# Does digital immersion improve students' digital literacy skills?

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## Introduction

The *New Zealand Curriculum* (2007) has a vision for young people that they will become confident, connected, actively involved lifelong learners, and states that young people should be effective users of communication tools and active seekers, users, and creators of knowledge. It notes that information and communication technology (ICT) has a major impact on the world in which young people live, and e-learning (i.e., learning that is supported by or facilitated by ICT) has considerable potential to support teaching approaches (Ministry of Education, 2007).

It is important that educators understand the effect of leisure time digital immersion on their learners, especially if educational establishments such as schools are to keep pace with the changing digital culture (Sefton-Green, 2004, cited in Grimley, 2011). If contemporary digital culture is having an effect upon cognitive functioning, learned behaviours, and learning behaviours, it is imperative that educational establishments adapt to the educational needs of the learners. However, while generation Y are confident users of technology, they are not necessarily also competent users (Coombes, 2008, cited in Grimley, 2011). Livingstone and Bober (2004, cited in Grimley, 2011) highlighted the lack of competence of some students, noting that "young people encounter difficulties with searching the web, with the critical evaluation of website contents and with a range of other online skills" (p. 413).

To this end, we are looking at how best to support the use of ICT in our school. In 2011, we ran a Digi Class in Year 9. The class was randomly picked from eight equivalent Year 9 classes, and each student in it has had access to a Toshiba Tablet 24/7 for the duration of the year. The purpose of the class was to trial students having their own devices in order to assess their usefulness and also highlight any problems and difficulties. This article will report on an investigation into the effect of the project on students' digital literacy skills.

**Literature review**

The notion of 1:1 devices (one device for each student) is a fast growing topic for discussion, as many schools are contemplating allowing students to bring their own device (BYOD) to school. This, however, poses many questions, issues and risks. Much of the research supports the notion that improvements can be seen in teaching and learning with the introduction of ICT technologies. For example, Chandra and Lloyd (2008) compared the achievements of two year 10 classes, one of which had access to ICT technologies and one that did not. They found that ICT-based intervention impacted positively on results. Swan, Kratcoski, Mazzer and Schenker (2005) also noted that ubiquitous computers leveled the playing field between high and low achieving students. Similarly, Dawson, Cavanaugh, and Ritzhaupt, (2006) reported in their study on Florida's EETT leveraging laptops initiative and its impact on teaching practices, that the infusion of laptop computing and professional development positively impacted on teaching practices in at least three ways: 1) increased student-centred teaching; 2) increased tool based teaching; and 3) increased amounts of meaningful technology. In many of the research articles (Chandra, V. and Lloyd, M., 2008; Grimley, M., 2011; Swan et al., 2005; Lei, J., 2010) improvement in student engagement, interest, and attention was noted. The students coming into our schools have grown up with technology and schools need to begin to embrace this in the classroom. Horrigan (2009, cited in Grimley, 2011) and Grimley (2011) also found that digital users tend to show different characteristics of use, with clear differences emerging between high and low users of technology.

When introducing devices into schools, there is a need to ensure that teachers do not lose sight of the main purpose of the devices, which is to aid teaching and learning. Technology integration needs to be approached in terms of learning goals rather than technology (Swan et al., 2005). In addition, there is a need to offer professional development, both for teachers and students. Penuel (2006) found that the role of professional development was significant and that many teachers reported that the most critical aspect was a focus on helping teachers to integrate technology into their instruction. Attewell (2005) and Lei (2010) both commented that time needed to be made available to train the students. School aged students often lack key digital information literacy skills that are required to use internet resources to secure reliable and valid information via the internet (Coombes, 2008; Livingston & Bober, 2004). This is also supported by Kirkwood and Price (2005), who state that developing and refining information literacy skills is an important element of courses using ICT. Similarly, Dunleavy, Dextert and Heinecket (2007) found that online research tasks presented instructional challenges for teachers.

Introducing devices into schools also relies on a sound infrastructure. Without a fast, reliable network, you are likely to come across issues that will deter users. It is also important to plan for the future. You need to take into account the on-going costs and issues that arise as devices get older. As Lei (2010) noted, issues and complaints regarding the technology rose each year over the course of their study.

It is however, clear that despite the challenges with regard to instigating a 1:1 project, if it is done and supported appropriately, there are clear benefits. We implemented a trial class so that we could endeavor to support the programme effectively and iron out any issues prior to introducing a school wide 1:1 initiative. This included ensuring that we had a robust wireless network and providing adequate PD for the staff involved. This article reports on the effectiveness of this project in terms of students' digital skills.

**Design of the study**

Two groups of students were chosen for this study. In one group, the students had access to a Toshiba Tablet for the year 24/7, while the other group had more limited access, on average visiting the computer lab once or twice a term. Each group was given a survey to complete and they were observed while they completed a research task and an internet task.

*Digital immersion questionnaire*

A comprehensive questionnaire was designed to survey the type and extent of digital behaviour that students were engaged in during their leisure time. The questionnaire included a question asking participants to indicate how often they perform 28 digital activities. Choices were never, sometimes, often, and all the time. High levels of engagement were deemed to be those in the often and all the time categories. These digital behaviours were subsequently broken down into creation, consumption and communication groupings.

*Research task*

Students were asked to research a particular era in English history and present a report on their findings. They were given one period (50 minutes) to complete the task and they were allowed to use any resources in the school library, including books, the librarian, and computers.

*Internet task*

Students were asked to answer a number of questions about a particular topic using only Internet resources. The students were instructed to either share their responses as a Google Doc or send them via e-mail.

These tasks were all used by kind permission from Dr Mark Grimley, School of Educational Studies and Human Development, University of Canterbury.

**Procedure**

The class that we wanted to compare was a Year 9 Mixed ability B band class who had had a Toshiba Tablet for the year (High Immersion). In order to find out whether their digital literacy skills had improved over that time we wanted to compare them with an equivalent group. We have 8 mixed ability B band classes who are all roughly equivalent in makeup (the school runs a streaming system with two A - top-band classes, three C - bottom-band classes, and eight mixed ability B band classes). We therefore randomly chose another Year 9 mixed ability B band class to act as the control (Low Immersion).

All the students were given the questionnaire to complete. This was completed online using Survey Monkey. Neither class had completed an on-line survey using this format, making it a fair comparison.

Next, each class was taken into the library to complete the research task. The same teacher read the instructions to the students to ensure that there was no bias in the way the task was set up. The students all began the task sitting at tables in the main body of the library. From here they could use any resource available, including computers. At the end of the time they had to hand in what they had done. This could either be hand written or completed online.

The final task was for them to complete an internet research task. For this task, the High Immersion class completed it on their tablets in their social studies class. In order to make it a more comparable test, the Low Immersion class also completed the task in their social studies class, but they completed it on a borrowed Net Book.

Throughout the two tasks the students were observed and comments were recorded regarding how they carried out their research and what they entered in the search engines while completing the internet task. The responses to these questions are not reported on here, as the focus was on how they completed the tasks in terms of the tools

we had focused on, namely Google Docs. We also focused on the finished product rather than the process that it took them to get there.

**Results**

*Levels of digital behaviour*

The Low immersion individuals showed lower levels of engagement for almost all of the digital activities, although there was a big variance in each of the three categories: communication, creation, and consumption.

*Table 1: Communication*

|                                                | High Immersion | Low Immersion | Difference |
| ---------------------------------------------- | -------------- | ------------- | ---------- |
| Use the computer for chatting e.g. MSN or Facebook | 96%            | 41.3%         | 16.3%      |
| Use a mobile phone to text                     | 80%            | 70%           | 10%        |
| Use a mobile phone to talk                     | 37.5           | 30%           | 7.5%       |
| **Communication means**                        | 57.6%          | 41.2%         | 16.4%      |

The communication category saw the biggest variation (16.4) between the two groups, with the High Immersion individuals being more engaged in each activity and by a significant amount.

*Table 2: Creation*

|                                          | High Immersion | Low Immersion | Difference |
| ---------------------------------------- | -------------- | ------------- | ---------- |
| Install computer programs from DVD/CD    | 12%            | 25%           | -13%       |
| Use the computer to compose music        | 20%            | 25%           | -5%        |
| Create webcasts or podcasts              | 4%             | 5.3%          | -1.3%      |
| Use a computer to write                  | 8%             | 15%           | -7%        |

| blogs | | | |
|---|---|---|---|
| Use the computer for writing | 64% | 35% | 26% |
| Use the computer to edit videos | 32% | 15.8% | 16.2% |
| Use the computer for drawing | 36% | 20% | 16% |
| **Creation means** | 29.8% | 23.8% | 6% |

In the creation category, the difference between the groups was much closer at 6%. The low immersion Individuals were also more engaged in several of the activities.

*Consumption*

The Consumption category showed the smallest difference between the two groups, with a difference of only 0.6%. The main differences in this category were centered around two main themes. The High Immersion group were more engaged in activities to do with listening to music, with a combined total of 31.3%, while the low immersion group were more engaged with computer games, with a combined total of 45%.
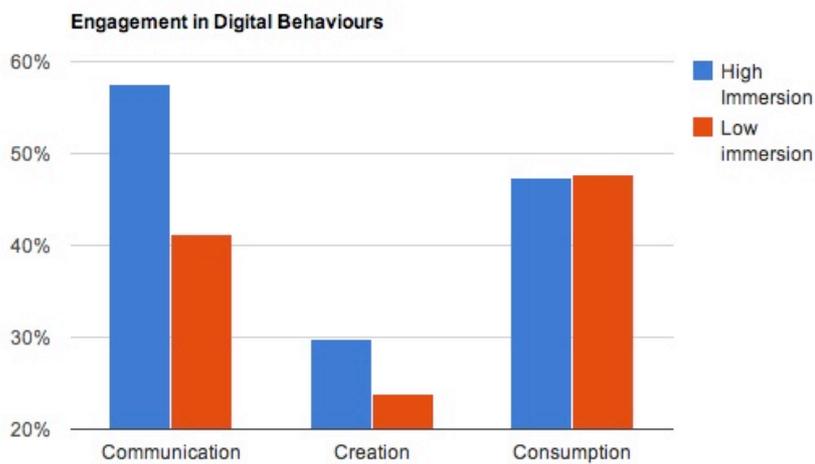


*Figure 1: Engagement in digital behaviours*

*Research task*

In the research task, students could opt to research the task using any of the available resources. It was noticeable between the two groups where the students went first for information. In the low immersion group, the majority of the students went for the books first, while in the high immersion group the vast majority went straight to the computers. While the low immersion group went to the books first, most students ended up on the computer when they could not find what they wanted in the books. The low immersion group was the only one to ask the librarian for help. There were also noticeable differences in how the students presented their work. Table 3 summarises how the students presented their work.

*Table 3: Presentation of Student Work*

|  | **High Immersion group** | **Low immersion group** |
|---|---|---|
| Google Doc | 80% | 26% |
| e-mail | 0% | 32% |
| Paper | 20% | 42% |
| Work that was not given a title | 0% | 100% |

Both groups managed to successfully find the answers to the task and present their work. There were, however, noticeable differences in how the work was presented. The low immersion group tended to write out the questions and then answer them underneath, while the high immersion group presented their work in a much more narrative way. The other noticeable difference was in the formatting of the work. The low immersion group used the default font and text size etc., and no-one inserted a picture into their work, while in the high immersion group, 75% of the students changed the font and text size and 42% added images to their work. The high immersion group presented a better quality of work, so while it could be argued that they spent their time

on formatting rather than content, it was observed that they were able to produce a higher quality of work that was also better presented.

*Internet task*

In this task the students had to answer three questions using the internet for their research. The most noticeable difference between the two groups in this task was with regard to how comfortable they felt with the technology. Some of the low immersion group were unsure of how to access the web browser and in which format to present their work. Many of the low immersion students also entered the whole question into the search box, instead of trying to break it down. The high immersion group was not much better in their choice of search text, and both groups ended up using similar sources for their information. Both groups, however, managed to answer all of the questions successfully. Table 4 shows how students presented their work in the internet task.

*Table 4: Presentation of student work for internet task*

|  | **High Immersion group** | **Low immersion group** |
|---|---|---|
| Google Doc | 87.5% | 53% |
| e-mail | 12.5% | 47% |
| No title on doc | 0% | 90% |
| No subject in e-mail | 0% | 56% |

**Discussion**

Examination of the percentage of engagement for different digital activities for the high and low immersion groups indicated different patterns for each group. Both groups were frequently engaged in some of the uses of technology such as using the computer for

chatting, using a mobile phone to text and talk and using a computer to surf the web. Both of these groups also had similar levels of engagement for the consumption tasks. The differences were more marked for creation, with the low immersion group engaging in 24% of the tasks and the high immersion group 30%. The biggest difference was recorded for the communication tasks, where the low immersion group engaged in 41% of the tasks compared to 58% for the high immersion group. This is in line with Grimley's (2011) research, which identified different characteristics of use between high and low users of technology.  In the current study, the main reason for the high immersion group to have higher scores in the communication category may be due to the fact that they had access to a computer 24/7. This is supported by the fact that the scores are much closer for communication using mobile phones than it is for communication using a computer.

Although the two groups were similar in the creation category, there were clear distinctions between the two groups on specific items. The high immersion group tended to have higher levels of engagement when using the computer for writing and drawing. They were also more engaged with the use of digital and video cameras. This is probably due to the fact that the high immersion students used the computers in all of their classes, so to a certain extent they were expected to use their computers for writing and drawing. These students also regularly used digital and video cameras to record science experiments, so again would be expected to be higher in this category. An interesting difference was in installing programs from DVD/CDs compared with downloading programs from the web. The low immersion group were much more likely to install programs from DVD/CDs while the high immersion group were much more likely to download programs from the web. This may be due to the fact that the high immersion group were much more confident when it came to ICT use and tools. The high immersion group also did a lot of their work on the web using tools such as Google Docs, Moodle, and Glogster, so may have been much more comfortable and familiar with this environment.

Both of the groups had similar scores in the consumption category, suggesting that both groups feel comfortable in a digital world. There were, however, differences in the tasks

that were being engaged with. The low immersion group was much more engaged in tasks associated with games, while the high immersion group was more engaged in tasks associated with music.

The results of this study also support those of Dawson, Cavanaugh and Ritzhaupt (2006). The high immersion students were generally more engaged in more meaningful uses of technology such as participating in web discussion forums, using the computer to write and draw, editing video movies, and creating web pages. Similarly, Lei (2010) found in her longitudinal study on the conditions for ubiquitous computing that during the study, the uses related to entertainment experienced a steady decrease. This was in line with these findings, where the average use of computer games in the low immersion group was 48% compared to 33% in the high immersion group.

In the research task, both groups managed to locate information relating to the topic, however, the searching behavior differed between the two groups. The majority of students in the high immersion group headed straight to the computers whereas in the low immersion group the majority of students started researching the task in books, although many did turn to the computers eventually. The low immersion group was also the only group who made use of the school librarian. These findings are in line with those of Grimley (2011), who reported that it is likely that children who are more immersed in technology at home may be more inclined to utilize technology in other contexts, when they are given a choice,

The high immersion students appeared to be better skilled at using the internet. In general, they appeared to find the material more quickly and had more useful search results. They were more skilled at opening a search engine and a document to record their findings, in line with Grimley's (2011) findings. More students in the high immersion group also produced their report using a Google Doc rather than on an e-mail or hand writing it, compared to the low immersion group. This supports the notion that these students have better knowledge of common productivity tools, in line with Penuel's (2006) findings that laptop students had better knowledge of hardware, their laptop's operating system, common productivity tools, skill in using the internet, and

knowledge of basic computer security. Also in line with Penuel's findings, the high immersion students demonstrated a difference in their writing and presentation when compared to the low immersion group. The high immersion group tended to write more in their report. They also formatted their work, included pictures, and saved their work with a title. That the majority of students in the high immersion group opted to report their findings in a Google Doc while the majority of students in the low immersion group opted to use e-mail is as I would have expected, as the high immersion group have been taught how to use Google Docs, while the low immersion group had not.

Both groups appeared to lack some skill in negotiating a search engine to find appropriate information, although the high immersion group was marginally more successful and found appropriate articles more quickly. Grimley (2011) found in his study that although many students chose technology as their preferred source of information, they appear to lack skills appropriate to the task. This also supports other studies that show school-aged students lack key digital information literacy skills required to use internet resources to secure reliable and valid information via the internet (Coombes, 2008; Livingston & Bober, 2004). Grimley (2011) also suggests that such skills are unlikely to evolve naturally and often need to be taught. In our study, the high immersion students had previously been taught some skills, which was evident from their higher and quicker success rate in finding suitable resources. However, there was room for further improvement.

**Conclusions**

Grimley (2011) provided two recommendations from his study. These were:
1.  Parents and educators should encourage children to use technology in an active way through creation and communication, and moderate the amount of consumption behaviour to a minimum.
2.  Educators should put more time into educating children about digital information literacy as is recommended by the Digital European Literacy Program (Rosado & Belisle, 2006).

These recommendations are evident from our findings. The high immersion group had access to a Toshiba Tablet 24/7 for the whole year. The teachers of the class also had additional time to allow them to focus on the teaching of the class. The teachers have been mainly using the technology for communication and creating. This is evident from the results of the digital behaviour survey, where communication and creation tasks scored highly with regard to engagement from the high immersion group. The low immersion group, however, scored highest for consumption, followed by communication, and then creation. The teachers of the high immersion group have also spent time educating students with regard to digital literacy, which is evident from the fact that they were more comfortable using the technology for their research tasks. They were also more confident to add pictures into their work and they all saved their work with a title. These are skills that we assume students inherently know, but as suggested by Grimley, we need to spend time teaching students these skills.

Dunleavy, Dextert and Heinecket, (2007) found that online research tasks presented instructional challenges for the teacher, mainly around the issue of concerns that students might access inappropriate materials or waste time with inefficient or ineffective searches. During the course of the research tasks in this study we did not encounter any students accessing inappropriate material or wasting time. This may be due to the fact that clear expectations were set regarding the use of the school network and that the task was well set out and managed. This study supports, however, the contention that time could be wasted with inefficient or ineffective searches. Despite efforts to address this issue, this was still the case in this research, suggesting more was needed to teach students these skills.

When considering the results of this study it must be remembered that small numbers of students were involved. One class was used for each group of students and while all students were invited to participate, due to the tight time frames not all students completed all of the tasks, thus limiting the value of some of the information. There may also be other variables that affected the study, such as the fact that the two classes had different teachers.

## Implications and further study

The main implications and findings of this study is that students who were immersed in ICT tools tended to use these tools for more creation and communication tasks and their digital literacy skills had improved. In the case of this study, however, this is likely to be a result of the teaching that has accompanied the introduction of the technology. The teachers of this class have tried to keep the focus on teaching and learning and have been using and teaching students how to use a range of tools. This has impacted on the students' ability to complete ICT related tasks. The main implication for educators, then, is that when introducing a 1:1 programme or similar, you need to allow time to teach the students how to use the tools. A study by Dunleavy, Dextert and Heinecket (2007) concluded by saying that, "In order to create effective learning environments, teachers need opportunities to learn what instruction and assessment practices, curricular resources, and classroom management skills work best in a 1:1 student to networked laptop classroom setting" (p. 450). We need to bear this in mind when introducing any programme, and allow time to teach the teachers as well as the students.

This study also highlighted the differences between high and low immersion students with regard to the tools that they use and engage with. As teachers we need to bear this in mind when planning the use of ICT in our classrooms as each student may be coming from a very different background and level of experience. Grimley and Allan (2010) analysed data regarding students' use of ICT and came up with five categories of children's digital technology use. These were:
1. A "web presence and resources" category,
2. The "standard computer use: Games, music, email" category,
3. The "mobile phones" category,
4. The "very basic document production" category,
5. The "creating multimedia: Music, sound, vision" category.

These represented distinct types of users that seemed to be present for 10-12 year olds. It would however, be interesting to see whether there were the same distinct types at a secondary level and if there was, then this might be a good tool to use to allow teachers

to gauge the digital activity of their students. In our study it would also be interesting to evaluate how students' academic progress had been affected by the immersion in technology and to see whether it concurred with the findings of Chandra and Lloyd, (2008) who concluded from their study that e-learning does improve student performance.

From our experience we would advocate that a 1:1 initiative does have clear benefits for students' digital skills. Given the digital nature of the world for which we are preparing the students, these skills are only going to become more important.

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