Show and tell:
Using iPads for assessment in mathematics

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Abstract

This paper reports on a New Zealand study into the use of an iPad application as a device for exploring an alternative way of using the Numeracy Project Assessment (NumPA) tool in primary schools. Educreations is an example of an application (app) that enables the user to make notes, while recording sound in real time. Students' voices are recorded as they work on and explain how they solved a mathematical problem – at the same time as recording anything they write down. The aim of this research is to investigate whether this feature enables teachers to gather more detailed evidence into how their students solve mathematical problems during assessment. Three teachers used the app to assess a range of students in their year 2–5 classes. Think-aloud protocols and qualitative methods were used to

analyse the assessment data and the teachers' reflections. The three main benefits of using Educreations were:

1) *that the students were motivated and engaged;*
2) *that students and teachers could use the recorded student assessment to promote dialogue by 'going back' and 'going forward'; and*
3) *students could choose to "jot down" their thinking onto the iPad screen when problem solving.*

Keywords: iPads, mathematics, assessment, think aloud

Introduction

iPads are becoming more prevalent in classrooms because of the rapid uptake of tablet devices by schools (Clark & Luckin, 2013). These mobile devices enable students to access the internet easily and have a range of apps available for educational purposes. As students and teachers become familiar with using iPads, new ways of using this technology for teaching and learning can be explored (Hutchison, Beschorner & Schmidt-Crawford, 2012; Murray & Olcese, 2011). So far, there is little evidence that iPads are necessarily good (or bad) for learning (Clark & Luckin, 2013), and understanding how iPads can enrich learning within the classroom is critical in assessing their use (McGregor, 2011). Furthermore, iPads need to be assessed as to whether they support teachers to meet curricular goals and therefore engage in curricular integration (ICTs as part of the curriculum) as opposed to technical integration (ICTs separate from the curriculum) (Hutchison et al, 2012).

In mathematics, there is an extensive range of iPad apps available and used in New Zealand (Hutchison et al, 2012). These apps can be loosely categorised into four types: internet; encyclopedic (e.g., Wolfram Alpha); single use (e.g., Math Bingo); and general classroom use (e.g., Notability). The researchers were interested in investigating the use of a general classroom iPad app which allowed voice recording in real time as students worked on a mathematics problem. Educreations was the app chosen for this purpose. Educreations is marketed as a recordable interactive device that captures both voice and handwriting in real

time. It is an app designed for teachers to create lessons to share online either publicly or with their students – "Teach what you know. Learn what you don't" (Educreations, 2013). There is, however, another use for this app – the assessment of students' learning. The app allows the capture of any writing the student does as they work out a mathematical problem, and records the student explaining the strategies they used to solve the problem – thinking aloud as they solve it. There are other similar apps available such as Show Me. However Educreations does not have public sharing as a default setting, which is an essential privacy requirement for use in student assessment.

This article reports the findings of research that investigated how Educreations could be used as an assessment tool to gather evidence of students' mathematical learning. Specifically, the research questions were:

1. What was the experience/effect of the teachers involved?
2. Does the use of an app that allows the recording of voice and student writing in real time enable teachers to collect more detailed evidence about students' mathematical learning?
3. What considerations are needed to implement Educreations into classroom assessment practices?

Three primary teachers used the app with students in their classrooms. They had the students work on a series of mathematics tasks, and used Educreations to record their voices and record any writing. The data consists of the recorded student assessments and the teachers' reflections about the use of Educreations in the assessment. This data was analysed using think-aloud protocols and the gathering of themes through inductive, qualitative methodology. The think-aloud protocol, which informed our methodology, is then reviewed and the methods of data collection and analysis detailed. The findings are then presented and discussed.

Using iPads for assessment in the primary mathematics classroom

There is little research on using iPads to assess students' understanding of mathematics knowledge and strategies. The majority of studies about using iPads in mathematics are more general and concerned with the delivery of instruction and students' learning being supported by the use of the device. For example, Attard and Curry (2012) investigated how the introduction of iPads influenced the mathematical teaching and learning practices and student engagement of year 3 primary students. The teacher's perspective was that the introduction of iPads had a positive impact on the class, and student engagement with mathematics had improved with students having increased enthusiasm and higher levels of participation during mathematics lessons. The iPads provided a resource that "promoted interactivity, immediate feedback, challenge and fun" (Attard & Curry, 2012, p. 81).

In terms of the use of iPads for assessment, the Center for Educational Testing and Evaluation (CETE) at the University of Kansas, which specialises in large-scale assessment and online test delivery systems, has been trialling the use of iPads to deliver computerised assessments in a number of content areas, including mathematics. The teachers involved in a recent small-scale trial were positive about doing formative assessments on an iPad. The students seemed to adapt well to using the already popular iPads and found it better to use a touch screen than a mouse (University of Kansas, 2013).

These findings are consistent with a report that reviews research into the use of iPads in schools by Clark and Luckin (2013). Researchers were generally in agreement that teachers and students were positive about iPads, although there were various implementation issues. iPads enabled teachers to explore less traditional forms of assessment. Furthermore, with increased network connectivity and cloud storage, data about learning activity can be efficiently collected, collated and analysed, which is "vital to formative evaluation, assessment, self-assessment and reflection" (Clark & Luckin, 2013, p. 3).

The use of tablet devices like the iPad is simply too new for impact in the area of assessment to have been fully investigated although "we know that [we] can collect, collate

and share data, conduct basic analysis in real time to enable monitoring and feedback on students' learning as it happens to support formative assessment and self-assessment" (Clark & Luckin, 2013, p. 10). Kristjansdottir (2010) puts forward that the model used for researching the use of ICTs in mathematics education "should offer frameworks for identifying students' conceptions of mathematics learning…" (p. 75). Research is therefore needed that explores assessment on the iPads by looking at the impact on students' learning in a detailed way. In others words, whether the app Educreations enables teachers to gather more detailed evidence about students' understanding and thinking when solving mathematical problems needs to be investigated.

Think-aloud method

It is essential for a teacher to be able to understand students' thinking when students are solving mathematical problems in order to decide their next learning steps and to address misconceptions (Pottier et al., 2010). However, being able to access this thinking presents methodological problems for researchers (Branch, 2006). Interviews, observations and work samples do not fully access students' thinking about a task (Branch, 2006).

The think-aloud method, also known as protocol analysis, stems from psychological research (see Ericsson & Simon, 1999). It requires participants to perform a particular task while verbalising what they are thinking (Ericsson & Simon, 1999). These verbalisations represent underlying cognitive processes, allowing insight to be gained into how the students apply strategies to solve questions (Hoppmann, 2009; Schellings, Aarnouste & van Leeuw, 2006). There are some concerns noted about the think-aloud method in research. Smagorinsky (1994) cautions think-alouds only give a sampling or a glimpse of students' cognitive processes. Concerns have also been raised about how the verbalising of thought processes can impede the task performance (Ramey, 2006). Hoppmann (2009) explains that when verbalising and the cognitive processes are occurring simultaneously, this can have a tendency to slow down the cognitive processes (Hoppmann, 2009). However, the think-aloud method is generally accepted as a valid way of collecting data on thinking (Branch, 2006).

The collection of data during think-aloud studies is either done concurrently or retrospectively (Karo-Ljunberg et al., 2012). Ericsson and Simon (1999) argued that concurrent verbal reports provided more reliable data whereas retrospective verbal reports were done after the event and, therefore, more prone to omissions and errors. The need is for the participants to "talk aloud" rather than "explain aloud" in order to understand how they apply taught strategies to solving mathematics questions. Koro-Ljungberg et al., (2012) assert that "the closer the verbalization mirrors the contents of short-term memory (i.e. talking aloud as compared to explaining aloud), the greater the utility of the process" (p. 5). This has implications for the current research. When the teacher is assessing a student, they need to encourage the students to talk aloud as they solve the problem, as well asking them "How did you get that?" after they have provided an answer. Richardson and Whitaker (1996) suggest that the researcher must use neutral prompts, such as "keep talking", when there are silences in the participant's verbalisation, as any suggestion that an utterance is "good" or "bad", can skew how the participant continues with the verbalisation.

It is a generally accepted practice in primary schools for students to explain their thinking when solving mathematical problems. As Branch (2006) states, "individual students are often asked to problem-solve aloud so that their teacher can understand their thought processes" (p. 150). Students are also often asked to show their workings when solving a problem so that the teacher can see the process and where errors may have occurred. Through the use of the app Educreations, the students will potentially do both, allowing the teacher to gain a more holistic picture of the thinking and application of strategies that occurs when students attempt mathematical questions. The next section describes how this study, using the think-aloud protocol, was conducted.

The study

The participants in the study were three primary school teachers who teach at schools representing a range of decile (socio-economic) ratings within the city boundary. Their students are in grades 1–4. Students in these years were chosen because they had some

experience of mathematics assessment yet were still developing their ability to verbalise their thinking.

The teachers provided written responses to questions designed to gather demographic information, explore how they currently assessed students in mathematics, and gauge the teachers' level of experience with using iPads, both for assessment and generally in the classroom. All of the teachers had used iPads to some extent within their classroom practices, but none of the teachers had experienced the app Educreations prior to the study. The teachers were then given training on the use of Educreations and the assessment tasks were loaded onto their iPads. The assessment task items used were based on questions from the ongoing numeracy assessment at primary schools in New Zealand (Ministry of Education, 2008). The Numeracy Project Assessment tool (NumPA) takes the form of a diagnostic interview that is designed to enable teachers to make judgements about the knowledge and mental strategies of students. This ensured that the students were familiar with the type of assessment tasks they encountered in this study.

The teachers used the assessment tasks on Educreations to assess children from their class. The teachers determined which students would undertake the assessment tasks on the iPad based on their knowledge of the students and results from previous assessment of each student, according to New Zealand National Standards for that year level: below the standard, at the standard, and above the standard. Only the teachers know the students assessed and pseudonyms are used to keep names of students, teachers and the schools from being identified. In total, fourteen students were assessed using the Educreations app in this study.

The assessments took the form of an interview. This is consistent with current New Zealand primary teachers' practices of conducting assessments using the NumPA tool as a diagnostic interview for gathering data about a student's numeracy knowledge and mental strategies. In these interviews, conducted in a classroom or in a familiar withdrawal space, teachers verbalised each of the questions with the student and the questions were also written in Educreations. The teacher took the student through the assessment task, asking

the child to think-aloud and say whatever was in their head as they solve the problem. The students were also given the opportunity to write on the question page in Educreations if they wanted to. Being able to write during the interview is a departure from the expected practices around conducting an assessment using the NumPA tool. As discussed in the previous section, the students were encouraged to think-aloud as they answered the question. The iPad has a built in microphone so that the students were potentially not as aware that they are being recorded once they are concentrating on the task at hand as they would be with an external microphone. After each interview the teacher provided written reflections of the experience.

The teachers were then interviewed individually. These interviews were inductive and semi-structured. The questions were designed to gather teachers' reflections about their experience, and included questions about difficulties encountered using Educreations, their perceptions of students' experiences, the quality of the assessment information gathered, and how this information could be stored and used. These interviews were recorded, with the permission of the participants, and then transcribed by the researchers.

The data set therefore consisted of initial written teacher responses to questions about demographics, their current assessment practices in mathematics, and their experience in using iPads; the recorded assessment data of the students; post-assessment teacher reflections; and the transcribed interviews of the teachers. In this research, the researchers did not directly seek student feedback. Rather, the teachers were the participants and their reflections on the students' experiences of using Educreations were sought. However, several of the students directly verbalised their feelings about their experience and this was captured on the recording and included in the analysis. As one of the teachers explained:

> There's no point in me assuming that they found it [the assessment task] easy or they found it hard. It's a good idea to ask the children how they felt about it. I wouldn't have known otherwise that [name of student] found it hard. (Teacher B)

This data was analysed in three stages: third-column analysis, the think-aloud analysis of the recorded assessment data, and the development of themes.

The third-column analysis was the initial interpretations made during data collection. These interpretations consisted of "thoughts, musings, speculations, and hunches" (Merriam, 1998, p. 165). These interpretations, which were written in the right-hand (often third) column of the transcripts, were added to throughout the research and included methodological decisions and directions, reflections on interviewing technique and musings related to all of the research questions. These were shaped by our own backgrounds and experiences, our interpretations of the literature associated with this research, data already gathered in the research process, and the emerging findings from all of the stages of analysis in the research. In both this initial and subsequent analysis, we remained conscious of seeking alternative explanations, or discrepant evidence.

In the second phase of analysis the recorded assessment data was explored to understand the range of prompts teachers used to encourage students to think aloud, and to assess whether students were thinking aloud concurrently (as they were solving the problems) or explaining aloud retrospectively (after they had solved the problems).

In the third phase of data analysis, possible themes or concepts were developed. This process is called open coding "because to uncover, name, and develop concepts, we must open up the text and expose the thoughts, ideas, and meaning contained therein" (Strauss & Corbin, 1998, p. 102). As the analysis proceeded, these themes were consolidated – Merriam (1998) described this process of going back and forth between the concrete and the abstract as a meaning-making process.

The next section reports on the results of these three phases of analysis with respect to the research questions. Italics have been used to identify direct quotes from the teachers.

Findings

The stages of analysis described above have been merged to present the findings of research, which have been structured by the research questions:

- What was the experience/affect of the teachers and students involved?
- Does the use of an app that allows the recording of voice and student writing in real time enable teachers to collect rich evidence about students' mathematical learning?
- What considerations are needed to implement Educreations into classroom assessment practices?

What was the experience/affect of the teachers involved?

All three teachers were very positive about their experience in using Educreations. Two of the teachers experienced some frustrations when they had difficulty in initially uploading the questions onto the Educreations app. This was due to their previous iPad experience, wireless facilities at their schools and their school access to Dropbox. Both of the teachers acknowledged that, while these set-up issues were initially frustrating, they did not detract from their feelings about using Educreations:

> The little things at the start were a pain, but in the big term of things it would definitely be the coolest thing out. (Teacher B)

> It took a while to get it set up and to get my head around how to use it but once I had done that it was absolutely fine. … I certainly found it easy to do. It was very comfortable for both parties to do. They seemed at ease. I was at ease. The questions were there. Logistically … it was very smooth. (Teacher C)

Indeed, all of the teachers felt the experience was a very positive one for their students. Already familiar with the use of iPads in the classroom, the students seemed to relish the opportunity to do the assessment:

> They felt it was like something fun on the iPad. And [they] went away feeling really good about themselves. That was a good experience for them. (Teacher A)

> [Their] engagement is certainly high. They like it and it was interesting. They're automatically a little bit more clued in and on-task. (Teacher C)

Teacher A thought that this positive student reaction was, in part, because the students did not seem to feel anxiety related to doing an assessment and viewed it more like using a modelling book (where example questions are given and then solved as a group during instruction) in their group sessions.

> It wasn't like a test for them. It is less threatening for the children. [Name of student] has got this real barrier about testing. She just freaks out on any maths question. [It is a] confidence thing with her but she … worked really well using the iPad. I think she found it was just like down on the mat like a lesson. (Teacher A)

From the above quotes it can be seen why the teachers felt that the experience was a positive one for their students. None of the teachers reported that their students were anxious about or disadvantaged by using the iPad for the assessment task.

Does the use of an app that allows the recording of voice and student writing in real time enable teachers to collect more detailed evidence about students' mathematical learning?

The app provided more detailed evidence of the students' learning and enabled the teachers to make judgements on the students' knowledge and use of strategies.

> It certainly makes it clear who can use that part whole thinking and who is at a counting-on stage with my children. (Teacher C)

> I found you could see how they worked it out and see how they are using the strategies at that level so it was useful. And because when they're showing their working as well,

> you can clearly see when – for those subtraction ones whether they're partitioning their numbers or not. (Teacher A)

Although Teacher A thought she found out what she normally would in doing the assessment the usual way, she did reflect that she learnt one of her students could do a problem when she was given the chance to write using Educreations. We note, however, that this might have occurred in a non-iPad situation if the student had been "allowed" to use paper to write during the NumPA interview.

> She can use her tidy 10s when she's showing her working and I wouldn't have known that before if I'd just asked her without letting her write it down. (Teacher A)

Teacher B thought he would learn more because he could "see it as well as hear it". Teacher C thought that the use of the app alerted her to an issue she would not otherwise have known about.

> The writing of numbers was very interesting. It was amazing how many children … were writing the one's digit first. I wouldn't have picked that up otherwise because we're not necessarily working that closely with the writing. It is something to correct and tidy up. (Teacher C)

The students' recorded assessments can be played back by the teachers on the Educreations app or online. The three teachers described this as the major advantage of the use of Educreations for students' learning over other forms of assessment. When this recording was replayed with the student involved, the teachers referred to this as "going back".

Going back happened both during an assessment and at the end. Teacher C noted a boy who felt comfortable enough during the assessment to scroll back through the pages and change an answer he realised he had done wrong. At the end of the assessment, the teachers often showed the students what had been recorded. According to the teachers, this was the real advantage of the app as it allowed the teachers to show the students where they had

made errors as they were doing the assessment task and what the next steps in their learning needed to focus on.

> I made sure each child got to see at least one of their answers and they thought that was very cool. (Teacher C)

> Being able to record her information and she could actually do the 8 + 5 using her tidy 10s I was like yay! She was so proud of herself, and for her, me being able to go back and show her what she'd done and how she'd done it correctly she was so proud of herself. (Teacher A)

According to the teachers, not only did the students enjoy doing this, the self-reflection and the conversation they had with their teacher was of benefit to their learning. The students and teachers were able to review the assessment task, discuss at what point the students had made errors, and clarify understandings of concepts:

> There was one boy … who wanted to know where he went wrong. We talked about it and when he had the understanding he was really interested to go back and see what he did and unpack it … it's very powerful for their own learning to go back and see where they've missed a number or where they've misinterpreted something. (Teacher C)

> I went back through after and we talked about it and to me that would be the advantage [of Educreations]. Normally you'd do the numeracy test bang, bang, bang, filling out the bit of paper and "next"! (Teacher B)

In the following quote, the teacher's assumptions about assessment and the importance of sharing the information with a student, to identify where they are at currently, what the gaps are and what their next learning steps need to be, are evident:

> I could say well you've solved it this way and you haven't got the correct answers and this is what – you show them what they're doing incorrectly so show them to help them understand why they're working at that level. Because I think it is really important that

> children know why they are working at a certain level in their learning and if they know why they're working there they're more likely to try and achieve that – to get to the next stage because they can see the gaps they have in their learning, especially for the children that are below. You can say you're below because of this and make them aware of that. That's what we could do here. (Teacher A)

The teachers sometimes replayed the recording of the student assessment to check their recall of the interview:

> If you missed what a kid said you could actually go back and listen to it. (Teacher A)

The teachers also could see the potential of checking their judgement with another teacher or using the recording for moderation:

> If you are struggling with the judgement of a child you could … share it with other colleagues to get their opinions whereas if you were just writing it on a bit of paper you've only got what you've heard and your interpretation of notes. (Teacher A)

The teachers also discussed potential ways this recorded assessment could be used to enhance students' learning. In this article, this has been called "going forward". The recorded assessment could be shared at parent–teacher interviews to show them what their child can do or where they're struggling. They could be used the following day to hook the students in to the previous lesson or could be shared with the class as an example of how a person solved a problem. They suggested they would collect examples of students work to show evidence of different types of strategies or to help student teachers or for teachers' professional development. Records of student assessments could be collected at different times of the year to show a child's progress and passed on to the next year's teacher. Teacher B noted this had distinct advantages for children with special needs.

> If you had a special needs child that would be brilliant because they're not going to see that improvement when it's written down but they will see the improvement when

> they're shown the difference between last year and this year. It's visual and they're seeing it all. (Teacher B)

The students were able to choose to show their working by drawing or writing on the iPad screen. This was seen as a strong advantage of using the Educreations app for assessment:

> [Educreations] does allow children to jot, which I think is quite powerful. (Teacher C)

Given the questions were based on the NumPA tool and the assessment took the form of an interview, the teachers often made comparisons between the two types of assessments. The main difference between using the NumPA tool on its own and using it in conjunction with Educreations is that, when using the NumPA tool, students are not allowed to jot workings down on paper:

> To compare it to doing the NumPA testing, there they're doing it all in their head …
>
> I do have some queries around the way the NumPA is done as a mental thing because I think, for children who need visuals, it disadvantages them quite possibly … One wee boy that I've tested before – [when] he's got to do it in his head he couldn't do the question, but when he did it on here, he solved it correctly and he felt really proud of himself for that. … He's a really visual hands-on learner so it's good for those sorts of children. (Teacher C)
>
> [Name of student] couldn't solve the 8 + 5 question in her head when I tested her on the numeracy questions, but when she did it on here, because she could write down what she was thinking she actually solved it and then she solved the next one up – the harder one which she had no idea last time. She had tears last time. I think because she could write it down, she's not having to hold it in her head. (Teacher A)

As stated earlier, NumPA testing does not make provision for the students to record as they work through a question. In this research, the affect of recording on paper versus recording on the iPad has not been explored. It is our contention, however, that the ability to record

the voice and the work of the student in real time provides more detailed data for assessment purposes. The use of the iPad app allows the teacher and the student to review the assessment task with the student's verbalisation of their thinking around the task evident in the recording.

What considerations are needed to implement Educreations into classroom assessment practices?

The teachers thought the app was very easy to use, even for Teacher C who had not used iPads extensively, and while there were some initial set-up issues, all of them felt they did not need much professional development to use the app. The students did not need any particular support either on Educreations before beginning the assessment:

> We had a little practice go first because they haven't used it. They thought of it as like a little whiteboard. The children soon got their head around how it worked so that was very good. (Teacher C)

The students were generally able to think aloud although not always concurrently with their working on the problem. Level of achievement and age seemed to both be factors in this.

> My kids who were above [national standard] found [thinking aloud] really easy to do … My lower kids struggled and I had to prompt them a lot or I had to say "remember to say what you're thinking" or they actually usually told me the answer and then told me how they worked it out. They didn't tell me the process as they were trying to work out the answer. (Teacher A)

> They needed a little bit of prompting. I used the language that I use in the classroom. "Tell me what you're thinking. Tell me aloud. Talk aloud so I can hear what you are thinking". I did talk to them about it prior to make sure that that they would be doing it. At [years 2 and 3], they're used to doing a lot of talking aloud. They're used to reading aloud and [doing] group work … Possibly for older children who are used to working more independently and quietly that might be a little shift. (Teacher C)

The teachers perceived that the main issues needing consideration would be the collection and storage of the students' assessments and the time involved. In terms of collection a relatively quiet space is needed as sound is being recorded and this is not always easy with a large class. Teacher C was concerned about this not being possible in a large and noisy classroom. The teachers thought that the storage and management of the data would need to be considered carefully. Teacher A thought the student assessments throughout the year could be stored in individual folders, which were added to over time.

Teacher C felt is was not possible to collect data on individual students if assessment using this or a similar app was added into the already crowded assessments in mathematic:

> I could possibly collect this sort of assessment information for each student during the year but it depends if it is as well as or instead of. *(Teacher C)*

On the other hand, Teacher A thought this would save time because of storing recorded information rather than writing her interpretation:

> I see it as a benefit for me not having to write stuff down. *(Teacher A)*

Interestingly, teacher B thought Educreations would be a good tool for using with the NumPA diagnostic interview.

> If you had the whole numeracy test on there, mate – you'd be home and hosed. *(Teacher B)*

Discussion and conclusions

Clark and Luckin (2013) described an iPad as not only a window for learning, but also as a "window through which invaluable data about the learner and their interactions can be captured, stored and analysed" (p. 10). Indeed, think-aloud protocols and the app Educreations together enabled the teachers to gather more detailed assessment data about their students' mathematical learning and assist them in deciding their next steps of teaching. In considering using the iPads and the Educreations app for assessment in

mathematics, we needed to take into account how these ICTs supported the teachers in assessing students in a way that was not available by other means (Murray & Olcese, 2011). Our results show that, according to these three teachers, insight was gained into their students' learning that they would not have had using the NumPA tool in its current form.

The three main benefits of using Educreations were: 1) that the students were motivated and engaged; 2) that students and teachers could use the recorded student assessment to promote dialogue by "going back" and "going forward"; and, 3) students could choose to jot down their thinking onto the iPad screen when problem solving. These benefits were seen by the three teachers as enhancing their students' learning.

In general, the think-aloud methods worked well in being able to capture the students' thinking. Gill and Nonecke (2012) caution that researchers need to be aware of the reactive effects of using think-aloud method. A participant's performance of a task or thought processes may be different when they are verbalising what they are doing compared to if the participant was not thinking aloud and this should be noted. As Branch (2006) found, students need to have opportunities to practice and become comfortable with verbally expressing their thoughts while working through mathematical questions. In this study, thinking aloud about mathematics is part of the students' normal mathematics practices and this may have made the students generally more comfortable with thinking aloud in an assessment.

There are a number of practical considerations for the implementation of Educreations as a device for conducting assessment in mathematics. There are continuing issues of set-up and management, although extensive professional development was not necessary. At this stage, Educreations does not enable a template to be saved so each question had to be loaded separately from an image which was somewhat frustrating for the teachers. In Attard and Curry's (2012) study, teachers found the initial set-up and maintenance of iPads to be cumbersome. This feeling is reflected by the teachers using Educreations but did not impact on the teachers' view of the effectiveness of the app. Teacher B suggested showing teachers what Educreations can do, rather than describing it, the best way to smooth its

implementation. There is much potential in using a digital cloud to store students' results. As Clark and Larkin (2013) write, schools are starting to monitor students' learning with iPads in combination with cloud computing using digital portfolios to store a record of their ongoing work. The protection of students' privacy and the sharing of their assessment tasks need to be taken into account. The teachers in this study caution that any system of management would have to be carefully considered.

This is a small study of three teachers. However there is potential for the use of an app such as Educreations in the primary classroom. An app that enables the user to make notes, while recording sound in real time, worked well in mathematics. Furthermore, the teachers also were enthusiastic about using it in other content areas and for cooperative learning. This needs to be explored and, in the area of assessment in mathematics, further consideration needs to be given to how it can enhance and work in partnership with students' NumPA testing and how students' recorded assessments can be managed and stored.

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