The iPad in education: uses, benefits, and challenges

A survey of 6,057 students and 302 teachers in Quebec, Canada

Preliminary Report of Key Findings

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Table of contents

1. Summary

What do 6,000 Quebec (Canada) students do with their iPads every day? What benefits does this technology have for education? What are the challenges for students and teachers? To respond to these questions and to shed more light on this new education trend, we decided to carry out one of the largest studies to date on the use of iPads in education in collaboration with 18 elementary and high schools in the province of Quebec, Canada. By the same token, we wanted to help teachers, students, principals, parents, educators, and other education stakeholders use the iPads for learning in more reflective and educational ways. The results show that the benefits outweigh the challenges. It would appear that incorporating the iPad into education constitutes a necessary risk for schools, and that this technological tool has breathtaking cognitive potential. At the same time, introducing it into the classroom does not necessarily make for a smooth transition. On the contrary, this new technology can pose challenges that teachers may find hard to cope with if they are caught unaware. The key to successful integration of the iPad in education is therefore to provide teachers with proper training.

2. Introduction

In a few short years, the iPad has made unprecedented inroads into elementary and high schools around the world. Today, over 6,000 students in Quebec (Canada) are using a touchpad in class every day, and in the United States that number has exceeded 4.5 million (Etherington, 2013). The touchpad's strong penetration into the classroom is due as much to its appeal as to the oft-claimed potential of technology for education: that it motivates students to learn.

Why did we conduct this survey of students and teachers and teachers in 18 Canadian schools? Can the iPad become an agent for educational change? Can this technological device turn around education systems that are exhausted, with record-breaking dropout rates in Quebec (Canada), Europe, and the United States? At a time when parents and children are arguing about time spent on video games, will the advent of the iPad at school spark further conflicts in the classroom? Can the iPad actually level the education playing field, or will it instead help widen the digital divide between techno-haves and have-nots?

It was not possible in a single study to provide all the answers to these questions concerning the iPad's role in education. We therefore focused on deepening our understanding of how students and teachers use the iPad in class, as well as the associated benefits and challenges. Our aim was to shed scientific and empirical light on these issues in order to help schools, teachers, and students use the touchpad for learning in more reflective and educational ways.

We begin with a reminder that neither the iPad nor any other technologies can foster motivation or learning in young people. What counts is the ways that they are used, by both teachers and students. We believe that the touchpad has a role in the classroom only if it contributes to the school's mission, which is to "provide instruction, to socialize and to provide qualifications" (Ministère de l'Éducation du Québec, 2004, p. 5).

The aim of this study was to demonstrate that introducing the touchpad into education constitutes a necessary risk for schools, that this technological device has considerable cognitive potential, and that it comes with certain challenges.

Many self-described 'experts' on the touchpad claim that it is a panacea for educational problems, and going even further, that one can do just about anything with the touchpad at school. For example, Proffitt (2010) contends that its potential is limitless. Others (e.g., Huber, 2012) propose that the touchpad allows viewing the entire contents of school curricula, and nothing less! In this study and in the analysis of the collected data, we adopt a more nuanced and critical position: we underscore that teachers do not have to be technophiles to use touchpads in school, nor should they be technophobes. In our information society, what matters is that they are technoreflective. Schools may have no choice but to deal with the inventions that come out of Silicon Valley, but they do not have to charge ahead with blinders on.

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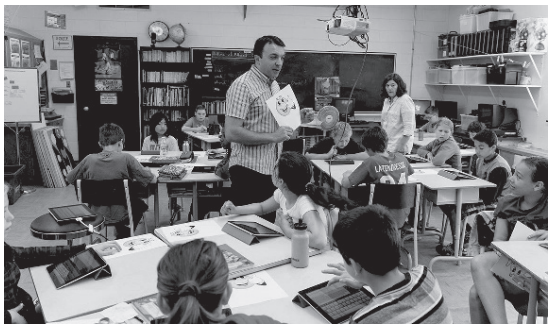
1 Québec Education Program. www1.mels.gouv.qc.ca/sections/.../secondaire2/.../1_QEP_Chap01.pdf



Before conducting this study, we consulted and analyzed 17 books on the use of touchpads in education. We also conducted an extensive review of the literature on the use of touchpads in education, including an analysis of 359 academic publications (see Section 3: What does the research say about the use and impacts of touchpads in education?). The results revealed that, on the one hand, no books to date have described the pedagogical uses of this tool. On the other hand, the research on use of the touchpad in education is very recent, which is to be expected, given that prior to 2011, schools had not implemented it. The research findings in this area are therefore very scarce, which provided part of the motivation for this study.

The question has been repeatedly raised: why focus on the iPad and not other touchpads? First, the iPad is by far the most widely used device in schools around the world. According to Khaddage (2013), the iPad has captured over 75% of the education market worldwide. In Canada, it accounts for over 90% of the education market. The iPad is also one of the most advanced technologies: it supports over 300,000 specifically designed applications (King & Bass, 2013). Finally, because the Quebec (Canada) sample used iPads almost exclusively, we felt it relevant to examine the use of this device in particular.

3. What does the research say about the uses and impacts of touchpads in education?

In recent years, information and communications technologies (ICT) have been gaining significant ground, not just in the day-to-day lives of the young and not-so-young (Endrizzi, 2012), but also at school, where many believe that they are the very future of education in our societies (see OECD, 2011). According to Livingstone (2012), technologies have transformed society from top to bottom, and particularly in terms of education and what the public expects education systems to deliver. In the Google era, people are deluged with information. Technology has made it possible to view the world through a digital lens, and teachers can access this knowledge at will via interactive smartboards (touchboards) or students' laptops and touchpads. The philosopher Michel Serres (2012) views the exponential growth of technologies as an alarming societal shift, equaled only by the invention of writing, against which Socrates strenuously warned us, or perhaps Gutenberg's printing press. Others fear that the widespread and startling inroads of technologies into classrooms will completely destroy so-called traditional interpersonal relations, and that peer relationships will be preferred and fostered over hierarchical ones (Mouissset-Lacan, 2012). Some authors, including Jouneau-Sion and Touzé (2012), consider this a major advantage: "It is the cherished idea of Edgar Morin that enters the classroom. A form of teaching that considers the world in its inclusiveness, that situates students in a climate of autonomy and interaction so that they can construct relationships between knowledge, between the school and the world, with responsibility for their own learning" [free translation]. According to Dutta and Bilbao-Osorio (2012), decision makers also see in technologies, and with good reason, a solution for improving students' academic performance. Thibert (2012) sees new ways of learning for young people, notably owing to a permanent connection to the Internet. Others view technologies as limitless opportunities for formal and informal learning (see Deschryver, 2010; Redecker & Punie, 2011). Further to this last point, we note that recent technosocial changes have led us to rethink what the term "digital divide" means. Normally understood as unequal access to technologies (Warschauer & Matuchniak, 2010), it is beginning to be understood as inequalities that perpetuate a digital underclass without the skills to use emerging technologies, between those who can put them to good use and those who merely submit to them, between youth who use technologies for learning and those who spend their time gaming or texting for fun. Nevertheless, despite the significant potential of technologies for education, it remains an enormous challenge to introduce them into classrooms (Underwood & Dillon, 2011). Moreover, little is known about effective pedagogical uses that have real impact on academic performance (Alluin, 2010; Thibert, 2012). A CEFRIO report (2011) points out that young people are using technologies mainly for amusement, and not necessarily for learning: "ICT are omnipresent in the lives of Quebec's students, who use them continuously to amuse themselves, to contact their friends . . ." (p. 6) [free translation]. Although many studies have focused on the impact (or lack thereof) of technologies on education (see, e.g., Livingstone, 2012), it appears that in 2013 we have arrived at another phase: we now understand that it is how the technologies are used for

educating that counts, and not the technologies themselves. In agreement with several studies (see Fourgous, 2010, 2012; Goulding & Kyriacou, 2008; Norris, Hossain, & Soloway, 2012; Paryono & Quito, 2010), it can be said that the teacher plays a central role in the successful pedagogical integration of technologies. As noted by Thibert (2012), we should not be assessing the impact of technologies on outcomes; instead we should be looking at the teaching and learning conditions in which the technologies are being used. Accordingly, and as mentioned above, the compelling issue in the current research on technologies in education is how to realize the full pedagogical potential of technologies for education (see Norris et al., 2012). Norris and colleagues found three conspicuous classroom teaching trends that the research should address: interactive smartboards, student laptops, and student touchpads. Hence, the motivation for conducting this study. We focus on both the tools themselves (Türel & Johnson, 2012) and the combined uses of these technologies (Erstad & Arnseth, 2013).

In barely a handful of years, the touchpad appears to have invaded elementary and high schools around the world, as no previous innovation has ever succeeded in doing. In Quebec, over 10,000 students use a touchpad in class every day, and in the United States that number exceeds 4.5 million (Etherington, 2013). This strong penetration here and abroad is due as much to the appeal of this device as to the oft-claimed potential of technology for education: that it motivates students to learn (see Underwood & Dillon, 2011). Because this device has only recently appeared in schools, the literature on its educational uses and impacts is also recent, but growing fast. This finding is based on our extensive literature review on the topic, covering 359 academic works. First, the body of empirical evidence and research results in the reviewed works is rather sparse. A second noteworthy finding is that the assumed benefits of touchpads are frequently cited, but without much empirical support gathered from educational settings. For example, we found statements such as, "…they are ideal tools for sharing content, videos, images, and presentations because they are easy for anyone to use, visually compelling, and highly portable" (Johnson, Adams, & Cummins, 2012, p. 15). As mentioned above, some authors, such as Profitt (2010), go so far as to claim that the touchpad has limitless potential. Meanwhile, others (see Huber, 2012) contend that the touchpad allows viewing the entire contents of school curricula. Why are only the benefits of using touchpads for education reported in the literature? Perhaps because evidence and empirical findings are lacking, and scholarly works have been based on somewhat ideological rhetoric and perceptions (Maddux & Johnson, 2012). In fact, and despite the growing and sometimes even scientific claims that the touchpad fosters learning, no studies based on sound empirical data have been conducted to date to demonstrate this. This is no surprise, given that before 2011, no schools had provided their students or teachers with touchpads (see Johnson et al., 2012). That said, our literature review allowed us to identify some assumed benefits of the touchpad for education, even though these remain to be demonstrated. Therein lies the motivation for our study.

Among the main benefits of using a touchpad in class, we found the following benefits for students:

1. Increases motivation (see Kinash, Brand, & Mathew, 2012; Sachs & Bull, 2012; Wainwright, 2012);
2. Facilitates access to, management of, and sharing of information (see Babnik et al., 2013; Fri-Tic, 2012; Hahn & Bussell, 2012; Martin, Berland, Benton, & Smith, 2012);
3. Fosters student learning and performance (see Churchill, Fox, & King, 2012; Fernández-López, Rodríguez-Fórtiz, Rodríguez-Almendros, & Martínez-Segura, 2013; Isabwe, 2012; Lau & Ho, 2012; McKechan & Ellis, 2012; Ostler & Topp, 2013; Rossing, Miller, Cecil, & Stamper, 2012);
4. Allows a wider range of teaching strategies (see Fernández-López et al., 2013);
5. Fosters individualized learning (see McClanahan, Williams, Kennedy, & Tate, 2012; Wasniewski, 2013);
6. Improves the reading experience (see Fernández-López et al., 2013; Huber, 2012; Sloan, 2012; Zambarbieri & Carniglia, 2012);
7. Encourages communication and collaboration among students and between teachers and students (see Geist, 2011; Henderson & Yeow, 2012; Hutchison, Beschorner, & Schmidt-Crawford, 2012);
8. Improves computer literacy skills (Huber, 2012; Killilea, 2012);
9. Nurtures students' creativity (Sullivan, 2013);
10. A highly portable tool (see Henderson & Yeow, 2012; Hill, Nuss, Middendorf, Cervero, & Gaines, 2012; Kinash, Brand, Mathew, & Kordyban, 2013; Villemonteix & Khaneboubi, 2012; Williams, Wong, Webb, & Borbasi, 2011);
11. Facilitates student assessment (Alberta Education, 2012; Isabwe, 2012; McKechan & Ellis, 2012);
12. Improves the quality of pedagogical support (Murray & Olcese, 2011);
13. Facilitates learning how to write (Murray & Olcese, 2011);
14. Makes it easier to organize schoolwork and assignments (Churchill et al., 2012);
15. Students can make versatile and vivid multimedia presentations (Murphy & Williams, 2011);
16. Significant benefits for students with learning problems (McClanahan et al., 2012).

As UNESCO underscores in its 2012 report, mobile technologies such as the touchpad are undergoing rapid development, but these innovations come with both benefits and challenges. As revealed in our literature review, the various benefits can be considered in terms of the uses that are made of them.

Let us recall that the literature review revealed very little evidence or empirical data on this issue. Nevertheless, it allowed identifying some of the assumed benefits of the touchpad for education, which remain to be demonstrated, and therein lies the motivation for this study.

4. Methods

Knowing that several schools in Quebec (Canada) had set up programs to provide individual iPads to students in fall 2012, we first decided to establish a research protocol in collaboration with each of these schools. The research objective, in addition to helping the schools achieve their education mission, was to gain a deeper understanding of the uses, benefits, and challenges of using the iPad in school. We therefore set up partnerships with 18 schools across the province of Quebec, Canada.

4.1 Participants

Figure 1 shows that 6,057 students (from Grade 6 to 10) participated in Phase 1 of this study on iPad use in Quebec schools (48.4% girls, 51.6% boys). Participants were 14 years old on average. Note that Phase 2 of the study is ongoing.

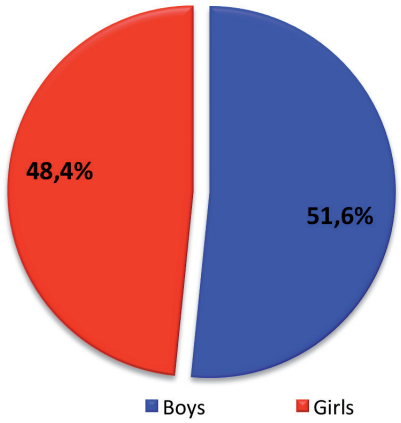


FIGURE 1. Percentages of boys and girls who particpated in the study.

In addition, 302 teachers (42.7% men, 57.3% women) participated in the study (Figure 2). The teachers taught a variety of school subjects (Figure 3) and had a wide range of teaching experience (Figure 4).

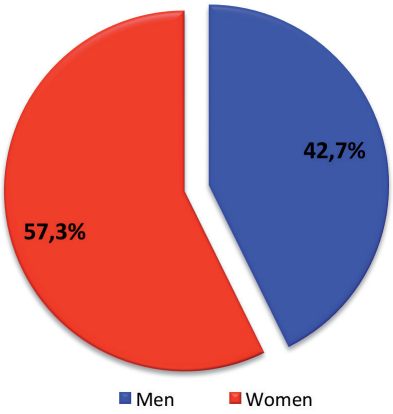


FIGURE 2. Perecentages of male and female teachers who participated in the study.

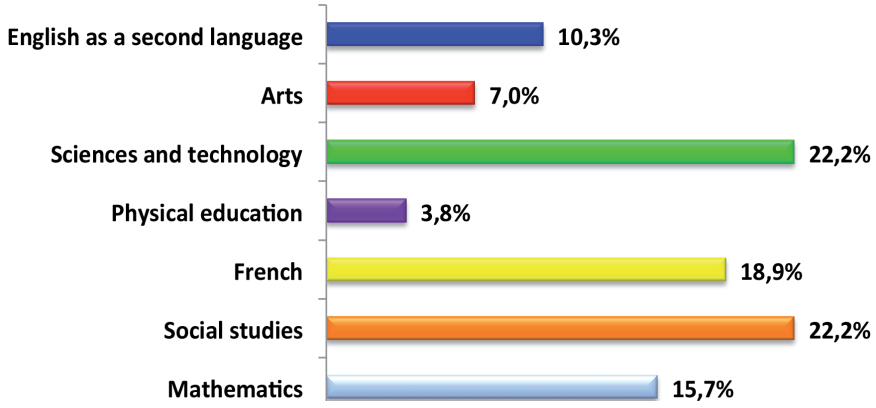


FIGURE 3. School subjects taught by the teachers who participated in the study.

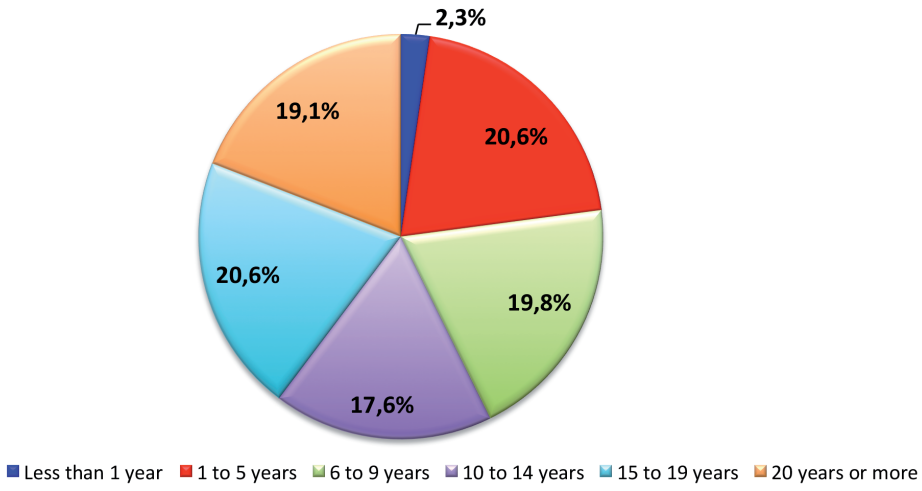


FIGURE 4. Years of experience for teachers who particpated in the study.

Our final sample comprised two use settings for the iPad at school (Figure 5):

1. Individual use: an educational setting in which each student has an individual iPad at school and at home (87% of participants)
2. Shared use: an educational setting in which students share an iPad with at least one other student and the iPad remains at school (13% of participants).

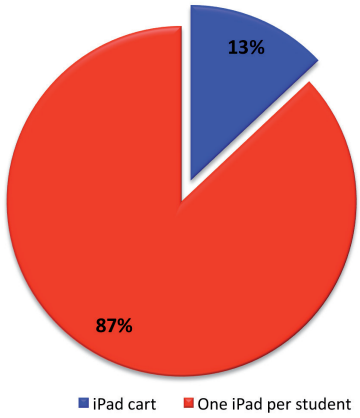


FIGURE 5. Classroom use settings for the iPad.

4.2 Main data collection instruments

We used six main instruments to collect the data for this study:

1. Online surveys for teachers (n = 302)
2. Online surveys for students (n = 6,057)
3. Semi-directed individual interviews with teachers (n = 18)
4. Semi-directed group interviews with students (n = 44)
5. Semi-directed group interviews with teachers (n = 16)
6. Videotaped classroom observations (n = 18, 60–90-minute periods).

In this preliminary research report, we focus mainly on the data obtained from the online questionnaires completed by students and teachers. To illustrate some of the findings, we also present some extracts from the individual and group interviews. The questionnaires were designed following an exhaustive review of the literature on technologies in education, particularly educational uses of the iPad, and in relation to the research objectives. The questionnaires were validated on three different occasions in subgroups of teachers and students. Both teachers and students responded to the online questionnaires. However, to maximize the number of respondents, students were asked to complete the questionnaire in class, online, using their iPads under their teacher's guidance and supervision. Teachers were given a choice of either responding in class while the students were completing their questionnaires or responding later online.

The protocol for the semi-directed individual and group interviews with students and teachers revisited the topics covered in the questionnaires, with the aim of gaining more insight into the main trends and their interrelationships. From the individual interviews, we gathered the students' and teachers' perceptions of the research objectives. The group interviews were particularly useful for broadening our understanding of how the iPads were used in class and the benefits and challenges of daily use of the iPad. The findings of the videotaped classroom observations are not presented here.

4.3 Data treatment and analysis

Because the questionnaire data comprised both Likert scales and open questions, they were analyzed quantitatively and qualitatively. Textual data (open responses) were qualitatively analyzed by coding: each segment (e.g. a group of words) was assigned to a semantic reference category, as systematically and rigorously as possible. For example, "Using an iPad in class really motivates me to learn" was assigned to the category "positive impact on motivation." The qualitative analysis was performed using an adapted version of the approaches developed by L'Écuyer (1990) and Huberman and Miles (1991, 1994). Thus, we adopted a content analysis approach using QDAMiner software, which is widely used in qualitative research (see Fielding, 2012; Karsenti, Komis, Depover, & Collin, 2011). For the quantitative analysis, we used SPSS 22.0 software to conduct descriptive and inferential statistics. We also conducted inferential statistics to further explore the iPad's role in teaching and learning, along with its motivational effect. The results will be presented in a subsequent report.

Once the preliminary qualitative and quantitative results on the questionnaires were obtained, and in order to validate the results, we met with a number of the teachers and students to determine the extent to which the findings matched their perceptions and knowledge of the issues. Based on their feedback, we then refined some of the interpretations of the results to obtain a better understanding of the educational setting.

5. Main findings

In this section, and in relation to our research objectives, we begin by presenting some data on the study participants (students and teachers). Next, in relation to the main research objective, we address how the iPad was used at school and outside the classroom before the school's iPad program was introduced into the classroom. This is followed by a presentation of the benefits and challenges for the 6,057 students and 302 teachers who participated in this large-scale study.

5.1 Uses of the iPad

First, we attempted to gain a better understanding of the students' and teachers' experiences with the iPad before it was part of a mandatory school program. The aim was to help us interpret the gathered data.

5.1.1 Previous uses of the iPad by students

The survey results showed that 53.6% of the students had "never or very rarely" used an iPad before the school's experimental program, 30.9% had used one sometimes, and 15.5% had used one regularly (Figure 6). These findings are in line with the numbers on iPad use by North American youth (see Khaddage, 2013).

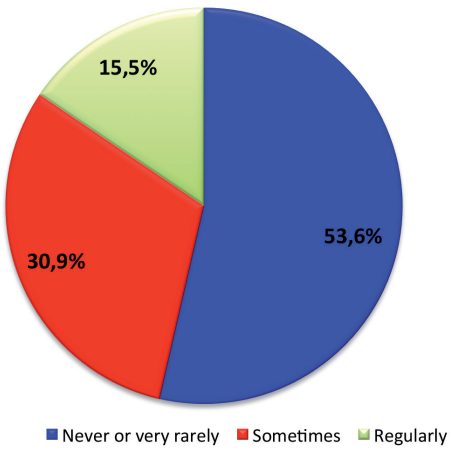


FIGURE 6. Previous use of the iPad by students.

5.1.2 Previous use of the iPad by teachers

The survey results showed that 70.2% of the teachers had "never or very rarely" used an iPad prior to the school's experimental program, 14.5% had used one sometimes, and 15.2% had used one regularly (Figure 7). These findings illustrate the crucial need to prepare teachers before iPads are introduced into classrooms. In effect, given that 70.2% of the teachers reported no previous experience with the iPad, they appeared to have had only the most basic notion of how to use it. Furthermore, the teachers appeared to have had even less experience with the iPad than their students had. Thus, 53.6% of the students reported that they had no previous experience with the iPad (Figure 6), which is 16.6% less than the percentage for their teachers. These findings illustrate the vital importance of training teachers in effective methods to integrate technological tools into their teaching practice.

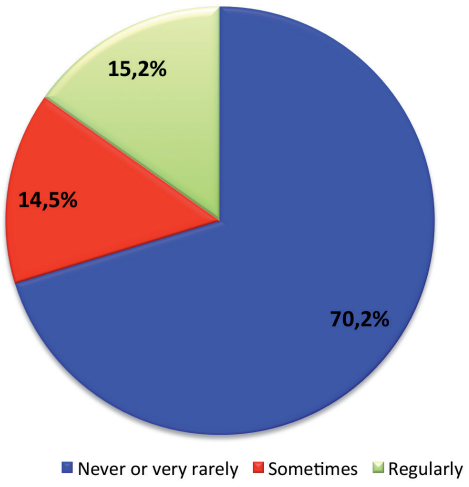


FIGURE 7. Previous use of the iPad by teachers.

5.1.3 How is the iPad actually used in the classroom?

The results indicate that, given that this was a large-scale experimental school program, the iPad was generally well used. For instance, we note that for every 60 minutes of teaching, 88.5 % of the students reported using the iPad for an average of 30 minutes or longer. Only 11.5% of students reported using the iPad for less than a quarter of the class time. Although some might consider this inadequate, it is a significant amount of time when we compare the educational use of other technologies. For example, in a previous study on laptops in the classroom (see Karsenti et al., 2012), we found that at the start of a similar experiment, teachers had great difficulty getting their students to use the laptops for more than 25% of the class time. In this large-scale, iPad study, just a few months, the teachers and students reported that they were using the iPad for over half the class time.

These findings are also largely supported by the interviews with the teachers and students, although the responses were sometimes qualified and showed some variation across academic subjects.

> *[. . .] I try to use the iPad most of the time. Sometimes it's not possible, so I ask my students not to use them, but it's rare. (T23[2])*
>
> *We use it [the iPad] in most of our subjects, except for math. (S17)*
>
> *There are only some teachers who don't want us to open them [sic]. For the others, I always have it open. (S74)*

2 All interviews were transcribed for analysis with QDAMiner. Extracts are used to illustrate the findings. The names of the interviewees have been removed to protect their anonymity and to retain data confidentiality. Participants are assigned a code, prefaced by "T" for teachers and "S" for students. The codes are numbered to allow the researchers to distinguish between the interviewees' responses, but all information that could identify the interviewees remains confidential.

5.1.4 Main educational uses of the iPad

In this study, it appeared particularly important to attempt to gain a better understanding of how the students actually used the iPads in class. Were they playing games on them, or were they working, and hopefully learning? We therefore asked both the teachers and students about the main educational applications on the iPad that they used in class. Figure 8 shows the main applications according to the frequency of the students' responses to the questionnaire, where they could choose to provide from two to five responses. Of the most frequently applied uses, electronic textbooks (etextbooks) headed the list, mentioned by 4,365 students. Next were applications such as iAnnotate and PDF Expert (mentioned by 2,047 students), which allow making notes on PDF documents and forms. Next was Pages for iPad (n = 1,667), the main word processing program for Apple's iPad. The students also mentioned that they used Dictionary (n = 1,576), which cannot be used at the same time as Pages, but can be used in parallel. The multimedia application Keynote (n = 1,232) came fifth. Next came the school's portal, which was used mainly for managing schoolwork and homework. For example, students regularly used school portal (n = 1,196) to hand in work to their teachers. Students used iStudiez (n = 707) to organize their agenda and course schedule and to see what work and homework they had to do, either individually or collaboratively. In lesser numbers, some students used Instagram (n = 145), a photo-sharing, video-sharing, and social networking application. Email (n = 144) came in last place.

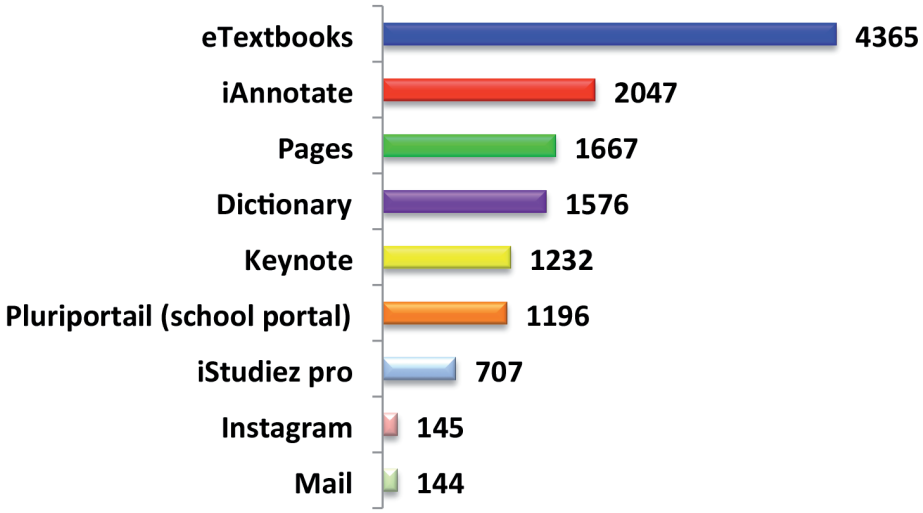


FIGURE 8. Main applications that students were required to use at school.

The interviews with the students and teachers supported these findings. It appears that the etextbooks took up a large part of class time.

We also asked the students why they rarely mentioned using email in class. Many of them reported that they very rarely used email for learning purposes:

I think that some students handed their work in by email [. . .]. But we don't use it to contact the teacher [. . .]. (S32)

I don't need to use email with my students [. . .]. I see them every day in class. (T3)

We then asked the teachers and students about the main learning tasks that they carried out using the iPad. At this point, we go beyond the notion of the iPad as a device that supports various applications (iAnnotate, Pages, Keynote, etc.) to a tool that allows performing a variety of tasks in the classroom, whether or not they are strictly academic. Figure 9 shows the students' response frequency, where they could choose more than one response. The results indicate that the iPad was used primarily to "work with the textbook" (n = 5,072). This finding is unsurprising, given that etextbooks are frequently used in schools where the iPad is mandatory. Figures 8 and 9 show that the iPads were used in class mainly for reading etextbooks and working with them. Internet searches on the iPad also took up a significant amount of class time (n = 2,645). Even though we specifically asked the students about what they were required to do in class, we were surprised to find that 2,301 students spent their time playing games on their iPad in class. This most often occurred when the students had finished a task or assignment. The students also used a variety of applications (e.g., iAnnotate) to make notes with the iPad (n = 2,264), particularly for PDF documents. A certain amount of time was spent using and updating agendas (n = 1,178). The iPad did not appear to have been used much for communications between classmates or with the teacher. A small percentage of the students' responses indicated that they used the iPad to communicate in class (n = 1,177). Students spent even less time doing projects with the iPad (n = 725), or studying and reviewing (n = 707), and they rarely used the iPad's multimedia applications in class (n = 507). A particularly noteworthy finding concerning the novelty of using this tool in class was that only 362 students mentioned that they spent time in class reading electronic books (ebooks). This suggests that the enormous potential of the iPad to improve the reading experience (see Fernández-López et al., 2013; Huber, 2012; Sloan, 2012; Zambarbieri & Carniglia, 2012) was being underused. Even though the iPad had been introduced into the classroom, many teachers had not changed the students' reading assignments to integrate it: paper assignments continued to predominate. Furthermore, we were surprised to find that many of the schools continued to require the students to buy hard copies of books, a mandatory purchase even though ebooks were available free (more specifically, classical works that were out of copyright, such as novels by Jules Verne, Victor Hugo, and Emile Zola). Knowing that reading is a core academic competency, and knowing that young people are decreasing inclined to read, it appears that the full potential of the iPad—in terms of reading—was not being used at the schools.

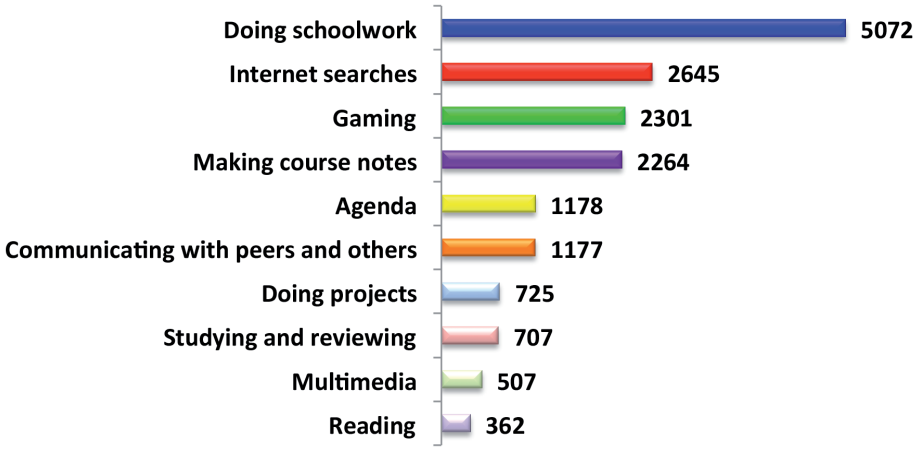


FIGURE 9. Classroom use of educational applications on the iPad by students.

The individual and group interviews confirmed the questionnaire results. For example, according to the students, they spent a large part of their time doing schoolwork, particularly with the etextbooks available on the iPad.

> *[. . .] in my classes, we always work on our textbooks [. . .]. That's how we spend all our time. (S04)*
>
> *[. . .] we spend most of our time working on the books on the iPad [. . .]. (S09)*
>
> *[. . .] once I've explained the lesson, the students work on their textbooks and I go around the class to answer their questions [. . .]. (T14)*

The students reported that they not only spent a lot of class time searching for information, they also greatly appreciated being able to use the iPad to do so. That is, they could decide how they would search for the information they needed.

> *[. . .] when the teacher asks a question, we can look for the answer on the Internet [. . .]. With the iPad, it's easy, and I like that. (S19)*
>
> *[. . .] in history, they usually ask us a lot of questions, and we have to look for the answers with our iPad [. . .] it's more interesting like that. (S42)*
>
> *[. . .] I usually ask the students to look up the information for themselves when they have questions [. . .] this gives me a break sometimes [. . .] and they seem to like it. (T52)*

We also learned that the students were often rewarded when they finished their work by being allowed to play games in class.

> *[…] we were usually allowed to play games in class […] if there was enough time at the end of the class. (S68)*
>
> *[…] for example, if you finished your math homework […] then you could play games […] not before. (S34)*
>
> *[…] we were allowed to play sometimes […], but some kids play even during class. (S64)*
>
> *[…] I sometimes let them play games when they've finished their work. (T38)*

It is important to note that we asked the students and teachers about "educational" and "pedagogical" uses of the iPad. Consequently, the students did not mention other ways that they used the iPad in class, which, according to them, were much less educational. For example, one student reported that he spent a lot of time in class answering iMessages from his classmates, and that this activity was sometimes "intense."

> *[…] there's iMessage, which is really intense. It creates conversation groups, where everybody writes to everybody […] and you answer them […]. (S28)*

5.1.5 Main uses of the iPad outside the classroom

In this study, we wanted to gain a deeper understanding of how students used the iPad outside the classroom as well, from the time they got home until bedtime. Similar to figures 8 and 9, Figure 10 shows the frequency of the students' responses, with students being able to choose more than one response. Unsurprisingly, when asked about how they used the iPad outside the classroom, 5,980 students (out of 6,057) told us that they spent most of their time on social networks such as Facebook. A large proportion of students (n = 5,739) also reported that they did their homework on the iPad. In addition, 5,739 students said that they used it to play games after school. The students also spent considerable time watching videos (n = 3,087), surfing the Internet (n = 1,592), listening to music (n = 1,302), and organizing their school agenda (n = 289). These results indicate that whereas the students did not find it very easy to use other iPad applications after school, they spent over 76% of their time on the iPad outside the classroom on social activities, amusement, and other recreational uses. When we add that they spent 12.7% of their extracurricular time on gaming, we may conclude that the students viewed the iPad as primarily an entertainment device. Parents should be advised that the survey results revealed that the students spent barely 20% of their time on schoolwork. However, we should also keep in mind that these are self-reported results. Without the potential social desirability bias inherent in such surveys, this percentage could have been significantly lower (i.e. less time spent on schoolwork at home).

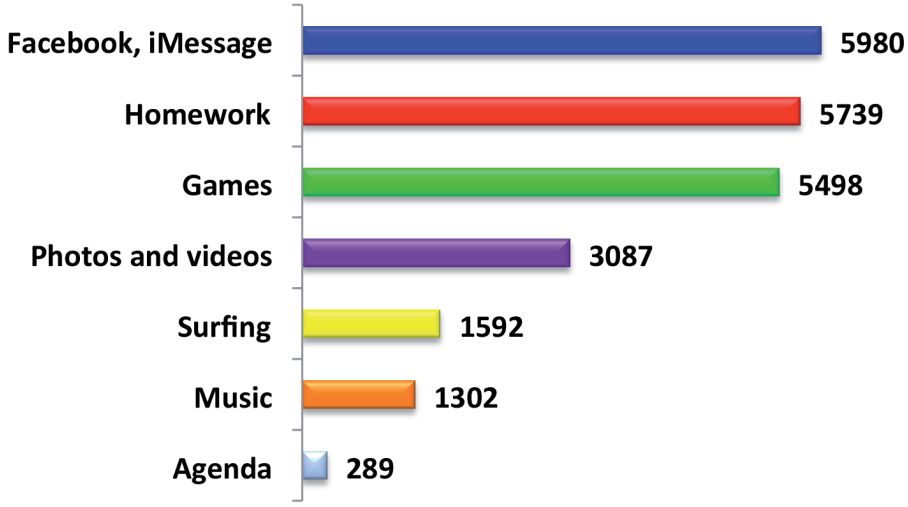


FIGURE 10. Stduents' use of the iPad outside the classroom.

The individual and group interviews clearly confirmed the questionnaire results. Generally, and unsurprisingly, the students spent most of their time on the iPad outside class entertaining themselves or socializing, although ostensibly after completing their homework.

> *[…] the first thing I do is go on Facebook […] once I get my homework out of the way […]. (S74)*

> *[…] I'm always on Facebook […] I look at it all the time […] I do my notifications […] even when I'm doing my homework […] I know when I've received a message. (S59)*

> *[…] it takes me a lot of time to read all my messages on iMessage […] one time I went to the cottage […] when I got back I had more than 1,200. (S38)*

One student said in a group interview that before he got the iPad, he never took out his school books when he had finished his homework. But now, with the iPad, it was always out:

> *[…] before the iPad, I never took my books out of my [school] bag once I'd done my homework […] now, my iPad is always out […] I always have it with me. (S17)*

One student said that before the iPad "at school," he did more sports after school. However, now, because of the iPad and the iMessages he received, he spent less time on sports:

> *[…] there's iMessage […] everybody writes to each other […] At home, it's really different too, on the weekends. Before, I did more sports, but now, I'm more on my iPad than before. (S28)*

5.1.6 Is the iPad used for writing and learning how to write?

Given that the literature reveals certain shortcomings of the iPad in terms of writing tasks as well as learning how to write (see Murray & Olcese, 2011), we asked both the students and teachers about how they used this technological tool for writing. The results are worrisome. The responses by the 6,057 students and 302 teachers show that 85% of the students (as a reminder, use of the iPad in class was mandatory) never (n =2278) or rarely (n = 2871) used the iPad to prepare written work (Figure 11). In view of the fundamental importance of writing skills in elementary and high school, this finding indicates that either the iPad cannot be used for everything at school, or else the teachers had not yet realized the full potential of this tool. When this result is combined with the significantly low percentage of students who reported that they read ebooks on their iPad, we must again conclude that the full potential of this tool was not realized.

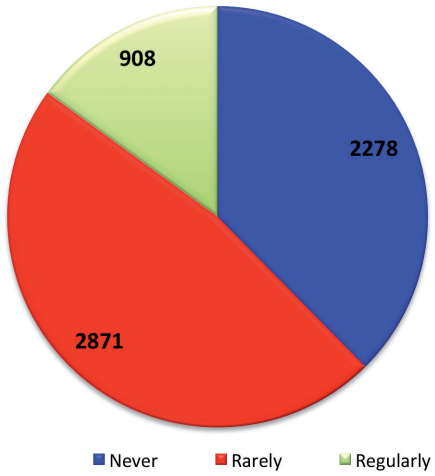


FIGURE 11. Percentage of iPad time spent on writing, as reported by students.

The analyses of the individual and group interviews clearly indicate that the iPad posed challenges for the students in terms of learning how to write. First, they did not use it often for writing tasks.

> *[…] we don't use the iPad often for writing […]. (S48)*
>
> *[…] we do our compositions on paper […]. (S18)*
>
> *[…] we just write short messages […] for real compositions […] we use a pencil […]. (S24)*
>
> *[…] I find it hard to get them to write with it. (T18)*

The interviews also show that the touchpads appeared to hinder the students from learning how to write. For instance, one student told us—with good reason—that it was as if each application was in a different box, and they did not interact, making it hard to write with the iPad.

> *[…] it's hard to write with the iPad […] to use the other tools like Antidote and Dictionary […] you have to switch applications […] it's too complicated, so you don't check it. (S17)*
>
> *[…] when I have to write a big assignment […] I use the computer […] the spell check is better […] I make less mistakes. (S38)*

6. What are the benefits and challenges for students who use an iPad at school?

One of the objectives of this study was to gain a deeper understanding of the impacts, including the benefits and challenges, of using the iPad in class, from the perspective of both students and teachers.

We began by asking the students about the benefits of using an iPad in class. Like the previous figures, Figure 12 shows the frequency of student responses, with students being able to choose more than one response. We note that portability came in first place (n = 3,223), with more than half the students mentioning it. Access to information (n = 2,320), the quality of student presentations (n = 2,014), creativity (n = 1,676), and motivation (n = 1,402) came next. More rarely mentioned was an improved reading experience using the iPad in class (n = 1,402). The fact that students could make notes on PDF documents was also considered a significant benefit (n = 1,387), as well as the fact that they could organize their work (n = 1,160). The students also appeared to realize that using the iPad allowed them to collaborate more (n = 886) and to develop their IT expertise and skills (n = 612). Finally, some students mentioned that the iPad allowed them to work at their own pace (n = 501).

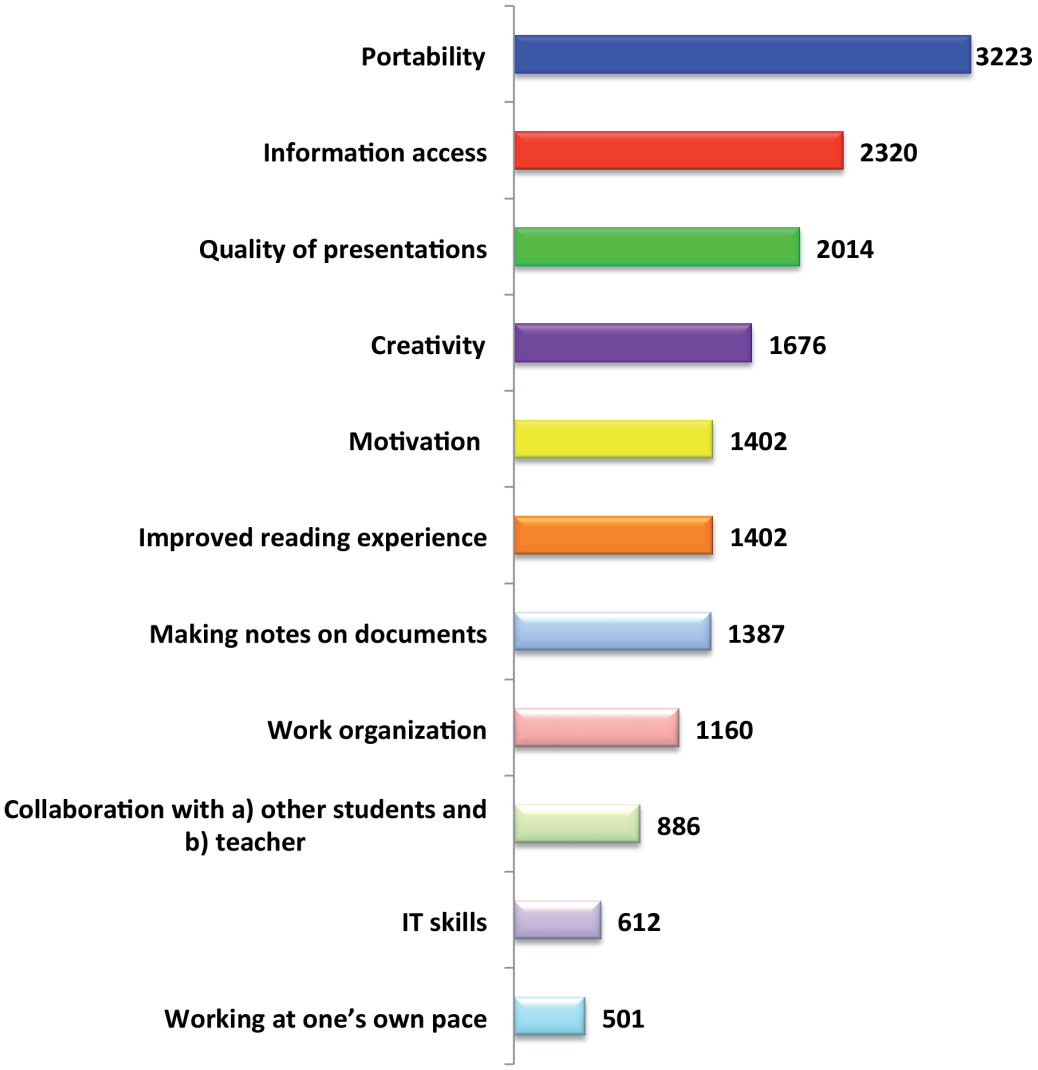


FIGURE 12. Main benefits of using the iPad in class, as perceived by students.

We also asked the teachers about the benefits of using iPads every day in class (Figure 13). Many of their responses concurred with those of the students. Thus, access to information (n = 154) and the portability of the device (n = 125) were the most frequently cited benefits. Next came greater collaboration, both among students and between the teacher and students (n = 105), the possibility for students to work at their own pace (n = 94), and easier organization of the students' work (n = 76). Higher student motivation (n = 54), albeit not frequently chosen among the questionnaire responses, appeared to "go without saying" for the teachers, as revealed in the individual and group interviews. The teachers stressed some other benefits, such as the quality of presentations that they (n = 45) or their students (n = 43) could prepare, as well as greater student creativity (39). The teachers also mentioned (n = 38) that they cut down on their use of paper. Less often mentioned were the variety of educational resources that they could use in class (n = 37), the fact that students could make notes on PDF documents (n = 34), and an improved reading experience (n = 32). Finally, the teachers pointed out that using the iPad in class developed IT skills, for themselves (n = 19) and their students (n = 19).

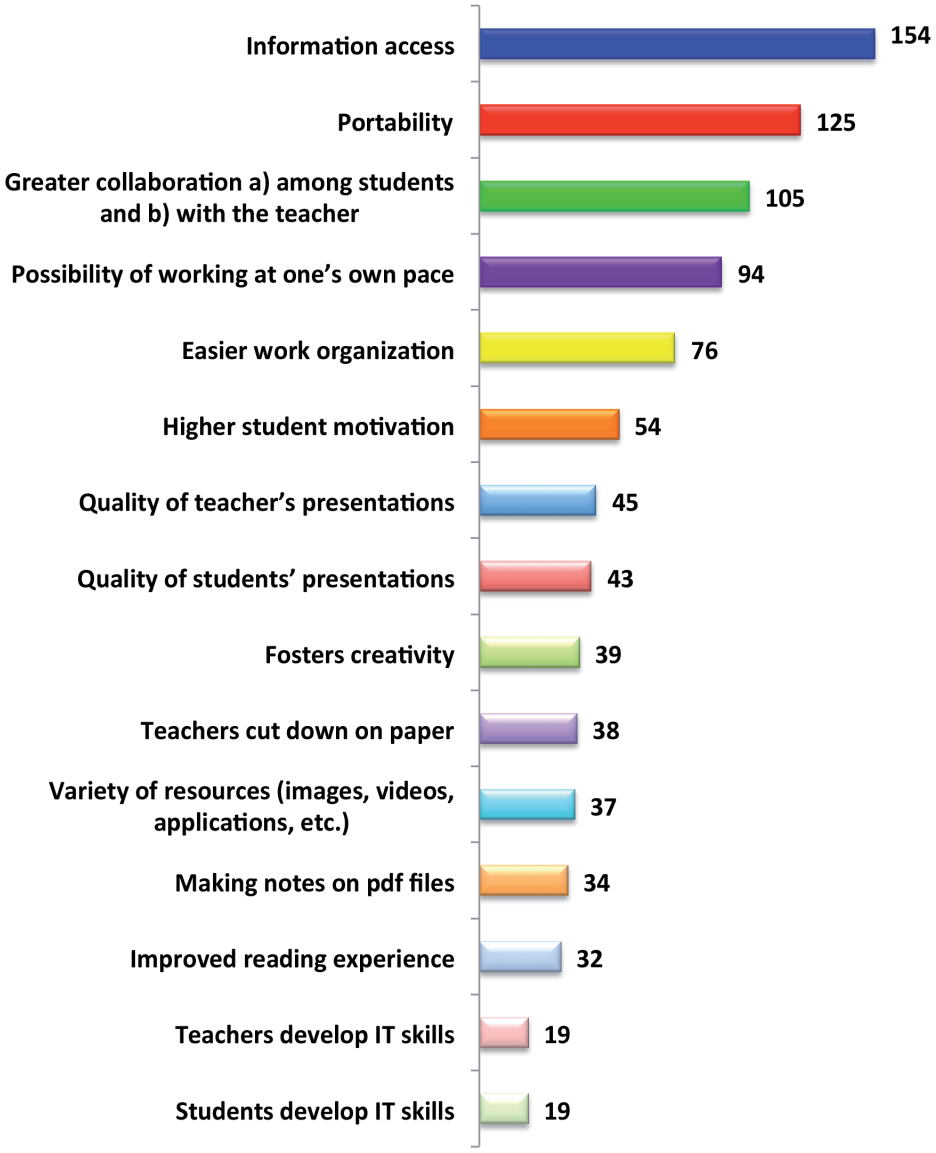


FIGURE 13. Main benefits of using the iPad in class, as perceived by teachers.

The same benefits that were mentioned by the students and teachers were also generally mentioned in the individual and group interviews. For instance, many appreciated the portability of the device:

> *[…] it's super portable […] I always have access to my books […]. (S05)*
>
> *[…] I have my whole schoolbag on my iPad […] it's super small and practical […]. (S42)*
>
> *[…] before, my schoolbag weighed a ton […] now it's a lot lighter. (S45)*

Many other benefits, such as access to information, quality of presentations, motivation, and creativity, were mentioned by both students and teachers during the interviews:

> *[…] with the iPad, I can access all kinds of information on the Internet […] it's great for school. (S28)*
>
> *[…] the presentations that we do in class with the Apple TV […] it's really professional […] it's motivating too. (T31)*
>
> *[…] if I didn't have it anymore […] [I'd be] a bit discouraged about the idea of going back to workbooks […] it's much more comfortable to use the iPad than writing on paper. It's motivating […]. (S17)*
>
> *[…] you can do so many things with the iPad […] take photos or videos for our projects […] I'm more creative with it. (S16)*
>
> *[…] it's a lot more motivating with the iPad in class […] that's why I chose this school. (S09)*

In line with the questionnaire results, the individual and group interviews showed that reading was more enjoyable with the iPad, and it was also easier to make notes on PDF documents, organize work, develop IT skills, and work at one's own pace.

> *[…] it's more fun to read with the iPad […] than with a paper book. (S08)*
>
> *[…] The iPad makes my students want to read again. (T11)*
>
> *[…] it's great that we can write notes on the textbooks that the teacher gives us. (S25)*
>
> *[…] with my iPad […] it's easier to organize my schedule […] my assignments […] my homework […] everything's easy to manage. (S14)*
>
> *[…] I didn't have an iPad before […] I've gotten used to it […] now I'm super good on it […] I can do everything fast […]. (S56)*

> *[…] we have to teach the students how to use computers […] society has gone completely digital, and our role as teachers is to prepare the students to find a place in this society […]. (T48)*
>
> *[…] I can go at my own speed […] if I don't finish something in class […] I can do it at home. (S62)*

We should emphasize as well that the individual and group interviews show that using the iPad fostered two types of collaboration: among the students and between the students and the teacher:

> *[…] before […] I didn't communicate much with my students online […] now I communicate a lot more […] I find it stimulating […]. (T27)*
>
> *[…] when we have homework to do […] we write to each other and we get help right away. (S35)*

We then asked the students about the main challenges of using the iPad in class. Figure 14 shows the frequency of responses, with students being able to choose more than one response. The most frequently mentioned negative impact of the iPad in class (n = 6,055, or > 99% of students) was that it could be distracting. Moreover (n = 1,739), and in accordance with the results on writing, the students had difficulty writing lengthy compositions with the iPad. Many students (n = 1,579) also mentioned that they had problems managing the work they had to hand in to the teacher. They (n = 1,337) also reported that they were dissatisfied with some of the textbooks, which they felt were unsuitable. Finally, a few students (n = 757) said that using an iPad actually had a negative effect on their schoolwork.

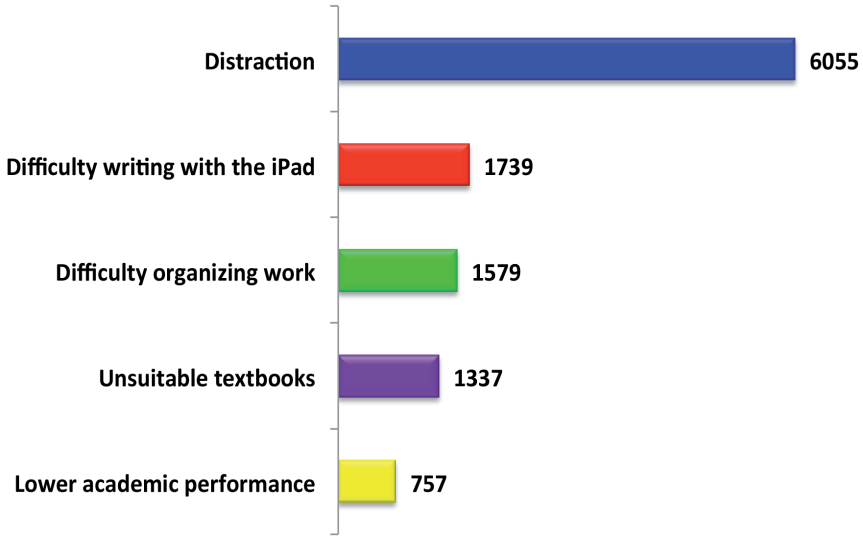


FIGURE 14. Main challenges in using the iPad in class, as perceived by students.

We also asked the teachers about the challenges involved in daily use of iPads in class (Figure 15). Like the students, most of them stressed that the iPad was a major source of distraction for the students (n = 301). The students' difficulty in producing lengthy compositions (n = 89) was also mentioned by many teachers, along with the challenges in organizing work to hand in (n = 71). Like the students, many teachers pointed out some problems with the textbooks (n = 47), particularly when all the students had to be simultaneously connected to the Internet in order to access them. Finally, a few teachers (n = 14) said that the iPad appeared to have a negative effect on the performance of some students.

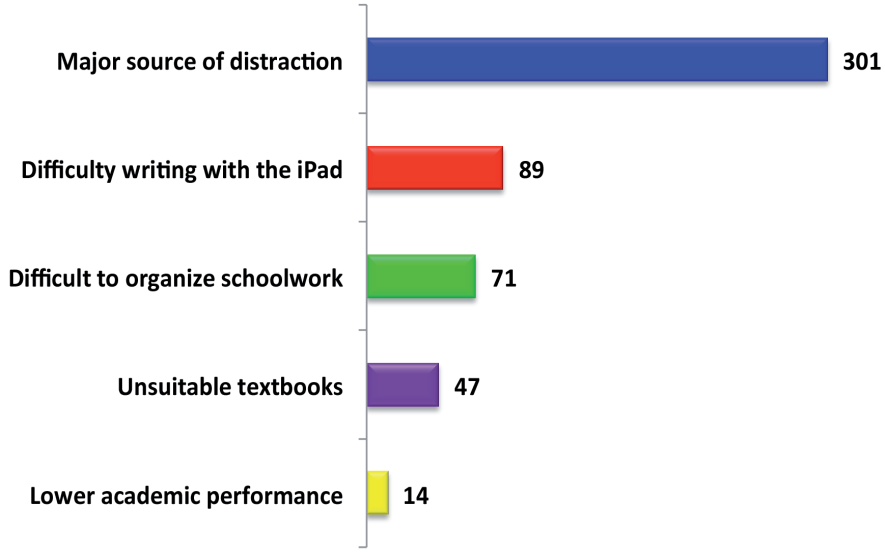


FIGURE 15. Main challenges in using the iPad in class, as perceived by teachers.

The individual and group interviews provided us with a broader understanding of the extent to which the iPad could distract students, which was a bane for teachers:

> *[…] it's hard to concentrate in class […] all my Facebook friends are online at the same time. (S12)*
>
> *[…] I get more than 400 messages a night […] it makes it hard to do my homework […]. (S32)*
>
> *[…] lots of people are doing something else in class […] the students don't listen to the teachers […]. (S03)*
>
> *[…] I can't concentrate when I see other people playing games. (S63)*
>
> *[…] for me, the biggest problem in class […] is to make sure that the students are not doing something else […] that they're not on Facebook. (T12)*
>
> *[…] Facebook in class […] it's a disaster […] the students are all on it all the time […] or they're sending messages […] sometimes I just don't know what to do any more. (T34)*

The interviews also reveal problems concerning textbooks that were accessible only when students were connected to the Internet:

> *[…] one time the Internet was down […] and none of my students had access to their book […] I had 32 students in front of me who didn't know what to do […] and neither did I! (T10)*
>
> *[…] some of the textbooks are no good […] the exercises don't work […] that's really the worst thing about the iPad. (S37)*
>
> *[…] with some books you have to go on the Internet for it to work […] when I take the subway […] I can't do my homework. (S42)*

In order to gain a more comprehensive picture of both the benefits and challenges of using a touchpad in class, and to examine how these benefits were perceived differently (or not) between students and teachers, we decided to compare their perceptions graphically in a single fi gure (Figure 16). This fi gure shows the perceptions of the students and teachers about some of the potential benefits and challenges of using the iPad in class. On the one hand, the positive scores (from 0 to 2) show gradual benefits (improving from "somewhat" to "a lot").

On the other hand, the negative scores indicate certain challenges involved. Relatively few differences are observed between the perceptions of students and teachers. The only major challenge appears to be the problem of concentrating in class due to the presence of the iPad,

mainly because it is a source of distraction. Surprisingly, the various benefits appear to be perceived similarly by the two groups.

Thus, there was an impact on academic performance, albeit weak. The greater access to a variety of resources and the development of IT skills appear to be the most significant benefits for both teachers and students. Access to textbooks was also perceived positively, but only somewhat. Motivation was perceived positively by teachers and students, with only a minimal difference between the two groups. Collaboration, doing schoolwork, preparing presentations, and creativity were all perceived positively, but again to a low degree. On the other hand, perceptions of the impact of work organization differed between students and teachers. Teachers perceived a lower impact of the iPad on the students' ability to organize their work, but students perceived the touchpad as positive insofar as it helped them organize their classwork. This finding was confirmed by the questionnaire results.

In order to obtain a more general overview of the benefits and challenges from the perspective of both students and teachers, we decided to compile them into two inclusive lists comprising 15 benefits and 9 challenges associated with using the iPad for education, according to the questionnaire responses and the individual and group interviews with the students and teachers. These are presented in Section 9 (Conclusion).

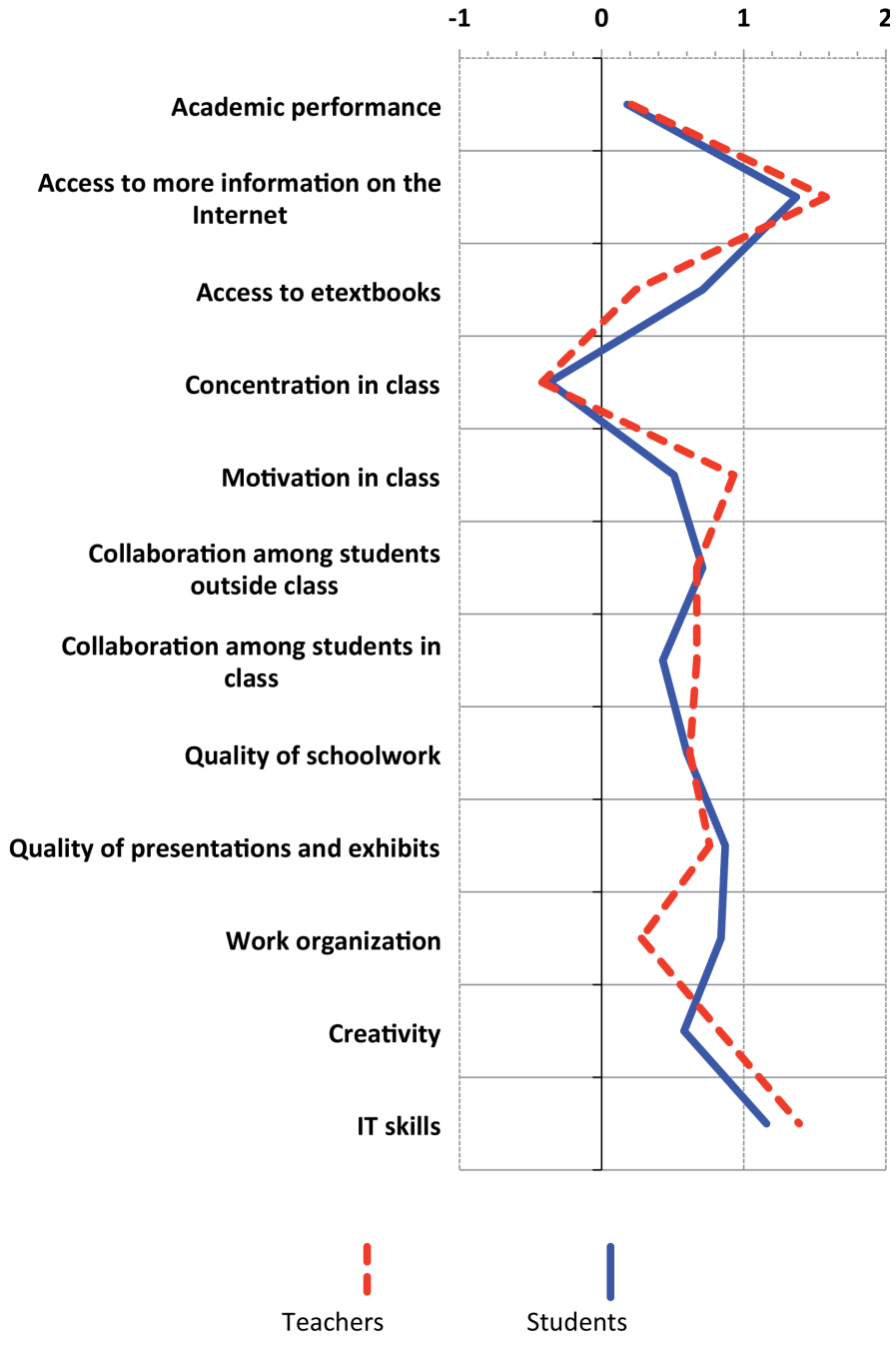


FIGURE 16. Benefits of using the iPad, as perceived by students and teachers.

7. What is the overall satisfaction with the iPad at school?

We have presented the benefits and challenges involved in using the iPad in class. As a follow-up, we felt it relevant to determine the overall satisfaction of the students and teachers with using the iPad. The results highlight the greater satisfaction of the students compared to the teachers. On average, the teachers felt that they were moderately satisfied with using the iPad in class (average score of 3 out of a maximum of 5). The students felt that they were moderately to very satisfied with using the iPad in class (average score of 3.6 out of a maximum of 5).

We wanted to delve further into the overall satisfaction of the students and teachers who participated in the study. Generally, as many students as teachers appeared to be satisfied. However, as Figure 17 illustrates, the students appeared to be more satisfied, with 56% reporting that they were very or extremely satisfied.

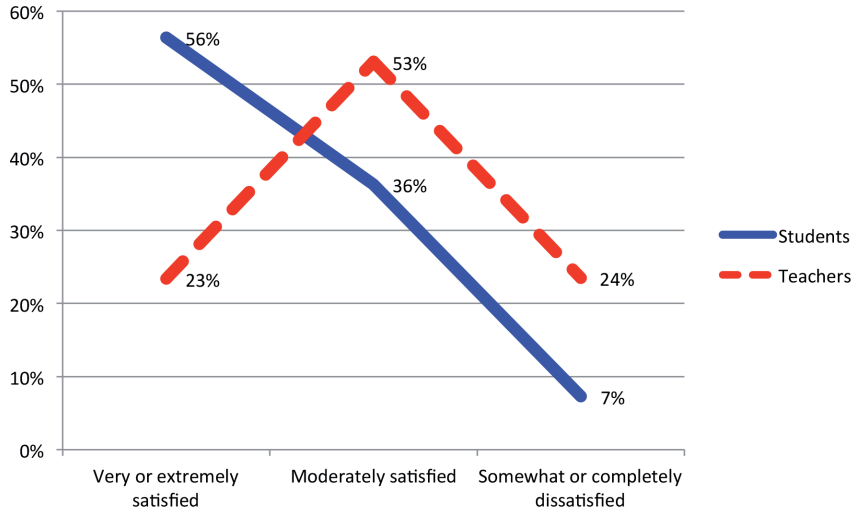


FIGURE 17. Degree of satisfaction with using the iPad in class for students and teachers.

We applied a new method by asking the students to summarize in one word their experience of using the iPad for learning (Figure 18). About 2513 students responded with the idea of "fun" (using vocabulary such as "cool," "stimulating," etc.), whereas 744 found it "useful." Some of them appeared to enjoy the experience less, describing the device as "useless." Surprisingly, no student mentioned the fact that the iPad helped them learn more.

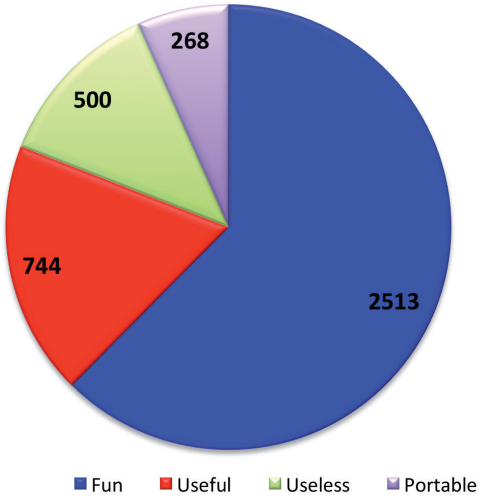


FIGURE 18. Grahpic representation of the four main terms used by students to describe the overall experience of using the iPad in class.

8. Teachers' suggestions

We asked the 302 teachers to offer suggestions to all education stakeholders involved in implementing projects in which students are given individual touchpads. Figure 19 shows that the teachers had a number of ideas, which would be expected, given that this was the first year of a massive program to introduce the iPad into the classroom. Among the many ideas put forward, training topped the list (n = 73), followed by more (free) time (n = 36) to plan their lessons.. In other words, the teachers needed to be trained in how to use the touchpads for classroom learning, and they also needed time to integrate the newly learned methods into into their practice and lessons plans. Use policies for the iPad came third (n = 24). This is not surprising, given that the students were too often distracted by texting or social networking, which became a real bane for the teachers. Additional financial investments (n = 23), setting up learning circles for teachers to exchange ideas (n = 21), and better technical support (n = 19) were next. More effective strategies for student accountability were also proposed. Teachers would also like to have a shared platform for documents (n = 16), in order to deal with the many challenges involved in sharing documents with the students. Many teachers also stressed that they wanted to be able to simply and rapidly block the entire class from accessing their iPads (n = 15). Finally, some teachers would like to receive a list of useful iPad applications ahead of time (n = 9).

These suggestions may be summarized as three main themes:

a) Training and resources (training, time, technical support, practice communities, list of relevant applications, etc.)

b) Use policies and student accountability strategies

c) Classroom management tools (shared platform for documents, simple and rapid process to block student access).

These are all promising avenues to explore for schools that plan to initiate similar experiments in the coming years.

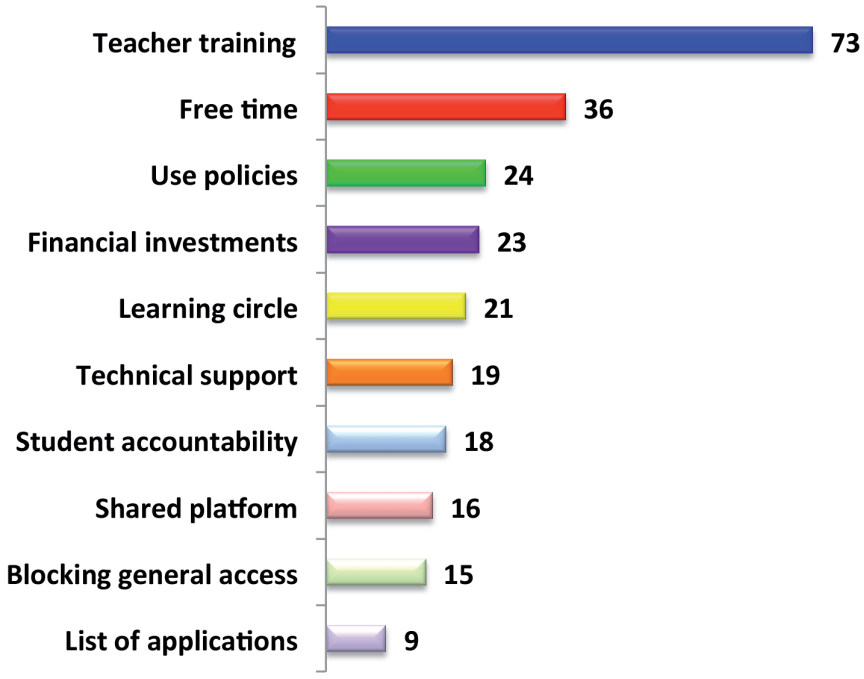


FIGURE 19. Main suggestions by teachers for future iPad projects at school.

9. Conclusion

In this study, for which Phase 2 is ongoing, we aimed to determine through the perceptions of students and teachers the main uses, benefits, and challenges involved in daily use of the iPad in class. We also wanted to find out whether this innovative technology could provide a vital lifeline for schools or whether it is merely a cleverly marketed commodity. We carried out a survey of students, teachers, and other education stakeholders, and the results are presented in this report. We also conducted semi-directed interviews in order to examine additional aspects and so that we could triangulate the data. In all, 6,057 students (from Grade 6 to 10) and 302 teachers responded to the questionnaire. In addition, we held 44 group interviews with the students (from 6 to 9 per group) and 16 group interviews with teachers. We supplemented these with 18 videotaped classroom observations. This large-scale research method enabled us to obtain a more comprehensive picture of the uses, benefits, and challenges associated with the use of touchpads at school. We must remind the reader that this was the first time that any of the schools had experimented with using iPads in the classroom, and that a certain number of challenges were to be expected.

First, the findings demonstrate that using the iPad at school provided many benefits, as highlighted by both students and teachers:

1. Increased student motivation
2. Greater access to information
3. Portability of the device
4. Ease of making notes on PDF documents
5. Ease of organizing work
6. Quality of students' presentations
7. Quality of teachers' presentations
8. Greater collaboration a) among students, and b) between students and teachers
9. More creativity
10. Variety of resources used (images, videos, applications, etc.)
11. Students can work at their own pace
12. Development of students' IT skills
13. Development of teachers' IT skills

14. Improved reading experience
15. Teachers can cut down on paper.

The collected data also allowed identifying a number of challenges for both students and teachers. These challenges were revealed in the questionnaire responses as well as the group interviews. The following are the nine main challenges encountered:

1. The greatest challenge for the teachers, who found it a major headache, was that the touchpads provided a **distraction** for the students. They enabled the students to do something other than listen to the teacher, and perhaps too easily so. Even at a young age, the students soon discovered the iMessage and networking functions that diverted their attention so frequently.
2. Many students and teachers stressed that they had problems **writing lengthy texts** with the iPads.
3. In line with the above challenge, it must be noted that the iPads did not make **learning to write per se** easier. One notable problem was that the devices and applications did not yet include all the help features in a single application. Therefore, **learning to write** appears to be a major drawback of the iPad. Although the various iPad applications helped younger students practice forming their letters, once they passed that stage, the resources were less useful and more complicated compared to those typically found on computers.
4. Many students and teachers felt that some of the **textbooks were unsuitable** for working with touchpads. For example, they might require continuous Internet access.
5. Many teachers also spoke about the challenges of **planning** their courses. It is not so easy to make the transition from a physical book to the iPad, and some found the transition too rapid.
6. **Organizing** the students' work was very challenging for some teachers. Many platforms were involved, and numerous teachers had the impression that they were doing three times the work, and that in the end, it was more complicated than when they used traditional paper and pencil.
7. Many teachers were **poorly informed** about the resources that were available for the iPad.
8. In addition, the **ebooks were underused**. And yet, this is a flagship function of the touchpad. In fact, the results showed that less than 3% of the students reported that they read books on their touchpad screen.
9. Lastly, many students and teachers mentioned that because they were distracted by the touchpads, their **academic performance suffered**.

We observed that the benefits (15) identified in this large-scale study largely concur with those found in the literature, but with some notable differences. In our case, few or no students or teachers reported that the touchpads enabled them to learn more. On the contrary, both students and teachers stressed the potentially negative impact of touchpads on learning, particularly because this novel technology can distract the class. Moreover, from our observations, it is clear that the teachers were dealing with considerable challenges, and that life was not all rosy when the touchpads were introduced into the class, especially when the teachers were not well prepared to make the best use of them. Nevertheless, when training was provided (pedagogical and/or technological), and when there was adequate support during implementation, we observed that the challenges were fewer. This finding concurs with the works of certain authors (see Elliott, Livengood, & McGlamery, 2012) who demonstrated that when teachers lacked the technical and pedagogical information to effectively integrate this new tool, they usually had plenty of problems. The teachers echoed this sentiment when we asked them to propose suggestions for using the iPad at school: training generally topped the list.

Aside from training teachers, we should recall the teachers' three main suggestion themes. All the teachers mentioned training (training, time, technical support, learning circles, list of applications, etc.), but they also raised the idea of establishing use policies and student accountability strategies. In addition, the teachers wanted simple and effective classroom management tools, not only for sharing documents with the students, but sometimes for blocking student access to the touchpads.

As mentioned above, these are promising avenues to explore for schools that are planning similar experiments in the coming years. The results of this primary study open the way to further research, including:

1. More systematic studies on the impact of enriched technological environments on students' academic performance
2. More specific examinations of how teachers and students adapt when the class moves from a more traditional learning style to an iPad learning environment
3. Studies on the relationships and interactions between students' use of the iPad at school and at home
4. Longitudinal studies to track the academic and professional paths of students who attended iPad classrooms in order to determine the impact extent of this innovative experiment.

In this summary report, it was not possible to respond to all the questions raised about the use of iPads in education. Instead, this study invites educators to reflect more thoughtfully on how this tool can be used at school. It is important to remember that the technologies and touchpads per se do not foster student motivation or improve their performance. What counts is the use that is made of them, by both teachers and students, and possibly both inside and outside the classroom. In other words, these technologies have a role to play in education only insofar as they can make a meaningful contribution to the school's mission, which is to provide instruction, socialize, and provide qualifications. Based on the results of this study, we may propose that iPads, and specifically the iPad, have enormous educational potential—as demonstrated by the list of benefits reported by students and teachers—but that, contrary to what many believe, their advent in schools will not be problem-free. In fact, this new technology may pose challenges that teachers will find difficult to overcome, especially if they are poorly prepared. The key to successful integration of the touchpad in the classroom, and arguably for all newly introduced technologies, is to provide teachers with adequate training. In future studies, it would also be useful to investigate whether better preparation of students would also lead to more productive use of the iPad in school.

10. Key recommendations

Based on the results presented in this report, we developed a list of key recommendations for all education stakeholders involved in implementing similar iPad projects.

1. **Teacher training and networking**. In line with the teachers' recommendations, it would be crucial to train teachers in both the pedagogical aspects (class management and subject teaching methods) and technical aspects of student use of iPads at school. Resources should be made available to teachers ahead of time, according to the subjects they teach. The training should be combined with designated free time so that teachers can try out newly learned practices, preferably in teams. During training, teachers should be reminded that the iPads per se do not motivate students or improve their performance, and that what counts is how they are used. As part of their training, teachers should join networks and create learning circles at the school and/or province level.

2. Besides being provided with training, teachers should be made aware of both the benefits and challenges of iPads in education, particularly in terms of **class management**. Our study revealed that the better teachers do not remain in front of the class, but instead circulate among the students. The results also showed that the better teachers, even though they get their students to use the iPad regularly, ask them to put them away at times in order to get their full attention. Of course, there are no foolproof classroom management strategies for this new teaching and learning environment, but these two suggestions immediately arise from the results of this study.

3. **Student training and accountability**. In line with the main challenge for teachers, which was the distraction that iPads in class can cause, it would be critical to implement various strategies to train the students in how to get full use out of their iPad and to ensure accountability, in and outside of class. A chart or use code should be set up so that both students and teachers could participate in developing guidelines. The students should rapidly be shown the possibilities for learning with this tool. A particularly important step for any school that initiates similar programs would be to promote responsible use of the touchpad by teaching about digital citizenship. For instance, the results of this study suggest that ways must be found to foster suitable behaviors without constraining educators from monitoring the students' use of the iPads. However, this might be wishful thinking at schools where teachers are responsible for hundreds of students each.

4. **Get students to read books on their iPads**. Our results clearly show that too few students read books on their iPads, even though this is one of the flagship functions. It appears critical to promote reading on the touchpad, and to rekindle students' interest in reading in general via the touchpad.

5. **Use iPads for learning to write**. Education stakeholders should be aware—and this is backed by clear evidence—that the iPad is not yet an ideal tool for learning how to write. Knowing this drawback, it might be easier to set up more targeted learning activities to help offset this shortcoming.

6. **Textbooks should be suitable and accessible at all times**. Our results clearly show that certain textbooks are more suitable than others. First, textbooks should be accessible at all times. In addition, the activities they contain should be interactive and they should appeal to the students.

7. Schools that undertake similar initiatives should make an effort to **raise parental awareness** of not only the many potential benefits of touchpads at school—which seems to have occurred already—but also the challenges involved in certain uses of the iPad. This awareness raising of potential challenges does not appear to be current practice in the schools. Even though the benefits largely outweigh the challenges, it would be critical to set the parents straight so that they could cope better with problems as they arise.

8. **Designers of educational applications** could take into account some of the clearly identified needs in this study when they develop applications. For example, corrections could be suggested as students write their texts, as do many computer word processing programs.

9. It would be important to **conduct studies** on experimental programs implementing iPads in schools, not only to advance the understanding of the benefits, but also, and above all, to help overcome the stumbling blocks for students, teachers, and all other education stakeholders involved in these projects.

10. Finally, we must encourage government agencies and teacher training educators to provide **current and future teachers** with a coherent and accurate vision of how mobile technologies such as the iPad can contribute to the school's mission: to provide instruction, socialize and provide qualifications. Our teachers of the future must be shown how these technologies can be integrated into training programs, and how they can play a role in achieving learning and competency objectives.

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12. Table of figures