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Bring Your Own Device – a Snapshot of two Australian primary schools

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Structured Abstract

Background
The use of 1:1 and Bring Your Own Device (BYOD) strategies in schools is in its infancy and little is known about how mobile devices such as tablets are being used to support educational practice.

Purpose
In this article, two suburban primary schools in Sydney, Australia were focused on with an aim to understand how mobile device strategies were developed and implemented and how the devices were being used in the schools.

Design and Method
This qualitative study uses a case study method. It draws upon questionnaires, interviews and classroom observations, and builds upon previous research in English and Australian schools.

Findings
Results of the research indicate that the devices have only recently been incorporated into the school and suggest that their usage has been generally embraced by both school staff and parents. Key issues highlighted by these two schools included the importance of the school's vision and uncertainty about the differences between models of provision. Participant responses also referenced some positive impacts on classroom practice, which amplify constructivist pedagogy: there were examples of device use extending student learning by supporting peer-assessment, collaboration, research skills and projects.

Keywords: BYOD (Bring Your Own Device) strategies, home/school links, primary schools, mobile devices

Introduction

Between 2008 and 2013, the Australian Federal Government, as part of the Digital Revolution Program (DRP), put in place the National Secondary Schools Computer Fund (NSSCF). The aim of the fund was to equip all secondary schools students from years 9 to 12 with a laptop to support learning. During that time, 967,000 computers were reportedly issued to students and staff (Sydney Morning Herald, February 3, 2013). The move towards Bring Your Own Device (BYOD) strategies, or variants such as Bring Your Own x (BYOx) where x is a specified device, is being driven by financial considerations (Lee, 2012; Stavert, 2013). The Horizon Report (Johnson et al., 2013), an American publication which looks at technological innovation in education in different countries, identifies BYOD for adoption in one year or less, which is being fuelled by schools' inability to provide sufficient digital technology to meet their students' needs.

Indeed, in many countries, BYOD strategies have been identified by schools as attractive ways of achieving cost savings in an era of considerable constraint on education budgets. For instance, one United States (US) school has claimed savings of $1.27m through BYOD and a virtual desktop system, which can be accessed through any device students or teachers bring into school (Lepi, 2012). In the UK, a report by Ofsted (2011) gives examples of schools encouraging pupils to bring their own devices as a potential way of both saving school costs whilst strengthening home-school connections. BYOD is also seen as a lower-cost route to 1:1 computing – the school district need only then buy devices for those students who do not have them (Quillen, 2010). BYOD can mean overhauling the curriculum and spending money training teachers, though it is argued that it does help create a more personal and memorable learning experience (Lepi, 2012). However, although BYOD strategies can offer potential savings, it has also been observed that savings can be less than expected (Azzurri 2011).

As indicated earlier, there is a range of different BYO models. BYO is used here to refer to a strategy in which students are allowed to bring in mobile devices that they have access to from home. This should not be confused with a 1:1 strategy in which a school expects students to bring in a specified device, which they may have to acquire in order to meet this school requirement. BYO simply allows devices that students already 'own' to be used in school. Variants on the BYO model may specify that any device can be brought in to school (BYOD) or set out specifications that the device must meet (BYOx). This is a refinement of the definition of BYOx provided by the State of Queensland Department of Education, Training and Employment (2013).

Lee (2012) distinguishes BYOD from Bring Your Own Technology (BYOT), though both share the element of pupils bringing their own mobile devices in to school. The distinction that Lee identifies relates to the locus of control of the devices, with BYOT being less controlled by the school. BYOD and BYOT programs are based upon the premise that mobile devices are in widespread use among young people (CoSN 2012). Schools, it is argued, can benefit from using these devices in class because the students are already familiar with them, so removing the need for technical familiarisation (Azzurri 2011). As mentioned earlier, the report by Ofsted (2011) draws attention to further benefits, as BYOD can engage students and parents in learning at school and at home. BYOD is seen as bringing a range of other benefits to learning. This use of technology can bridge formal and informal learning, it can allow learners to construct their own learning environments, or get real-time feedback (CoSN 2012). BYOD can challenge the prevailing approach to school infrastructure

(Livingstone 2012) and teaching. It can bring about a change to instruction – pupils can do a lot of learning on their own while the teachers monitor progress and keep students on task (Schwartz, 2012). Teachers and students can discuss the capability of technology and find creative solutions, or students can become technology experts and so allow teachers to focus on content (Bartelt 2012, Nielsen 2011).

BYOD does raise issues around equity and the digital divide – for example, what is to be done about those who cannot afford their own devices? (Azzurri 2011, Nielsen 2011, Schaffhauser, 2011). Some are concerned that there may be a stigma associated with the use of school-provided devices (CoSN, 2012) or that jealousy may encourage technological rivalry (Walsh, 2012). On one large programme, some teachers seemed reluctant to use BYOD if everybody did not have a device of their own (Mindshift, 2012). Some critical voices are reported as saying that BYOD pushes costs to families that should be met by government and that it may exacerbate the digital divide (Waxman, 2012).

The educational use of mobile technology such as the iPad or other tablets to support learning in the classroom is widely reported in the literature. Such devices can support the development of information literacy (Chou, Block, & Jesness, 2012), literacy development (Hutchison, Beschorner & Schmidt-Crawford, 2012) and language learning (Sandvik, Smørdal, &Østerud, 2012). Through the use of movie making on tablets, students also develop multimodal literacy as well as being highly motivational (Morgan, 2012). Importantly, if these devices are to benefit learning, they should be accompanied by "student-centred pedagogies and authentic learning experiences" (Goodwin, 2012, 11).

In 2011, the New South Wales Department of Education and Communities (NSW DEC) instigated an iPad pilot study involving primary schools (Goodwin, 2012), and other schools, both secondary and primary, have started to implement their own BYO strategies (Raths, 2012; Song, 2014).

This article explores the use of BYO iPads in two primary schools situated in greater Sydney, New South Wales. The aim of the study was to further understandings about their effective implementation; more specifically the study set out to identify and/or refine key dimensions of practice underpinning BYOx strategies.

Study design
The two Snapshot Studies reported here were both state primary schools in the suburbs of Sydney Australia, which were implementing mobile device strategies. Table 1 provides a summary of these two Snapshot Study schools and classes involved.

Table 1 about here

Sandrinham Street bought 10 iPads for use in Years 3 to 6, which were supplemented by students being allowed to bring in their own iPads from the start of 2013 – they were not allowed to bring in any other sort of device. The school had invested in its filtered WiFi infrastructure to ensure that all of the devices would be able to access the Internet. The school also had clusters of desktop machines in each classroom and was using EdModo (a cloud based virtual learning environment).

Greenfields Primary had been moving towards a mobile device strategy since mid-2011, when they acquired 30 iPods. In 2012 they obtained 30 iPads for use in two classes (in Years 5 and 6) as part of the NSW DEC tablet pilot referred to in the

introduction to this article. When the pilot ended the school obtained 24 iPads, and from the beginning of 2013 students in Years 5 and 6 were allowed to bring in their own iPads, but not any other devices. Initially only 8 students brought in their iPads, but by the third term the vast majority had a device. The school also had clusters of desktop machines in shared areas.

Methodology
The aim of the research was to seek new insights, ask questions and find out what was happening in particular school settings in which mobile technology strategies had been introduced. Whilst there was no intention to be able to generalise from these specific instances to schools in general, the expectation was that this research would help to inform decision-making about the implementation of mobile technology strategies in other comparable contexts. This fits with what Yin (1984) and Robson (1993) describe as exploratory research and Bassey (1998) labelled as 'theory seeking'. Yin (1984) and Robson (1993) identified a case study approach as an appropriate methodology for exploratory research.

Whilst the scope of the two cases reported in this paper in isolation is limited, they form part of a series of 13 studies carried out in Australia between September and December 2013, which are referred to as the Snapshot Studies. These complement 22 studies carried out in England between September and December 2012, which are referred to as the Vital Studies (see http://edfutures.net/Technology_Strategy_Case_Studies).

The Snapshot Studies used a cut down version of the methodology used in the Vital Studies (see http://edfutures.net/Research_Strategy), which in turn was based on the methodology used in 13 case studies that focused on the use of Tablet PCs in schools in 2005 (Twining et al., 2005). The Snapshot Studies involved data collection prior to and during one day spent in school by the researchers (see http://edfutures.net/Research_Strategy#The_.28Australian.29_Snapshot_Studies). The overall methodological design reflected the exploratory nature of the studies and the limited time for collecting data in school. Both the methodological design and the particular instruments used, such as questionnaires, interview, focus group and observation guidelines, and portfolio specifications, would need to be revised and refined for use in larger studies.

Due to local circumstances, the design was modified in each of the studies reported here. Table 2 provides a summary of the data sources used in Sandrinham Street and Greenfields.

Table 2 about here

Potential participants were identified by the school, and then asked if they would like to take part. In the case of the teachers, students and parents, the schools used a participant selection model, which it could be argued would ensure that the participants were more likely to be able to provide informed responses to the research questions (Cohen, Manion, & Morrision, 2000). However, it must be borne in mind that this method of selection means that participants might be more likely to provide a positive view of the school's digital technology strategy. Therefore, participants should not be thought of as necessarily being typical members of the school community in relation to digital technology usage and attitudes.

The questionnaires all shared a common core set of questions about the digital technology strategy that was being implemented. The variations between the

questionnaires related to the basic information about the respondents. Thus, for example, the Teacher questionnaire asked about how long the respondent had been teaching, and the subjects and year groups that s/he taught, whilst the Parent questionnaire asked about how many children the respondent had at the school, and whether s/he had any other role in the school besides being a parent. In addition, the ICT Coordinator questionnaire asked for detailed information about the digital technology provision within the school.

The interview schedules mirrored the questions in the questionnaires, and were designed as an interview guide (Patton 1980 cited in Cohen et al., 2000). Thus, they identified the key topics to be covered in outline, but left the precise sequencing and wording of the interview questions to be determined during the course of the interview. This inevitably means that there will be less consistency across interviews, but helps to create a more informal and conversational experience. This was felt to be important in order to help develop trust between the researcher outsiders (Hammersley, 1995) by creating a naturalistic interaction (Woods, 1986).

The questionnaire not only provided raw data, but also engaged the respondent in thinking about the issues that were going to be discussed in the interview. This was intended to serve two purposes: firstly, to enhance the richness of the answers provided during the interviews; and secondly to help address the problem identified by Burgess (1984) that respondents say things during interviews which differ from what they think or believe before, after or even during the interview.

The observation was informal, and involved taking notes from the back of the classroom during teacher input sessions (e.g. at the start and end of the lesson), and circulating around the classroom talking with individual students as they worked at other times. Where permission had been obtained to do so, photographs were taken of the classroom layout, samples of work, or other aspects of the lesson.

The focus group, which consisted of four students, was designed to start by looking at the portfolios of work the children had compiled and then broaden out into a discussion of the use of digital technology in the school. As with the interviews, the focus group discussions were designed to be informal and naturalistic.

Ethical considerations

Ethical approval for the Snapshot Studies was obtained from the Human Research Ethics Committees (HREC) in all the collaborators' universities. This ensured that the Snapshot Study research complied with the British Educational Research Association's guidelines for educational research (BERA, 2011) and the Australian National Statement on Ethical Conduct in Human Research (Australian Vice-Chancellors' Committee, 2013). In keeping within the ethical guidelines, the names of participants and the schools have been changed. As Sandrinham Street and Greenfields were state schools, approval was also obtained from the relevant Department of Education for them to be involved in the research.

Analysis

The analysis was undertaken using Emergent Themes Analysis (ETA), which was developed by Wong and Blanford (2002). This form of analysis draws on interviews and real-time operational environments, such as those used in these cases and in the preceding Vital Studies and earlier Snapshot Studies. For these exploratory studies, the interviews were conducted with teachers, students, parents and principals and the operational environment consisted of the classroom lessons where the BYO iPads were being used.

Analysis of the earlier studies had led to the development of a set of emerging themes (http://edfutures.net/Digital_technology_trends). These themes informed the analysis of the data from these two Snapshot Studies, which in turn led to refinements and extensions to the emerging themes, thus extending their scope.

Thus, analysis was a cyclical and iterative process, involving:
- both researchers independently being immersed in the data – reading notes, listening to recordings of interviews, examining the samples of pupils' work, and reading the questionnaire responses;
- transcription of sections of interviews that related to the themes that had emerged from the earlier studies;
- transcription of sections of interviews that had been highlighted by the participants as being important or struck the researchers as addressing new aspects of practice (not previously identified in earlier studies)
- cross-referencing between different sources (e.g. cases, participants, modes of data collection)
- triangulation between researchers
- testing the data from these studies against the emerging themes from earlier studies, and where the new data didn't fit with existing dimensions they were either refined or new dimensions were suggested
- the revised/new dimensions were then tested against data from all the studies and further refined – a key aspect of this testing was looking for counter evidence

Results and discussion

The analysis resulted in the identification of a number of new themes, which had not emerged from the earlier studies, as well as refinement of existing dimensions related to the models of provision. Emerging factors related to the school's vision-and ways that the devices were used to support assessment practices, home-school links and pedagogical practices.

Realising and implementing the vision for the school

Both principals had a very clear vision for the school and could articulate how the mobile technology policy fitted in with this vision. Sandrinham Street's principal (SS-P) articulated the vision in terms of her students being '*literate, creative, culturally aware and socially conscious young adults and ready global citizens*' (SS-P Interview). She recognised the critical role of technology in enabling that, and highlighted the creativity that the tablets could engender:

> *Now that technology is so immediate and intuitive, it lets people concentrate on the creative task at hand. Kids need to be literate and know maths, but they also need to be creative. By this I mean problem solving skills, rather than the cliché of being an artist.*

<div align="right">(SS-P Interview)</div>

For Greenfields' principal (GF-P) there were a number of factors that the devices could contribute towards:

> *Wow, they [iPads] enable kids who may not be engaged, to be engaged. It allows them to shine in what they find interesting. You start thinking of all those things: like, higher order thinking skills, critically looking at what they've done.*

<div align="right">(GF-P Interview)</div>

This emphasis on 21st century skills was also taken up by the Greenfields classroom teacher (GF-T) who noted in the interview:

> *Technology fits in a number of ways. We do have a focus on 21st century skills. When students leave school, they need to know much more about how to access information than older generations.*
>
> <div align="right">(GF-T Interview)</div>

The importance of having a vision that informs your digital technology strategy is well established in the literature (e.g. Conlon 2002) and with specific reference to tablets in schools (Heinrich, 2012). This was also evident in the Vital Studies and other Snapshot Studies. However, these two studies helped to clarify the need for a dimension that distinguished between different kinds of visions (as illustrated in Table 3).

Table 3 about here

In order for a vision to be realised it is important that the school community is on-board. The principals in both these schools worked hard to ensure that their visions was clearly understood and shared by stakeholders.

Both principals emphasised the importance of consulting and engaging with the school community members (which included teachers, parents and students) in order to ensure that their digital technology policies were educationally effective.

> *We took the new policy to the Parents and Citizens group P&C and convinced them of the benefits of introducing technology. We explained that the purpose was to show kids the power of the devices they have.*
>
> <div align="right">(SS-P Interview)</div>

Both the schools had the support of the students, teachers and, importantly, the parents. All the parents at Greenfields were extremely supportive, and only one parent at Sandrinham Street expressed concerns:

> *she said their kids had enough screen time as it is. I don't know if I convinced her, but we had a lengthy conversation.*
>
> <div align="right">(SS-P Interview)</div>

The schools' visions clearly underpinned their models of provision.

Provision

The models of provision were different in Sandrinham Street and Greenfields. Greenfields wanted every student to have an iPad, whilst Sandrinham Street did not want 1:1 provision:

SS-P:	*1:1 it's sort of doesn't really [hesitation] I'm proud of it in a way because its [hesitation] its perpetuating good practice. We're not saying you need a device for 1 child, every child needs 1 device, it's actually turned out that well you don't actually need one device per child*
Researcher 1:	Right
SS-P:	*Even if 5 kids bring their devices in the kids are*

	working on a video or film together they can
Researcher 2:	*sharing*
SS-P:	*It's good practice*
Researcher 1:	*You've got enough for groups to*
SS-P:	*Yeah and its better practice cos the kids get to talk*
	about what they're doing and that collaboration is
	more valuable than the 1:1 1 kid looking at a screen.

<div align="right">(SS-P interview)</div>

These differences were reflected in the other data from each school. In Greenfields the aim was for each student to have a tablet, and if they didn't bring one in from home then the school lent them one. Over time the number of students bringing in a device had increased, until over two thirds were doing so on a regular basis (according to the teacher, substantiated by observation). In Sandrinham Street, less than half the students brought in a tablet each day according to the ICT coordinator/teacher (substantiated by the principal), although she knew that the vast majority of the students (all but 2) had access to one at home. In both schools, students were observed sharing devices. In Sandrinham Street the teacher set up activities that necessitated students sharing their devices; in the observation students were working in groups of three filming each other reciting a poem, they then swapped their tablets with other groups so that they could peer-review each other's recitations. In Greenfields, the teacher reported that

> *I try to discourage them doing that [sharing devices] because I remind them that if anything goes wrong you are going to hate whoever [laughs] … but I'm not going to stop them.*

<div align="right">*(GF-T Interview)*</div>

Both these schools also flagged up the potential to mix up different models of provision. Greenfields challenged the existing 'Who pays' dimension (Table 4) by aiming to achieve a 1:1 model through the use of a BYO strategy combined with the school funding some devices. Thus, the overall mobile technology model is based on an interaction between a new 'Mobile Provision' dimension and the 'Who pays' dimension, which also needed to be refined, with the removal of the Hybrid category, as shown in Table 5.

Table 4 about here

Table 5 about here

Having explored the schools' differing models of provision, the most important question that needed answering was what impact, if any, did the devices have on practice?

Observed practice - peer assessment
In the observation at Sandrinham Street the students were undertaking a literacy lesson and were working in groups. One group, who were using tablets, was focussing on working with poetry. The students in this group were split into further teams of three. To begin the session, the teacher and students developed a rubric to assess the poetry reading of each team. There were five items on the rubric, which included eye contact, pause and pace, expression, the use of punctuation, and actions.

In each team, one student videoed the other two students. The students being videoed were able to view the recording to self assess using the rubric to guide the process.

After recording the poetry, the teams then got together, viewed each other's poetry on the tablets and provided feedback using the rubric.

The use of tablets facilitated the students' assessment of each other's work within their team by viewing a number of readings and refining their performance, and by teams commenting on each other's final performances.

Similarly, in Greenfields, students were observed working in small groups developing presentations; in this case to explain the way in which the sun, moon and Earth move in relation to each other. One group worked outside the classroom, using a tablet on a tripod. Members of the group took on the role of the sun, moon and Earth and acted out the way they moved in relation to each other, whilst other members of the group controlled the tablet. As the students recorded and reviewed their movie they discussed the planetary movements and re-recorded the movie several times as their understandings became clarified and refined.

In both schools a high degree of collaboration was evident, with students working in groups using video recording to help them reflect upon and refine their knowledge and skills. This aligns with Heinrich's (2012) reported use of movie production to support peer review, and with Henderson and Yeow's (2012) claim that tablets facilitate social collaboration between students due to their form factor, which includes their size, shape and weight. Burden et al. (2012) noted that tablets provide increased opportunities for collaboration between the student and teachers. This was also evident in both these schools, because the video recordings allowed the teachers to review student activity at a later point in time. However, this form of teacher assessment was not unproblematic.

Teacher assessment

Whilst teachers in both Sandrinham Street and Greenfields were observed carrying out formative assessment of students' videoed material during lesson time, it appeared that marking of work (outside lessons) was predominantly paper-based. The teacher at Sandrinham Street (SS-T) said that she did some assessment of electronic material:

> *the girls probably showed you all those interviews that they did [yup] so I did my assessment for HISE which is like social studies. I did my assessment with my rubric by watching videos and ticked. So my reporting for that unit is done because I watched all those videos. So in that sense and then I could have done all my talking for English tick tick tick watch video. It took me half an hour*
>
> (SS-T Interview)

However, when asked directly about how she provided feedback to students she said:

> *On paper. I give random feedback online, but if you're talking about an assessment piece, I do it on paper. […] It wouldn't be practical to, on Edmodo I can post to each child or I can email to each child but I wouldn't electronically but I wouldn't do that. … Um I think it would take me longer …*
>
> (SS-T Interview)

The teacher at Greenfields similarly indicated that he used traditional assessment practices for much of the time:

> GF-T: *The majority of the time it's on paper. Especially*

formal assessment.

Researcher 1:   *Why?*

GF-T: *Yeah I know! I ask myself the same thing. Why! I have ideas for how to make things so much better, but I don't have the time*

<div align="right">(GF-T Interview)</div>

The students corroborated that most marking was still paper-based:

Researcher 1:   *If you're doing work that a teacher is going to mark, would you do that on the iPad, paper or an exercise book?*

GF-S:

Usually on paper. If its maths we usually do it on paper, if it's writing we do it in books.

<div align="right">(GF Focus Group)</div>

Thus, it appeared that whist digital technology provided new ways to assess students' the assessment and feedback practices in both schools remained largely paper-based, particularly where the assessment was part of formal reporting. This seemed to be driven, at least in part, by time considerations, with assessment using digital technology being perceived as more time consuming. As hinted at by the teacher at Greenfields, this meant that they were not always taking full advantage of the potential of the tablets. Quillen (2011) suggested that part of the problem is that many app developers are gearing educational content to parent-child interactions. Thus, the currently available software is not designed to facilitate teachers' work. However, Kearney and Maher (2012) and Maher (2013) have found that assessment through the use of mobile devices is being taken up by pre-service teachers and may thus start to be more common in schools as these trainees take up teaching positions.

The teacher in Sandrinham Street also flagged the importance of providing feedback on paper because it was easier for the children to manage (and share with their parents):

… I have one document where I fill out all their rubrics and then I print it out and give it to them [Ok] and they stick it on their fridge. A lot of them stick it on the fridge [mumble] and they need to refer back to it. They're not as organised, they're only in Year 3 4 so they don't have Like we're not there yet

<div align="right">(SS-T Interview)</div>

This comment highlights the importance of home-school links and the pragmatic considerations of the most effective ways of sharing information.

Home/school links

Northrop and Kileen (2013, 531) claim that tablets are "giving educators an excellent opportunity to use technologies to connect school and home learning opportunities". As already indicated, this was something that was raised by staff. Thus, the teacher in Sandrinham Street responded in the questionnaire that the school decided to implement the tablet initiative because*:*

We think that if students take their own devices they could share their work at home and consolidate learning by taking work home.

<div align="right">(SS-T Questionnaire)</div>

When asked in the interview if having the BYO iPad strategy had 'changed what happens at home and the kinds of relationships between home and school' she responded:

> *Yes. Absolutely because if you are writing on here or creating content and then going home with your own device [yeah] you're sharing it [yeah] and [Amy] is one example. She went home as soon as I showed her Scribble Press she went home and got it on her iPad that night so now she be working in here and take it home ....*
>
> *…*
>
> *…She never did any homework. She was very, when she first came at the start of last year 'No I'm not very good at this not very good at that' didn't want to do anything. As soon as I said 'You can do your homework online, you can email me or you can [yeah] post it on Edmodo you don't have to use a book' [Yup] she was posting her homework every week and creating like doing way more than necessary [yeah] and its good stuff it's not like writing out sums, it's you know something exciting*
>
> <div align="right">(SS-T Interview)</div>

It also emerged from the parent interviews. When asked what difference the BYO initiative had made Greenfields Parent (GF-Par) commented:

> GF-Par: *I feel I mean like [Laura] comes home and she shows me what she's done at school and um um to even to the point where I wrote on there she takes photos of her work you know her art work cos she takes photos so I mean she shares everything because she can just that that I guess that interface between home and school is.*
>
> Researcher 1:   *And she wouldn't have shared stuff with you if she hadn't had the device?*
>
> GF-Par: *I don't think [pause] I wouldn't have seen so much I mean she probably brought home maybe worksheets [yeah] which is what my son in Year 1 does he brings home worksheets but he doesn't have that you know 'Wow mum look at my work!' [yeah] it more it's like scrumpled up in the bottom of his bag and I'll pull it out and say 'Wow look at what you've done' and he'll be like 'Yeah whatever mum' whereas she is showing me with enormous pride what she's done and yeah I think it's a very different feeling. She feels like she's really achieved something.*
>
> <div align="right">(GF-Par Interview)</div>

This view was corroborated by the Greenfields teacher:

> *… we start something at school and something that I would usually expect like a concrete example I mean you have seen [Laura's] Buddy story that she wrote [Yuh] for her kindergarten buddy um it was something that we were working on in school and normally I would anticipate that would take maybe five weeks of school time and you know just a couple of lessons a week [Ok] just give you a bit more time on it [Yuh] That was done in probably no more than three days. In that she um oh actually it may have been a bit more cos*

there was a lot of fiddling around, but say a week [Yuh] I'm just thinking back to it um in that she she'd started it in school and was so inspired that she spent hours and hours and hours on it at home. And done, not just, not just the time on it but the actual thought that she's put into it. I couldn't of possibly of said to her before she did it that you should use this app and you should do this and you should do this, I couldn't have told her the process that she was going to go through. She did it herself and because she'd committed the time to do that the product was amazing.

<div align="right">(GF-T Interview)</div>

It thus appeared that the devices enabled an increased level of linking between the home and school beyond traditional means. Whilst there was agreement on the benefits of using the tablets in terms of the home having greater access to what their children were doing in school and extending the time students spent on school-type work,, there were differences of opinions as to whether they enabled a flow of ideas and information from the home to the school. When asked whether she thought that the BYO enabled her daughter 'to bring something in to influence what happens in the classroom' the Greenfields Parent said:

GF-Par: *That's exactly right, yes. That's exactly right too. Um um she um [pause] she both my kids make endless home movies*

…

GF-Par: *Yeah absolutely incredible. Yes it's something it's a fantastic thing. I guess we used to put on plays and some stuff for our parents all the time so I guess it's the same thing but you've suddenly got this technology to you know bring it in and*

Researcher 2   *So she brings a lot of her own movies into the classroom*

GF-Par   *Yeah and shares …*

<div align="right">(GF-Par Interview)</div>

The Greenfields teacher agreed that this was the case, but was unable to give any examples of it having happened. When asked if students had brought apps or ideas into the classroom that had changed her practice the Sandrinham Street teacher replied "*Not, no not yet*" (SS-T Interview).

It appears from the above discussion that students were bringing in products, ideas and apps from home but they were not having much, if any, impact on educational practice in the classroom. This raises a larger question about the extent to which the use of the tablets is impacting on pedagogy.

Impacts on pedagogy

Whilst all the participants in the research were positive about the impact of the BYO iPad strategies in both schools, none of the staff in the schools thought that the iPads had fundamentally changed their pedagogical approach. When asked explicitly if the tablets had impacted on the way teachers taught in the school the principal at Sandrinham Street said:

No I think that they probably didn't. I'd say, yeah. I'd say that it's just because that's a better way of teaching

<div align="right">(SS-P Interview)</div>

This was corroborated by the Sandrinham Street teacher, who felt that whilst her pedagogical approach would be the same, the tablets had extended what she and the students were able to do. This was echoed by the ICT Coordinator at Greenfields (GF-ICT):

GF-ICT: *I don't think I'd teach any differently. I don't think the iPads have forced me to do something different. I think though the iPads have just, for the kids if you asked the kids they would say 'Oh tremendously' They wouldn't be able to know and research and find out and create as much as possible before. For me they would look like they're still learning and doing the same things in the same dynamics, the same groups. Just the iPad happened to come along and it's a nice engaging device for them that [pause] no saying that actually I didn't create as much multimedia. Multimedia has completely just ballooned because of the iPad. Before it was very hard to do that*

R1:   *Yeah, but you still did a lot of collaborative projectey type work*

GF-ICT   *Yes. Underlying, pedagogically, yeah that was there, but the product is different. So I've always kind of liked play and having autonomy built into learning.*

(GF-ICT Interview)

This was also reflected in the comments from the Sandrinham Street student focus group where one of the students commented:

I didn't say we learnt we didn't learn any differently, what I meant was that we learnt just as much. Like if we didn't have iPads we would still be just as smart as we were without them. It doesn't change learning but it changed the way of learning.

(SS-S1 Focus Group)

In both schools the students felt that they had greater independence. Thus, for example the students at Greenfields noted that having the tablets meant that:

GF-S1:   *Well like, we're like doing it ourselves. Like really with the iPads like you don't have much help from the teacher. He just gives you the assignment and lets you go on your iPad to like search it up*

R2:   *So more independent?*

GF-S1   *Yeah, definitely.*

(GF Focus group)

This reflects Dexter, Anderson and Becker's view (cited in Crichton, Peglar & White, 2011) that the use of technology would shift the roles of teachers and students, with teachers becoming facilitators.

Thus, whilst the overall pedagogical~~pedagogy~~ stance in each school seemed to be unchanged, the tablets did appear to enhance and amplify the existing practice, and extend the students' learning. When asked how the tablets had impacted on the

children's learning, the teacher at Greenfields responded:

> *In really profound ways, and it's hard to just say 'Oh like this'. You know.*
> *But, they have really deep understandings now of not just the basics any more.*
> *They don't. They can take it beyond um the boundaries of the classroom. …*
> *it's because the information is at their finger tips and they have a way and all*
> *on device that's the size of a book they ca not just find that information but*
> *then explain it in another way for the rest of the for their audience or even*
> *better for the world.*
>
> (GF-T Interview)

This reflects findings of Clark and Luckin (2013) who found that tablets could support deeper learning as well as enhance and augment the learning, particularly in maths and science.

Thus, it would appear that the BYO iPad strategies in these two schools aligned with and amplified the teachers' pedagogical practices, rather than changing them. However, this still resulted in major impacts on how the students learnt which staff, peers and parents clearly saw as beneficial. This was summed up by the Greenfields Teacher:

> *The way I approach my teaching hasn't changed. But it's the tools it's the*
> *tools that I've got at my fingertips that have really changed. That said though,*
> *in the past, before having all these devices I hadn't felt as though we can go as*
> *far as I wanted to go with that sort of process. I mean it's a constructivist*
> *approach [Yeah]. That's never changed for me but I can do it to a greater, it's*
> *constructivism on steroids.*
>
> (GF-T Interview)

Conclusions

Before summarising the key outcomes from these two studies it is important to bear in mind their limitations. They were snapshots of practice, involving only one day of data collection in each school. At best they therefore represent partial views of only two schools. As such they are not intended to be representative and, as noted previously, the results are not intended to be generalizable. In conjunction with the earlier studies they do highlight aspects of practice related to mobile device use in schools that are worthy of further attention. Clearly, additional research, involving more in-depth studies across a wider range of settings, is required to extend our understanding of digital technology strategies and practices in schools and their impacts.

From the two schools we observed, it was clear that there needed to be a clear vision of how the tablets would support learning in the schools. The principal had a clear role here but teachers and parents, as well as students all needed to be part of the journey to ensure that this vision would become a successful reality. In both of the schools, this vision was supported by all participants and the journey was well under way.

Importantly, the model of provision adopted in the both these schools aligned with and enhanced their visions. In Sandrinham Street the desire to enhance collaboration fitted with a BYO iPad policy within which a relatively small number of students brought in their own devices each day. In Greenfields, a blend of BYO iPads with school funding enabled them to achieve a 1:1 model, which fitted with their

desire for all their students to develop their 21st century skills.

      The devices were used in both observed classrooms to support a constructivist approach to learning, in which movie making featured as a way of supporting students' understanding. The tablets facilitated the students to both self and peer assess. The use of the tablets also supported collaboration where the devices were shared. Whilst there was some evidence of tablets being used for teacher assessment, traditional (paper-based) approaches seemed to predominate, particularly when it came to summative assessments.

      One of the affordances of the tablets was that they enabled and enhanced home-school links, although it appears that this was mostly a one-way flow from the school to the home. There was limited evidence that there was a flow of ideas and resources moving from the home to the school.

      In both schools, the BYO iPad strategies appeared to enhance and amplify the existing pedagogical stance of the teachers. However, by its nature, it also fundamentally changed the characteristics of the student learning experience. It remains to be seen whether BYO tablet strategies impact positively on students' learning outcomes as they progress to their secondary schools and high stakes assessments.

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Table 1   **Summary of the two Snapshot Study schools reported here**

Pseudonym	Sandrinham Street	Greenfields
Type	State	State
Phase	Primary	Primary
No. students on roll	Over 100	Over 200
Digital technology strategy	BYO iPad	1:1 model, utilizing a BYO iPad strategy
Year group(s) observed	3 & 4 (mixed)	6
Number of students in class	26	29

Table 2　　　　　**Summary of data sources**

	Sandrinham **Street**	**Greenfields**
Principal	Senior Leadership Team (SLT) questionnaire Follow up interview	Senior Leadership Team (SLT) questionnaire Follow up interview
ICT Coordinator	*Teacher was ICT Coordinator* ICT Coordinator Questionnaire	ICT Coordinator Questionnaire Interview
1 Teacher	Staff questionnaire Observation 2 Interviews	Observation Interview
4 Students	Portfolio Focus group	Portfolio Focus group
1 Parent	Interview	Parent questionnaire Interview

Table 3   The vision dimension

Vision	Example
Clear educational vision	Students will be literate, creative, culturally aware and socially conscious young adults and ready global citizens (Sandrinham Street)
21st Century vision	To prepare children for the 21st Century (Greenfields)
'Apple pie' vision (banal/unsophisticated/clichéd)	Every child reaches their full potential
Technology vision	To have 'a computer lab in every classroom'
No vision or mismatch between vision and digital technology strategy	Can not articulate a vision and/or specify how digital technology will help them achieve it

Table 4   **Original 'Who pays' dimension**

Category	Explanation
School	The school pays for all the equipment used in school. In practice, they may have funding from grants or commercial sponsors.
Subsidised	Parents make a (voluntary) contribution towards the cost, which complements the school funding. In some cases the contribution may only pay part of the cost of the equipment, whilst in others the contribution covers the full cost. The pupil may (or may not) end up legally owning the device.
Hybrid	This is essentially a mix between 'Subsidised' and 'Home' in which pupils who already own a suitable device are allowed to use that (and so don't have to pay for another one, though they may have to buy additional insurance).
Home	Parents pay for the device their child is using.

Table 5   **New 'Who pays' dimension and its interaction with the new Mobile Provision dimension**

Mobile Provision

Who pays	1:1 loan	1:1 owned	Bring Your Own x (BYOx)	Bring Your Own Device (BYOD)	Bring Your Own Technology (BYOT)
School	School pays and specifies devices				
Subsidised	Parents subsidise devices specified by the school				
The home	Home pays for devices specified by the school			Can bring in any device they have at home	