The ups and downs of BYOD: A sociocultural perspective

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Abstract: This paper reports on the first two years of a Bring Your Own Device (BYOD) initiative in a New Zealand secondary school, using data derived from a series of surveys of teachers, parents and students. In this paper we present the data gathered from these surveys, which includes not only quantitative data but qualitative data from free text responses, giving insights into the challenges faced by teachers, students and parents in moving to a BYOD classroom, and the potential benefits for teaching and learning, and preparing students for a digital world. We frame our analysis from a sociocultural perspective that takes account of structures, agency and cultural practices and the interactions between these domains over time. We find that there are some tensions in these relationships, with contexts and practices having to be renegotiated as the BYOD classroom and the structures within which it operates evolve. Our findings also suggest that students perceive their digital skills as developing rapidly, while teachers are more circumspect. From our interpretations of our qualitative data, we suggest that this is because members of staff are considering the development of their skills in the context of transformations of classroom practice, which demands a more extensive skill set than student use of one-to-one devices. On the surface, it appears that many of the changes to cultural practice are substitution or augmentation of previous activities, for example using one-to-one devices for researching and presenting material. However, when we look deeper, it is evident that apparently straightforward adoption of digital media is having a more profound impact on structure and agency within the classroom. If there is an area where agency may be problematic, it is in the responses of parents, who may feel increasingly alienated from their children’s learning activities if their own digital skills are lacking. These findings will be of interest to anyone who is engaged in BYOD projects, particularly those who are planning such initiatives or in the early stages of implementation.

Keywords: BYOD, mobile learning, sociocultural structures

1. Introduction
For the last three years we have been gathering data from the first secondary school in New Zealand to introduce a Bring Your Own Device (BYOD) policy based on recommending the iPad. Over this time the initiative has moved from initial controversy, through a pilot year, to an ongoing process of full implementation throughout the school. This process has gained national interest and the school has run two conferences to share their experiences with other schools and interested parties. Our own research has included a number of methods, including surveys, interviews, observations and workshops. However, this particular paper focuses on the results of three surveys that were carried out between 2012 and 2014 to record the perceptions of teachers, parents and students from the school. It should be noted that this data is a snapshot of the first phase of the rollout of BYOD. In 2016 the school will become fully BYOD across all years.

1.1 BYOD
The move towards BYOD is driven by a number of factors. First, there is the recognition that education must adapt to technological changes in wider society. As the everyday use of digital tools by school students grows, so does the need for schools to integrate digital technologies to remain relevant (Engelhard and Seo, 2012; Collis and Moonen, 2008.) Second, there is the drive towards making digital tools available as an integral part of education rather than episodic interaction in a computer lab. BYOD in this context has been claimed to improve learning outcomes in some contexts (e.g. Cristol and Gimbert 2013) and to foster collaborate learning (Falloon, 2015.) Third, there is the financial pressure on schools that are unable to provide every student with a device. Thus the onus is increasingly being put on parents to provide such devices. Along with potential benefits come some concerns, such as disruption in the classroom (Sharple, 2002) and concerns about a lack of inclusivity and an increase in cyber-bullying (Sangani, 2013). There may also be digital divides in learning outcomes (Wei et al, 2011.)

It is important not to view BYOD in isolation, not to focus only on the device. BYOD can only take place within the context of certain enablers, such as a suitable wireless broadband infrastructure, with supporting policies and procedures for secure and appropriate use, such as those outlined by UNESCO (2013), and may be
associated with other initiatives such as a move towards cloud based resources (Lennon, 2012.) In addition, it does not operate independently of the teaching and learning process, driving changes in curriculum and pedagogy (Cochrane et al, 2014.)

1.2 Investigating digital device use in the classroom

There are a number of different approaches that may be used to investigate the use of digital devices in the classroom. For example Khalid et al (2014) applied a social constructivist perspective and grounded theory, identifying available knowledge and adoptable practice, advantages and adoption barriers as core topics of analysis. In contrast, Martin and Ertzberger (2013) took an experimental approach using pre-tests and post-tests, focusing on achievement and attitude. Cheung and Hew (2009) identified a number of methodological approaches used by different researchers, concluding that surveys are the most common method, with interviews, observations and focus groups also regularly used. Our own analysis focuses on the broad spectrum of contexts within which a move to digital teaching and learning operates. Because our study focuses on a BYOD initiative, this impacts not only on activities within the classroom but also those that take place in informal spaces and in the home. Therefore we adopted a sociocultural approach that takes account of structures, agency and cultural practices (Pachler et al, 2010.)

The main feature of this approach is that it acknowledges how each context influences the others. The role of agency, which is particularly powerful in a BYOD context, where learners have already appropriated their own devices, means that the presence of digital devices is only the starting point. The way that learners operationalize their own agency defines the actual role of these devices in the classroom; “a tool is what it is used for” (Bannon & Bodker, 1991, p. 238). On a similar theme, MacKenzie and Wacjman (1985) note that that specific technologies succeed or fail for a number of contextual reasons that derive from both structure and culture. For example we have noted how teachers of different subjects utilise mobile devices in their classrooms in very subject specific ways, and that these devices are not ideal for every situation (Parsons, 2013.)

Once digital tools are adopted, over time there is a two-way process through which the use of these tools changes the learning activities within which they are applied. The structure within which this happens is important, but the tools can, in turn, impact on that structure. In our model, for example, using digital tools within the curriculum impacts on that curriculum. This concept has previously been referred to as the “coevolution” of tasks and artefacts (Carroll et al., 1991), and the “reciprocal shaping” of technology and society (Brosveet & Sorensen, 2000). There are also echoes of McLuhan here, where we ourselves are extended by technology use (McLuhan, 1964.)

2. Methods and materials

The source data for this article comes from three sets of online surveys administered in mid 2012, early 2013 and mid 2014. There were three separate sets of questions administered in each of these years, to teachers, parents and students at the school. There were no sampling criteria to include or exclude any members of these groups. We did not record any demographic data, but the students concerned were primarily from year 9 (first two surveys) and some from year 10 (third survey), so were aged 13-14. The gender balance at the school is approximately equal. As part of the low risk ethics process under which the research was undertaken, the surveys were all anonymous and voluntary, and publicised though the usual school communication channels (e.g. school newsletters.) The researchers designed the surveys but were not involved in publicising them. The questions were not identical in each survey, because we wanted to address a range of issues over time. The numbers of fully completed responses to each of the surveys are shown in Table 1. The school roll is approximately 2,000, but only one year group was involved in the pilot year (2012), and the programme is only slowly expanding through other year groups (there are seven in total.) Our 2012 and 2013 results therefore represent roughly 25% of the initial cohort of students and almost all the relevant staff. The number of parent and student responses dropped in 2014. This may just be due to ‘survey fatigue’ but we can only speculate about this. Despite these limitations, the amount of data gathered in these surveys is substantial, and combines both quantitative (multi choice, ordering, Likert scale) and qualitative (free text) data. The qualitative data provides a number of insights into various aspects of the BYOD project. In this article we present those elements of this data that address some specific research questions, as described in the next section.
Table 1: Numbers of respondents to each survey

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<th>2012</th>
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<td>Teachers</td>
<td>14</td>
<td>40</td>
<td>63</td>
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<td>Parents</td>
<td>4</td>
<td>71</td>
<td>50</td>
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<td>Students</td>
<td>56</td>
<td>98</td>
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2.1 Analysis framework

Our framework for analysis is based on the sociocultural approach of Pachler et al (2010), which recognises the interrelationships between structures, agency and cultural practices (Figure 1).

Figure 1: The sociocultural framework used in our analysis (adapted from Pachler et al, 2010)

This framework recognises the interrelationships between its three main components. Therefore, in our analysis, we seek to identify data that relates to the specific items within each concept, but also relationships between them. Further, given that we have some longitudinal data, we try to identify changes over time where possible. Thus we formulated the following research questions, based on the framework.

1. How have structures (curriculum, infrastructure and individual mobile communication) evolved as a result of the BYOD initiative?
2. How has agency (of students and teachers) evolved as a result of the BYOD initiative?
3. How have cultural practices (collaboration, meaning making, media use) evolved as a result of the BYOD initiative?
4. How have structures, agency and cultural practices interacted during the period of the BYOD initiative?

3. Results

Our results are presented under the main concepts of the framework, namely structures, agency and cultural practices. Within each of these we seek to identify any changes that are evident over time, and the relationships between concepts. Our comparisons over time have to be interpreted with the proviso that we
did not ask exactly the same questions in each survey, and we do not know to what extent the same parents, teachers and students answered the surveys. Thus, where our quantitative data suggests the possibility of an interesting result, we have looked for supporting qualitative data that may potentially explain such outcomes.

3.1 Structures
Structures are the most straightforward of the three concepts encompassed by the model. Simply put, they relate to the BYOD devices, the technological infrastructure within which they are used, and the curriculum within which they are applied.

In terms of pervasive technology, the wireless infrastructure turned out to be more problematic than was first anticipated. In the 2012 survey, only one member of staff expressed concerns about network connectivity. Having actually experienced device use in their classrooms, twenty teachers expressed issues with network connectivity in the 2014 survey. Thus we note how structures may act as constraints to agency.

When analysing individualised mobile communication, one interesting finding from the data was that the proportion of students who were using a non-iPad device actually appeared to increase between 2012 and 2014, from 4% to 19%. Most of this change was due to students using laptops. One reason given for this by a parent was due to the different handling of the laptop; some iPads were carelessly exposed to accidental damage by other students.

“He has a laptop now as his iPad kept cracking”

Another motivation, again expressed by a parent, was the greater power of a laptop.

“We had no problems with the iPad but now he is getting more specialised it appears we may need a Mac to accommodate his learning requirements.”

This time we see a more positive relationship between structure and agency, with choices being made from the perspective of potential benefit.

Looking at the curricular frame of the institution, most of the curriculum in New Zealand schools is driven by the National Certificate of Educational Achievement (NCEA), which is the main national qualification for secondary school students. NCEA results are recognised by employers and by higher education institutions both nationally and internationally. In most subjects, students sit externally assessed examinations. Within this external constraint, it is clear that the in-school curriculum cannot freely evolve. Thus the changes we have seen within the curriculum are confined to changes in the way that the existing content is delivered. The most common change to curriculum delivery within the school is that work has become more research based. When asked what changes students had noted in their learning (2014 survey) around 25% of the students referred to benefits for research, some explicitly. For example

“I have noticed that research is a lot easier for classes”, and “faster to do work and better access to information”

Despite these positive effects, some parents, teachers and students were concerned about the dissonance between digital teaching and learning and traditional written exams.

“It concerns me that NCEA is seemingly lagging behind with assessing our students.” (Teacher, 2014)

Although the future strategy for NCEA includes at least some online assessment (NZQA, 2013), in the short term the school has to prepare its students for written exams. This is a major constraint by structure on both agency and cultural practice.

3.2 Agency
One of the core components of agency is the ability to act on the world. In the context of BYOD this means having a suitable skill set for making optimum use of digital tools, thinking critically and processing and applying the information to create new knowledge. We note that the overall skill levels of staff appeared to be slightly lower in the 2014 survey than in 2012 (Figure 2, top). However it should be noted that the 2012 staff
were early adopters who volunteered to take part in the first year of the BYOD initiative. The figures for 2014 represent a larger cohort of teachers across the school. This suggests that we cannot expect the agency of staff overall to reach its maximum potential until the BYOD approach has been fully rolled out across all school years so that all the staff have had the opportunity to fully develop their digital skills.

From the surveys of students, we note a strikingly different pattern (Figure 2, bottom), though it should be noted that asked a somewhat different question about their levels of skill in making meaningful use of digital devices in learning. Further, the 2014 survey only had three options instead of five. Nevertheless, there is a marked increase in the perceived level of digital skills, thus we see the potential for agency has increased over time. These results for teachers and students suggest a possible skills gap, but of course the skill set that teachers need to bring to bear is more complex and demanding than the skill set needed by the students. Nevertheless, for those who are already actively engaged in using the one-to-one devices, there is certainly skill development going on. Two responses from the 2013 teacher survey noted:

“my skills have grown SO MUCH”

“The students and I have definitely gained some skills with using these devices”
As student skills and agency have evolved, students appear to have developed critical thinking about the role of technology in the classroom. In the 2014 survey, although almost all of the students were in favour of using one-to-one devices for learning, around half suggested changes in practice (Figure 3).

![Figure 3: Student support for digital devices in learning measured by self-reported percentages](image)

Many of the students requested a balance between digital device use and more traditional activities such as using printed books and handwriting. Once again, the value of digital devices for research was stressed, but some suggestions that they were not ideal for all activities, for example:

“I would like to do half and half, like everyday classroom learning we could hand write and when we are doing assessments or researching for things we could use one to one devices”

Perhaps underlying these feelings is a concern that well-understood agency that students have gained through skills taught in their earlier school career, such as reading books and handwriting, are being replaced by less familiar skills. We might postulate, perhaps, that some students feel a lack of agency in the process of this skills transfer, given the results outlined in Figure 3. Compounding this, some students and parents feel that handwriting skills are declining, suggesting a diminution of agency in this area.

![Figure 4: Parent support for digital devices in learning measured by self-reported percentages](image)
Parents, too, were supporting of the use of digital devices in the classroom, but many felt the need for financial support (Figure 4). Parental concerns around finance indicate that while they recognise the value of these devices within agency and cultural practices, they operate within their own family structures that have to take account of financial issues.

Both students and parents occasionally referred to the students being treated as ‘guinea pigs’, i.e. the subject of an experiment. This response again suggests anxieties about agency; being acted upon, rather than acting on the world. We might suggest that many of these anxieties about agency are a direct result of being part of a culture in transition. Similarly, parental concerns about their own agency with regard to their children’s school work often suggests an increasing sense of separation, suggesting that there may be a significant skills gap between parents and students.

3.3. Cultural practices
Cultural practices emphasize the areas that can benefit learning, as they relate to collaboration, meaning making and media use. Our surveys indicate positive transformations of cultural practices within both formal and informal learning spaces. Indeed, the concept of space in the digital world has moved from a sense of belonging to a physical place to a sense of belonging to a communications network (Strivastava, 2005.)

One of the most important transformations is the increase in student to student and student to teacher (and vice versa) collaboration. Digital one-to-one devices have widened communication opportunities and provided common platforms for collaboration between students. For example, one student stated:

“iMessage helps kids connect with sick members of their group in group projects”.

If we consider these digital media in isolation, they might appear as somewhat one-dimensional. However, the settings and learning spaces where these communication channels are utilised, and the learning activities enabled by them, suggests that the BYOD initiative has brought a shift in the wider understanding of learning with and between contexts. In fact, it has contributed to integrating formal and informal learning spaces by extending team work and collaborative learning beyond the school gates. Students are now able to collaborate in real time to complete group tasks. Communication and collaboration between teachers and students has also improved. All of this encourages students to get engaged in learning activities not only in classrooms but also elsewhere. In terms of meaning making, many students have reported that the BYOD classroom allows their learning to be more self-managed.

“Learning is constantly evolving and it has shifted from learning through rote to processing and using the information.”

Student use of technology has, despite some concerns by parents, remained focused predominantly on educational activities (Figure 5). Media use has also extended the students’ ability to express and communicate their work, as this parent reported in the 2013 survey:

“The quality of presentations on the device are incredible. It’s great to be able to see the science assignment posted on YouTube.”

Much of the reported media use might be seen as primarily substitution or augmentation, rather than more fundamental changes in teaching and learning. However the staff surveys reveal that the true impact is seen in teaching practice and student engagement, for example; a more informal approach to classroom teaching, more ability to differentiate disparate learning styles and abilities, more flipping of the classroom and more engagement from boys in terms of their writing.
The structural impact of pervasive technology has of course impacted on the culture of the school, and leads to challenges for teachers such as keeping an eye on students during classes to prevent them from going off task. Since the impact of change goes beyond the classroom, parents too noted changes in social interaction. Some parents were concerned with the change in the behaviour of their children. One parent reported:

“She is now constantly on the iPad, for things other than school work”

Others commented that they now had to communicate with their children electronically rather than face to face. However, some others acknowledged the positive changes even while expressing some concerns, for example.

“...very secretive around their IPAD but also very switched on to learning.”

Changes in their children’s attitudes, impacting on social interaction, were a concern of a number of parents, who stated that their children had become less communicative, more aggressive, less interested in physical activities and less willing to do things with the family. Of course we have to note that the cohort for this study was aged 13-14, when these behavioural changes are not uncommon, regardless of whether a digital device is used in the classroom. Thus, while we cannot dismiss these concerns, neither can we isolate any effects of the BYOD classroom. Another concern was ‘addiction’ with respect to student relationships with their devices. In a separate study, young New Zealanders suggested that a preference for cyber communication in social settings, purposeless preoccupation with a device, and feelings of anxiety when unable to use a device might be indicative of device addiction (Vacaru, Shepherd and Sheridan, 2014.) The authors of that study caution against using the term ‘addiction’, suggesting ‘problematic use’ is more appropriate, but such behaviour is certainly an issue of cultural practice that needs monitoring.

3.4 Interaction of structures, agency and cultural practices
As described previously, structures, agency and cultural practices characterise the sociocultural framework. Most importantly, this framework sees learning through mobile devices in and around different learning spaces and is governed by a triangular relationship between the three components represented in Figure 1. There are a number of aspects associated with each component and these aspects have either positive or negative impacts on each other in the learning activities of students in both formal and informal learning spaces.

Looking at the structure component, it contributed positively to the agency of students and teachers in terms of digital skills. The BYOD device and the technological infrastructure in school provided an opportunity for
skills development. The results show that digital skills have improved in students since the BYOD initiative and also suggest a slow but positive trend in the digital skills of the teachers (Figure 2).

Other aspects of structure, however, act as constraints, in particular the curricular frame and its associated external examinations. Our results indicate that many students have included time with pen and paper, combining learning strategies to prepare for the NCEA assessment method. For example:

“I do think learning with devices is great but we need a balance until NCEA is done via computers as it’s hard to get back into using pen and paper for exams”

In a different context, one of the aspects of cultural practices (media use) is having an impact on structure (learning environment). There are some concerns for classroom management and distractions caused by the inappropriate usage of the one-to-one devices by students within the classroom.

One of the most important benefits of the BYOD initiative is the increase in collaboration (cultural practices) across formal and informal learning spaces. This is enabled by improved mobile communications (structure) and contributes to the development of agency in the students.

Despite few some contradictions and challenges, interaction between the three components of the social-cultural framework in the context of BYOD has resulted in positive outcomes. However, there are a number of constraints caused by structure, and tensions raised by changes in culture.

4. Conclusions and future work
The longitudinal analysis of the BYOD project, based on the multiple surveys conducted with different stakeholders in different point of time has given us a good understanding of how the BYOD classroom has developed since its introduction. The analysis of data based on the social-cultural framework has been worthwhile to understand the relationships and interactions between the digital devices and infrastructure, various stakeholders and the learning environment.

The majority of the quantitative results were positive, including improvement in the digital skills of students and teachers, increases in opportunity for individual mobile communications and collaboration for learning activities and also the advancement in social and personal development of students. From the qualitative data there were some persistent issues around the nature of media use by students and the impact it is having on teaching and learning activities. Qualitative data from teachers was substantially positive, while responses from parents and students were more mixed. This may suggest the impact of agency; in this context, teachers have the greatest agency, parents the least.

The focus of this article has been on survey data from the initial stages of a long term BYOD initiative that is not yet fully embedded. The data we have collected suggests that this is a period of transition and in many ways the BYOD initiative is being used also as an opportunity to redefine itself. There are skills that need to be developed further, dissonances between new forms of teaching and learning and traditional assessment structures, and anxieties about the unknown impacts of such major changes to schooling. There is clearly much more work to be done before we truly understand the implications of what is currently happening in the BYOD process. The next stage of our work will continue to investigate the themes introduced in the paper as the school completes its BYOD rollout.

References


