iPads in the Classroom : Year 1 Maths

A Macquarie ICT Innovations Centre Project | Cathie Howe & Dr Nerida McCredie | 2012

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The Project Team


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Project Introduction

Many schools are considering introducing iPads into their classrooms.

In Term 3, 2012, Macquarie ICT Innovation Centre (MacICT) conducted a small case study to explore how Year One students and teachers might make use of iPads in their classrooms.

The project particularly focused on exploring how iPads can support and extend mathematical learning.

The MacICT team worked with students and teachers from two schools in the Northern Sydney Region to investigate how to uncover useful apps, ways to introduce and use iPads with young students and explored new opportunities for students to show their teachers how they work mathematically.

Project Outline

At the beginning of the project, the Teaching Team (see attached) spent a day working with Cathie and Nerida in at MacICT. The teachers shared their professional experience and described the strategies they use to teach mathematics in their classroom.

Working together, the teachers explored a range of maths apps available for Year One students to use on iPads and investigated how to use the camera and microphone to record conversations and capture screen activity.

Having decided on a suite of twenty apps, the iPads were updated and delivered to the schools where they were used for five weeks.

During this time, the Teaching Team kept a journal recording their classes experiences and also shared with other teachers and classes at their school some of what they were discovering about learning and teaching with iPads. Nerida and Cathie also had the opportunity during these weeks to visit the classes and spend time observing and talking with the students.
The Teaching Team returned to MacICT where a further two days were spent sharing and reflecting on our project question:

**Can teachers support and strengthen young students’ ability to work mathematically and build their mathematical competence through the use of educational apps on an iPad?**

**Key Findings**

As the Project Team examined the students’ experiences of learning with iPads, the discussion soon highlighted that the students and teachers had been using the iPads in two distinct ways in their classrooms.

The **first way** involved students interacting with a specifically selected app to explore and gain confidence in their understanding of a particular mathematical concept.

The **second way** students were using iPads for learning did not involve maths apps. Instead, students were designing and creating videos and screen casts to share with their class using design apps and the iPad’s camera and microphone.

The Project Team was able to identify that both of these approaches provide teachers with the opportunity to support and strengthen their students’ ability to work mathematically.

**The First Approach: Using Specifically Selected Apps**

When they made use of content specific apps, the Teaching Team identified that:

- Students who had expressed a dislike of maths enjoyed learning using apps on the iPads
- They had greater confidence that all students were engaged and participating during the activity
- Apps could allow for each student to work at the appropriate level while providing the opportunity for them to progress to the next level when they wished
- The apps could be used as “conversation starters” between partners, or for valuable class discussions about mathematical concepts and strategies

In the words of the Teaching Team:

“I had a division lesson where we were using the Lady Beetle app. Two of my weaker students were debating whether it was a fair share. This never would have happened in a “normal” lesson.”
“Most of the games based apps were of excellent for reinforcing concepts that had already been taught. Students began using mathematical language to discuss their strategies at the conclusion of the lessons.”

“It was special to see the excitement and joy on the faces of some children that are usually quite shy and reserved and dread the thought of doing maths.”

“It was much easier to spend time with a student asking him or her to explain a maths process when the rest of the class were engrossed in their iPads rather than them sitting in front of a text book.”

The Second Approach: Designing and Creating with iPads

When students were involved in tasks that made use of the camera, microphone and a design app, the Teaching Team identified that:

- Providing students with a design task using an iPad promoted discussion and reasoning as they work together to create a response
- iPads enabled students to design ‘on the go.’ Young children could easily master design apps and the iPad’s camera and microphone to creatively capture their ideas
- Showcasing and sharing the students’ design projects encouraged quality responses
- Using video and voice recording, along with screen capture features could help students demonstrate ideas that they might not have been able to articulate
- Observing students working with iPads and carefully examining their design tasks provided teachers with new ways of gaining insights into their students’ thoughts, strategies and mathematical abilities

In the words of the Teaching Team:

“Since starting the study, Year One students are all using mathematical language to question and communicate with each other on a regular basis. I was inspired by the level of reasoning and talk coming from our students and we are regularly discussing the different strategies we have used. Any of the apps that used screen capture and the camera tool were excellent at evoking quality mathematical questioning and reasoning from my students.”

“The iPads helped me discover the reasoning side of their working mathematical abilities. This is a side of my children I had never or rarely seen.”

“Students worked well in pairs and used mathematical language using the apps that recorded their thinking. Because the students knew they would be played back in front of the class, they all put in their best efforts and really put thought into the questions they asked their partners as well as their responses.”
Project Report: Student Interaction and Engagement

Key Findings:

- increased student enthusiasm and attention
- greater opportunity for teacher to facilitate personalised learning
- increased levels of student interaction and engagement
- partnering stimulated mathematical conversations
- promoted class discussions and demonstrations of mathematical strategies

The Teaching Team found that their students were very keen to work with iPads during maths lessons, either individually or with a partner.

The Teaching Team observed that all of their students, even those who had previously shown little enjoyment of or interest in maths lessons, were excited each time the iPads were brought out for an activity. Not only did the Teaching Team notice an increase in their students’ enthusiasm, each teacher also commented on a change in their classes’ attention span.

Students who often had a short attention span on tasks that were not teacher directed, remained focused and involved while using an iPad, either working individually or with a partner. One benefit of this increased class engagement was that it provided teachers with an opportunity to spend time with students needing support or enrichment, confident in the knowledge that the rest of the class was immersed in their own learning.

The students in this project worked very confidently with the iPads. Several teachers noted that during the five weeks students assisted and helped each other with activities. One teacher commented that help was always close at hand for her students and no one felt intimidated by the iPads or apps.

Interestingly, the Teaching Team also commented on their surprise that even though their students were highly engaged, working together and having fun, the noise levels remained low.

The Teaching Team found it very worthwhile to carefully consider when and how to group children to work together on an iPad. Thoughtful pairings of students helped to increase their level of interaction and engagement.

At times, teachers paired students who were working at a similar level of understanding. Several apps let partners challenge each other in a game, requiring them to work quickly and accurately to score points and rewards. When partnered with an appropriate challenger, students enjoyed these games. Teachers noticed that this interaction increased the speed, accuracy and confidence of their students.

At other times, teachers would partner students together in ways that would particularly assist their students with learning and support needs. These pairings helped to stimulate conversations, enabled students to
demonstrate or explain a concept to their partner and provided support to students needing additional time to become familiar and confident using an app.

The Teaching Team consider that one of the most influential factors contributing to their students’ engagement was the opportunity they had to demonstrate and share with their classmates what they had accomplished using the iPads, either in a circle share time or by mirroring their iPad up on the Interactive White Board.

One teacher commented that she thought the knowledge that their task would be shared and discussed inspired the students to create high quality responses. Another benefit of these student demonstrations was that they promoted class discussion about the different strategies students had used to find answers to challenges.

Project Report: Learning Concepts and Working Mathematically

Key Findings:

- effective consolidation of concepts
- promoted accuracy in work
- enabled differentiation
- increased frequency of mathematical discussions
- improved levels of reasoning

As reported in our Project Outline and Key Findings, the Teaching Team identified two main ways that the iPads had supported learning in their classrooms. The first of these ways involved students interacting with a specifically selected app to explore and gain confidence in their understanding of a particular mathematical concept.

Students enjoyed spending time working their way through different apps, and the Teaching Team identified that this helped their students to consolidate their understanding of concepts that had been taught to them in earlier lessons. One teacher commented that it made difficult concepts more enjoyable for her students to learn, as they found the iPad apps engaging.

Not only did the students in the project impress their teachers with how accurately they completed tasks, they were able to reflect on their learning by replaying these experiences on the Interactive White Board. Because many apps allow users to a choose a challenge level, teachers could easily differentiate for their students, catering for their individual needs by choosing the level a student would start on. Teachers noted that their students’ confidence increased, and that the dynamic nature of learning with an iPad meant that students themselves could increase the level of challenge when they felt ready to.

The aim of our project was to investigate the question "Can teachers support and strengthen young students’ ability to work mathematically and build their mathematical competence through the use of educational apps on an iPad?"
These findings suggest that the teachers could identify ways that iPads support and strengthen young students’ mathematical competence, as they observed their increased confidence and ability to accurately complete tasks. The teachers were also able to identify ways that the iPads had strengthened their students’ ability to work mathematically.

In each classroom, the Teaching Team noticed that the introduction of iPads significantly increased the frequency and rigour of mathematical discussions. When they requested that their students work with a partner on a task, this often led to discussion and, at times, disagreement over a response.

Such a situation prompted students to provide reasons to their partner that would support and explain their thinking. As ideas were challenged and questioned, students were required to demonstrate using the iPad how they had answered a mathematical challenge – an answer alone would not convince.

The tasks that teachers set for their students to complete using iPads frequently provoked such discussion and collaboration, and all teachers agreed that the rigour of the conversations taking place both during and at the end of these maths lessons was new – it had not been occurring prior to the using the iPads.

While the Teaching Team highly valued the learning opportunities the iPads had provided for their students, they also recognised that what makes learning successful is a combination of hands on equipment for modeling and explaining, teacher demonstrations and technology.

One activity that brought all these approaches together was when pairs of students modelled and explained how they could make even groups with counters, used an iPad's camera to film their demonstration and then shared their movie with the rest of the class up on the Interactive White board. Their teacher observed that after just a week of using the iPads to question and explain their answers in this way, every student in her class had improved their level of reasoning.

**Project Report: Observing and Evaluating Learning in Action**

**Key Findings:**

- greater opportunity for teachers to gain insight into students’ ability
- more time available to interact with individual students
- assisted students to learn from each other
- many ways to capture and evaluate student learning
- possibility to support professional learning and consistent teacher judgement

The Teaching Team found that a further benefit of using iPads in maths lessons was that as their students were engaged, motivated and working on appropriate tasks for sustained periods of time – in ways they hadn’t seen when students were working through concepts using a text book, they had greater opportunity during lessons to take a step back from direct teaching, and observe and interact with their students.
As well as gaining insights into their students’ mathematical abilities as they listened to them explain an idea to their partner, watched them change strategy in the middle of a game or observed them calculate using a digital number chart, teachers were able to take time to interact with individual students, to question their understanding or provide support or an extension task.

The teachers commented that they consider the iPads helped their students to learn from each other and that, like them, their students enjoyed being able to see their learning. One teacher recounted that in free time, some of her students chose to create and answer their own maths questions on the iPad.

When using the iPads, teachers found that there were many ways to capture and evaluate their students’ learning. It was quick and easy for the students themselves to film hands on activities or use screen capture to record their tasks, and then share their progress and achievement with their class and teacher.

Sometimes the Teaching Team would review students’ learning together as a class, watching it on the iPads or Interactive White Board, while at other times they would choose to appraise their students’ work at a later time. While a class review session often prompted valuable discussion, teachers also appreciated the opportunity to play back recordings of their students’ learning in their own time. It enabled them to easily watch the strategies that each of their students used to form and explain even groups, or to listen to who was able to confidently count on, or to add and subtract on a number chart by ones, twos or groups of ten. They noted that as busy teachers, there isn’t often time to reflect on lessons, and the opportunity for careful examination and assessment of how students were learning added a new level to their reflection.

One teacher anticipated further uses for these documented demonstrations of student learning. She considered how they might be shared on a class blog, showcasing what her students were doing week by week, or how personal selections could be collected as digital work samples for individual students. She also raised the possibility of teachers across a grade being able to easily share work samples with their colleagues, helping them to be consistent in their planning for and evaluation of student achievement.

Tips from the Teaching Team: Selecting Apps

When planning an iPad activity, we think it’s best to find an app to suit your lesson rather than design a lesson to suit an app. As you browse through the App Store, look for topics that you think would work well digitally. Here are some questions to consider when you are selecting an app:

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Does the app progress to higher levels?
Does the app give the student a reward for getting their answers correct?
Can they personalise within the app (character name clothes hair etc)?
Is the app Australian or can it be modified to adapt to our syllabus?
Is it multi-touch for working in pairs?
Is there a screen capture function for assessment and playback?

Take your time! The hardest part is trying to work out what is relevant without being able to try them out. Ask around, word of mouth is a great way to find good apps. Ask your colleagues and the parents of the students in your class. Your students are also a great source because they know what they like. There are also forums on the internet that give feedback on different apps.

As well as looking for apps to teach particular concepts, try out apps that let your students be creative with tasks you design. There are many clever things you can do with an iPad using the camera, video, sound and screen recording.

A Selection of Maths Apps to Consider:
Jungle Coins, Hungry Fish, Counting Caterpillar, Ladybird Maths, Maths Sumo, Squeebles

A Selection of Design and Create Apps to Consider:
Doodlecast, ScreenChomp, Explain Everything
Tips from the Teaching Team: Practicalities and Lesson Ideas

Grouping Students:

The way you organise your groups really depends on what you are trying to achieve from the lesson and also the different students you have in your class. Sometimes you should group according to ability to make it fair, but at other times it is beneficial to group according to personality to evoke more conversation.

It was fascinating to watch how the students interacted with each other while using the iPads. There can be a lot of cooperation, but at the same time the children can become quite competitive with each other. You need to discover what works for your classroom, as you would with any other activity.

Lesson Ideas:

A typical Year One shape lesson often involves drawing and labelling 2D and 3D shapes on Isometric paper. We adapted this lesson using the Explain Everything app. Instead of using a pencil to draw shapes directly onto Isometric paper, the students took photos of the paper, then loaded the photo into the app. There they could draw shape after shape, recording their drawings and their voice to create a video. This was excellent for students with literacy difficulties because they could name and describe the shape instead of writing it down, demonstrating to their peers and teacher what they knew about shapes. Doing this activity digitally also meant that students could draw, correct and redraw shapes many times, never running out of paper.

Kindergarten took the iPads outside and went looking for right angles. Students took photos of right angles that they found in the playground and then they imported them into Explain Everything. Students recorded their voices over the top of their photo as they traced the angle they had found, explaining what it was they had taken a photo of and why it was a right angle. All the students were engaged and enjoyed the activity. The librarian walked past and made a right angle with her body for the students to take a photo of. All the kindergarten students walked away from the lesson knowing what a right angle was.

The Project Team:

Michelle: I have been teaching since 2000. I have had experience in teaching nearly all grades K-6 as well as RFF. I am currently teaching a Year One class. My class has a broad range of abilities with a large proportion of students performing above the state average. My teaching career has had a focus in K-2 and being a part of this trial has been a fantastic experience.
Juanita: I have been a teacher for just over 20 years with a focus in infants for the last 10 years. I did a post graduate degree in TESOL 2 years ago and have returned to class this year after teaching ESL children for the past 3 years. I have a Year 1 class that is ESL loaded with mixed abilities. The children and I really enjoyed the iPads and I hope we get to purchase some for our whole school’s enjoyment and education.

Joanne: I have been teaching for 11 years. I have taught Kindergarten and Year One with a focus on students with special needs. I am currently teaching a Year One class with a wide range of abilities. I thoroughly enjoy working with all my students and celebrating their achievements. At present I am the Year One coordinator which is assisting in developing my leadership skills.

Kimberly: I have been teaching for 9 years on stage one. I am also the Assistant Principal and IT Coordinator at my school. I am currently supervising and teaching Grade One. My class has a high proportion of ESL students. The majority of my class are performing above state average across all key learning areas.

MacICT Centre Manager | Cathie Howe

As an SEO 2, Cathie is currently a Professional Learning & Leadership Coordinator managing MacICT. Cathie focuses on evidence-based practice & professional learning for teachers and their students. Cathie collaborates closely with other educational leaders, Macquarie University (MQ) academic research partners, other educational institutions & industry partners to design and deliver professional learning workshops and activities for K-12 teachers & their student, research projects & presentations. In 2010, Cathie was awarded the Microsoft NSW Innovative teacher award for her work in game design. In 2011, she was invited to join the Microsoft Global Partners in Learning Network. During Cathie’s role as a teacher in both public and private schools, she has been an Assistant Principal for 12 years, taught students from Kindergarten to Year 6, led project teams &, for most of her teaching career, has been the school’s Computer Coordinator. She has taught moderately intellectually disabled students as well as gifted and talented students for many years.

Research Officer | Dr Nerida McCredie

During her 13 years of classroom teaching, Dr Nerida McCredie has been recognised for her work in digital learning and awarded for her innovative classroom practice. Her doctoral thesis explored students’ insights into how they learn through design using technology. Nerida now works as an educational adviser, trainer and keynote presenter. She is highly regarded for her dedication in working with students, teachers and principals to explore and create innovative ways to use technology for effective and lasting learning outcomes.