader activities in which ICT is used, such lesson planning or administration?

Teachers were also asked about their **plans** for using the tablets.

Underlying questions of the tablet survey included:
Use of devices and tablet-based activities: (at school and at home): How often do teachers use the tablet, in addition to other devices at school, such as laptops or PC's for example? With what other applications and software was the tablet used (e.g. interactive whiteboards, projectors, digital textbooks)? What type of learning resources were accessed from the tablet? In which subjects was the tablet used? For what kind of professional activities did teachers use the tablets, such as lesson preparation or administration? Are there any differences between the use of the tablet for those activities at home or at school? How often did they use the tablet for professional or personal purposes?

Professional development and collaboration activities with ICT: How often have teachers received professional development courses during the pilot implementation? In what areas? How often and for what kind of activities have teachers collaborated with other teachers? Which types of collaboration did they prefer (formal, informal, ICT-based, face-to-face)?

---

3   The framework also served as the reference framework for the Acer-European Schoolnet Netbook Pilot evaluation (Vuorikari, R.; Garoia; V. et.al 2011).

Confidence and competence using the tablet: How do teachers self-evaluate their competence in using the tablet for ICT-related activities (e.g. Internet use, use of VLE's, or social networking tools), or teaching with the tablet (pedagogical use of ICT)?

Impact of using the tablet: What is the impact of using the tablet on areas such as the students learning, the school atmosphere and teaching practices?

Characteristics and functionality of the tablet: Which functionalities of the tablet did teachers exploit the most, and were there any technical problems?

Feedback on the project support: How did teachers make use of the support that was given at European level via the 1:1 community website, and related events (e.g. webinars)?

Table 2: Evaluation focus of the ICT survey and the tablet survey

Evaluation Focus	ICT questionnaire (investigating the use of ICT by the pilot teachers during the 6 months prior to the pilot)	Tablet questionnaire (investigating the use of the tablet by teachers during the pilot period)
	About the teacher and the school	About the teacher and the school
		General use of the tablet
	ICT use in school	Tablet use in school
	ICT use at home	Tablet use at home
	Professional and collaboration activities with ICT	Professional and collaboration activities with the tablet
	Confidence and competence using ICT	Confidence and competence using the tablet
	Attitude towards ICT	Tablet Impact areas
	Plans for using the tablet	Follow up plans

The underlying objective of documenting the ICT use before the tablet pilot, and the use of the tablet during the pilot was to have a clear picture of the ICT-based environment teachers already act in, and related ICT practices as a starting point for the integration of tablets. The focus was not on systematically comparing the situation before and after the pilot.[4]

The following chapter outlines the results from the online evaluation, addressed to all teachers participating in the project. In addition to the online evaluation, EUN carried out ten case study visits. The aim of the case studies was to gain a deeper understanding of the framework conditions of teachers in a specific school context and investigate "how" teachers used the tablets e.g. the type of pedagogical activities carried out by teachers with their students, and purposes of use. The case study visit report can be found at: *http://1to1.eun.org*

Moreover, a set of practical guidelines has been developed by a team of experts at European Schoolnet following their work with 1:1 computing initiatives; in particular, the experience gained in the practical implementation of the Acer-European Schoolnet Educational Netbook Pilot, and the Acer-European Schoolnet Educational Tablet pilot. The guidelines are designed to be a starting point for school leaders, teachers, education advisers, policymakers and the research communities who are seeking to implement the use of 1:1 devices within teaching and learning. They will also support the work of commercial suppliers and industry. You can find further information and join in the discussion at: *http://1to1.eun.org*

---

4   It has to be noted that the sample of teachers answering to both evaluation questionnaires was not controlled and might not exactly be the same due to slightly differing response rate and the fact that not necessarily all the same teachers answered the first and final questionnaire due to changes during the school year (e.g. tablet was given to another teacher, even if this was only marginally documented throughout the project).

4. Analysis of findings

4.1. Response rate

Table 3: Response rate

	Estonia	France	Germany	Italy	Portugal	Spain	Turkey	UK	Total
Teacher responses Pre-Q	20	30	50	32	19	12	19	34	**216**
Response Rate Pre-Q	100.0%	75.0%	76.9%	80.0%	95.0%	100.0%	95.0%	70.8%	**81.5%**
Teacher responses Final Q	19	28	58	33	18	13	21	31	**221**
Response rate Final Q	95.0%	70.0%	89.2%	82.5%	90.0%	108.3%	105.0%	64.6%	**83.4%**

4.2. Presentation of data

A large majority, around 80% of the pilot teachers, have answered both questionnaires, the pre-questionnaire (ICT survey) and the final evaluation questionnaire (Tablet survey). In analysing the findings, the different overall participation rate of teachers per country has to be considered, as it varies considerably: from 12 teachers in Spain, to 65 teachers in Germany. Likewise the number of teachers' responses on which the analysis is based differs from country to country – in the case of Spain and the UK, only a small number of teachers took part. Therefore, the following evaluation presents the findings of the overall sample of teachers, and uses descriptive statistics to analyse the results. In a few cases, the results are presented also by country level, to identify marked differences among the teachers from the participating pilot countries.

In the next section, the main findings from the pre-questionnaire on teachers' general use of ICT in the school prior to the pilot implementation (ICT survey) will first be presented as an overview. The results from the evaluation of the tablet use by teachers will then be presented in more detail (tablet survey).

When it was possible to draw interesting conclusions from the findings from the two surveys, areas that might be worth further exploration are highlighted.

Figure overview including likert scales and grouping of questionnaire indices are outlined in detail in Annex 2.

5. Teachers' use of ICT before the pilot

5.1. ICT context at school, teachers' experience and competence

In general, ICT use is supported in the pilot schools, with more than half of the pilot teachers (59%) participating in the ICT survey questionnaire (n=216) indicating that ICT is supported "a lot" in their school. Another one third of pilot teachers think ICT is "somewhat" supported in their school.

Moreover, teachers participating in the pilot have prior experience using ICT. More than half of the teachers have used ICT for more than six years to support their teaching, and 28% of teachers have used ICT for between four to six years in their teaching.

Teachers were asked to rate their competence for a number of professional activities, such as using ICT for administration, lesson planning, delivery, and follow up, as well as for assessment and professional development. In addition to these more general activities, teachers' assessed their competence for more specific competence areas, such as general ICT skills, teaching with technology, device- and equipment-related use, subject-specific use on learning applications, and the use of virtual learning environments and social networking tools.

Results show that **pilot teachers feel competent using ICT in all professional areas**. The majority of pilot teachers (80% to 88%) feel confident (indicating "very good" competence and "good" competence) to use ICT for lesson planning, lesson delivery and administrative tasks. Slightly fewer teachers, but still around ⅔ of pilot teachers, feel competent to use ICT for professional development, lesson follow up and assessment.

As regards specific competencies, most of the teachers (86%) rate their **ICT competence** (Internet use and general applications) as *"good"* or *"very good"*. Two thirds of pilot teachers feel competent in **teaching with technology** and **devices- and equipment-related use** (e.g. interactive whiteboard). More than half of the teachers (56%) do not feel competent in the use of virtual learning environments and using social networking tools.

5.2. Use of ICT in school

Equipment

When asking teachers what percentage of time they have used ICT in class during the six months prior to the pilot, around **half of the teachers stated to have used ICT in more than 50% of all their lessons**.

A comparison with the use of tablets shows that only one quarter of teachers used the tablet in more than 50% of all their lessons. More than half of the teachers used the tablet in between 10 % and 50% of their lessons.

PCs and laptops are the most commonly used tools for the pilot teachers in supporting professional objectives. When investigating the frequency of ICT devices used by teachers, more than ⅔ of the teachers use a PC *"often"* (daily and 2-4 times a week) at school. More than half of the participating pilot teachers use a laptop, netbook or an interactive whiteboard *"often"* at school. **Half of the pilot teachers had "never" used a tablet device in school during the 6 months prior to the implementation**.

60% of teachers used a PC or laptop for administrative purposes, and half of the teachers used them for lesson planning and lesson delivery on a "daily" basis.

As it can be seen from the final survey (tablet survey) , the tablet was used by more teachers during the pilot, which is also explained by the fact that due to the provision of tablets more teachers had access to tablets. In comparison to the pre-survey (ICT survey),

*however, only 11 % of teachers used tablets **on a daily basis** for lesson planning and lesson delivery. In the pre-survey, 50% of teachers used a PC or laptop on a daily basis. Half of the teachers used the tablet during the pilot implementation **1-4 times** per week, indicating a gradual integration of the tablet in addition to the use of other ICT equipment at school.*

Resources used by teachers with the aid of ICT

When teaching their students with ICT, the majority of teachers used **material that they have found on the Internet, and material from established national or regional educational resources**. 70% of teachers also used electronic offline material.
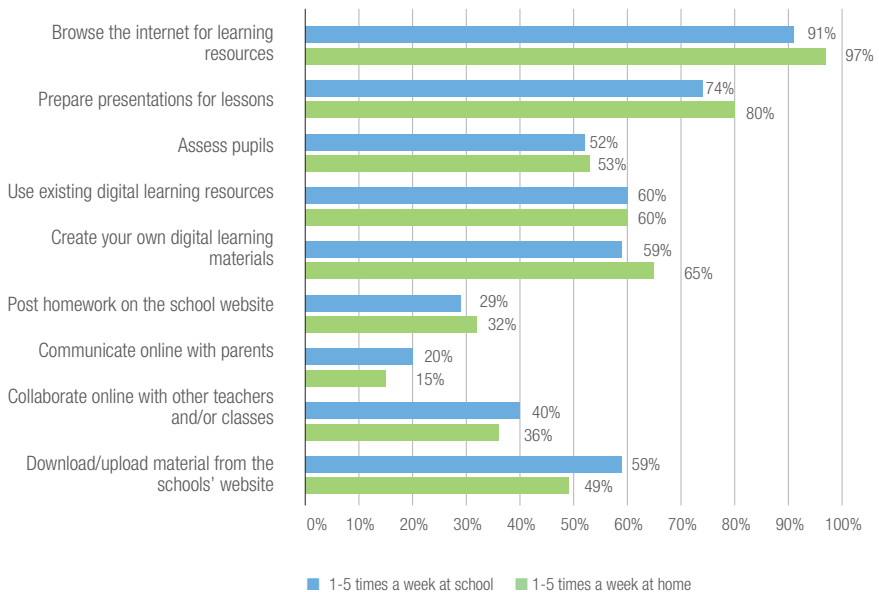
In the final survey on the use of tablets, only 38% of teachers indicated to have used electronic offline material with the tablet, which could suggest that more teachers had access to Internet-based resources through the provision of the tablets during the pilot implementation.

Almost half of the pilot teachers exchanged material and resources between teachers from their own school or country during the 6 months prior to the pilot. Fewer teachers used material from the Virtual Learning Environment (VLE) (30%) or material from other teachers in Europe (10%).

5.3. ICT–based activities in school as opposed to home

The majority of pilot teachers had used ICT for browsing the Internet for learning resources, and to prepare presentations for lessons on a frequent basis **at school as well as at home** during the last six months prior to the pilot (Fig. 1). In general, activities frequently carried out by around ²/₃ of teachers involved the use or creation or resources. Activities related to the preparation of classes were performed by slightly more teachers using ICT from home. At the lower end, activities related to online communication with parents, or to post homework on the school website were not carried yet out by a lot of teachers on a very frequent basis, neither at school nor from home prior to the pilot implementation.

Fig. 1.   Teachers' activities with ICT at school and at home

	1-5 times a week at school	1-5 times a week at home
Browse the internet for learning resources	91%	97%
Prepare presentations for lessons	74%	80%
Assess pupils	52%	53%
Use existing digital learning resources	60%	60%
Create your own digital learning materials	59%	65%
Post homework on the school website	29%	32%
Communicate online with parents	20%	15%
Collaborate online with other teachers and/or classes	40%	36%
Download/upload material from the schools' website	59%	49%

5.4. Pedagogical approaches (with or without ICT)

The SITES study (Law, et.al. 2008) found that teachers pedagogical orientation, such as their understanding of the changing demands of the citizens in the knowledge economy and their readiness to employ more collaborative, inquiry-oriented learning activities, to create a more open and connected learning environment, and to take more facilitative roles, make a major difference to the ways teachers use ICT in their classroom.

When looking at the pedagogical approaches pilot teachers applied in general (using ICT or not using ICT) as part of everyday teaching practices, traditional approaches prevail. Almost all teachers stated that they present, demonstrate and explain to the whole class (frontal teaching style), or applied teacher-centred approaches (stating the learning goals, summarising former lessons, checking students understanding) "a lot" or "sometimes". However, collaboration-based activities (project-based work, group work) were likewise applied by almost 80% of the teachers. Still more than ²/₃ of teachers apply student-centred approaches in their teaching, such as differentiating student tasks, involving students in planning and assessment, letting students hold debates and engage them in enquiry-based activities. We can therefore state that the pilot teachers, before the implementation of the pilot, applied a variety of teaching approaches: frontal, teacher-centred, collaborative as well as student-centred approaches, with a slight preference for frontal teaching approaches and less-student-centred approaches.

5.5. ICT–related professional development

Frequency of training

Teachers were asked how often they received training in:

- Development of ICT skills
- Teaching with technology (pedagogical use of ICT)
- Device- and equipment- related training (Interactive Whiteboards)
- Subject-specific training
- Using Virtual Learning Environments
- Using social networking tools (blogs, wikis, etc.)

As regards the frequency of training received, *6 to 12 months*[5] training intervals are most common among the pilot teachers, with 40% to 54% of teachers indicating they receive ICT-related training within that period in the areas of **Internet and general applications, pedagogical use of ICT, device- and equipment-related training and subject-specific ICT training (e.g. simulations)**.

These areas also correspond to the areas teachers feel most competent in. 86% of teachers stated that they have *"very good"* or *"good competence"* in general ICT skills, 72% in teaching with technology (pedagogical use of ICT), and 67% of teachers feel "very competent or competent" in device- and equipment-related use. Half of the teachers indicated to have very good competence in subject-specific applications (e.g. tutorial, simulations); 32% of teachers, however have never received training in this area.

More than half of the teachers indicated they never received training in the use of social networking tools, or in the use of VLEs. The same number of teachers does not feel competent in both of those areas, pointing to a possible relationship between training received in one area and perceived competence levels in the same area.

Professional coordination and collaboration activities

Teachers were also asked how often they have engaged in professional coordination or collaboration activities *with or without using ICT*. **Professional coordination activities** (as defined by the OECD, 2009) include activities, such as the exchange of teaching material, discussions on ICT-related issues, or attendance of team conferences. **Professional collaboration** activities involve activities where teachers are investing time in a "true" professional collaboration, e.g. observing other teachers to provide feedback, team teaching or participating in online communities for professional discussions with other teachers.

More than half of the pilot teachers already engaged "weekly" in the discussion of the **development of individual students**. Almost half of the teachers engaged in the **exchange and discussion of teaching material**, or in the **exchange and discussion of ICT-related issues**.

---

5   Other categories included: every week, every two weeks, every month, every 3 months, every 6-12 months, never

40% of teachers **never observed other teachers in class** to provide feedback or participated in online communities (mailing lists, Twitter, blogs) for professional discussions with other teachers.

The majority of teachers had not read research about tablets before the pilot.

5.6. Perceived impact of ICT

Most teachers strongly agree that using ICT has enriched and supported their current teaching method, by allowing them to explore new methods of teaching and through providing them with enriched, subject-specific content. Almost half of the teachers see an added value in using ICT to carry out cross-curricular projects and to improve the school atmosphere (Fig. 2).

In general, teachers are convinced that ICT has a lot of positive impact on pupils' learning and on their learning outcomes; however, their opinion in this area is more equally split between "a lot" and "somewhat", indicating that the concrete positive impact is less tangible for teachers in this area.

Around one third of the teachers are not yet convinced that ICT offers more possibilities to support assessing students' work, for communication with teachers, students or parents.

The findings from the final questionnaire (tablet survey) show that the majority of teachers also did not use the tablet for these types of activities.

Fig. 2. *Indicate how much you agree with the following statements. Using ICT has had a positive impact on ...*
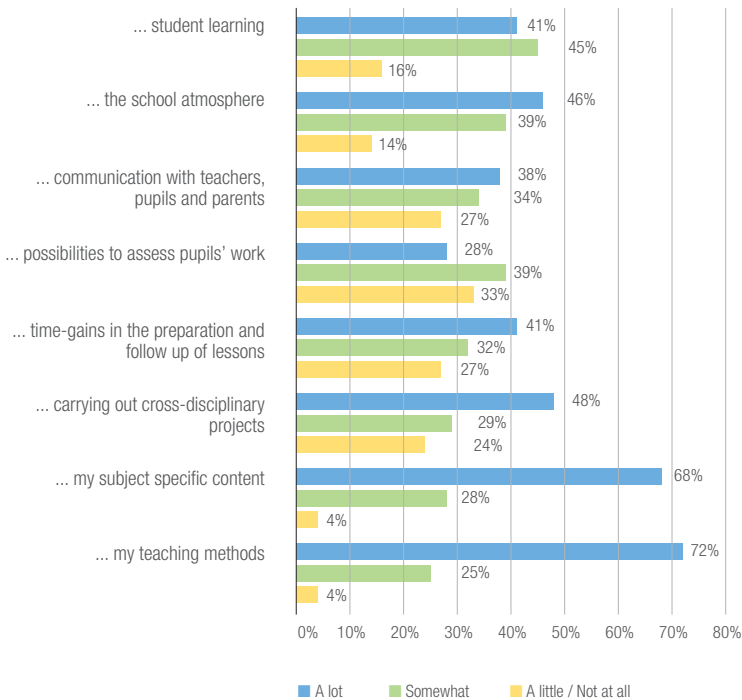
6. Summary of the ICT survey

The majority of teachers participating in the tablet pilot were experienced teachers and had more than ten years of professional experience. Pilot teachers teach a variety of secondary school subjects.

Almost all teachers feel that **ICT is supported** in their school. ICT is not new to the pilot teachers; the majority of teachers have at least **4 years of experience of using ICT** to support their teaching. Half of the pilot teachers have used ICT in more than 50% of all their lessons prior to the pilot implementation.

The majority of teachers had used a PC or laptop/netbook during the prior 6 months. ¾ of teachers had also used the interactive whiteboard and underpinning software. Half of the pilot teachers have used a tablet to support their teaching in the six months prior to the pilot.

Pilot teachers feel **confident to use ICT** for lesson planning, lesson delivery and administrative tasks, but less so to use ICT for professional development, lesson follow up and assessment.

Most of the teachers feel competent to use the **Internet and general ICT-based applications, teaching with technology** (pedagogical competence) and **using a specific device or technology** (technology use). Fewer teachers feel competent in the use of virtual learning environments and using social networking tools.

ICT-based activities of teachers at school do not differ considerably from those at home. Some ICT-based activities are in general carried out more frequently than other activities, more pilot teachers use ICT for browsing the Internet for learning resources, fewer teachers use ICT for communication with parents. Slightly more teachers carry out **lesson preparation activities using ICT from home**.

Around half of the teachers participating in the pilot received ICT-related training every 6-to-12 months in Internet **use and general applications, pedagogical use of ICT, device- and equipment- related training**.

Around half of the pilot teachers already engaged in "weekly" discussions on the **development of individual students**, on the **exchange and discussion of teaching material** or on the **exchange and discussion of ICT-related issues**. 40% of teachers **never observed other teachers** to provide feedback or participate in online communities (mailing lists, Twitter, blogs) for professional discussions with other teachers.

Almost all teachers apply traditional **teaching approaches** on a regular basis, using ICT or not, but also more than ²/₃ of teachers foster collaborative group work of students or apply student-centred learning approaches with or without using ICT.

Teachers are, in general, convinced about the **positive impact** of ICT. In some areas, such as teaching methods, school climate, and student learning, the impact is estimated higher than in other areas, such as using ICT for assessment, using ICT to speed up lesson preparation and follow up of lessons, and as a means of communication between teachers, students or parents.

In conclusion, teachers participating in the tablet pilot are confident in the use of ICT, and have a positive attitude towards the use of ICT. Moreover, they already have access to ICT equipment and resources at school. The latest evidence on the access, use of and attitudes towards technology in schools in Europe (EUN, University of Liège, 2013) contains cluster analysis identifying the profile of teachers who indicate a higher frequency of ICT-based activities with students in classrooms. A digital-confident and supportive teacher is defined as a teacher with high access to equipment, few obstacles, and who is highly confident and positive about ICT use in teaching and learning. Therefore, one underlying assumption is that the pilot teachers, who have a similar profile, should be able to make the most and best use of ICT during the pilot implementation.

7. Teachers' use of tablets during the pilot period

7.1. Tablet use in general

The Acer-European Schoolnet Tablet pilot project ran from September 2011 to December 2012, with a piloting phase for teachers from January 2012 to July 2012. The first 4 months of the pilot, September-December 2011, were dedicated to the preparation of the pilot implementation, including operational issues such as finalising contracts with schools, appointing a responsible school coordinator for the pilot and the dissemination of information about the pilot to schools to teachers and head teachers.

In January 2012, Acer delivered tablets to schools with the delivery date varying on a country-to-country basis. One important question to investigate was therefore for how long teachers actually used the tablet to support their teaching within the project period.

Tablet pilot implementation period

As Fig. 3 shows, more than ²/₃ of teachers used the tablet for 4-6 months, and the remaining teachers of the pilot used it at least 1-3 months. Only 6% of teachers participating in the pilot used the tablet for one month, and 3% did not use it at all, which shows that the pilot project motivated the teachers to experiment with the tablet. The usage period by teachers has to be kept in mind when interpreting the results of the survey, especially as regards the practices observed, and when evaluating the impact of the tablet by teachers.

Fig. 3.   *For how long have you used the tablet to support your teaching?*
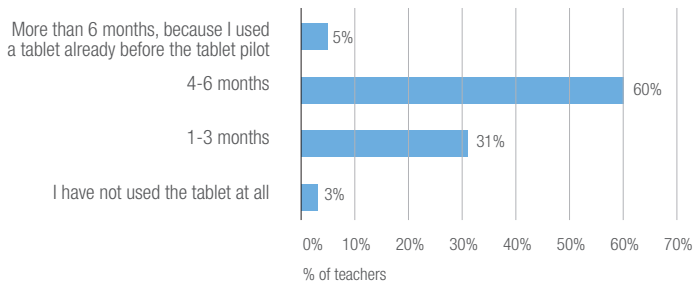
Tablet use in subjects

Teachers could indicate maximum 3 subjects in which they used the tablets (Fig. 4). Teachers participating in the pilot are teaching in secondary schools. There is no indication that the tablets were used in some subjects more than in others. As figure 4 shows, the tablets were used in a variety of different subjects. In the category "others", teachers indicated physical education, health education, special needs education, management, design, professional development courses, home economics, project-based work or subjects already part of the main categories (e.g. natural sciences), such as astronomy, technology or languages.

Fig. 4. Which subjects have you taught with the aid of a tablet computer?

% of responses (maximum 3 responses per teacher)
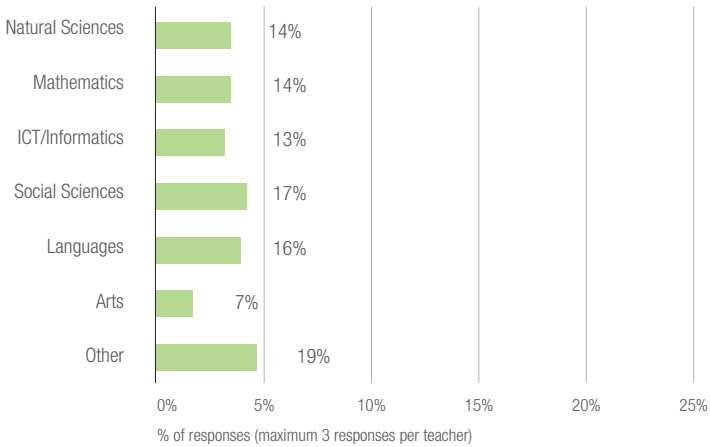
7.2. Tablet use in school

Frequency of tablet use and use of other classroom devices

One area of investigation was to identify how often the tablet, and other ICT devices, were used by teachers during the project implementation (Fig. 5).

During the pilot implementation, the tablet was used by most of the teachers, with 90% of teachers having used the tablet "often" or "sometimes". However, teachers did not only use the tablet, but also the PC or laptop, which were used by ¾ of the pilot teachers.

As regards the frequency of use, it has to be noted that the PC was used by 60% of teachers "often",[6] whereas the tablet was used only by half of the teachers "often".

The data suggests that teachers did not only use one ICT device during the project implementation, and that the tablet was used in conjunction with other ICT devices. The tablets were not used as the PCs were, on a daily basis, but rather several times per week, indicating a complementary integration of tablets (in addition to existing devices) in the classroom routine.

Ebook readers were not used by the majority of teachers participating in the pilot. However, in general the survey did only investigate the **use of devices**, not the availability or access to devices.

---

6   "Often" combines indices from the likert scale items "every lesson/almost every lesson" and "often".

Use of tools and software with the tablet

It was further identified **which tools and software** teachers used on the tablet in order to support their teaching (Fig. 6). Around half of the teachers used interactive whiteboard software and subject-specific software during the pilot ("often and "sometimes").

Digital textbooks and classroom management software were not used by two thirds of the pilot teachers. The majority of teachers "never" used e-book readers. It has to be noted that it was not investigated via the survey whether teachers had access to this type of software.[7] However, from the equipment that was acquired by schools during the pilot, it can be seen that teachers were interested in connecting the tablet to visualising devices, such as the interactive whiteboards and projectors.

Fig. 5. How often did you use the following devices, tools and software in your lessons during your tablet project implementation?

___
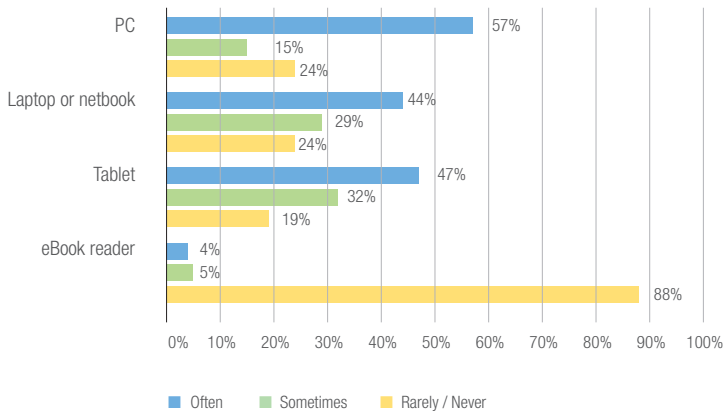
7   At EU level, depending on the tool and grade, between 50% and 80% of students never use digital textbooks, exercise software, broadcast/podcast, data-logging tools, simulations or learning games/video games. Digital textbooks are the most frequently used resources at grade 8. More than 30% of students use them daily, or more than once a week. (EUN, University of Liège 2013)
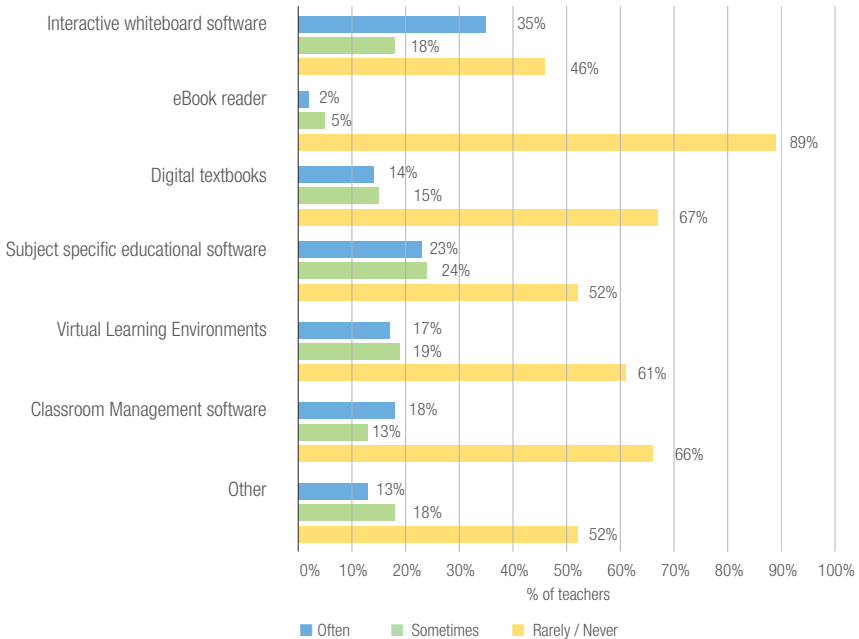
Schools acquired a variety of additional tools, devices, applications or software to use the tablet more effectively in their teaching. 42% of the pilot teachers reported that their school **acquired an interactive whiteboard and corresponding software**. On average, 30-40% of teachers said that their school bought **projectors**, **digital pens and basic computer software or programs, adapters or compliant cables**. Digital textbooks and classroom management software were acquired to a lesser degree by schools during the pilot, with 20% of teachers indicating that their school bought such type of material and software.
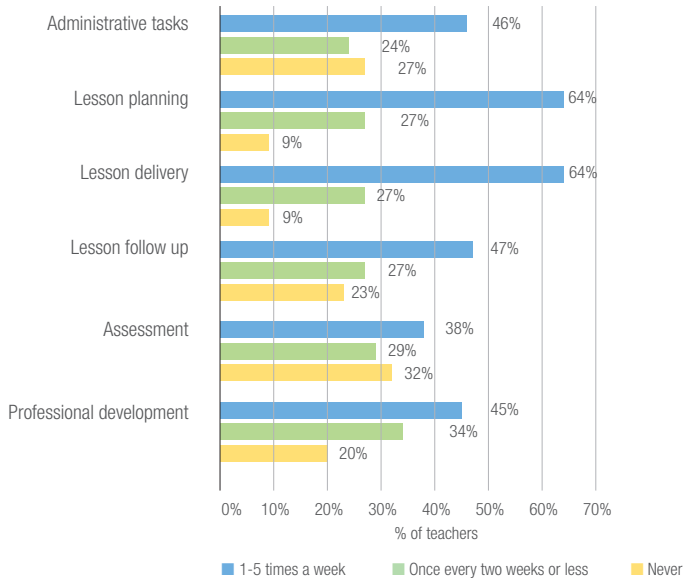
7.3. Tablet-based activities

Frequency of using ICT for professional activities

Teachers were asked how often they used the tablet for professional activities, such as administrative tasks, lesson planning, lesson delivery and lesson follow up, assessment and professional development (Fig. 7).

As figure 7 shows around ²/₃ of teachers used the tablet "1-5 times a week" for **lesson planning and lesson delivery**. Almost half of the teachers used it for **lesson follow up**, **administrative tasks** and **professional development** 1-5 times a week. The figures are more or less equally distributed as regards the use of the tablets *"once every two weeks or less"*, with around 25% to 34% of teachers indicating that they had used the tablets for these professional activities within that timeframe.

Around ¹/₃ of teachers indicate that they have *"never"* used the tablets for **assessment** within the project implementation period.

Fig. 7. *How often did you use the tablet for the following activities in school during your tablet project implementation?*

Activity	1-5 times a week	Once every two weeks or less	Never
Administrative tasks	46%	24%	27%
Lesson planning	64%	27%	9%
Lesson delivery	64%	27%	9%
Lesson follow up	47%	27%	23%
Assessment	38%	29%	32%
Professional development	45%	34%	20%

% of teachers

■ 1-5 times a week   ■ Once every two weeks or less   ■ Never

As regards more specific ICT-based activities carried out by teachers in school, please see section 6.5. on tablet-based activities at school and at home.

Planned use vs. actual use of the tablet

Teachers were asked in the pre-evaluation questionnaire (ICT survey) for what kind of activities they planned to use the tablet. The following graph illustrates the **actual use** of the tablets at least "once a week" at school and the **planned use** (Fig. 8).

Whereas the planned use and actual use correspond more or less in the areas of using the tablets for administrative tasks and assessment, slightly fewer teachers (10%) actually used the tablets for lesson delivery or professional development. 5% more teachers used the tablet for lesson planning. This can indicate that the pilot teachers followed more or less their initial plans of using the tablet and there were no major barriers in one professional activity to shift the use of the tablet towards another professional activity. Likewise, this can also indicate that there was no major shift in professional practices (e.g. to experiment the use of the tablet in a specific professional area, e.g. assessment)[8] during the pilot implementation, with a rather short implementation phase of, on average, 5 months.

---

8   Evidence from blog entries at the 1to1 community website and case studies shows that the tablet was also used for assessment, with students showcasing their work in front of the classroom and other students giving feedback. The online survey shows that it was not primarily used for assessment, maybe because teachers see assessment as a formal activity at the end of a specific intervention carried out by the teachers themselves.

Fig. 8. *Tablet teachers' planned and actual areas of use of the tablets*
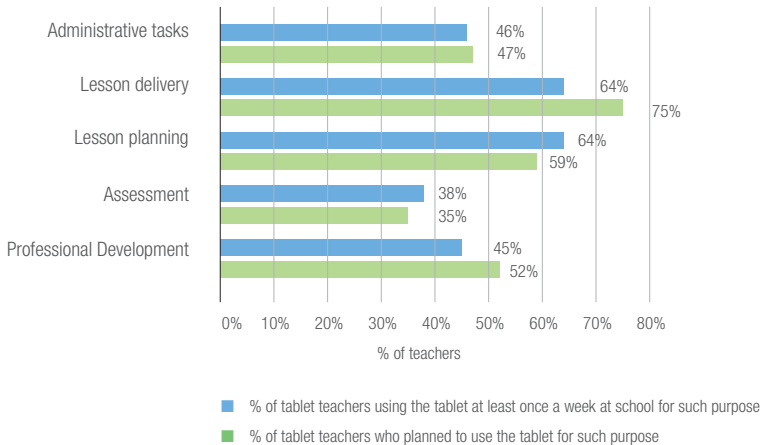
Context of tablet use

Almost all teachers (90%) used the tablet for school-based activities with their students in class. This suggests a first step of the implementation, where teachers adopt the new tool in the traditional learning environment, the classroom (Fig. 9). Given the mobile nature of the devices, other learning contexts, such the use of the tablet for field work, or in other parts of the school (e.g. library) were underexploited by teachers. This finding indicates the need for pedagogical scenarios of how to use the tablet in less traditional, non-formal, or informal learning environments (e.g. flipped classroom), or for cross-curricular projects including field work. It also shows that teachers adopt technology in a rather traditional setting, in a familiar formal learning context, the classroom in the beginning, and do not shift immediately to a completely different teaching scenario.

Fig. 9. *Where did you use the tablet for school-based activities with your pupils? Select all that apply.*
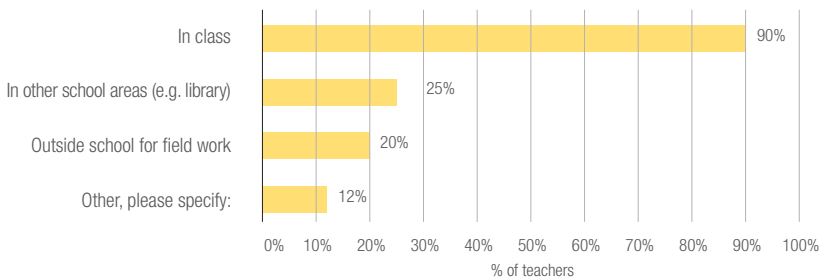
7.4. Teaching and learning resources and processes

Teachers' use of resources

The type of content used by teachers, as well as those used by students, can be one indicator to determine to what extent teachers adapt new practices. Replacing work sheets and hand-outs with Internet-based materials, which can be more interactive or inquiry-based (e.g. web quests), offers possibilities to engage students in new types of learning experiences.

Teachers were asked which types of material they normally used when teaching their students with the aid of the tablet (Fig. 10). The majority of teachers (88%) mainly used **material or resources they browsed and searched for on the Internet** when teaching their students, or online material from **established national/regional education sources** (66%). Still more than one third of pilot teachers used electronic offline material, but compared to the pre-ICT survey, where 70% of teachers also still used electronic offline material when teaching their students, much fewer teachers (38%) did so when they used the tablet.

Fig. 10. *Which of the following types of material did you normally use when teaching your pupils with the aid of the tablet? Select all that apply.*
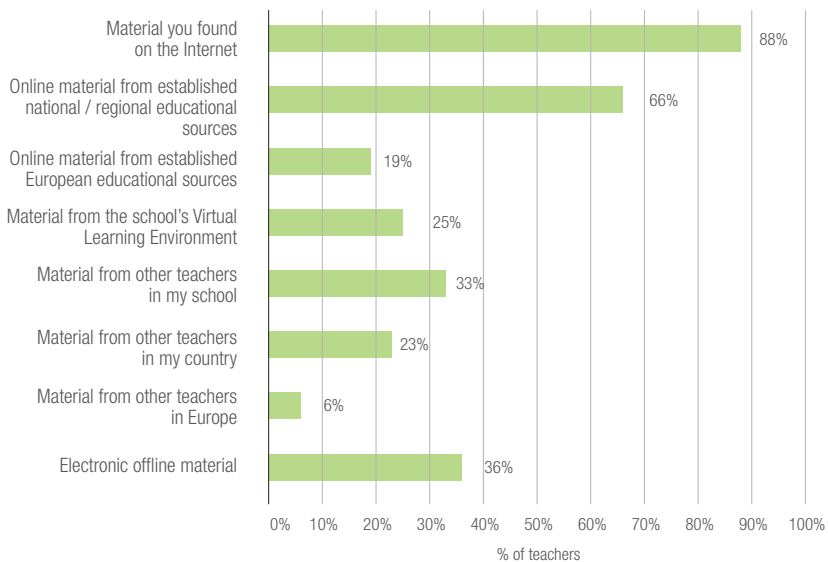
Students' use of resources and ICT devices

Though it was primarily only teachers who received tablets during the pilot, the type of learning material students accessed when taught with the devices was also investigated. The large majority of teachers (80%) mentioned that students used **paper-based learning material** (e.g. textbooks, printed exercise sheets) with the tablet. Half of the teachers said their students used online learning resources, and 40% mentioned **subject specific computer-based applications**. Whilst around half of the teachers already also permitted students to use **online learning resources**, the use of paper-based learning material still prevailed during the pilot, suggesting that students had less access to Internet-based material in the classroom, at least not to the same extent as teachers, who were equipped with the tablet.

Half of the students whose teachers participated in the pilot had access to a PC with Internet connection (1:1 or group access to a PC), and 40 % of students had access to a laptop/netbook with Internet connection (1:1 or group access to a PC). Only ¼ of the students had access to a tablet (mainly those students, who received the tablet as part of the class set).

Teaching processes

A main focus of the evaluation was to identify which teaching methods teachers applied when teaching with the tablet. We hereby distinguish between methods that are aimed at supporting the individual student (**individual teaching processes**), frontal teaching processes or methods that aim at collaboration between students (**collaborative teaching processes**). These broader groups contain data from a set of sub-questions that were combined for the analysis. The following items were investigated separately and grouped according to the 3 main categories.

- **Frontal Teaching:**
  - I present, demonstrate and explain to the whole class
  - Students give presentations to the whole class

- **Individual Processes:**
  - I support and explain things to individual students
  - Students work individually at their own pace
 - Students work individually but at the same pace

- **Collaborative Processes:**
  - Students work in groups

The findings are shown across countries, as well as country by country, in order to investigate whether teachers favoured different approaches in different countries (Fig. 11).

The cross country average shows, that **all 3 teaching methods** where applied by teachers when teaching with the tablet. Frontal teaching processes prevailed slightly, with 45% of teachers saying that they have applied this method "often". On average, 40% of teachers applied **collaborative and methods that support the individual student**.

However, in some countries teachers favoured frontal teaching methods more than teachers in other countries. In Turkey and Spain, around ⅔ of teachers participating in the pilot applied this method. In Spain, around the same number of teachers applied also methods aiming to support the individual students. This indicates that pilot teachers in Spain used both methods quite frequently. In Germany, around half of the participating teachers applied frontal teaching processes, as well as collaborative teaching methods. Moreover, in France, Portugal and Spain, collaborative teaching approaches were applied by half of the teachers. In Estonia and in the UK, a higher percentage of teachers favoured teaching methods to support the individual student, as opposed to collaborative teaching processes or frontal teaching processes.

Fig. 11. *When using your tablet during a lesson, how often were the following ways of teaching and learning applied?*

% of teachers who replied they used the teaching process "often"

- Frontal Teaching Processes
- Individual Teaching Processes
- Collaborative Teaching Processes
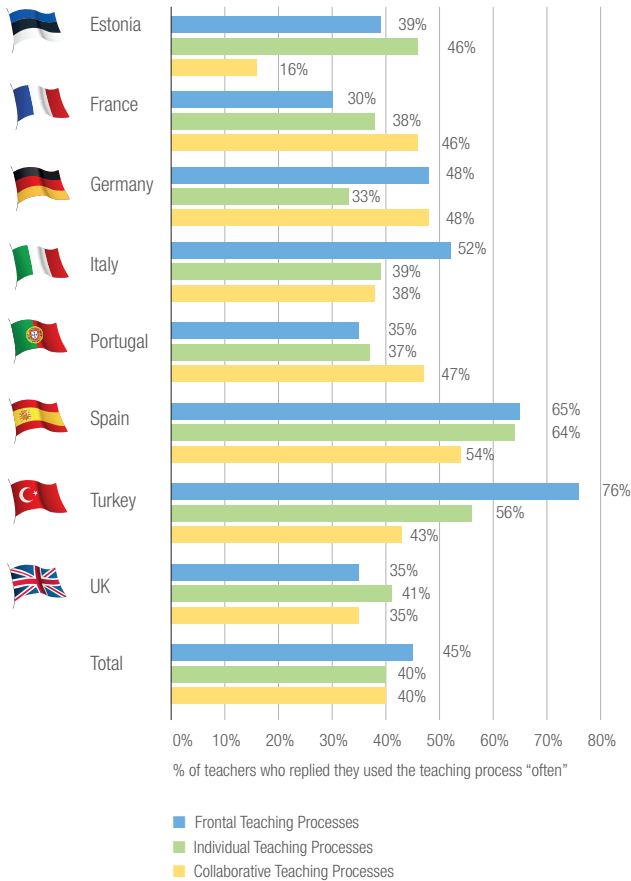
In addition to the pedagogical practices applied by teachers when teaching with the tablet, the survey investigated the student practices, seeking to describe the type of activities they are involved in, either in **individual activities** (offline or online) or **collaborative activities** (offline or online)[9].

Engaging students in **Internet-based activities** was mentioned by most pilot teachers. 80% said their students **worked together** while using the Internet, another 73% of teachers mentioned that their students worked alone while using the Internet. More than half of the teachers also engaged students in offline activities in groups or individually. The findings suggest that teachers engaged their students in a variety of learning activities, individual as well as collaborative, involving them in online activities as well as offline activities.

9   Multiple answers were possible.

# 7.5. Tablet-based activities at school and at home

One focus of the evaluation was to investigate how often teachers carried out ICT-based activities with the tablet at school and at home (Fig. 12). It shows there were no marked differences between school-related activities carried out at home or at school. Teachers perform the same kind of ICT-based educational activities at school and at home, with a slight preference to do some activities more at school. **Browse the Internet for learning resources and prepare presentations for lessons** are the two most popular activities carried out by the teachers at school and at home. More than ⅔ of teachers browsed the Internet for learning resources 1-5 times a week at school. Another 61% of teachers prepared presentations for lessons.

Still almost half of the teachers indicated they **use/download or create digital learning resources** 1-5 times a week at school; fewer teachers do so from home, especially when it comes to downloading material from the schools website.

Very few teachers in the pilot used the tablet at school to **communicate online with parents, post homework on the school website or collaborate online with other teachers or classes**.[10]

The tablet was mainly used as a teaching tool for teachers, and they used it mainly in class. This can also be conducted from the type of activities teachers primarily performed with the tablet, aimed at the preparation and delivery of lessons and browsing the Internet or education websites for learning resources.

Fig. 12. Tablet teacher's specific activities with the tablet at school and at home
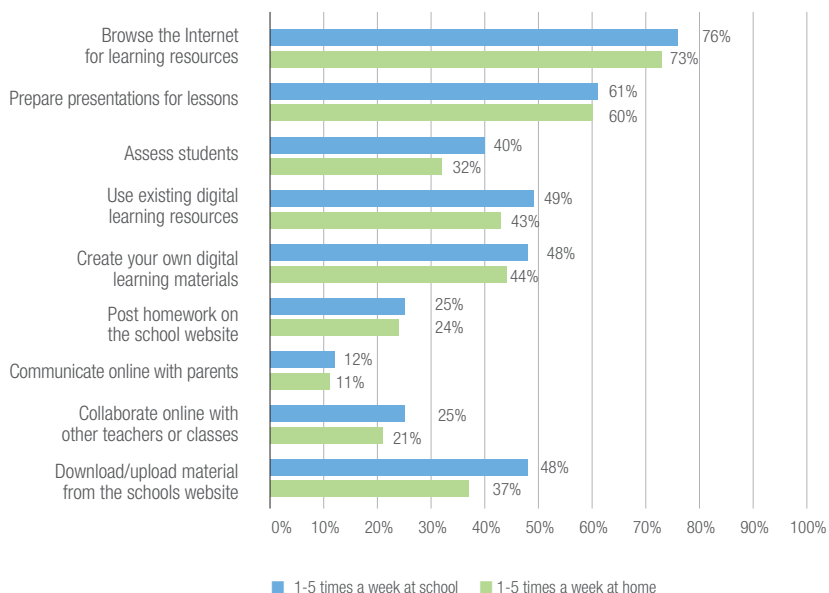
Teachers used the tablet for both **personal use** and professional use, but **professional use** was prevailing. The majority of teachers used the tablets for **professional use** between 50% and 100% of the tablet usage time.

---

10   At EU level (EUN, University of Liège), most teachers have been familiar with ICT for teaching and learning for some years but still use it first and foremost to prepare their teaching. Only a small proportion's use is directed at working with students during lessons, and even less frequently to communicate with parents or to adjust the balance of students' work between school and home in new ways.

7.6. Support and collaboration

Training provided during the pilot

Teacher professional development is considered a critical element in the implementation of ICT in schools generally, but specifically for 1:1 computing programmes including tablets (Schaumburg 2007, Valiente 2010, SRI International, 2005). Teachers ICT- related professional development significantly and positively correlates with the adoption of ICT (Law, 2008).
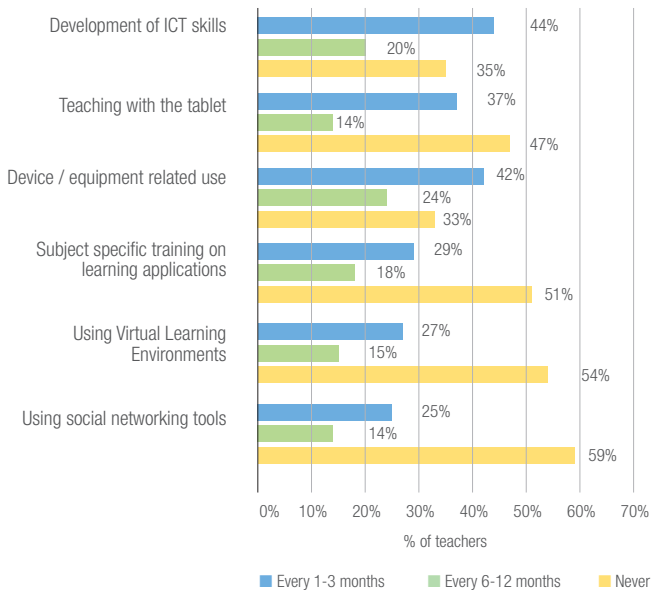
The findings from the ICT questionnaire (pre-survey) to teachers, where teachers were asked about the frequency of ICT training they received before the pilot implementation, showed that the largest proportion of teachers (40%) received ICT-related training *"every 6-12" months*. Looking at the training opportunities provided to teachers during the tablet implementation, one can observe a shift to more frequent training opportunities becoming available to teachers during the pilot implementation (Fig. 13). A higher number of teachers (more than 1/3) received training *"every 1-3 months"*. The implementation of the tablet pilot therefore brought professional development opportunities to the teachers as a 'side effect' of the actual implementation of the pilot. Some specific actions were planned and carried out at EUN level, but likewise training actions were initiated at school level, as recommended to teachers in the beginning of the project. The types of exchanges between teachers about the use of tablets are further elaborated in the sections on collaboration and communication activities.

More than 30% of pilot teachers received training (every 1-3 months) in the **development of ICT skills** and in **device/equipment related use**, and more than 60% of teachers received this type of training at least once during the project period. Half of the teachers received training in the pedagogical use of teaching with the tablet at least once during the pilot implementation. However, half of the teachers "never" received training in the pedagogical use of the tablet.

The use of **social networking tools** and **virtual learning environments** was not a focus of training sessions for teachers during the project implementation.[11] More than half of the pilot teachers never received training in that area during the pilot implementation. The self-reported competence levels are likewise lower for these areas (see section: competence using tablets).

---

11 Evidence from the survey of schools ICT in education (EUN, University of Liège, 2013) shows that at EU level there is a positive correlation at all levels between teachers' confidence in their operational skills and their participation in professional development, as well as between their confidence in social media skills and participation in professional development.

acer   European Schoolnet

Fig. 13. *How often did you receive training or participated in professional development activities in the following areas during the tablet pilot?*
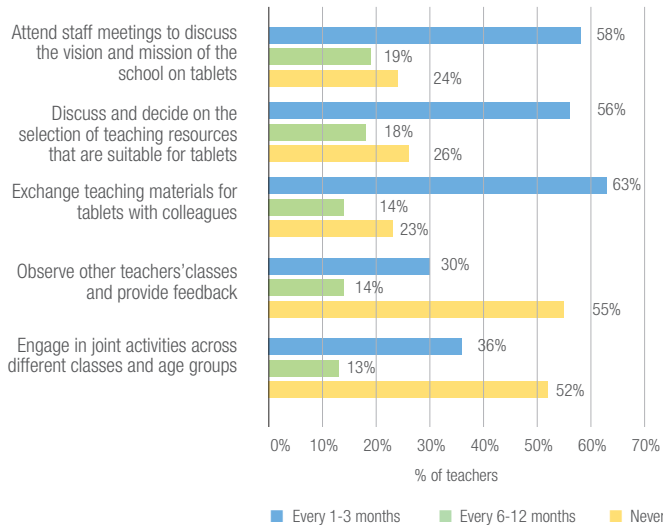

Development of ICT skills
44%
20%
35%

Teaching with the tablet
37%
14%
47%

Device / equipment related use
42%
24%
33%

Subject specific training on learning applications
29%
18%
51%

Using Virtual Learning Environments
27%
15%
54%

Using social networking tools
25%
14%
59%

0% 10% 20% 30% 40% 50% 60% 70%
% of teachers

■ Every 1-3 months   ■ Every 6-12 months   ■ Never

Collaboration activities

As regards the collaboration activities that pilot teachers engaged in during the project, one of the most commonly carried out activities by teachers *every 1-3 months* was the **exchange of teaching material with colleagues,** or the attending of **staff meetings to discuss the vision of the school on tablets** (Fig. 14). The latter indicates the e-maturity of the schools participating in the pilot, as the tablet becomes integrated in the overall ICT plan/policy of the school. More than 30% of the pilot teachers also held discussions on **teaching resources** that are suitable for tablets during the pilot implementation period. Peer learning activities, such as **observing other teachers classes** and providing feedback or **engaging in joint activities with other teachers from other classes** were only carried out by one third of the teachers every 1-3 months.

*In comparison to the pre-survey, the exchange of teaching material was carried out less frequently by the pilot teachers during the tablet survey. 40% of teachers did so **monthly and every 3 months**. Only a few teachers did so on a weekly basis, whereas in general, for ICT, already half of the teachers exchanged teaching material with ICT every week. This can point to the adaption process that is needed when experimenting with the tablet as a new tool. Teachers probably need to have some time to work on their own resources before sharing resources and material with teachers as part of more frequent routine practices.*

In general, half of the teachers did not engage in collaboration-type activities, such as observing other teachers, or joint teaching, as the data reveals from the ICT survey as well as from the tablet survey.

Attend staff meetings to discuss the vision and mission of the school on tablets: 58%, 19%, 24%

Discuss and decide on the selection of teaching resources that are suitable for tablets: 56%, 18%, 26%

Exchange teaching materials for tablets with colleagues: 63%, 14%, 23%

Observe other teachers' classes and provide feedback: 30%, 14%, 55%

Engage in joint activities across different classes and age groups: 36%, 13%, 52%

% of teachers

■ Every 1-3 months   ■ Every 6-12 months   ■ Never

Communication

The survey investigated the communication channels (**ICT-based or not ICT-based**) and methods of communication (**formal or informal**) that teachers used to communicate about the use of the tablet. Informal communication channels prevailed during the pilot implementation.

Overall, the majority of pilot teachers engaged in **informal face-to-face** discussions during the project, and ²/₃ of teachers carried out **informal ICT-based discussions**.[12]

More than 50% of the teachers held formal face-to-face meetings "sometimes", but formal ICT-based meetings were the method used least by teachers to communicate about the use of tablets. More than 60% of teachers 'never` did so over the course of the pilot implementation (Fig. 15).

The preferred practice of teachers to rather engage in informal sessions (face-to face or ICT-based) during the pilot seems normal, as on average only 4 to 5 teachers per school participated in the project. It also suggests that at that scale the pilot implementation was driven by the teachers themselves, with less direct and less frequent interventions by the head teachers (e.g. in setting up formal sessions), who gave a lot of autonomy to teachers during the project (bottom-up implementation). Teachers also needed to find sufficient time to exchange on the use of tablets, and informal methods of communication were considered to be more efficient by teachers. However, through this method of communication, teachers might mainly communicate to those teachers already interested or concerned by the use of tablets.

---

12 The OECD report (TALIS, 2008) measures the type of professional activities undertaken by teachers and the impact teachers perceive the training. It shows that "informal dialogue to improve teaching" is mentioned as the most frequent activity for professional development with a participation rate of more than 90% in most countries.
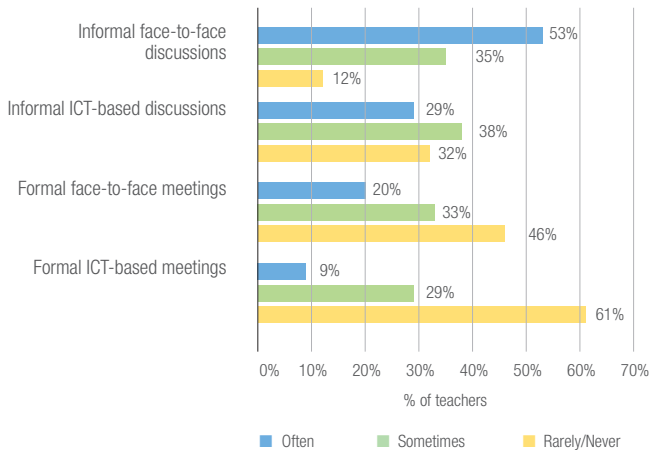
7.7. Use and usefulness of pilot services

Teachers participating in the pilot could benefit from a number of support services at European level, provided by European Schoolnet as coordinator of the pilot[13] (Fig. 16). These were mainly online distance events (kick off meetings and themed webinars), and services on the 1:1 community website such as newsletters, forum, resources, and a section on 1:1 pedagogical scenarios. These services were availed of by the majority of teachers on a regular basis during the pilot. Moreover, more than 70% of teachers found the 1:1 pedagogy website – resources, news and updates, community (teachers' blog and forum) - very useful or useful (Fig. 17). This suggests that teachers look for support related to finding resources (1:1 pedagogical scenarios, information on other projects and resources), but also want to be informed about the project developments as part of a pilot implementation (news, updates), and to see what other teachers do as part of the project (community, teachers blog). Two teachers per country likewise participated in a final workshop to exchange best practices on the use of tablets at the end of the pilot.

---

13 The national support provided differed widely as part of the pilot. There was no dedicated national coordinator in each country, but in some countries, such as in Spain and Turkey, the Ministry of Education took a leading role in supporting the schools. In other countries a school coordinator initiated some actions between schools at regional level (e.g. Germany).

Fig. 16. *Have you made use of the following content or services of the pilot website?*

	% of teachers
1:1 pedagogy section	76% / 24%
News (incl. videos and events)	80% / 20%
Community – Others teachers' profiles	74% / 26%
Community – Teachers' blog	77% / 23%
Community – Forum	76% / 24%
Resources	74% / 26%
Projects (information on projects)	79% / 21%
Pilot kick-offwebinars	78% / 22%
Themed webinars (eTwinning, eSafety, IWB)	70% / 30%
Tablet pilot updates by email	80% / 20%

% of teachers

■ I have used this content or service   ■ I haven't used this content or service

acer   European Schoolnet

	Very or somewhat useful	Little or not useful
1:1 pedagogy section	84%	16%
News (incl. videos and events)	77%	23%
Community – Others teachers' profiles	64%	36%
Community – Teachers' blog	74%	26%
Community – Forum	72%	28%
Resources	76%	24%
Projects (information on projects)	73%	27%
Pilot kick off webinars	66%	34%
Themed webinars (eTwinning, eSafety, IWB)	61%	39%
Tablet pilot updates by email	72%	28%

7.8. Teachers' competence using the tablet

Evidence (Ainley, et al. 2009) shows that ICT use is higher when teachers have a high level of confidence in ICT. Evidence from the Survey of schools: ICT in education (EUN, University of Liège, 2013) suggests that teachers' confidence and opinions about ICT use for teaching and learning affect the frequency of students' ICT use for learning.

Most teachers, after having used the tablet, reported "very good" or "good" competence in general ICT skills and in device/equipment related use (Fig. 18).

The development of pedagogical competence of teachers to use tablets is one area which deserves further attention, in order to raise competence levels of all participating pilot teachers. While overall teachers feel to have very good/good competence, and the same number estimate themselves as having satisfactory competence, still ¼ of the pilot teachers rate their pedagogical competence in the use of tablets as "poor".

Almost half of the teachers stated to have "satisfactory" or "poor" competence in using social networking tools or virtual learning environments. These are also the areas in which more than half of the teachers never received professional training, neither before the project implementation, nor during the project implementation of the pilot.

Teachers' self-estimated competence in the tablet pilot seems to be linked to the frequency of activity performed by teachers during the tablet pilot as well as to the training received in that area.
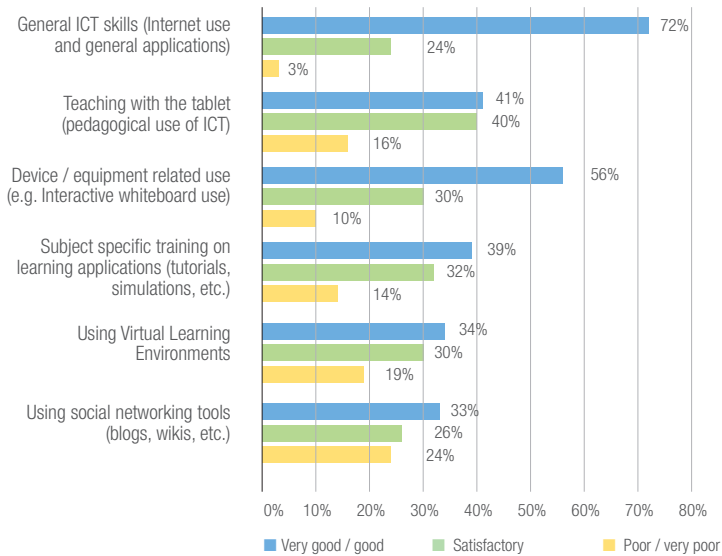
7. 9. Impact of tablet use

General integration

As the pre-survey data showed in relation to the use of ICT in general, pilot teachers also have a positive opinion of the use of tablets and their impact after the project implementation. Most of the teachers in the pilot (more than ²/₃) stated that since the implementation of the pilot, they understand the potential benefits of tablets in teaching. Around ²/₃ of the teachers also stated that they know which content to use on the tablet, and how to effectively integrate tablets in their teaching, despite the short implementation period (Fig. 19).

More than half of the teachers know which software to use on the tablet and where learning resources in their national language are available, and have received support from other teachers.

Teachers are most hesitant about the workload associated with the use of the tablet. This is not surprising, given the short implementation period, as true time-gains and benefits will only occur at later stages of integration of the tablet in their teaching practice.

Fig. 19.

Fig. 19.   Regarding the use of tablets and your teaching activities, indicate how much you agree with following statements

I know how to integrate tablets into my teaching effectively — 64%, 25%, 11%
I konš which content and other material to use with tablets — 66%, 23%, 11%
I konw which software to use on tablets — 57%, 28%, 15%
I can find enough content and learning resources in national language — 56%, 22%, 22%
I have received support and examples from other teachers/colleagues — 55%, 22%, 23%
I now understand the potential benefit of tablets in teaching — 71%, 17%, 11%
Using tablets has increased my workload — 32%, 38%, 30%

% of teachers

■ Agree   ■ Neither agree nor disagree   ■ Disagree

Most teachers stated that teaching with the tablet has had a positive impact on developing their digital competence (Fig. 20). More than half of the teachers also mentioned that the tablet has had an impact on their teaching method; slightly fewer teachers agree that the project had an impact on students' learning.

Almost half of the teachers have not formed an opinion about the use of the tablet to assess students' work, the impact on communication with teachers, students, parents, and whether the tablet had a positive impact on time gains in the preparation and follow up of lessons. However, these are also the areas where teachers used the tablets the least during the project (see section 7.3).

These findings suggest a link between the type of ICT practices performed and corresponding perceived levels of impact in those areas.
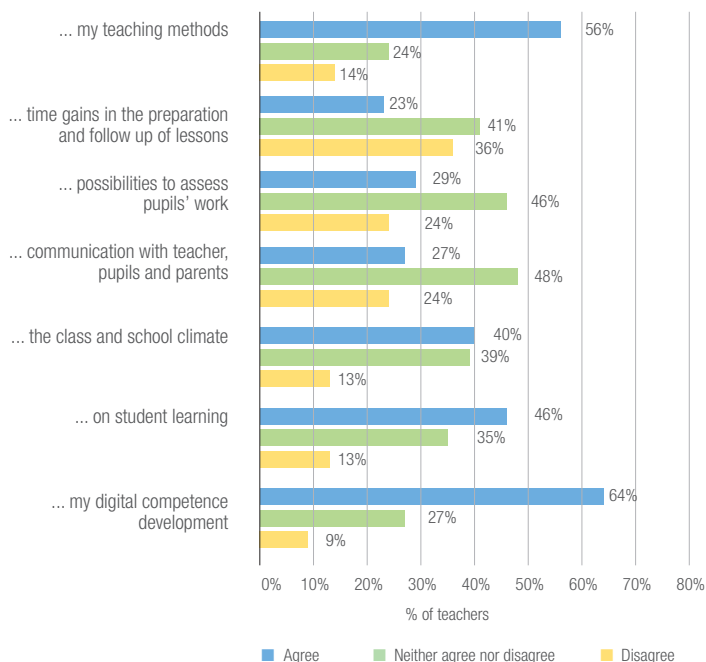
More motivated students, and more opportunities to train in new teaching methods were the most rewarding outcome for more than half of the teachers participating in the tablet pilot. Recognition from the school head or colleagues was of less importance to teachers, and was only stated by around 20% of the teachers.

7.10. Feedback on the tablet

Functionalities

The majority of teachers have used the tablet's touchscreen in the first place, but around ⅔ of teachers used both the physical keyboard, coupled with the tablet, and the keyboard on the screen. The stylus was least used by teachers, also due to the fact that this was not delivered with the tablet and had to be purchased additionally by teachers, if they wished to use it.

Fig. 21. Have you used the following parts of your tablet?
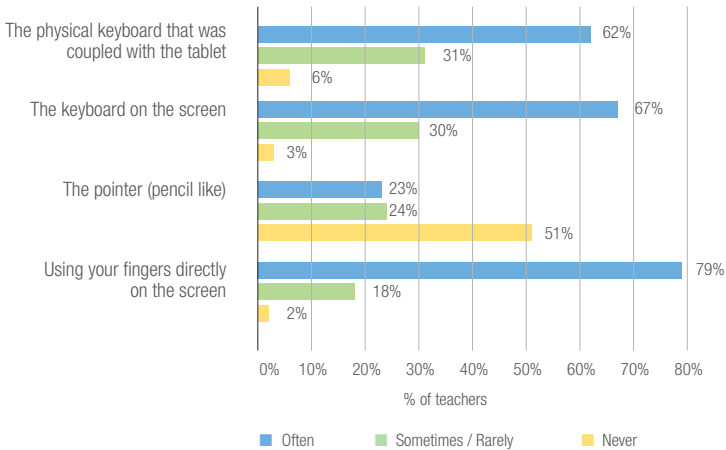
Teachers were in general satisfied with the tablet screen (size, quality and touch), the keyboard and the tablet build (size, weight, robustness). Less teachers were fully satisfied with the tablet hardware features (in-built audio-visual tools, speed, memory), battery life, and the tablet's compatibility with other devices.

Fig. 22. Regarding tablets' characteristics when used by teachers, indicate how much you agree with the statements below
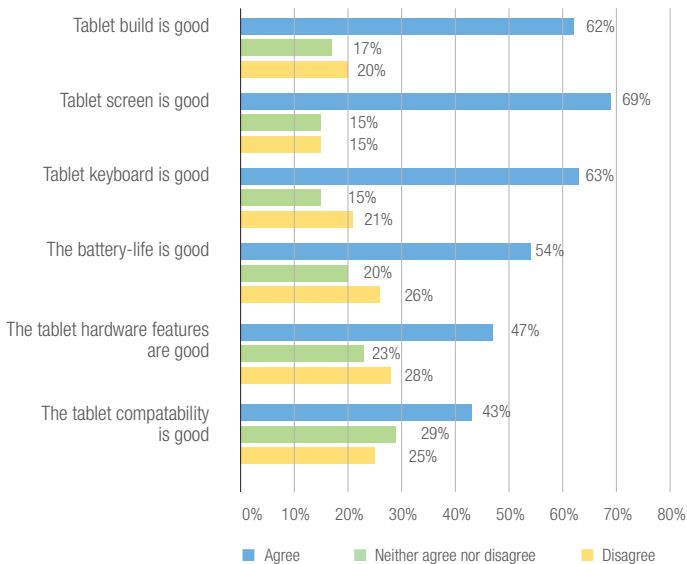
A large majority of teachers did not have any problems with a broken tablet (hardware problems or a broken tablet) or insufficient Internet access at home. Insufficient Internet access at school, incompatibility between the tablets and the school ICT infrastructure, and software problems were issues, reported by around ⅓ of the teachers. Unavailability of technical support occurred only "rarely" or "never", as reported by 80% of teachers in the answers to the online questionnaire.

Future plans

When asking teachers about their future plans after the project implementation, most teachers participating in the pilot stated that they wanted to continue using the tablet themselves. ⅓ of teachers will share them with other teachers. Around 20 % of teachers indicated that their school will acquire more tablets, either for teachers or students.

Fig. 23. *What kind of plans does your school have with the tablets once the pilot has finished? Select all that apply*
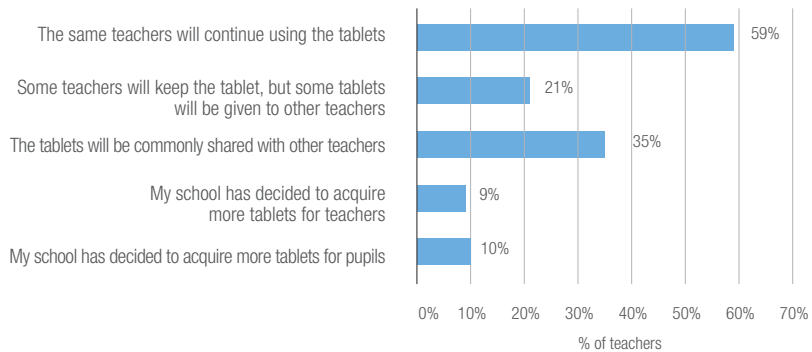
% of teachers

8. Summary of the tablet survey of teachers

Almost all teachers (Total N=359) have used the tablet during the project, with more than ²/₃ of the participating tablet pilot teachers having used the tablet on average 5 months between January and July 2012. Teachers have used the tablet in a variety of subjects, ranging from subjects related to languages, social sciences, natural sciences, mathematics and ICT-related subjects. This suggests that the tablet is suitable for use across a variety of subjects.

The tablet was the **device** used by most of the teachers during the pilot implementation, with 90% of teachers having used the tablet "often" or "sometimes". However, ¾ of the pilot teachers also used the PC or laptop during the pilot. The use of the tablet was integrated with the use of existing devices, with teachers using it 'often' rather than using it on a "daily" basis. Around half of the teachers used interactive whiteboard software and subject specific software during the pilot on a regular basis.

Almost all teachers used the tablet for school-based activities with their students in class. Pilot teachers followed more or less their initial plans of using the tablet for general **professional activities**. The majority of teachers have used the tablets to support lesson planning, lesson delivery and for professional development activities. Around ¹/₃ of teachers indicate that they have *"never"* used the tablets for assessment within the project implementation period.

There are no marked differences between **specific tablet-based school related activities carried out at school or at home**. Teachers performed the same kind of ICT-based educational activities with the tablet at school and at home, with a slight preference to do some activities more at school. Browse the Internet in order to find learning resources, and prepare presentations for lessons were the two most popular activities carried out by the teachers at school and at home. The tablet was used only by a minority of teachers for communication with parents, or online collaboration activities with other teachers or classes.

Whilst the majority of teachers mainly used **material or resources** they had found on the Internet when teaching their students, or online material from established national/regional education sources, 80% of teachers mentioned that students used paper-based learning material when taught with the tablet. Half of the teachers said their students also used online learning resources, and 40% mentioned subject-specific, computer-based applications. In general, around half of the students had access to an ICT device (PC, laptop or tablet) at school during the pilot implementation.

On average, pilot teachers alternated between three main **teaching methods** when teaching with the tablet: frontal teaching, teaching aimed at collaboration between students, and teaching methods to support individual students. Frontal teaching processes were slightly prevailing, with 45% of pilot teachers applying it "often". Likewise, country differences on the use of teaching practices can be observed. This variety of approaches was likewise reflected in student practices. Teachers reported having engaged students in a variety of learning activities, individual as well as collaborative, involving them in online activities as well as offline activities.

Looking at the **training opportunities** provided to teachers during the tablet implementation, a shift to more frequent training opportunities (every 1 to 3 months) can be observed during the pilot implementation. Most of the pilot teachers received training in the development of ICT skills, and in device/equipment-related use, and training on teaching with the tablet (pedagogical use of ICT). The use of virtual learning environments, or using social networking tools, was not a focus of the training most teachers received.

As regards the **collaboration activities** that pilot teachers engaged in during the project, one of the most common activities carried out by the teachers every 1-3 months was the exchange of teaching material with colleagues, or the attendance of staff meetings to discuss the vision of the school on tablets. Peer learning activities, such as observing other teachers classes and providing feedback, or engaging in joint activities with other teachers from other classes were only carried out by one third of the teachers every 1-3 months.

During the pilot, teachers **communicated** about the use of tablets occasionally, informally and face-to face, rather than by using ICT. Overall, the majority of pilot teachers engaged in informal face-to-face discussions during the project, and ²/₃ of teachers carried out informal ICT-based discussions.

The majority of teachers made use of the **support services** provided at European level, mainly from the 1:1 community platform, and specific online events. Teachers particularly appreciated support relating to finding resources (1:1 pedagogical scenarios, information on other projects and resources), but also information about pilot project developments (news, updates), and insights into other teachers' pilot actions and practices (community, teachers' blog).

After the pilot implementation, most teachers felt **competent** (very good or good competence) in general ICT skills and in device/equipment-related use. Pedagogical competence of teachers is one area that deserves further attention, to raise competence levels of all teachers. In areas such as using social networking tools or virtual learning environments, fewer teachers felt competent after the pilot.

Teachers were in general content with the tablet screen, the keyboard and the tablet build. The tablet hardware features, its battery life and the tablets' compatibility with other devices were problematic for some teachers during the pilot. Most teachers made the most use of the touchscreen, but likewise teachers used the physical keyboard tablet in conjunction with the onscreen keyboard. There were no major issues hindering the use of tablets by teachers, no issues of broken tablets or insufficient Internet connection at home. Areas such as compatibility of the tablet with the existing ICT infrastructure at school, or general technical problems with the tablet are areas to watch.

Overall, teachers have a positive opinion of the **use of tablets**. Teachers stated that they now understand the potential benefits of tablets in teaching, and that they know which content to use on the tablet and how to effectively integrate tablets into their teaching. More than half of the teachers know which software to use on the tablet, the availability of learning resources in their national language and have received support from other teachers.

Teachers have a split opinion about the workload of using the tablet.

Most teachers stated that teaching with the tablet had an **impact** on developing their digital competence, and their teaching methods. Slightly fewer teachers agreed that the project had an impact on students' learning. Almost half of the teachers had not formed an opinion about the use of the tablet to assess students' work, and the impact on communication with teachers, students, or parents, and whether or not the tablet had a positive impact on time gains in the preparation and follow up of lessons. However, these are also the areas where teachers used the tablets least.

9. Conclusions from the pilot

ICT-positive and experienced pilot teachers

The tablet pilot started off on fertile ground: teachers participated voluntarily in the project, were motivated and ICT-experienced teachers, felt competent in the use of ICT in a number of professional activities, and had a positive attitude towards ICT's impact on teachers and learners. Moreover, teachers had already had access to a variety of ICT devices, mainly PC, laptops and interactive whiteboards. This reflects the uses, practices, and positive attitudes of teachers during the pilot implementation.

> The profile of teachers, as well as their ICT-based teaching and learning environment should be taken into consideration when implementing a pilot, where new devices will be used, in order to design appropriate support measures, and to provide guidance and training for teachers during the pilot implementation.

Tablets used across a variety of subjects

The tablet was used in a variety of subjects, and there is no indication that the tablet is more suitable for any particular subject. Most of the teachers used the tablet mainly for browsing and searching the Internet to collect learning material, or use of applications to prepare presentations for lessons. These types of practices suggest that there is a set of basic tools and functions that cuts across all subjects. To what extent the tools and functionalities of the tablet can be exploited for specific subjects can only be obtained from case studies documenting and observing classroom practices.

Tablets mainly used for preparation of lessons and classroom-based activities

The tablet was mainly used by teachers with students in class. Tablets were also used in the manner of a more traditional focus of teaching in class, and teachers using it for lesson planning and delivery. Areas such as the use of the tablet for assessment and communication were the least exploited during the pilot implementation. However, there is evidence of good practice in these areas from the case studies. Using ICT for assessment and communication were also the activities carried out least by the pilot teachers prior to the pilot implementation, as the data from the pre-survey shows.

Teachers performed the same kind of ICT-based educational activities at school and at home, with a slight preference for doing some activities more at school. Browsing the Internet for learning resources, and preparing presentations for lessons were the two most popular activities carried out by the teachers at school and at home.

> Given the mobile character of the devices, the use of the tablet in other learning contexts, such as for field work, in other parts of the school (e.g. library), or in informal or non-formal learning environments, should be further exploited by teachers. Evidence suggests that these types of practices – tablets being used to extend learning beyond the formal classroom context – lead to more radical transformative changes in teaching and learning practices.

> This means that teachers need to be supported in the long term to experiment with these types of activities, by providing them with scenarios and professional development activities for using tablets outside the classroom; for assessment; and as a means for effective communication between teachers, students and parents. A knowledge base on informal learning spaces could include new scenarios that go beyond traditional classroom teaching models, such as activity-based learning and project-based learning.

Tablets are gradually integrated in the existing ICT environment

Tablets were the device used by most of the teachers during the pilot implementation, whereas only half of the teachers had used a tablet prior to the pilot implementation. The findings suggest that tablets are integrated gradually and used next to other ICT devices, not yet on a daily basis and not yet by a majority of teachers in more than 50% of their lessons.

Tablets lead to more frequent professional development opportunities

The project implementation led to more frequent professional development opportunities for teachers. In some areas, such as the in the development of ICT skills, or device-related training, teachers received more frequent training during the project's implementation. Other areas, such as training in the pedagogical use of using tablets, training in subject-specific applications, and most of all in the use of social networking tools or virtual learning environments, deserve further attention in the future.

Including a wider range of topics in professional development would support a variety of new practices with the tablet, and with ICT in general. It also has to be ensured that all teachers in the pilot receive training in the pedagogical use of the tablet.

The evaluation findings suggest a relationship between the type and frequency of professional development activities received and actual teachers' practices (as well as confidence levels in this area). Therefore, and in order to change existing practices, teachers need to be supported in those areas where change is desired via professional development activities that support such kind of activities.

Tablets as part of the ICT vision of schools, and support for the exchange of teaching material

Among the most frequent collaboration activities carried out by the teachers was the exchange of teaching material with colleagues, or attendance of staff meetings to discuss the vision of the school on tablets. The latter indicates the e-maturity of the schools participating in the pilot, as the tablet becomes integrated in the overall ICT plan/policy of the school. Peer learning activities, such as observing other teachers classes and providing feedback, or engaging in joint activities with other teachers from other classes were carried out by one third of the teachers every 1-3 months. These types of peer-to-peer learning activities were not done by approximately half of the teachers - as part of their general ICT practices, or as part of their tablet practices. In general, time and confidence with the new device is needed to engage in these kinds of collaborative exchanges.

> Teachers should be encouraged in the sharing of resources, documentation of practice and the creation of lesson scenarios. Moreover, true collaboration activities, such as peer learning and lesson observations, should be fostered in experimenting with new devices and tools at school as they can provide 'on demand' access to information. Teacher mentors have successfully supported these kinds of collaboration activities in 1:1 programmes.

Informal exchanges to communicate on the use of tablets

There are likewise indications from the findings, related to collaboration and professional development activities, that the project was driven by the teachers in schools themselves, with support from the head teacher giving a lot of autonomy to teachers as regards to the project implementation. Teachers mainly used informal face-to-face discussions or informal ICT-based discussions to communicate about the use of tablets during the pilot. Fostering these informal exchanges (face-to-face or ICT-based) should be taken into consideration when designing support actions in this area.

Teachers alternated between different teaching methods when teaching with the tablet

The evaluation shows that the pilot teachers used a variety of different teaching methods when teaching with the tablet, alternating between frontal teaching, and teaching methods supporting collaborative and individual activities with students. When looking at the ICT survey, it is evident that many teachers were already using these different teaching approaches (with or without using ICT) before the pilot, and that they most probably applied similar approaches when teaching with the tablet. Teachers reported to have engaged students in a variety of learning activities, individual as well as collaborative, involving them in online activities as well as offline activities.

> Teachers' general and ICT-based pedagogical practices have to be taken into consideration when implementing similar pilots in this area. Depending on the attitudes of teachers towards ICT and their teaching styles, specific support measures could be offered to teachers, taking into account their backgrounds and showing them the variety of approaches that can be applied.

Teachers' use of digital resources vs. students use

The majority of teachers mainly used online material (from the Internet, or from established national/regional education sources) when teaching their students. More than one third of pilot teachers used electronic offline material. In contrast to this, the large majority of teachers mentioned that students used paper-based learning material (e.g. textbooks, printed exercise sheets) when being taught with the tablet. Half of the teachers said their students used online learning resources, and 40% mentioned subject specific computer-based applications. Whilst around half of the teachers already also let students use online learning resources, the use of paper-based learning material still prevailed during the pilot, suggesting that students had less access to Internet-based material than the tablet-equipped teachers.

> Giving students access to the same or similar type of devices (individual access to a personal device or group access), including sufficient Internet access at school, would be beneficial for teachers; not only to support and extend their classroom instruction, but also to ensure richer content and a richer variety of content for students to work with.

Tablets building teachers' competence

Most teachers, after having used the tablet, stated that they had "very good" or "good" competence in general ICT skills and in device/equipment-related use. Almost half of the teachers stated to have "satisfactory" or "poor" competence in using social networking tools or virtual learning environments. The latter are also the areas where more than half of the teachers have never received professional training, neither before the project implementation nor during the project implementation, suggesting the importance of training and associated practices in these areas.

Impact on digital competence of teachers and teaching methods

Teachers estimate an overall positive impact in a number of areas, such as the development of their digital competence and their teaching methods. Teachers also know what content to use on the tablet, and how to effectively integrate tablets in their teaching. There are, however, some areas where an impact is not yet evident, indicating that more time and integration is needed. This is the case in relation to the impact on the use of the tablet to assess students' work, and the impact on communication with teachers, students, parents. These are also the areas where teachers used the tablets least.

Use of support services, and the lack of major barriers in the pilot implementation

Evidence shows that the quality of the implementation largely determines the achievement of desired outcomes. Studies on 1:1 implementations also suggest that higher levels of implementation are associated with higher levels of support (e.g. leadership, teachers' commitment, professional support).

The findings from the evaluation, especially on barriers in the implementation, show that teachers overall felt content with the tablet build, screen and keyboard. There were no major issues that hindered use of tablets by teachers, no issues of broken tablets or insufficient Internet connection at home. Areas such as compatibility of the tablet with the existing ICT infrastructure at school and general technical problems with the tablet are areas to watch.

The running of a tablet pilot showed that support services are needed to create and strengthen exchanges between the teacher community. The majority of pilot teachers made use on a regular basis of the services provided at European level. Teachers welcomed support related to finding resources (1:1 pedagogical scenarios, information on other projects and resources), but also information on project developments as part of a pilot implementation (news, updates), and writing about their tablet project experiences and challenges in the teachers blog as part of the 1:1 community.

> Fostering continuous exchanges between teachers beyond the project implementation phase remains a challenge, and illustrates the need for incentives for teachers to engage in such a community on a long term basis. Pedagogical learning scenarios should outline how digital devices can be used to support a plethora of learning strategies.

> Teachers also recognise the benefit of face to face exchange opportunities. The workshop delivered by European Schoolnet at the end of the pilot received excellent feedback. Teachers also indicated that they would benefit from additional face to face support.

acer   European Schoolnet

10. References

Ainley, J. Eveleigh, F. and O'Malley, K. (2009), *ICT in the teaching of Science and Mathematics in Year 8 in Australia: a Report from the Sites Survey*, Department of Education, Employment and Workplace Relations, Canberra.

European Schoolnet, University of Liège (2013), *Survey of Schools: ICT in Education, Benchmarking Access, Use and Attitudes to Technology in Europe's Schools*, Final Study Report. Brussels, April 2013.

Fredriksson, U., Jedeskog, G. and Tjeerd, P. (2008), "Innovative use of ICT in schools based on the findings in ELFE project", Education & Information Technologies, Vol. 13, No. 2, pp. 83-101.

Heo & Kang (2009), *Impacts of ICT use on social learning outcome. Assessing the effects of ICT in education: Indicators, criteria and benchmarks for international comparisons* (pp.189-200). Joint Research Centre.

ITU (2009), *ITU Monitor 2009 - The Digital State of Affairs* in Norwegian Schools in 2009, Oslo, 2009.

OECD (2009), Creating effective teaching and learning environments: First results from Talis. OECD publishing.

Schaumburg, H. et al. (2007), *Lernen in Notebook-Klassen. Endbericht zur Evaluation des Projekts 1000 mal 1000: Notebooks im Schulranzen*, Germany, Schulen ans Netz.

SRI International (2005), *Singapore Tablet Program Study*, Vol. 1: Technical Findings. Singapore 2005.

Valiente, O. (2010), *1-1 in Education: Current Practice, International Comparative Research Evidence and Policy Implications*, OECD Education Working Papers, No. 44, OECD Publishing.

Vuorikari, R., Garoia, V., & Balanskat, A. (2011). *Introducing Netbook Pedagogies in Schools. Acer - European Schoolnet Educational Netbook Pilot.* European Schoolnet.

Annex 1

Overview of pilot schools and national contacts

Estonia
Elo Allemann, Tiger Leap Foundation
Schools
- Konguta kool
- Kristiine Gümnaasium
- Haljala Gümnaasium
- Kiili Gümnaasium
- Tallinna Tõnismäe Reaalkool

France
Pascal Faure, ICT advisor,
Académie de Nancy-Metz
Schools
- Collège Jacques Marquette
- ES St. Léon IX Collège
- Collège Vincent Van Gogh
- Collège Louis Aragon
- Collège Val de Seille
- Lycée Jean Victor Poncelet
- Lycée Robert Schuman
- Lycée Jean de Pange
- Collège / Lycée Alfred Kastler
- Collège Paul Verlaine

Germany
Ringo Plöger,
Friedrich Myconius Schule
Schools
- Gymnasium im Schloss
- OBS Papenteich
- RS "Am Rennsteig" Tambach-Dietharz
- RS "Burgenland" Wechmar
- RS "Conrad Ekhof" Gotha
- RS "Friedrich Myconius" Gotha
- Staatliche Regelschule "Helene Lange" Friedrichroda
- Johann-Beckmann-Gymnasium
- RS "Am Kienberg" Crawinkel
- Thüringer Institut für Lehrerfortbildung, Lehrplanentwicklung und Medien
- Staatliche Regelschule "Am Nationalpark Hainich" Weberstedt
- Lobdeburgschule Staatliche Gemeinschaftsschule Jena

Italy
Antonella Turchi, INDIRE
Schools
- IIS Caduti della Direttissima
- Istituto Comprensivo di S. Pietro in Casale
- Scuola ebraica di Milano
- Istituto Tecnico Commerciale e Linguistico Marco Polo
- Istituto Comprensivo Renato Guttuso
- Istituto di Istruzione Superiore Piero della Francesca
- Istituto secondario di I grado Aldo Manuzio
- Istituto Comprensivo di Trofarello
- Istituto Comprensivo Lipari 2
- Istituto Comprensivo 9

Portugal
José Vítor Pedroso,
Director Education projects,
Ministry of Education
Schools
- Escola Básica Domingos Capela
- Agrupamento de Escolas de Campo Maior
- Escola Secundária D. João II – Setúbal
- Escola Secundária António Damásio
- Escola Secundária Domingos Sequeira de Leiria

Spain
Agustin Muñoz Núñez,
Pedagogical Advisor,
Ministry of Education
Schools
- IES Tiempos Modernos
- IES de Pastoriza
- IES Tomás Bretón

Turkey
Jale Akbas, Ministry of National
Education; Educational Research
and Development Directorate
Schools
- Aliye Pozcu İlköğretim Okulu
- Müfide İlhan İlköğretim Okulu
- Mersin Ticaret ve Sanayi Odası Eğitim Vakfı İlköğretim Okulu
- Konak Salih İşgören İlköğretim Okulu
- Bornova Ali Suavi İlköğretim Okulu

United Kingdom
Schools
- Blackburn Rovers FC Study Centre
- Longdon Hall School
- Chiswick Community School
- Cranbourne Community College
- St Lukes School
- Hackney Community College
- Ivybridge Community College
- Ernesford Grange Community School
- Stoke Park School and Community Technology College
- Alderman Bolton Primary School
- Mary's Catholic High School
- Cranford Community College
- St Ninians High School

Annex 2

List of figures

acer

European Schoolnet

Introducing Tablets in Schools:

The Acer-European Schoolnet Tablet Pilot

During the Acer-European Schoolnet Tablet Pilot 265 teachers from 8 European countries explored the use of Acer tablets in their teaching between January and July 2012. The Pilot was coordinated at European Schoolnet in cooperation with ACER, which provided tablets to teachers in a total of 63 schools in Estonia, France, Germany, Italy, Portugal, Spain, Turkey and the United Kingdom. In addition to teachers receiving tablets, 116 students in 4 classrooms in Spain and the UK were provided with tablets. The objectives of the pilot were to explore the use of tablets in schools and at home by teachers and students and to describe good practices from the participating countries including the key factors for successful integration of ICT in schools.

acer

European **Schoolnet**