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# BRING YOUR OWN DEVICE (BYOD) AND TEACHER PEDAGOGY IN A NEW ZEALAND PRIMARY SCHOOL

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## Abstract

*The practice of students bringing their own mobile devices (BYOD) to school is increasingly being used to leverage digital learning opportunities in New Zealand schools. This paper presents a summary of the findings from a case study that explored the experiences of three primary school teachers as they introduced BYOD into their classrooms for the first time. The aim of the study was to understand the impact BYOD had upon their pedagogical practices and to identify factors that influenced these practices. The paper includes recommendations for schools and teachers who may be considering implementing BYOD in the future.*

## Keywords

BYOD; case study; pedagogy; SAMR model

## Introduction

Primary schools in New Zealand have been progressively adopting the use of digital technologies in classrooms over the past two decades (Ministry of Education, 2014, 2015a). In the recent New Zealand Council for Educational Research (NZCER) report, Bolstad (2017) outlined a range of benefits identified by New Zealand primary/intermediate school teachers in their adoption of digital technologies. The benefits included the ability to support student learning needs, encourage deeper learning, increase student agency, and adopt new approaches to teaching and teacher professional learning. However, Bolstad also identified a range of concerns held by teachers, in particular digital safety, impact upon teacher workload, time constraints and, importantly, equity of access for students.

One way schools attempt to ensure students have increased opportunities to access digital devices is to introduce a school 'bring your own device' or BYOD strategy. This strategy enables students to bring their own mobile device from home, thus supplementing the number of digital devices available for student use within the school. The adoption of BYOD strategies in schools provides both opportunities and challenges for school leaders and teachers, and impacts teacher practices as 'digital dependent' learning and teaching strategies are implemented (Bolstad, 2017; Johnson, Adams Becker, Estrada, & Freeman, 2015; Ministry of Education, 2014, 2015b). BYOD has the potential to create more opportunities for students to learn anywhere, anytime (Adams, 2015), engaging students and adding value, flexibility and more personalised learning (Ministry of Education, 2015c).

Teachers may experience challenges when implementing BYOD that impact on their ability to effectively integrate devices into their classrooms. These challenges include technical issues (Lai, 2005, Minshew & Anderson, 2015), lack of time (Janssen & Lazonder, 2015) and limited professional learning opportunities (Davis, Eickelmann, & Zaka, 2013; Ling Koh, Chai, & Tay, 2014). Teachers require access to professional learning that builds confidence and develops the technological knowledge and skills to enable them to overcome these challenges when introducing BYOD (Minshew & Anderson, 2015; Starkey, 2010). Research by Davis et al. identified that professional learning is one of the key factors present in schools that had been successful in integrating ICT.

The case study presented within this paper investigated the impact BYOD had upon the pedagogical practices of three New Zealand primary school teachers. The teachers were working within one school, with children aged between six and eleven years, and were adopting BYOD in their classrooms for the first time. Pedagogical practices were defined within the study as the range of actions undertaken by these teachers as they prepared for, designed and implemented teaching, and

facilitated student learning. The purpose of the study was to investigate how these teachers experienced the introduction of BYOD in their classrooms, the impact this had upon their pedagogical practices and the factors that impacted these practices. The study makes a valuable contribution to the limited pool of research conducted in New Zealand that has explored the impact of BYOD within primary school contexts.

The SAMR: Substitution, Augmentation, Modification, Redefinition (Puentedura, 2006) model was used to investigate the pedagogical practices evident in the case study classrooms. The SAMR model (Figure 1) provides a framework that enables teachers to evaluate the ways they use technology in their classrooms and the impact this may have upon student learning and their teaching.
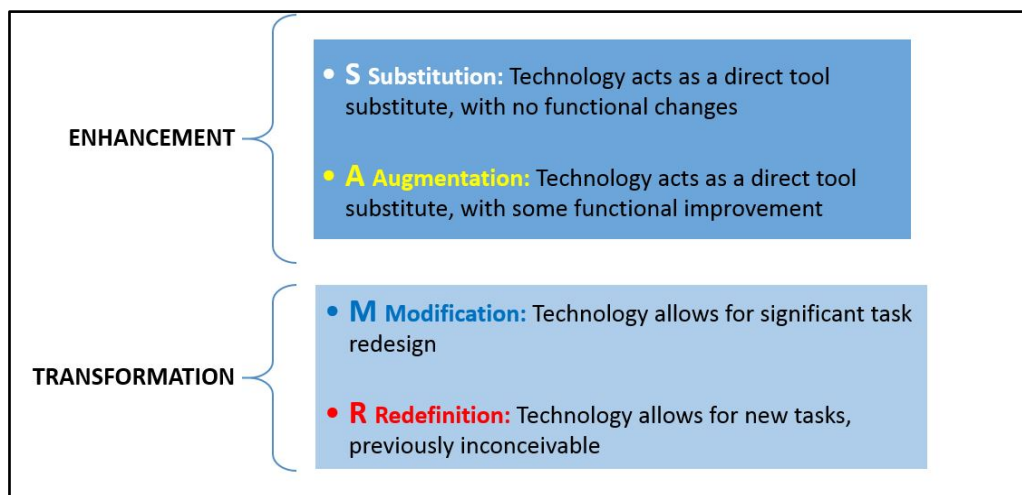


**Figure 1:    Overview of Puentedura's (2006) SAMR model.**

Ideally, teachers progress through the stages of this model from enhancement (the first two stages: Substitution and Augmentation) to transformation (the second two stages: Modification and Redefinition) in their use of digital technologies. It has been identified that the richest potential to revolutionise learning occurs within the transformational stages (Hamilton, Rosenberg, & Akcaoglu, 2016; Puentedura, 2006). Romrell, Kidder, and Wood (2014) further propose that learning activities situated in the transformation stage were more "personalised, situated and connected" (p. 9) than the tasks at the enhancement stage, and this is where teachers' practice should be situated to best leverage technology for learning. The use of this framework within the study enabled the researcher to examine the links between the teacher's use of digital technologies and pedagogy when introducing BYOD within their classroom.

## Research design

Case study methodology (Yin, 1994) was employed to design the study. A strength of case study method is that it encourages the researcher to concentrate on a specific instance or situation, and to understand the various interactive processes at work (Bell, 2001). As a member of staff at the case study school, the researcher's position could be described as that of an insider, or teacher researcher (Cullen, 2005). This position created some ethical challenges that needed to be considered carefully throughout the process. To address these, the confidentiality of the data was emphasised, only information that was relevant to the study accessed, and open dialogue maintained with the participants and school leaders.

The case study was conducted in a decile eight, full primary school with a roll of 360, situated in the South Island of New Zealand. Staff at the school had been considering implementing BYOD for three years prior to this study commencing. As the budget at the school did not extend to being able to purchase enough devices to cater for student needs, it was envisaged that implementing a BYOD programme would reduce the number of devices the school would need to provide. During this time, the teacher in charge of ICT had investigated other schools' methods of introduction, seeking guidance from resources and support material available on a range of New Zealand websites,

including the Ministry of Education 'Enabling e-learning' portal (http://elearning.tki.org.nz/) and the Netsafe website (https://www.netsafe.org.nz/). The lead teacher also evaluated the school infrastructure to identify if upgrades would be needed prior to a potential BYOD introduction. The school subsequently piloted a BYOD strategy within one Year 5–6 class over two terms (20 weeks) in the year prior to this study, and this informed the introduction of BYOD for the rest of the school. As a result of the pilot, the school-wide wireless system was upgraded, as was a security and monitoring system for student access to the school Wi-Fi. This case study was conducted in the year following this pilot. Appendix A illustrates how the study was situated within the BYOD timeline adopted by the school.

## Participants

Three teachers were invited to participate because of their involvement in the BYOD implementation at the case study school. Pseudonyms were used within the study to protect the identity of the teacher participants. The first teacher, Kelly (Year 2–3 class level/children aged 6–8), had been teaching for 16 years in a variety of primary schools in New Zealand. Although an experienced teacher, Kelly had been involved in a limited range of school-provided professional learning opportunities with integrating ICT in the classroom. Prior to implementing BYOD, Kelly had occasionally utilised school-owned devices in the classroom for inquiry purposes and to supplement literacy and numeracy programmes. The second teacher, Jo (Year 2–4 class level/children aged 6–9), had four years teaching experience in New Zealand primary schools. Over these years, she had utilised school-owned devices in the classroom and innovatively used Instagram (a mobile photo sharing application) and Class Dojo (a classroom management platform) to complement student device use. The third teacher, Nic (Year 4–6 class level/children aged 8–11), had been teaching in New Zealand primary schools for 14 years. Nic had previously been involved in a Ministry of Education ICT professional development cluster yet still described herself as having 'fairly limited' technological knowledge. Nic had previously used school-owned devices in the classroom for research linked to inquiry/reading, and within a numeracy rotation programme.

## Data collection

The school and participants provided written consent prior to the research being conducted. Data gathering was carried out at convenient times for the teachers, spanning a 20-week period over the school's academic year. Data gathering methods included semi-structured interviews, classroom observations, examination of teacher documentation (i.e., planning), and teacher reflections (see Table 1).

**Table 1:     Data Gathering Methods**

| Data Gathering Method | Purpose | Timeline |
|---|---|---|
| Semi-structured interviews x 4 | The first semi-structured interview introduced the study and gathered initial data. The second and third interviews were part of the follow-up to the observations and the reflections. The final interview addressed the previous three interview responses, in particular the first interview, to compare and contrast teacher pedagogy from the beginning to the end of the research. | Interviews with the teachers were approximately one hour at the beginning, middle and end of Term 3, and mid Term 4. BYOD was introduced to the students at the beginning of Term 3. Interviews were audio recorded and then transcribed. |
| Observations | To identify how BYOD was being used in the classroom and what teaching practices were involved. Ongoing observations were timetabled before the second, third and fourth interviews. | Classroom observations of one teacher were conducted during Term 3 and Term 4. |

| Teacher documents | To ensure the research included a variety of data the teachers shared their documentation. Documents included unit planning, weekly planning, small group plans (i.e., reading/numeracy) and lesson reflections/evaluations. This increased reliability and allowed for data triangulation and comparisons with observations and interviews. | Documents were shared and discussed during the interviews and were made available during the classroom observations. |
|---|---|---|
| Reflections written by the teachers | To identify and reflect upon pedagogical changes (if any) that the participant engaged in within their classroom teaching. | The teachers recorded written reflections throughout Term 3 and the first half of Term 4. |

Data were sorted into categories and collated using themes and patterns. Employing coding methods proved beneficial as it enabled the researcher to analyse the collated data and provide a structured interpretation (Neuman, 2015). As themes emerged the researcher was able to further analyse the responses and compare them to the data in the reflections and observations. The inclusion of three teachers within the study added scope and enabled data triangulation to occur (Bell, 2001; Scholz & Tietje, 2002).

## Case study findings

### *BYOD and teacher pedagogy*

Patterns were evident within the participants' practices that reflected two out of the four stages of the SAMR model. Initial practices by all three teachers indicated they were utilising devices as substitutions for pen and paper, practices indicative of the 'substitution' stage of the SAMR model. For example, Kelly and Nic used devices during writing time whilst those children without devices continued to use pen and paper, and Jo used devices during numeracy group teaching also as a substitute. At this stage, technology appeared to be acting as a direct tool substitute within the classroom, and there were no functional changes to teacher pedagogy. The three teachers utilised devices first within the learning areas they perceived they had the strongest content knowledge. All teachers began using Google Docs within their writing programmes. Kelly stated, "I was concerned about losing the writing process when using devices, but now I see how I can give feedback and it's so quick and children can make changes then and there without having to go back to it later."

Movement into the 'augmentation' stage of the SAMR model began as teachers further explored the potential for using Google Docs. At this point in the study, the teachers continued to use technology as a direct tool substitute within their classrooms; however, some functional improvements and changes in pedagogy were identified. For example, Jo began to utilise web-based programs for numeracy group teaching, enabling those with devices to complete tasks that the other children could not do with pen and paper. In addition, two of the teachers began to use the web tool 'Blendspace' to create digital content and lessons for students. Using an online environment for learning required the teachers to adopt different approaches within their teaching. As they continued to explore new programs and methods of using Google Drive, augmentation increased. Kelly introduced an application (Book Creator) for writing and used QR codes for the students to access specific websites. The use of Seesaw for assessment and communication with parents/caregivers also grew throughout the year. Kelly and Jo also attempted a flipped classroom strategy, sending an email to children and parent/caregivers that contained links to YouTube clips. The intention was that students watch the clips to prepare for the learning the following week. However, only a small number of students did so, implying the strategy was not as successful as they had hoped.

The teachers became increasingly positive about device use as the year progressed, and reported that children who may not have completed tasks in the past were more motivated to finish their work when using devices. Children without devices were also asking for more opportunities to use school-owned technology in the classroom. Jo reported feeling concerned about the social impact on children

who could not, for a number of reasons, bring a device to school. She tried to plan so the impact on these children would be minimal, while at the same time, planning for the children who were bringing devices. Jo mused, "I'm trying to find ways I can implement new tools and strategies in the classroom to support those with devices and those without. I don't want those without devices to feel like they're missing out and I want those with devices at school to feel like it's worth their time." Each teacher expressed a desire to be able to use digital technologies in more transformative ways in the future. Nic, however, suggested that the school needed to provide professional learning earlier in the BYOD journey to ensure teachers had the ability to be more creative and innovative in their practices.

## Factors impacting teacher pedagogy

The teachers experienced challenges that impacted their ability to fully utilise digital technologies in their classrooms for pedagogical purposes. These challenges included technical issues, time constraints and a lack of coordinated, timely professional development. The technical issues were varied and often ongoing. For example, many children did not regularly bring their device to school. The number of devices available ranged from day to day, as Nic indicated: "… one day out of a class of 61 we had maybe 15." Kelly also spoke about needing to access school-owned devices to supplement the number of BYOD: "It's really helpful having the iPads next door … because it means we have a better ratio in the room." There were also problems connecting to the school wireless network at the start of the day and issues with passwords. However, the most problematic challenge for two of the teachers was the variety of devices children brought and their lack of technical understanding to help children use them. This variety required teachers to have a working knowledge of a range of different platforms, programs and applications given technical help (via the school's contracted technician) was only available on a fortnightly basis. Teachers often had to find applications or add-ons that operated the same way on different devices to enable the children to successfully participate in the learning tasks in class. Jo spoke about trying to solve problems as they happened: "… if they aren't working like I had planned them to work because the device is now not connected to the Internet and I don't know (my) way around the settings, it hinders the learning that's meant to be taking place … and I need to be teaching."

A further challenge related to time constraints. Considerable time was needed to learn about devices, programs and applications, and the teachers simply lacked the time to do so. The teachers identified the need to timetable skills teaching for the children into weekly planning as well as time to design the learning tasks. In Reflection Three, Kelly wrote, "I tried to find a way to export the books from the iPads but with no success so that's some more learning that I need to do. Again I need more time to learn things!" Time was also required to solve issues related to access, as Jo indicated: "We don't have 100% buy-in with children with devices, so I am putting time and effort into setting up different activities for students with devices and those without devices."

The lack of timely professional development was also identified as a challenge. All three teachers emphasised their desire for ongoing professional development, with Nic stating that although past professional development was useful, she often needed to "get the PD quick" to make it more relevant. Thus, teachers had to spent time independently upskilling and finding support and resources. They did this by visiting websites where teachers shared ideas and resources (e.g., Pinterest, TKI and Blendspace), participating in online discussion forums and talking to other colleagues. They all expressed a keen desire to visit teachers who were experienced users of digital devices in their classroom and wished they had done so before starting the year.

## Discussion

The findings from the study suggested that teachers' pedagogical practices did change during their first year of BYOD implementation, and these practices generally reflected the 'enhancement' (substitution/augmentation) stage of the SAMR model. There was little evidence that participants reached the modification or redefinition phases of the SAMR model. In order for these teachers to be confident in redefining tasks, they believed that they needed further support in the form of professional learning, something that has proven to be an essential component when using digital devices in schools (Baker, 2010). This study concurs with Minshew and Anderson's (2015) findings that issues of teacher confidence and technical knowledge are barriers to integration. It appears

increased technological content knowledge was essential for these teachers to be able to progress further through the SAMR phases. For the devices to be implemented and used effectively (i.e., in the way that they were designed, not as a tool substitute), the teachers considered they needed to understand the possibilities of using them in the classroom prior to the planning process commencing. Teachers' practices were impacted by a range of challenges also identified in the literature, including technical issues (Lai, 2005; Minshew & Anderson, 2015), lack of time (Janssen & Lazonder, 2015) and limited professional learning opportunities (Davis et al., 2013; Ling Koh et al., 2014). All three teachers believed they needed to increase both their technological, and technological pedagogical content knowledge, to be able to implement BYOD to full effect in their classrooms. Minshew and Anderson (2015) and Starkey (2010) both identified lack of knowledge in these two areas as barriers to ICT integration in the classroom. The findings suggest that addressing the above would have potentially enabled the teachers to move their practices more into the 'transformation' (modification /redefinition) stage of the SAMR model.

## Recommendations and conclusion

This study provided some useful insights into the way three teachers implemented BYOD within their classrooms for the first time and the impact this had upon their pedagogical practices. Although this case study investigated the unique experience of three teachers within one primary school, themes emerged that have potential value supporting the successful implementation of BYOD in other schools. The following recommendations have been formulated from these themes.

### *Recommendations for schools*

- Schools should ensure BYOD is included in their forward/strategic planning goals if they decide to implement this initiative.

- Schools should consider specifying devices, applications and computer programs that will work within the school infrastructure if they wish to minimise technical issues.

- Ongoing, timely technical support needs to be available for teachers.

- Schools should select tools and learning management systems (e.g., Hapara or Google Classroom) that teachers understand and are willing to use.

- School leaders are encouraged to consult with teachers to better understand the support needed prior to and during the BYOD implementation.

- Ongoing, timely and relevant professional development opportunities need to be organised and made available for teachers.

### *Recommendations for teachers*

- Professional learning about devices and software, combined with technological pedagogical content knowledge development, is essential prior to, and during, implementation.

- Visiting other schools to observe the practices of, and have professional conversations with, educators who are implementing BYOD in their classrooms is encouraged.

- Learning how to use digital devices to support pedagogical practices is a process that develops over time. Teachers will differ in their stages and speed of development. Start in areas you feel most confident teaching, then explore other areas as your confidence grows.

- Students may also need support to develop their digital literacy skills within the classroom programme. This will enable them to develop the knowledge, skills and understandings to work effectively with digital devices, and participate safely within digitally supported environments.

It is hoped that other schools will benefit from the insights and recommendations that emerged as a result of this study. Despite the hurdles, the school and teachers who shared their BYOD experiences during this study remain positive, and committed to further leverage mobile devices for learning and teaching by refining their BYOD practices in the future.

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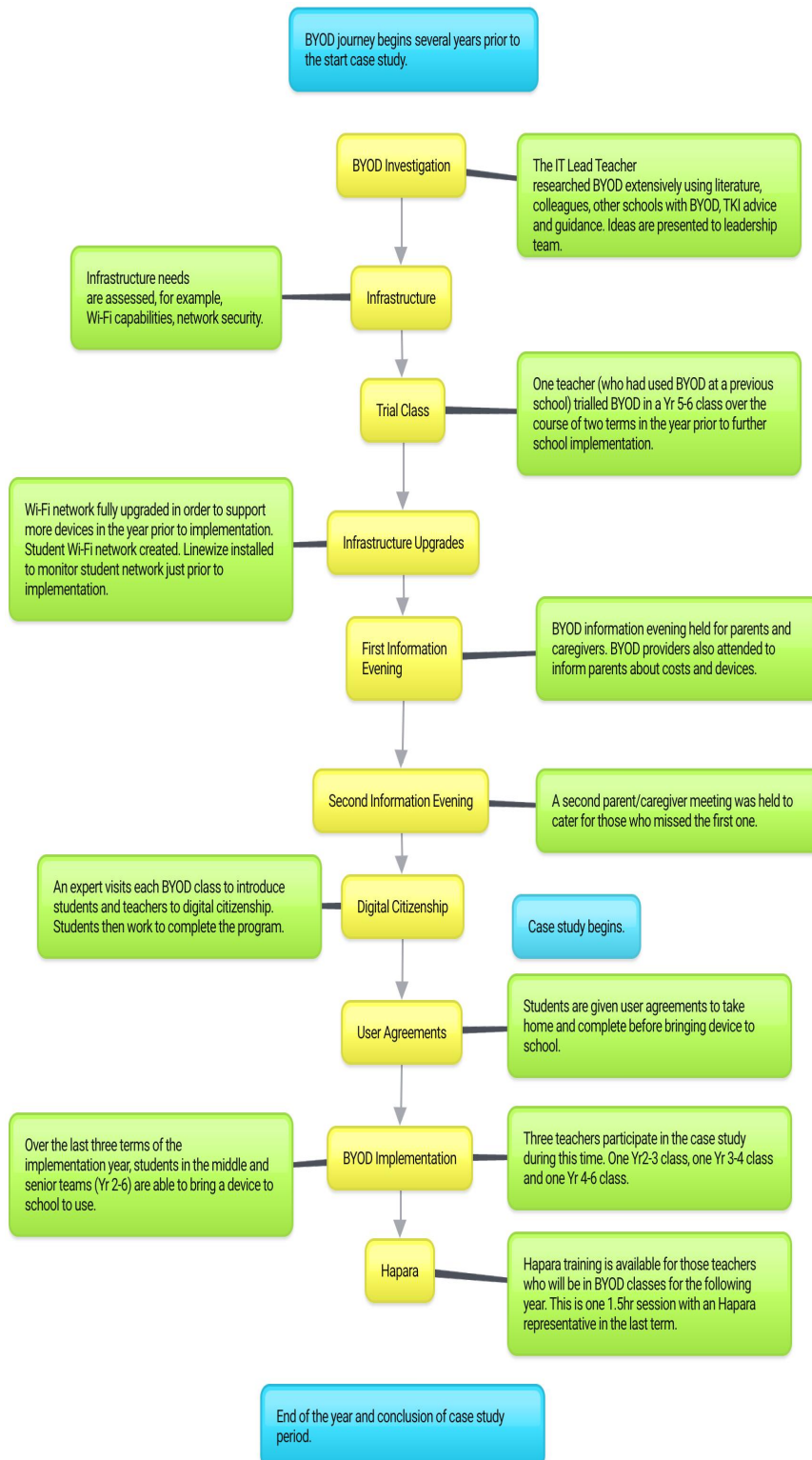https://doi.org/10.1016/j.compedu.2014.04.022

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## APPENDIX A:   BYOD Timeline