Peer-reviewed paper

Smart devices for supporting inquiry and conversations in early childhood education

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This article outlines the findings of a qualitative study investigating the deployment of a set of smart devices at an early childhood centre in Hawkes Bay, New Zealand. The devices were introduced into the centre to support the children's learning and communication. This study is a follow up to an earlier three month project launched in 2012, which focused on introducing devices into the kindergarten. The aim of this study is to determine how the teachers were using the devices two years since this trial. The study focused on how the teachers were using the devices to support teaching practice and inquiry. The findings indicated that the devices had become an embedded part of the culture of the centre. There was clear evidence that the teachers were actively engaging with the children's learning and developing strategies for improving their teaching and learning. The study provides pedagogically sound examples of the use of mobile devices in supporting effective teaching and learning within the early childhood sector.

Introduction

Technology can be used to facilitate, share and transform the activities, roles, and relationships with children and educators in an early childhood education setting (Bolstad, 2004). Smart devices, such as iPads, have become pervasive in all areas of our daily lives and their use, in education, is becoming increasingly more common. Mobile technologies offer the potential to enhance and support children's learning and development. They also offer the potential to positively influence current pedagogy and curriculum (Bird & Edwards, 2014).

The role of mobile technology to support teaching and learning is an emerging area of interest. Traditionally, however, most studies into mobile learning have focused on the secondary or tertiary setting (Wu, Wu, Chen, Kao, Lin & Huang, 2012). These findings, however, do not necessarily translate well into the early childhood sector. The role of mobile technology within early childhood education provides a unique set of challenges, due to the traditional focus of children's active play and exploration (Bird & Edwards, 2014).

The number of studies investigating the use of mobile technology in New Zealand early childhood centres has been small. A few of these, however, have

provided examples of how early childhood centres are using smart devices to support learning (for example, Fagan & Coutts, 2010; Khoo, Merry, Nguyen, Bennett & MacMillan, 2013). These studies show that the portability of smart devices provides educators with a way to enhance existing teaching practice. They also indicate that smart devices can support collaborative learning, creative play, and teacher documentation helping to build relationships with children and the wider community.

The role mobile devices may play in early childhood has been a source of considerable debate (Verenikina & Kervin, 2011). There has been great concern that these devices may remove the focus away from active learning and may ultimately be harmful to children (see for example Blackwell, Lauricella & Wartella, 2014, for a discussion on some of these factors). Continued research into mobile technology, in regards to its effective application and implications on play and pedagogy, is needed to inform the early childhood community. More research is needed especially on providing pedagogically sound examples of effective use of mobile devices to support teaching and learning (Bird & Edwards, 2014; McManis & Gunnewig, 2012).

This paper describes a single-site case study approach investigating how smart devices have been employed at one kindergarten in New Zealand. We provide exemplars on how the devices have been incorporated into the curriculum to support the teaching philosophy at this kindergarten. The study examines these stories within the framework of the Teaching as Inquiry model (Timperley, Wilson, Barrar & Fung, 2007).

Background

In 2012, teachers at a kindergarten in Hawkes Bay, New Zealand, were involved in a three month trial to investigate the potential for the use of smart devices in early childhood settings. The kindergarten in the trial was given two smart devices (one device between two teachers). The devices were not intended to be given to the children, rather, the aim of the trial was to explore how the devices could be used to support teaching practice. The trial included regular professional development provided by a learning facilitator from Massey University (See Bell & Van Dillen, 2013, for details and outcomes of this trial).

A Teaching as Inquiry (Timperley et. al., 2007) approach was adopted to embed the use of the devices in good teaching practice. The Teaching as Inquiry cycle (see Figure 1) was used to achieve improved outcomes for all children through building teachers' capacities to respond appropriately to learners' needs. The cycle is an organising framework that teachers can use to help them focus in on the evidence, explore their own practice, develop next steps for themselves and their learners, and reflect on the impact of changes, growing their pedagogical understanding and knowledge as a result. This process was guided by the following questions and actions:

1. What were the child's learning needs? (*learner evidence*)

2. What were our own learning needs as teachers? (*teacher practice evidence*)

3. What tasks and experiences will the learner have? (*what the learner will do differently*)

4. What teacher actions will enhance the learner's experiences? (*what the teacher will do differently*)

5. What has been the impact of our changed actions? (The impact or shift in learning resulting from different experiences and actions)
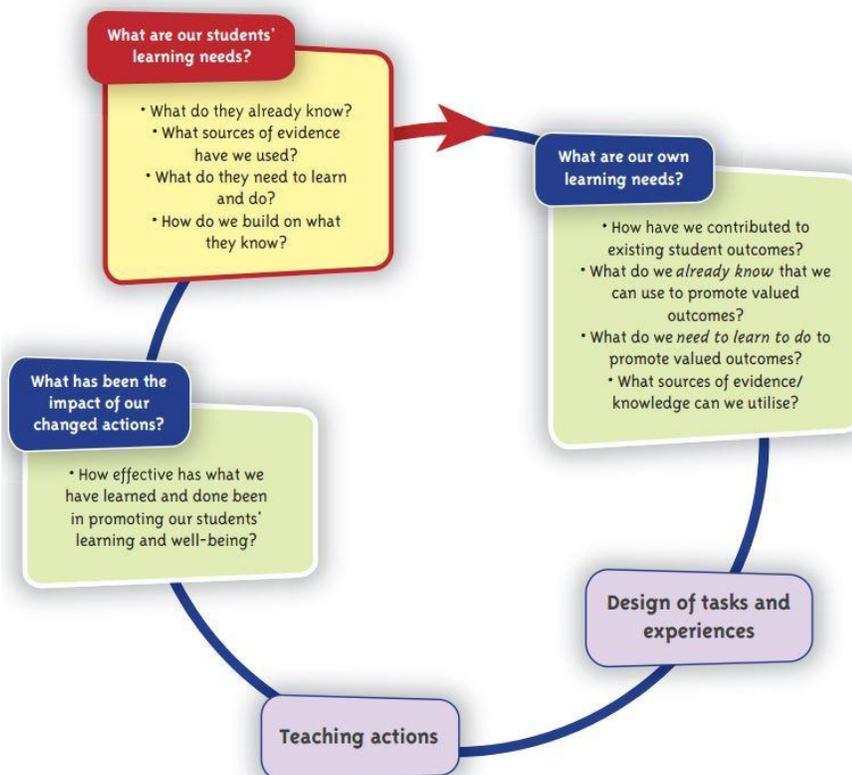

Figure 1: Teaching as Inquiry cycle
Source: Timperley, Wilson, Barrar, & Fung, 2007, p. 1

Current Study Approach and Methodology

The current study is based at the same early childhood centre as the earlier trial, the aim of the study being to determine how the use of the smart devices has evolved over the two years since the initial trial.

The kindergarten follows *Te Whāriki* (1996) as a curriculum framework and focuses on quality early childhood education for children between the ages of three and five years of age. The kindergarten has four trained and registered early childhood teachers. They occasionally have student teachers at the centre, training to become early childhood teachers.

To determine how the smart devices were being used at the centre, a qualitative study was undertaken. The researchers visited the kindergarten to observe how teachers were using the devices and how the children were interacting with the devices. Data were collected through interviewing the teachers, talking about their observations (notes, video, audio recordings and photos) of their interactions with children using the devices, and copies of children's artefacts produced as part of the teaching and learning process using the devices. Due to the nature of this study, the children were not interviewed and any examples collected were anonymized.

Findings

The current study showed that the smart devices had become an embedded part of the kindergarten teaching philosophy. From the earlier trial of one device between two teachers, now each teacher had their own iPad and they were carried by the teachers at all times. The devices had become a ubiquitous tool to immediately capture and evaluate children's learning stories. They also provided teachers with an opportunity to collaboratively reflect on the children's needs and to assess how to best support the child's needs.

From the analysis of the data collected, there was clear evidence that the Teaching as Inquiry model was being actively applied. Based on the data, two stories as exemplars were identified. The first story revolved around the child as a learner and how there was a shift in her learning as a result of the teacher's actions. The second story focused more on the changes in the teacher's practice. This story illustrates how teaching practice evolved as a result of the teacher's inquiry into her impact on the learning environment.

Story one: Lucy and the Lambs

Learner evidence that informed this story

Sometimes the kindergarten had animals come and stay at the centre and at the time of this story, the latest visitors were a couple of lambs. Generally the children were intrigued with the animals and were happy to pat and feed them. But one little girl, Lucy, showed great reluctance to go near the lambs. A few days after the lambs arrived, the teachers noticed that Lucy was getting closer to the lambs and showing a bit more interest.

Teacher practice evidence

Lucy's teacher decided to take this opportunity to encourage Lucy to get a bit more comfortable with the lambs. Teachers and children at this centre often used the smart devices to make books using pictures of children exploring their environment in creative, imaginative ways. These books were shared with

groups to showcase how different children engaged with their environment. Children have also been encouraged to create their own books, enlisting the help of their teachers to get their words onto their pages. Lucy was asked if she would like a book about her and the lambs and as she was familiar with this and comfortable with her teacher taking photos, she said yes.

Learner experiences and teacher actions

As a result of her new interest and growing confidence, Lucy's teacher took pictures of her with the lambs and helped her create a story using an ebook creator application. Lucy chose the images and her teacher wrote the story with Lucy's input. Lucy also recorded a few words and sounds, such as "baa", to illustrate the images. The teacher then emailed the book to Lucy's parents who responded later that day, pleased to see what Lucy had been up to.

Impact - shift in learning resulting from different actions

When Lucy returned to the centre the following day, she told her teacher that she had a new idea for a story. She used the smart device and started taking some photos of the lambs. She then asked her teacher to help her put the story together. Lucy recorded her voice retelling the story and the teacher placed her words into text. Lucy rewound her voice and frequently re-recorded her words until she was happy with how they sounded.

Once again the story was emailed to her parents, who were particularly pleased at how well Lucy's voice came through on the story this time. They noticed a clear progression in her use of language – from single words and sounds to clear sentences.

New learner and teacher practice evidence

Over the following few days the children had been reading "The Littlest Bird". Lucy once again came to her teacher to ask to use the device to create a story; this time she decided to make an ebook version of this story.

Learner experiences and teaching actions

Instead of creating another book on her own, Lucy's teacher encouraged her to include another one of the other boys at the centre, Lucas, to help her. Together, and with the aid of a stuffed chicken, they staged the various images for their story then recorded their voices to go with the pictures.

Impact - shift in learning resulting from different actions

This time, Lucy acted more as a director and divided the speaking parts, based on the original story, between Lucas and herself. Lucy knew by now how to record her voice so together they retold the original story almost verbatim. In the recording of the ebook, Lucy encouraged and supported Lucas to speak more confidently. To achieve their outcome, Lucy and Lucas needed to understand the stages of the story and be able to recreate these in their own imaginative ways. They also had to share the tasks of director and actor, knowing how to use the application efficiently, and know the story well enough to be able to retell it accurately. Lucy had stepped back and supported another child to learn

something she was now capable of doing on her own. This was a big step for a normally quiet, reserved child. This time the ebook was emailed to both sets of parents and also shown at the end of the day to all the children at the centre as they waited for parents to collect them.

Story two: Superman and Super-Kids

Learner evidence that informed this story

Two boys had been observed showing a high degree of interest in superheroes for a couple of days. The boys made great use of such things as capes and props that were easily accessed and acted out situations that showed their super powers. Their conversations involved language and thinking that mimicked common perceptions of superhero behaviour. However, other children in this group were not role playing to the same degree as these two boys.

Teacher practice evidence

Their teacher decided to use this interest to engage her children in new learning. Having clothing and props available that could easily be adapted to suit this role had encouraged the boys to play in this way, but she knew that using the device could potentially grow their learning further. Through sharing their stories, she knew she could provide new opportunities for learning for the rest of her group.

Learner experiences and teacher actions

The teacher decided to create an ebook about superheroes with her group. She started by downloading a range of superhero images. She knew that storytelling strongly supported early literacy development, so she encouraged all the children to develop a short story to go with each image, focusing mainly on the characters. She recorded each child talking about the pictures; the name or the character or something about the character, then transcribed their words into captions. The ebook was then shared with the whole group and was also printed off and made available as a hard copy.

Impact - shift in learning resulting from different actions

When the ebook was shared with all the children in the group, it sparked considerable interest and generated lively discussions as each child heard themselves talking. As a printed copy, children were able to read it on their own. Also, because it used their own words, they could retell the story using the same or similar language as was written. They were often observed finger following text, displaying initial concepts of text direction and word chunks. The teacher was also able to use it as a group story to prompt rich discussions, getting children to suggest how they could engage with each other in play in new ways.

Learner experiences and teacher actions

Based on the success of the original ebook, the teacher decided to use the impetus to further engage her children but this time through active play. She set up an obstacle course comprising of rope swings, monkey bars and high jumps onto mats. Each child then played a superhero of their choice – with a cape

wrapped around their shoulders - and went through this course. The teacher recorded their action on her device then created movie trailers by putting together all the actions in a movie.

Impact - shift in learning resulting from different actions

The movie was played at the end of the day when caregivers picked up their children. The movies played two roles at the centre: they allowed the children to see themselves and their peers in action, and they initiated conversation between the children and their extended family, whānau (family group). Caregivers were able to watch the day's events as the movies provided an insight into what had been happening during the day. The movies also created genuine opportunities for the teachers to have rich discussions with the caregivers, opening the door for the caregivers to talk to their children about what they had seen them doing.

Impact – shift in teacher practice

These ebooks and movies were being used as rich evidence of the learning and were a very important mechanism for teacher reflection. Having the opportunity to watch the stories at a later time enabled the teachers to notice, reflect and respond more directly to both their own and the child's strengths. The teachers were able to identify the needs of the children and pick up learning cues that may be have been missed earlier. Since these recordings were rewindable and did not change as oral versions of stories tend to do, they provided valid and reliable evidence of children's learning that could be shared with the other teachers at the kindergarten (Spencer, Coutts, Fagan & King, 2013).

The benefit of this practice was that through working collectively, the teachers could view the ebooks and movies and bring new perspectives to the understanding of the actual learning being demonstrated and the opportunities for next steps. Four different teacher lenses viewing the same material saw a significantly wider set of outcomes. The teachers were able to bounce off one another and bringing in their broader knowledge, the synergy created was huge. All teachers were able to see learning in new ways and to have a stronger awareness of their colleagues' knowledge, which they could then tap into. Accessing this would help the children across the centre, as all teachers grew their own pedagogical knowledge.

Discussion and conclusions

The findings of this study clearly show that the smart device usage at the kindergarten had not stalled since the earlier trial. The devices had now become a ubiquitous tool for capturing and evaluating children's learning. They were providing teachers with an opportunity to effectively reflect on and support the children's needs. Teachers were sharing their videos with the children at the time they were taken and rich conversations were being held with the children. These conversations focused on what the children were able to do and where the children would themselves suggest what they could do tomorrow. Learning stories (Carr, 2001) were being created on the spot with the children. These were less time consuming and more meaningful to the teachers and the children than the paper versions teachers had been creating. Sharing these videos also

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raised the quieter children's profiles when their peers saw them doing different and exciting things. The devices also supported communication outside the playground. The videos and ebooks provided a great springboard for family conversations.

The two stories outlined in this study each provide a slightly different viewpoint into the influence of the Teacher Inquiry Cycle. The first story reinforced the impact that the teacher's practice had on shifting the learning of the child. The teacher in that story supported and guided the child to expand on her own experiences and knowledge. The second story strongly emphasises the process of the reflection in teaching practice – of both the teacher as an individual, and later, collaboratively as part of a group. The reflection helped to evolve the teaching practice as the teacher evaluated and developed her actions and enhanced the learning experience for the child.

These case studies each highlight sound pedagogical practice and how that impacts on a child's learning. The use of the devices were well conceptualised and clearly identified effective practice that was grounded in appropriate pedagogy. The findings here challenge some of the fears raised earlier (Blackwell et. al., 2014) about the potential for such devices to be harmful to children through taking the focus away from active learning. Properly used, the opposite appears to be the case in this situation as teachers are using mobile technology to motivate and encourage 'active learning' and exploration.

Despite being a small study, the results provide solid groundwork for showcasing effective integration of mobile technology into early childhood settings. This study provides some pedagogically sound examples of how such devices could be used to support effective teaching and learning within the early childhood sector. It is anticipated that a wider study will be initiated based on the findings of this study, involving a wider set of early childhood centres to help evolve and develop further examples of effective mobile technology practice. Further studies will also address the role of the Teacher Inquiry Cycle. Specifically the study will investigate whether the good pedagogical practice identified here was the result of adopting the model, the use of the smart devices in new ways, or a combination of both.

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