When Students Misuse *iPads* in the Classroom

4th and 8th Grade Students' Attitudes and Opinions

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Abstract

In the current study, we analyzed 400 essays from 4th and 8th grade students in a city in the northeastern region of the United States on the topic of whether iPads should be used in the classroom setting, especially when students abuse the privilege. Using thematic analyses to code the essays, we found that students from both grades were sophisticated and discerning in their attitudes and views about the potential benefits and limitations of using iPads in schools. We also found that although a majority of 4th and 8th grade students (87.5% 4th grade; 68% 8th grade) generally supported the use of iPads in their classrooms, a larger percentage of 8th grade students (30%) were opposed to the decision. Students from both grades spontaneously justified their attitudes by explaining how iPad might affect individual and collaborative learning.

Keywords

educational technology – attitudes – individual learning – social interaction

In a recent article published in the *New York Times*, opinion columnist Farhad Manjoo commented that popularity of smartphones and tablets is the “only one tech trend worth paying attention to in the 2010s”. He wrote:

In one of his last interviews before his death in 2011, [Steven] Jobs declared the iPad to be the future of computing. ‘PCs are going to be like trucks,’ he told the journalists Kara Swisher and Walt Mossberg—meaning the traditional Mac and Windows machines would still be around, but like big rigs, they’d be used by a small set of power users for a dwindling set of specific, high-power tasks. The ‘cars’ of the tech industry, as Jobs saw it, would be phones and tablets.

Although concerns over their conventional use in K-12 education (DeWitt, 2013) remain, the overwhelming public acceptance of the tablet technology, such as the iPad, has been an essential requirement for its full integration in educational settings (Cardoso et al, 2015; Mangen & Kuiken, 2014). In recent years, educational researchers have responded to this trend by studying the effects of incorporating tablet computers in teaching and learning in different learning contexts. For example, researchers have studied how iPad-based software can teach numeracy skills (Jowett, Moore, & Anderson, 2012) and communication skills (Lorah et al., 2013) to children with autism-spectrum disorders, identified selected apps on tablets that provide unique approaches to helping students enhance their early literacy learning goals (Hutchison, Beschoner, & Schmidt-Crawford, 2012), and examined how to promote academic engagement for elementary school students with language-based disabilities (Cumming & Rodriguez, 2013). iPads have also been used to introduce STEM concepts in a mixed-ability inclusive preschool classroom (Aronin & Floyd, 2013).

Aside from exploring how tablet computers enhance the learning experience for learners with particular needs, a growing body of research has also reported students’ learning outcomes when tablets are implemented in routine classroom environments. Nguyen, Barton and Nguyen (2015) systematically reviewed research on the use of iPads in higher education, concluding that iPads potentially enhance students’ learning experience and engagement. They also discovered that teaching staffs found tablets beneficial in electronic information dissemination, academic administration and professional development support. A more recent review by Haßler, Major and Hennessy (2016) reviewed the learning outcomes associated with tablet use in primary and secondary school children. Haßler and colleagues found that 16 out of the 23 studies that were included in their review described mainly positive learning outcomes.

They also identified several affordances that contributed to successful use of tablets: the integration of multiple features within one device, easy customization, interactive screen, and portability.

A few studies have also explored how tablet computers can enable students to interact more collaboratively during everyday classroom activities. Kucirkova, Messer, Sheehy, and Panadero (2014) investigated the learning engagement of Spanish preschoolers when they were using educational apps in small groups and found that open-ended apps stimulated more peer discussion. Falloon and Khoo (2014) explored the type of talk 5-year-old students engaged in while they were using the iPads and interacting with each other and their teachers. They concluded that iPad's public work-space affordances could improve the talk quality of students. However, Falloon and Khoo also emphasized the critical pedagogical role of teachers in helping students raise their "talk quality." Additionally, Falloon (2015), using surveys and focus group data from New Zealand elementary school students to investigate the particular features of iPads and apps that affected students' ability to work collaboratively, found that iPad's design, robustness, reliability and ease of networking supported the multidimensional collaboration between students, teachers and family members, enabling students to get instant feedback that can be used to improve their work.

Although the above studies have suggested that tablet computers provide innovative characteristics that enable them to serve as supportive tools in the classrooms, there have been very few studies that have focused on the actual attitudes of the users. In one such study using questionnaires, Dündar and Akçayır (2013) investigated 9th grade students' attitudes and expectations of tablets in Turkish high schools. Results showed that after initial use for 6–7 months, students generally had a positive attitude towards tablets. According to the participants, tablet PCs should be used in schools because they made education more entertaining, they were much lighter than the laptop computers and the numerous textbooks that students carry, they were highly practical and enjoyable, and had made doing homework easier. Viberg and Grönlund (2013) found that college students from both mainland China and Sweden had very positive attitudes toward mobile-assisted language learning, with women having slightly more positive attitudes than men. Targeting a much younger age group, Eisen and Lillard (2016) explored how preschool children viewed touchscreens versus books for learning different types of information in an experimental setting. They found that younger children had no preference between books and touchscreen devices when they were asked to learn about a variety of familiar topics, but 6-year-olds chose a touchscreen device to learn about up-to-date information such as "today's weather".

While evidence from these studies points to the acceptance by students of tablet computers, it is worth noting that all the above studies have explored students' attitudes and opinions using feedback from students' responses to questionnaires or laboratory designed studies. To our knowledge, no studies to date have explored students' own attitudes or opinions toward tablet use in schools using more open-ended methods. In addition, even with the now (2020) pervasiveness of iPads (and other tablets) in use in educational settings, there is still little empirical research on the implications of iPad misuse in the everyday school context.

In the current study, we identified 4th grade and 8th grade students' attitudes and opinions about the use and misuse of iPads in a classroom setting by analyzing their hand-written expository essays on these topics. The essays were written in class as part of their curricular work in an authentic school context. We specifically explored whether there were any developmental (age/grade) differences in 4th and 8th grade students' opinions about: (1) whether iPads should be used in schools; (2) how iPads could enhance or harm academic learning; (3) the possible positive and negative influences of iPads on social interactions in the formal educational setting.

1 Method

1.1 Data Collection

The data used in the current study were collected as part of the Catalyzing Comprehension through Discussion and Debate (CCDD) project, which examined the reading comprehension and writing efforts of students in schools from low income communities across social studies and science subject areas in grades 4 to grade 8 (Duhaylongsod et al, 2016). The task for the students in the context of their language arts classes was to write a persuasive essay about whether tablet computers should be used in schools. Since Apple devices have dominated the tablet market (Filloux, 2011), we chose to use iPads to stand for tablet computers in the instructions. Before the students wrote this essay, classroom teachers at the participants' local public schools provided all participants with a set of written instructions and blank worksheets. The instruction stated:

Imagine that your school decided to give iPads to all students, so everyone has the opportunity to use iPads for learning. Most teachers like the iPads because all students can use online dictionaries and search the

internet for interesting information. But in the last few weeks, students have used their iPads to post videos with mean comments about other kids online. Now, many parents are worried about the situation. Because of this problem, your principal has decided that iPads will no longer be allowed in School! Write an article for the school newspaper that argues for or against allowing iPad at your school, mak[ing] sure to give specific reasons to support your position and to convince the people who read the article to agree with you; explain[ing] how the Principal's decision can impact you and others, [and] discuss[ing] other things that the school community could do to solve the iPad problem.

Teachers then read through the instructions with the students and answered possible questions they might have had about the instructions. All participants were then given one classroom period (approximately 40 minutes) to hand-write their essays, which were then collected by the teachers. This procedure was carried out in 21 schools and 3546 essays were obtained. From this total, a subset of 200 essays written by fourth graders and 200 essays written by eighth graders were randomly selected for in-depth coding. These 400 essays were written by students in Gloucester, Massachusetts,¹ USA, which is a middle-level income city with primarily Caucasian residents.

1.2 *Procedure*

To reliably develop a coding manual, we first used a stratified random sampling technique to draw a random sample of 80 essays from the whole set of student essays ($n=3546$) collected in the fourth year of the CCDD project. We then conducted a mixed etic/emic thematic content analysis. We first read each essay for the student's overall stance toward whether iPads should be reinstated in the school. This analysis yielded a range of Stance codes from fully positive to fully negative. We then read the essays for the students' rationales (or Reason codes) for each stance. Following a preliminary reading of the 80 sample cases for rationales, we noticed that students tended to mention two main themes in their reasons – some related to how the iPads influenced individual learning, and others referring to social interactions. We subsequently coded students' textual responses as one of two kinds of topical themes: Individual Learning codes, and Social Interactive codes.

¹ We choose this single district for our in-depth coding primarily because of the availability of the 8th grade students in the sample.

We then developed a preliminary coding manual with all the code definitions, inclusion and exclusion criteria, and anchor examples. Reliability for the coding manual was assessed by having two coders independently code a subsample of 22 randomly selected essays from the 80 sample cases; percent agreement averaged 97.31% for these essays (range = 85.91–100); for interrater reliability, this trial yielded a mean Cohen’s kappa value of 0.64 (range =0.23–1) across all Reason codes. The two coders then conducted a consensus interrater discussion to clarify the definition of those seven of the originally identified 34 codes that initially generated low agreement. The first author then used the revised coding manual to code a newly selected sample of 400 essays using the thematic content codes. The data used in the final analysis comprise these 400 randomly selected essays as written by 4th and 8th grade students in the single school district.²

2 Results

2.1 Analysis 1: students’ Stances for the Use of iPads in Educational Settings: descriptions and Findings

In our initial reading, we identified six stance codes; the definition for each stance is presented as follows:

As we see from Table 2, the majority of students from both grades were supportive of the use of iPads in schools, with similar percentages of students across the codes *Positive*, *Positive with awareness of restrictions*, *Positive with awareness of risks*, and *Mixed*. The difference in attitudes between the two age groups mainly lay in the percentages of students who thought negatively about introducing iPads in schools.

To conduct further analysis, we collapsed the three positive codes into one *Generally positive stance*, kept the *Mixed stance*, and collapsed the two negative codes into one *Generally negative stance*. The participants’ general stance was significantly associated with grade, $\chi^2(2, N = 400) = 24.33, p < .0001$ (see Figure 1). More specifically, a larger percentage of 8th grade students held a generally negative stance towards the use of iPads in the school setting (30.0%) compared with the 4th grade students (10.5%).

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2 The data comprises 11.28% of the whole sample (n=3546). We used a stratified random technique to select 400 essays, 200 essays were written by 4th grade students and another 200 were written by 8th grade students. Eight additional essays were excluded for failure to address to the essay topic.

TABLE 1 Stance Codes

Code Name	Description	Example
Positive	The participant fully supported the use of iPad in schools.	"I think we should keep the iPad because we can use iPads for some help."
Positive, with awareness of restrictions	The participant generally supported the use of iPad, but stated that iPad should only be used under certain restrictions.	"We should keep the iPads but the school should use firewall to make them safe and appropriate."
Positive, with awareness of risks	The participant generally supported the use of iPad, but also acknowledged potential drawbacks the iPad might bring to schools.	"Although buying iPads and giving them to students has its disadvantages, I still think it should be used in schools."
Mixed	The participant had a mixed opinion about the use of iPad in schools and mentioned both a positive and a negative attitude without explicitly stating any preference.	"I think we should have iPads in school.....I think the principle should take away the iPads....."
Negative with awareness of benefits	The participant generally disapproved the use of iPad, but also acknowledged potential benefits the iPad might bring to schools.	"It [The iPad] helps but it's not right to hurt people. I think it's right for the principle to take it away."
Negative	The participant completely disapproved of the use of iPad in schools.	"I believe the iPads given to us was[were] a mistake."

TABLE 2 Percentage of 4th and 8th Grade Students for each Stance code

	Positive	Positive with awareness of restrictions	Positive with awareness of risks	Mixed	Negative with awareness of benefits	Negative
4th Grade Students % Stance	15.5	55.5	16.5	2.0	2.0	8.5
8thGrade Students % Stance	11.0	40.5	16.5	2.0	9.5	20.5

This is the percentage of total participants from each grade.

FIGURE 1 The percentage of generally positive stance, generally negative stance or mixed as a function of grade

2.2 Analysis 2: student's Justification for the Use of iPads in Educational Settings: descriptions and Findings

In Analysis 2, we identified two themes that emerged in the students' justifications made about the use of iPads in the educational setting: The Individual Learning theme and the Social Interactive theme. The Individual Learning theme was related to the quality, incentive or convenience of the individual learning experiences in the academic setting. The Social Interactive theme, on the other hand, was related to the students' perceptions of the impact of iPads on the interactions between peers or teacher-student dyads.

Overall, we found that a smaller percentage of the 4th grade sample of students mentioned at least one code under the Individual Learning Theme compared to the 8th grade students, the difference being statistically significant, $\chi^2(1, N = 400) = 8.84, p = .003$. We also discovered that the percentage of participants who used at least one code under the Social Interactive theme differed slightly across the grades, $\chi^2(1, N = 400) = 7.38, p = .007$. More specifically, a larger percentage of 8th grade students mentioned at least one code under the Social Interactive theme (42%) compared to the 4th grade students (29%) (See Figure 2).

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To look for possible differences in the attitudes of girls and boys found in at least some previous studies, we also focused on a sub-sample of 180 participants

FIGURE 2 The percentages of participants who mentioned at least one code under the Individual Learning or Social Interactive themes as a function of grade
Note: Of all participants (N=200) from each grade.

(90 females) from the 200 8th grade sample.³ We found no difference in students’ general attitudes toward the use of iPads, with both girls and boys showing similar high levels of support ($\chi^2(2, N = 180) = 0.25, p = .88$).⁴ There was a trend, however, for girls to be more likely to mention at least one Social Interactive code⁵ in our sample, $\chi^2(1, N = 180) = 3.33, p = .06$.

3 Reasons Given Pro and Con for iPad Use in School within Individual Learning Theme

In reading for the reasons students gave for their positions, we identified sixteen reasons participants repeatedly brought up under the Individual Learning Theme. There were nine types of reasons supporting the use of the iPad and seven types of reasons opposed to the use of the iPad (see Table 3).

3 We used this sub-sample because of lack of gender information in our 4th grade sample.
4 71.1% girls versus 67.8% boys.
5 46.7% girls versus 33.3% boys.

TABLE 3 Positive Impact on Individual Learning Codes

Code Name	Description	Example
Information searching	The use of iPads to find information in order to fulfill academic goals.	“We can get useful information for projects and other work.”
Improving efficiency& orderliness	The use of iPads to remind oneself of academic schedule and to organize academic materials to make learning more convenient.	“With iPad you won’t lose your folders or paper. ”
Inevitable	The use of iPads is an unstoppable trend and children should learn to use iPad to prepare themselves for the future.	“Students should learn to use iPad because iPad will be on every desktop in the future.”
Learning motivation	iPad can be an incentive for active learning with fun apps or educational game apps. It can also be used as a prize after hard work.	“Kids will be more willing to learn because of the fun apps.”
Better than computers	Students compared iPads with computers and articulate the advantages of iPads.	“Students don’t have to take turns to use computers and it can save space.”
Multimedia awareness	iPads can facilitate learning by enabling students to make creative multimedia projects.	“Students can learn to be more creative. They can also make books and videos with friends.”
Portable	Students acknowledge how the iPad’s size and weight make it more convenient to use in schools.	“It is smaller, lighter and easier to carry.”
Eco-friendly	iPads can be reusable and will reduce the use of printed materials or books so as to save the environment.	“It will replace paper and save more trees.”
Rights and fairness	There is an unequal distribution of advanced electronic resources and underprivileged students should get the same learning experience as their peers.	“It’s not fair to the poor kids while their wealthier peers can go home to access technology provided for them to research and complete their work.”

FIGURE 3 The percentage of participants who mentioned each positive Individual Learning code as a function of grade
Note: Of the total number of participants who mentioned at least one positive individual learning code in each grade (N4th= 147, N8th=141).

Within the whole sample, the “pro-iPad” code that is most frequently brought up is *Information searching*, representing 33.5% of all participants. 20.5% of all participants used the code *Improving efficiency& orderliness* as a justification and another 20.5% mentioned the code *Learning motivation*.

We also compared the 4th and 8th grade students’ use of positive Individual Learning codes by generating the percentages of participants who mentioned each code out of the total number of participants who mentioned at least one code under this domain. As we see in Figure 3, a larger percentage of students from 4th grade used the code *Learning motivation* as compared with the percentage of 8th grade students ($\chi^2 = 17.79, p < .001$). It is also worth noting that a larger percentage of 8th grade students mentioned the code *Improving efficiency & orderliness* compared to the 4th grade students ($\chi^2 = 15.05, p < .001$).

The seven negative reasons clustered under the Individual Learning theme are described in Table 4.

TABLE 4 Negative Impact on Individual Learning Codes

Code Name	Description	Example
Distraction	Students fail to concentrate in class because they multitask with iPads for entertainment purposes.	“In my class people use it for watching videos and buying shoes, more of a distractor then a helpful tool.”
Lack of efficiency	Technical mishaps or difficulty to use the unfamiliar device can result in low efficiency if iPads are used for learning.	“Once my Ipad doesn’t work and I can’t do my assignment on time. It took a long time to fix it. ”
Academic dishonesty	The use of iPads to cheat during exams or to copy others’ work online without giving credit.	“Students hide their ipads under their desks and cheat in tests.”
Look up inappropriate information	Student would look up information that is not relevant or appropriate to the classroom setting.	“Instead of doing their work they[students] would be looking at inappropriate things on the internet.”
Costly	iPads are too costly and would not be a good way to spend the school funding.	“They (iPads) are too expensive.”
Fragile	iPads are too easy to break or malfunction.	“We will drop iPads on the ground and they will crack.”
Alternative learning tools	There are alternative learning tools like books and dictionaries and iPads are simply not necessary in schools.	“We got school to learn, we don’t need iPads.

The most frequently brought up negative Individual Learning code was *Distraction*, representing 19.5% of the whole sample. We also compared the 4th and 8th grade students’ use of negative Individual Learning codes by generating the percentages of participants who mentioned each code from the total number of participants who mentioned at least one code under this domain in each grade level. As we see in Figure 4, a larger percentage of students from 4th grade (79.0%) mentioned the code *Look up inappropriate information* compared with only 12.9% from the 8th grade students ($\chi^2 = 51.48, p < .001$). Additionally, a larger percentage of 8th grade students mentioned the code *Distraction* compared to the 4th grade students($\chi^2 = 28.16, p < .001$).

FIGURE 4 The percentage of participants who mentioned each negative Individual Learning code as a function of grade.
Note: Of the total number of participants who mentioned at least one negative individual learning code in each grade (N4th= 38, N8th=85).

4 Reasons Pro and Con for iPad use in School within the Social Interactive Theme

We reliably identified six reasons that participants brought up under the Social Interactive Theme; three supporting the use of the iPad and three opposing the use of iPads (see Table 5).

In those essays from the 400 where the positive Social Interactive stance was identified, 5.8% of all participants mentioned *Facilitate teacher-student interaction*, 3.8% of all participants used the code *Facilitate peer discussion and collaboration*, and 3.8% mentioned the code *No need to rely on teacher/peers for learning*.

We also compared the 4th and 8th grade participants by generating the frequency of codes mentioned under the positive *Social Interactive* stance (See Figure 5).

TABLE 5 Positive Social Interactive Effects Codes

Code Name	Description	Example
Facilitate peer discussion and collaboration	The use of iPads to facilitate classroom discussion and improve peer interaction in academic activities.	“Also, they can so lightweight and convenient that they can be carried around by students as the collaboration in different groups and share information which can be instantly inputted and displayed for the class using an interactive whiteboard.”
Facilitate teacher-student interaction	The use of iPads to improve the quality or efficiency of teacher-student interaction.	“ When they need to ask a teacher a question about something, you can email them using your iPad.”
No need to rely on teachers/peers for learning	The use of iPads can substitute for asking for help from an actual person.	“Another reason why it should be used is because students don’t have to ask the teacher for every single thing.”

FIGURE 5 The percentage of participants who mentioned each positive Social Interactive code as a function of grade
Note: Of the total number of participants who mentioned at least one positive social interactive code in each grade (N4th=18, N8th=28).

The three negative Social Interactive based reasons arguing against the use of the iPad were: *Detrimental to peer discussion and collaboration*, *Detrimental to teacher-student interaction* and *Cyberbullying* (see Table 6).

Of all participants, the most frequently brought up negative Social Interactive code is *Cyberbullying*, representing 20.5% of the whole sample.

We also compared the 4th and 8th grade students' use of negative Social Interactive codes by generating the percentages of participants who mentioned each code from the total number of participants who mentioned at least one code under this domain in each grade level. As we see in Figure 6, of all the participants who identified at least one negative Social Interactive code, a large percentage of students from both grades mentioned the code *Cyberbullying*, with 100% from the 4th grade students and 87.5% from the 8th grade students.

TABLE 6 Negative Social Interactive Effects Codes

Code Name	Description	Example
Detrimental to peer discussion and collaboration	The quality of classroom discussion is reduced / Students collaborate poorly because of electronic device.	"Students will get out of hand and start arguments because they are talking about people [online].When the teacher left students would run around looking at others iPads."
Detrimental to teacher- student interaction	Teachers will not communicate or cater to the needs of the students enough if they rely too much on electronic device; Students are distracted because of iPads and don't interact properly with teachers.	" Kids don't care [a] thing to[about] the teacher, kids only care about learning in the iPad. Kids need to listen to the teacher [about] what they said."
Cyberbullying	Using iPads to post negative comments/messages/videos or rumors about fellow students.	"Because students will be posting mean things about another student like secrets and privacy when you've been embarrassed."

FIGURE 6 The percentage of participants who mentioned each negative Social Interactive code as a function of grade
Note: Of the total number of participants who mentioned at least one negative social interactive code in each grade ($N_{4th}=40$, $N_{8th}=48$).

5 General Discussion

In this study, we investigated 4th and 8th grade students’ attitudes and stance justifications about using iPads in the classroom setting. Based on our analysis of 400 essays, we identified six categories of Stance codes for students’ attitudes, indicating that students’ opinions were more nuanced than simple support or objection. We found in Analysis 1 that the most common attitude for students from both grades is a generally supportive view towards the use of iPad. However, the majority of iPad supporters were aware of specific risks or stated that they were in favor of the use of iPads only under certain restrictions. For instance, students argued that iPads should be only used under the teachers’ supervision, or with specific setting that would prohibit students from getting access to irrelevant recreational apps.

Although the majority of participants from both grades were in favor of the use of iPads in school, we found 4th and 8th grade differences in the percentages of students who are opposed to the use of iPads, with more 8th graders who thought negatively about the use of iPads. One possible explanation is that the 8th graders had more experience with technical devices, perhaps even in an educational setting. Therefore, they had more exposure to problems that might arise with their classmates or themselves, or were more sensitive to the

issues mentioned in the given instructions. It is also possible that since the 8th grade students tended to use electronic devices more often than do fourth graders, they were more frequently reminded by their caregivers or teachers of the potential risks of using these devices in inappropriate ways. Another explanation is that younger students were more open to the challenge of new technologies. They were generally more optimistic that the potential problems could have an easy-fix. Future studies should address this potential developmental trajectory with other age groups, and explore the underlying mechanisms explaining the developmental differences by using other measures such as parental surveys or teacher interviews.

In Analysis 2, we found a variety of gradations in students' justifications: We reliably identified sixteen reasons students use to justify positive or negative impacts in the Individual Learning domain, and, similarly, six reasons in the Social Interactive domain (see Table 7). Students from both grades were able to speak to reasons from both domains, and instances of each type of reason is present in each of the two grades. Furthermore, students from both grades made their arguments in their essays, drawing upon Individual Learning reasons much more frequently than Social Interactive reasons. This might be in part due to the context of the task itself. But it is also possible that from the

TABLE 7 Thematic Emic Analysis Codes

Reason Codes: Individual Learning		Reason Codes: Social Interactive	
Positive	Negative	Positive	Negative
<ul style="list-style-type: none">– Learning motivation– Improving efficiency/orderliness– Inevitable– Information searching– Better than computers– Right & Fairness– Multimedia awareness– Portable– Eco-friendly	<ul style="list-style-type: none">– Distraction– Lack of efficiency– Academic dishonesty– Looking up inappropriate information– Costly– Fragile– Alternative learning tools	<ul style="list-style-type: none">– Facilitate peer discussion and collaboration– Facilitate teacher-student interaction– No need to rely on teachers/peers for learning– Cyber bullying inevitable	<ul style="list-style-type: none">– Detrimental to classroom discussion and peer interaction– Detrimental to teacher-student interaction– Cyber bullying

students' own experience, mobile technology was less frequently used to enhance collaborative working with peers or to connect with teachers. A few students in our sample even mentioned that teachers' pedagogical approaches changed little in response to the new devices. Previous studies (e.g. Falloon & Khoo, 2014; Falloon, 2015) have argued that tablet computers can support students' participation and contributions within a group, mainly because of their capability of co-construction and to facilitate sharing digitally produced work. Teachers are also able to take advantage of the ease of networking for classroom management and provide feedback to students. Although some participants in our sample mentioned the above aspects, our finding still suggests that to the extent that peer-to-peer talk has been found to be one of the most effective methods for the promotion of deep comprehension and learning (Applebee, Langer, Nystrand, & Gamoran, 2003), professional targeted training might be useful for educators in order to integrate tablets in classrooms to support multidimensional collaboration and interaction.

It is also worth noting that students from both grades brought up reasons referring to the unique characteristics of iPads. They commented on how iPads' wealth of learning-related software and multimedia features could be utilized to make more creative and interactive course-related projects, provide an incentive for learning, and easily help them organize study-related materials and set reminders. For example, one student wrote: "One reason I believe that iPads should be allowed in school is innovative learning. Children can easily do hands-on learning. It can be convenient for use, and make a way to search for things you don't understand." Students also directly compared iPads' features with desktop and laptop computers, and they highlighted how iPads' portability would make it a more efficient tool to use in the classroom. For instance, one student mentioned iPads should be used "because it's easier than going to a computer club or having kids take turns on class computers." Some students also showcased sophisticated understanding of the need of media literacy in the new information era. They argued that the implementation of iPads and other interactive electronic devices would be an inevitable trend, and the ability to use these electronic devices skillfully might become a necessity for higher education, or even for the job market. For instance, one student argued that "Technology is a huge part of this generation and many generations to come.", and another wrote if iPads were implemented in the schools of his/her own community, "The community will evolve faster. When applying for jobs in technology, they'd be already half-way there."

Students were also aware of the potential challenges that the unique characteristics of iPads might bring about in the classroom: The most common

negative Individual Learning reasons expressed students' concern of how iPads could potentially be used for activities that are irrelevant to the classroom materials. For example, one 8th grade student mentioned: "Instead of doing their work they would be taking pictures, playing games, or doing inappropriate things on the internet." This might also serve as a reminder for educators before introducing tablet computers into the classroom: It is critical for teachers to develop "ground rules" and clear objectives for tablet use in order to achieve optimal learning outcomes.

Students' social interactive reasons were not iPad-specific, and could be applied to any electronic devices that have access to the internet. The most common code to argue against the use of iPads was cyberbullying, which is not surprising considering the incident mentioned in the instruction, as well as the intense concern about this issue in the public discourse. However, we were aware of the possible influence of this hint and excluded participants who merely addressed to the prompt in our coding manual. We subsequently identified 20.5% participants who provided one or more examples of cyberbullying, expressed explicit negative attitude towards this behavior, or referred to the negative consequences cyberbullying might bring to the victims. Some students even commented that cyberbullying would continue to be an issue even if iPads aren't used in schools, and this statement was significantly more frequently mentioned by our 8th grade participants. One 8th grade student wrote: "There is no way to stop kids using the internet to bully, there is always internet somewhere." Students' awareness of the specific forms, negative consequences and pervasive nature of this extension of face-to-face bullying raises important questions of how educators and parents should manage the relationship between children and cyberspace.

6 Limitations

This study is limited in that it focused public school students in only one school district. Additionally, we don't have the information on whether iPads were actually provided in the participants' schools, which could be a major predictor of not only the students' attitudes and opinions but the range of code types we were able to identify. For example, students might witness more instances of misuse of iPads if they were implemented in their schools. It is also possible that their stances might be affected by the thought that there may be real life consequences for their own access to tablets. Although we used a less-structured and more student-focused measure, we still need to stress that

the information provided in the instructions might have had some influence in students' responses, especially in the frequency of several popular codes (e.g. *Looking for information*, *Cyberbullying*). Another limitation we should keep in mind when interpreting the results is that participants might regard this task as an argumentative writing practice. Consequently, some of them might have chosen stances that were easier for them to justify, even though they may not agree with these stances personally. It is also possible that some students did not personally agree with the justifications they provided or chose not to report some of their own opinions that were under-developed or they may have deemed inappropriate to put in the essay. Future research could make use of other techniques such as student focus-groups or questionnaires to further explore students' own views and attitudes about using technology in the classroom setting.

7 Conclusion

In conclusion, despite some important limitations, we found a majority of 4th and 8th grade students generally supported the use of iPads in the classroom setting, with a larger percentage of 4th graders expressing support. Based on the richness and breadth of the codes identified, we also found that students from both grades were sophisticated and discerning in their attitudes and justifications. Students mentioned a large number of learning-related reasons, and they were also well aware of a variety of potential impacts on student-student and teacher-student interactions (even though they referred to how iPads might alter individual learning experiences much more frequently than how they might affect communication and interaction). Despite its limitations, this study constitutes one of the first attempt to directly observe how 4th and 8th grade students view the use of tablet computers in the formal educational setting with an authentic approach of a regular school assignment. It is also the first to explore developmental differences in students' attitudes and rationales in iPad implementation. The findings of this study will help educators understand which aspects of the new technology students endorse for learning. Furthermore, students' own concerns about using tablet computers, as well as their general inability of address to social interactive aspects might shed light on how teachers need to adapt pedagogical approaches in order to fully utilize the unique capabilities of tablets and create an enriched and collaborative student-centered learning environment.

References

- Applebee, A. N., Langer, J. A., Nystrand, M., & Gamoran, A. (2003). Discussion-based approaches to developing understanding: Classroom instruction and student performance in middle and high school English. *American Educational Research Journal*, 40(3), 685–730.
- Aronin, S., & Floyd, K. K. (2013). Using an iPad in inclusive preschool classrooms to introduce STEM concepts. *Teaching Exceptional Children*, 45(4), 34–39.
- Cardoso Leite, P., Green, C. S., & Bavelier, D. (2015). On the impact of new technologies on multitasking. *Developmental Review*, 35, 98–112.
- Cumming, T. M., & Rodriguez, C. D. (2013). Integrating the iPad into language arts instruction for students with disabilities: Engagement and perspectives. *Journal of Special Education Technology*, 28(4), 43–52.
- DeWitt, P. (2013). Are schools prepared to let students BYOD? *Education Week*.
- Duhaysolongsod, L. Snow, C., Selman, R. L., & Donovan, S. (2016) Toward disciplinary literacy: Dilemmas and challenges in designing history curriculum to support middle school students. *Harvard Education Review*, 12/2015; 85(4): 587–608.
- Dündar, H., & Akçayır, M. (2014). Implementing tablet PCs in schools: Students' attitudes and opinions. *Computers in Human Behavior*, 32, 40–46.
- Eisen, S., & Lillard, A. S. (2016). Just Google it: Young children's preferences for touchscreens versus books in hypothetical learning tasks. *Frontiers in Psychology*, 7.
- Falloon, G. (2015). What's the difference? Learning collaboratively using iPads in conventional classrooms. *Computers & Education*, 84, 62–77.
- Falloon, G., & Khoo, E. (2014). Exploring young students' talk in iPad-supported collaborative learning environments. *Computers & Education*, 77, 13–28.
- Filloux, F. (2011, November 14). Does Apple have an antitrust problem? *The Guardian*. Retrieved from <https://www.theguardian.com/technology/2011/nov/14/monday-note-apple-apps-antitrust>.
- Haßler, B., Major, L., & Hennessy, S. (2016). Tablet use in schools: a critical review of the evidence for learning outcomes. *Journal of Computer Assisted Learning*, 32(2), 139–156.
- Hutchison, A., Beschoner, B., & Schmidt-Crawford, D. (2012). Exploring the use of the iPad for literacy learning. *The Reading Teacher*, 66(1), 15–23.
- Jowett, E. L., Moore, D. W., & Anderson, A. (2012). Using an iPad-based video modeling package to teach numeracy skills to a child with an autism spectrum disorder. *Developmental Neurorehabilitation*, 15(4), 304–312.
- Kucirkova, N., Messer, D., Sheehy, K., & Panadero, C. F. (2014). Children's engagement with educational iPad apps: Insights from a Spanish classroom. *Computers & Education*, 71, 175–184.

- Lorah, E. R., Tincani, M., Dodge, J., Gilroy, S., Hickey, A., & Hantula, D. (2013). Evaluating picture exchange and the iPad™ as a speech generating device to teach communication to young children with autism. *Journal of Developmental and Physical Disabilities*, 25(6), 637–649.
- Mangen, A., & Kuiken, D. (2014). Lost in an iPad: Narrative engagement on paper and tablet. *Scientific Study of Literature*, 4(2), 150–177.
- Mangoo, F. (2019) Steve Jobs Was Right: Smartphones and Tablets Killed the P.C. November 13, 2019, N. Y. Times <https://www.nytimes.com/2019/11/13/opinion/apple-macbook-pro-ipad.html>.
- Nguyen, L., Barton, S. M., & Nguyen, L. T. (2015). iPads in higher education—Hype and hope. *British Journal of Educational Technology*, 46(1), 190–203.
- Viberg, O., & Grönlund, Å. (2013). Cross-cultural analysis of users' attitudes toward the use of mobile devices in second and foreign language learning in higher education: A case from Sweden and China. *Computers & Education*, 69, 169–180.