Multi-dimensional evaluation of the impact of mobile digital equipment on student learnings

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NOTE D'INFORMATION

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Multi-dimensional evaluation of the impact of mobile digital equipment on student learnings: Preliminary results of the effects of the 2015 Digital Plan

▶ The preliminary results of the Longitudinal Evaluation of Activities related to Digital Education (a.k.a Élaine in French) report on the effects of allocating mobile digital equipment (mainly tablets) on student learnings in 7th and 8th grades. These equipment were especially distributed within the framework of the Digital Plan implemented from 2015, in the form of tablets, individually (individual mobile equipment - 1-to-1 tablets) or collectively (mobile classrooms - MC). At the end of 7th grade, we observe a positive effect of 1-to-1 tablets on the student results in French oral comprehension and on their digital skills. At the end of 8th grade, the results of students receiving 1-to-1 tablets also show a positive evolution in French reading comprehension and in mathematics compared to non-equipped students. In general, the effects measured two years after the distribution of 1-to-1 tablets correspond to the progression of one rank in the class for a median student. A positive impact of MC of the same magnitude can also be observed on mathematical and digital skills of 8th graders at the end of the school year. The first analyses also show some differentiated effects of mobile digital equipment according to student gender, their social background or the social composition of their school. Data on the use of digital equipment inside and outside the classroom, as well as the adoption of equipment by teachers allow us to explore potential mechanisms. 1-to-1 tablets availability leads teachers to include digital technologies to a greater extent into their practices, while the availability of MC, on the other hand, has no effect.

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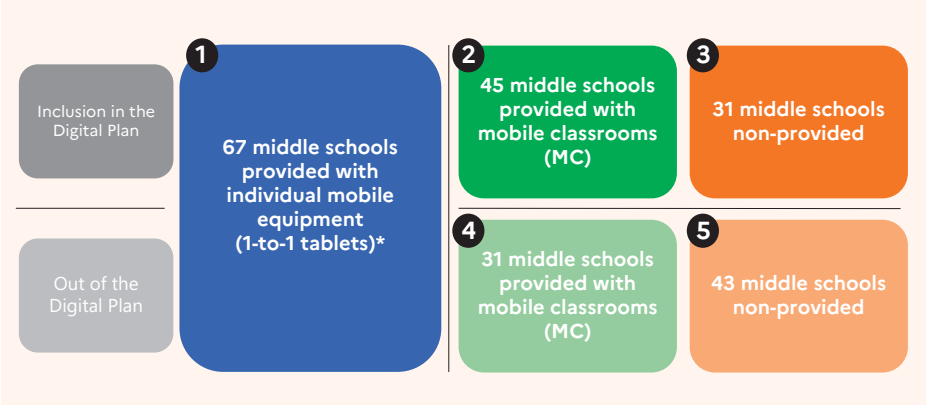
▶ In 2017, the DEPP launched the first impact assessment based on national data to document the effects of allocating mobile digital equipment (tablets or laptops) on student learnings, enrolled in schools equipped by the 2015 Digital Plan or other sources of funding. The Longitudinal Evaluation of Activities related to Digital Education (Élaine) is unprecedented, in particular because of the richness of data collected from a panel of students, teachers, and headmasters. It contributes to the international scientific literature on the impact of digital education on student learnings, from which there appears to be no clear consensus. Regarding 1-to-1 tablets, the first results, presented in this *Note* and detailed in a working paper produced by the DEPP, put Élaine on the side of studies concluding that the distribution of digital material to students has a positive impact. One of the goals of the Digital Plan launched in 2015 was the nationwide distribution of educational resources and mobile digital equipment in public primary schools and in public and "under contract" private middle schools through calls for projects. For the selected schools, the equipment provision could take two forms: individual mobile equipment (1-to-1 tablets) allocated individually for a use in class or at home, and mobile classrooms (MC) for an individual or a collective use in the classroom.
The Élaine sample includes 217 public and "under contract" private middle schools in Metropolitan France and its overseas territories. In December 2017, headmasters were asked about mobile digital equipment in their school and, if applicable, on the nature of these equipment (1-to-1 tablets and/or MC). These information was used to classify middle schools into groups that are compared for evaluation purposes ▶ **figure 1**.
This *Note* presents the main results of the first analysis of the disciplinary and digital skills assessments of the panel of students (5,203) followed in 7th and 8th grades and the survey of their 7th grade teachers.

▶ 1 **Classification of middle schools used for the evaluation**



* For middle schools with 1-to-1 tablets, we do not distinguish tablets funded by the 2015 Digital Plan from the ones funded by other sources given the small proportion of schools with it that are not included in the Digital Plan (10 middle schools, less than 5% of the sample). All schools with 1-to-1 tablets are therefore considered uniformly.

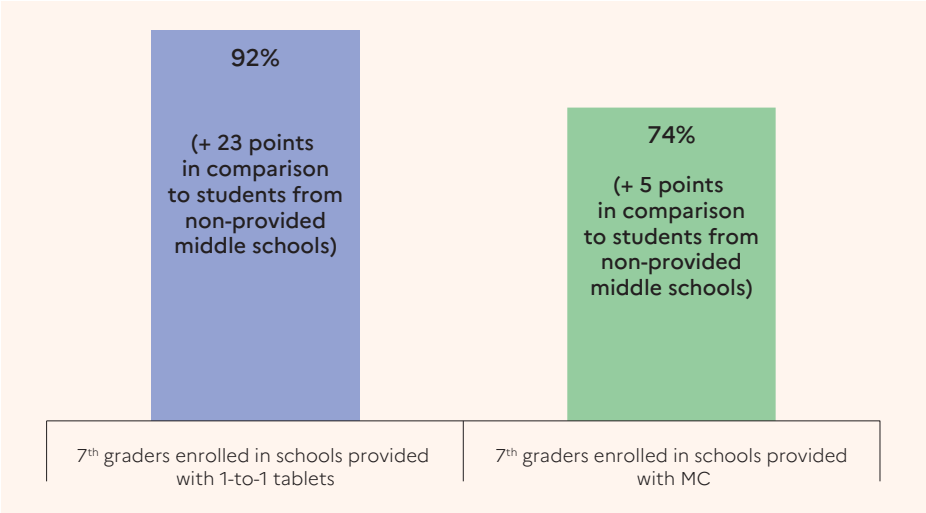
Students confirm that they do have access to the distributed mobile digital equipment and use it mainly in the classroom

Figure 2 shows that 7th graders in middle schools provided with mobile digital equipment (groups 1, 2 and 4) are significantly more likely to report having access to a tablet inside or outside their school, whether they own it or not. This gap is associated, at least in part, with differences in the nature of the digital equipment available at their school: 49% of students enrolled in middle schools provided with 1-to-1 tablets report having access to a tablet belonging to their institution, compared to 15% in schools with MC and less than 5% in those without any equipment.

In 8th grade, these same students were asked about the frequency and type of use of digital equipment. In schools provided with 1-to-1 tablets, 27% of 8th grade students frequently use a tablet or a computer in the classroom for their individual use and 19% for a collective use (differences of 18 and 10 percentage points (pp) with the comparison group, statistically significant at the 1% level). These proportions are respectively 13% and 14%, in schools with MC (differences with the comparison group are smaller – in the range of 3 to 4 pp – but remain statistically significant at the 1% level) ▸ **figure 3**. There is little to no difference between students from different evaluation groups in terms of use of digital equipment outside the school for any type of activity (e.g., searching for information on the Internet or sending messages). One of the only exceptions is the use of the school's digital work environment: 32% of students in schools with 1-to-1 tablets (group 1) use it frequently to look for information, compared to 21% in the comparison group (groups 3 and 5).

These initial findings are descriptive in nature. The rest of the analyses seeks to establish a causal link between mobile digital equipment availability and indicators based on student assessments and on surveys carried out among their teachers. Indeed, the middle schools equipped with 1-to-1 tablets (group 1) or MC (groups 2 and 4) do not share the same characteristics as those without any equipment (groups 3 and 5), which undermines the direct comparison of the results of students enrolled in these different groups of schools. To overcome this challenge, matching was performed on a large set of observable characteristics. This makes it possible to measure the effects of the distribution of digital equipment by comparing skills of recipient students with those of non-recipient who are as similar as possible in terms of individual characteristics (gender, social origin, place of birth) and school characteristics (public or "under contract" private sector, belonging to educational priority networks, social and school composition, size, territory).

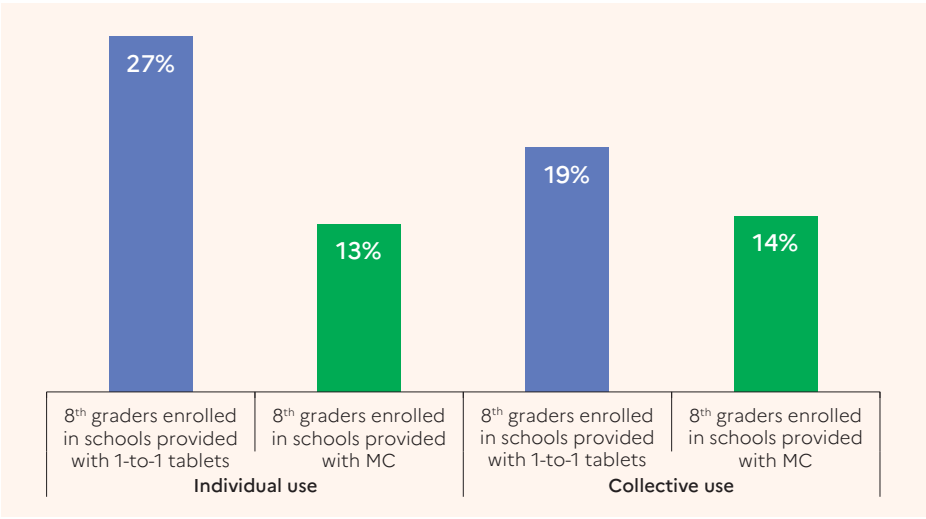
▸ **2 Percentage of 7th graders reporting having access to a tablet, depending on the equipment available in their middle school**



Note for the reader: In 7th grade, 92% of students in schools provided with 1-to-1 tablets report having access to a tablet and using it inside or outside the school. The difference with students from schools not provided with mobile digital equipment is 23 percentage points.
Data: 8th graders asked about their access to digital equipment and use of it in 7th grade in the ELAINE 2019 survey.
Source: MENJS-DEPP.

Réf. : *Note d'Information*, n° 21.05. © DEPP

▸ **3 Percentage of 8th graders reporting frequent use of a tablet or a computer in the classroom, depending on the equipment available at school**



Note for the reader: In 8th grade, 27% of students enrolled in schools provided with 1-to-1 tablets report frequent individual use of a tablet or a computer in the classroom.
Data: 8th graders surveyed about their use of digital equipment in the classroom in the ELAINE 2019 survey.
Source: MENJS-DEPP.

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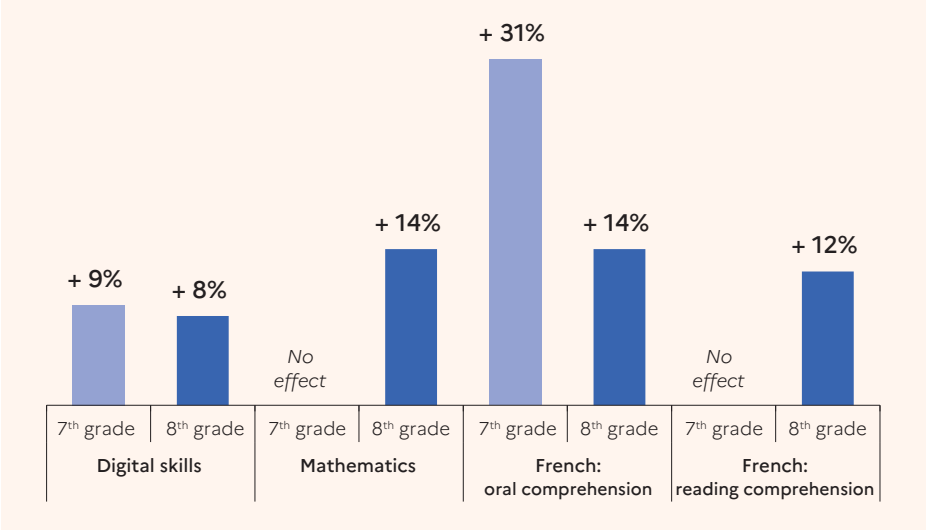
The availability of mobile digital equipment (especially 1-to-1 tablets) promotes learning among middle school students

In what follows, and according to standard practice in scientific literature, scores measuring student disciplinary and digital skills are standardized according to the comparison group (students enrolled in non-equipped schools), which then allows the estimated effects to be expressed as a percentage of a standard deviation of the score for this group. For ease of interpretation, these so-called "standardized" effects can be expressed in terms of progression for the median student in a class: for example, on average, an effect of 20% of a standard deviation means that an initially median student (ranked 13th in a class of 25 students) reaches the level of the student ranked 10th.

The availability of 1-to-1 tablets (group 1), whether it is *via* the 2015 Digital Plan or not, has positive effects on some learning outcomes measured at the end of 7th grade, and then on all learning outcomes measured at the end of 8th grade ▶ figure 4. The strongest effect is measured on the average level of French oral comprehension in 7th grade: it is 31% of a standard deviation, corresponding to a progress of 3 ranks in the class, and is statistically significant at the 1% level. It is even higher for girls. The digital skills of students in schools provided with 1-to-1 tablets also improved compared to the comparison group: +9% of a standard deviation (a gain of about one rank in the class), statistically significant at the 5% level. At the end of 8th grade, for all assessed fields (digital skills, mathematics, French), there was a positive impact of 1-to-1 tablets in the range of 8 to 14% of a standard deviation (differences are statistically significant at the 1% level, apart from the impact on digital skills, which is statistically significant at the 10% level). These effects vary significantly according to the social and academic composition of the schools and students' social background: impacts are stronger on mathematics and digital skills in underprivileged middle schools and are also stronger on digital skills for students from a low socio-economic background.
The effect of MC (regardless of the source of funding) on student skills varies depending on the area assessed and the year observed ▶ figure 5. At the end of 7th grade, there is a 7% effect of a standard deviation of the comparison group's score in French oral comprehension (statistically significant at the 10% level), but this effect vanishes the following year. At the end of 8th grade, mathematics and digital skills of students enrolled in middle schools provided with MC are higher than those of the comparison group (9 and 13% of a standard deviation with statistical significance at the 1% and 5% levels, respectively). The measured effect size is comparable to what is observed for 1-to-1 tablets.

▶ 4 **Impact of 1-to-1 tablets on student scores, in % of a standard deviation of the score of the comparison group**



Note for the reader: The estimated average effect of the availability of 1-to-1 tablets on the digital skills of 7th graders is 9% of a standard deviation of the score of the comparison group (schools not provided with mobile digital equipment).
Data: 7th and 8th graders surveyed in the ELAINE 2018 and ELAINE 2019 surveys.
Source: MENJS-DEPP.

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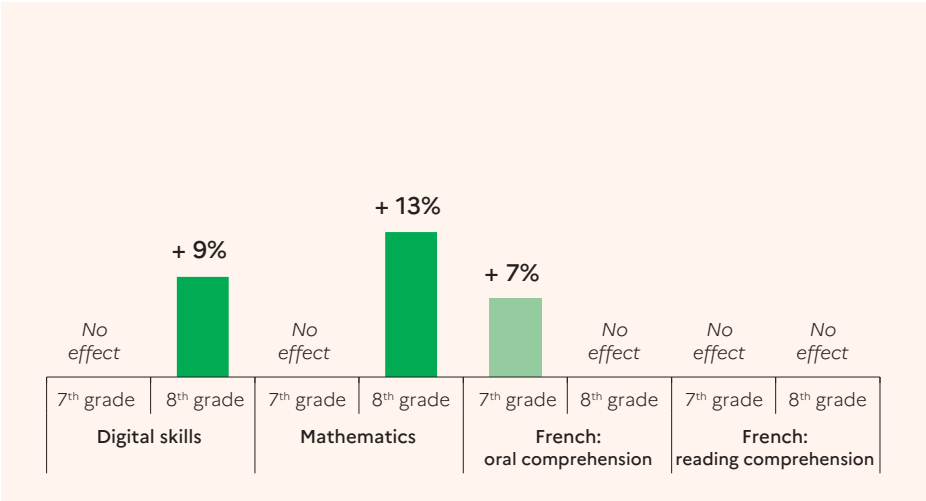
▶ 5 **Impact of mobile classrooms on student scores, in % of a standard deviation of the score of the comparison group**



Note for the reader: Compared to the comparison group (schools not provided with mobile digital equipment), there was no statistically significant effect of the availability of MC on the digital skills of 7th graders.
Data: 7th and 8th graders surveyed in the ELAINE 2018 and ELAINE 2019 surveys.
Source: MENJS-DEPP.

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In 7th grade, teachers' practices integrating digital technologies are more frequent in middle schools with 1-to-1 tablets

First analyses of the data collected from the teachers of the 7th graders assessed provide leads to explain the documented effects. Teachers working in middle schools provided with mobile digital equipment report higher rates of digital equipment than other teachers, whether it is in their school or at their home. This is still true whether 1-to-1 tablets and MC were funded or not by the Digital Plan. For example, 72% of teachers in middle schools provided with 1-to-1 tablets have access to a tablet at home, and 77% in their school, compared respectively to 53% and 37% of teachers in schools without 1-to-1 tablets.
In the middle schools that have benefited from the distribution of 1-to-1 tablets (and to a lesser extent, in those that have benefited from the distribution of MC), teachers perceive fewer obstacles to the pedagogical use of digital technologies. On the other hand, they do not feel more effective in integrating digital into their practices, and their digital skills (technical mastery of tools, communication, algorithmic thinking, information retrieval, etc.) have not improved when compared to those of their colleagues in schools without mobile digital equipment. In this regard, it should be noted that teachers in middle schools provided with mobile digital equipment do not report a significant increase of ICT professional training.
However, 1-to-1 tablets availability is leading teachers to integrate digital technologies more into their professional practices, including using ICT in the classroom (for example, by

having students work independently with digital tools). For instance, 33% of teachers in middle schools where students have access to 1-to-1 tablets (group 1) set up sequences of activities in the classroom at least once a week with students handling digital materials, compared to 22% in middle schools without mobile digital equipment (groups 3 and 5). On the other hand, the availability of MC has no effect on teachers' practices. Teachers were asked about the frequency and the nature of collaboration between teachers and their practices to foster student collaboration. While digital tools availability could have encouraged teachers to exchange more with each other and to develop collaborative work between students, no differences were found between the different groups of the evaluation.

At this point, data on 8th grade teachers' practices still needs to be analysed to further understand results on student outcome presented in the *Note* and working paper. Finally, it is important to note that all of the data presented in this document was collected before the nationwide school closures caused by Coronavirus from March to May 2020. Therefore, the results do not take into account the potential effects of remote learning. Further analysis will be conducted to this end. In addition, thanks to the follow-up of the panel of middle school students in high school, Élaine will also be able to assess the impact of the equipment on their school track after 9th grade (vocational, general or technological paths and optional courses followed). ■

FOR MORE INFORMATION

You can access this *Note d'Information* 21.05, the figures and additionnal data on **education.gouv.fr/etudes-et-statistiques**