

DEVELOPING EARLY LEARNERS' CREATIVITY AND COLLABORATION USING IPADS

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Abstract

Continuing developments in technology and consequent societal changes have been accompanied by calls for education to emphasise 21st century competencies such as critical thinking, communication, collaboration, and creativity. These competencies are reflected in the general capabilities of the Australian Curriculum and are to be developed across all learning areas. The study from which this paper is drawn investigated how teachers might use iPads to support development of creativity and collaboration in an early primary classroom. The study used primarily observational methods to describe the pedagogical practices of a teacher working in a shared teaching arrangement with 25 Year 2 students and access to 6 iPads. The focus was on discovering and describing effective approaches to enhancing creativity and collaboration in young learners. Results suggest that learning activities using iPads can be successful in separately developing creativity and collaboration among early learners but that learners were less likely to manifest both creativity and collaboration in the same activity. Implications of the findings are discussed.

Background

This paper responds to the interplay between two trends in contemporary education. First is the widespread understanding that, in addition to content knowledge, education must develop what are termed 21st century skills such as critical thinking, communication, collaboration, and creativity (Partnership for 21st Century Skills, 2011). There is an expectation that teachers will explicitly address these skills in their classrooms. Second is the surge in availability of powerful mobile computing devices (smartphones and tablets) and their rapid appropriation for use in classrooms.

While the so-called 21st century skills are not new to education, they have received increased attention in recent years. The *Australian Curriculum* (<http://www.australiancurriculum.edu.au>) promotes the development of 21st century skills by incorporating them as general capabilities (ACARA, 2013). These skills were highlighted in the *Melbourne Declaration on Educational Goals for Young Australians* (MCEETYA, 2008), which underpins the new curriculum.

Smartphones are handheld computers with a telephone function. Tablets are larger variants that lack telephony but have Internet access using WiFi or the phone network. Since Apple released the first iPhone in 2007, followed by the iPad in 2010, uptake of iOS devices and Android equivalents has been rapid. By 2012, 52% of mobile phones in Australia were smartphones and 58% of smartphone owners used them daily to access the Internet (Ipsos, 2012). Although tablets are designed for adult consumer use, characteristics, including their compact and durable construction, day-long battery life, and relative simplicity of use, have made them popular in schools. "Tablets, smartphones, and mobile apps have become too capable, too ubiquitous, and too useful to ignore" (Johnson et al., 2013, p. 16) and there are predictions that by 2015 all K-12 learners in the USA will have their own mobile devices (Norris & Soloway, 2011).

The host school for this study has been moving toward increased integration of information and

communication technology (ICT) for learning. It has deployed laptop computers and iPads in partial class sets and has been considering the implications of 1:1 computing. The availability of iPads in a Year 2 classroom afforded an opportunity to explore pedagogies that would support development of creativity with new hardware and software. Because the number of iPads was insufficient for 1:1 work it was necessary for students to work in groups thereby prompting exploration of collaboration.

Creativity

According to the *Australian Curriculum* (ACARA, 2013), creative thinking involves students in learning to generate and apply new ideas. It includes accepting different perspectives and possibilities and identifying new connections. The curriculum pairs creativity with critical thinking as distinct yet complementary dimensions of thinking (ACARA, 2013).

Some theorists, including Csikszentmihalyi (1996), set a high bar for creativity, arguing that an artefact is creative only when it is recognised by experts in a field as being original and valuable. This accords with the popular misconception that creativity is a rare gift and not an inherent human ability that can be developed. Gauntlett (2011, p. 218) offers a broader view, describing *everyday creativity* as “a process which brings together at least one active human mind, and the material or digital world, in the activity of making something which is novel in that context”. The creativity of highly talented individuals has been characterised as “Big-C” Creativity and everyday creativity as “little-c” creativity. That model has been extended to include “mini-c” creativity, which describes the innovative thought processes inherent in the learning process (Kaufman & Beghetto, 2009).

The *Australian Curriculum* (ACARA, 2013) is based on inquiry principles that require students to develop an inquisitive disposition and intellectual flexibility. Both are promoted and enhanced by the development of creative thinking (ACARA, 2013). Recognising “mini-c” creativity values the creative thought processes of students as they learn new subject matter (Kaufman & Beghetto, 2009). This is essential in fostering and encouraging creative thinking processes (ACARA, 2013). Kaufman & Beghetto (2009) suggest that fostering “mini-c” creativity, emphasising creative thought processes within learning, is more important for supporting creative thinking in young children than the more traditional emphasis on creative products, or “little-c” creativity.

In spite of observed difficulties in assessing creativity, Amabile (1996) maintained that it is assessable provided those assessing it are familiar with the domain. The consensual assessment tool (Amabile, 1996) uses a panel of experts or observers from a field who make judgments about the creative nature of works. The *Australian Curriculum* includes a learning continuum for critical and creative thinking capability that suggests that creative thinking can be both developed and measured (ACARA, 2013). Researchers have also developed frameworks and tools for describing and measuring 21st century competencies such as creativity. Jamieson-Proctor and Larkin (2012) developed and used tools for measuring creativity based on the three components of the creativity systems model: individual, domain and context, described by Csikszentmihalyi (1996). These tools include an observation protocol to assess creative dispositions, the Creativity Checklist developed by Proctor and Burnett (2004), and a consensual assessment process based on the work of Amabile (1996).

Collaboration

Collaborative skills including establishing and building positive relationships, making responsible decisions, working effectively in teams, handling challenging situations constructively, and developing leadership skills, have been included within the *Australian Curriculum* as personal and social capabilities that are applied across the curriculum in all learning areas (ACARA, 2013). These skills are considered important for successful classroom and playground interactions and can be taught using a combination of explicit teaching and opportunities for practice (McGrath & Francey, 1996). Co-operative skills that can be taught in order to promote collaboration include negotiating, dealing with fights and arguments, suggesting and persuading instead of bossing, making decisions in a group, respecting other people’s opinions, sharing, and including others (McGrath & Francey, 1996).

Students can practise and develop collaborative skills through structured collaborative learning experiences (Gokhale, 1995), which have been found to increase engagement and interest among students, as well as promote critical thinking skills. It is also thought that co-operative teams achieve higher levels of thought and retain information for longer than learners who work as individuals (Gokhale, 1995).

The *Australian Curriculum* includes a learning continuum describing the development of personal and social skills, including collaborative skills. It provides a useful basis for an assessment of working collaboratively that would be compatible with the curriculum intent.

iPads for learning

Although the iPad was launched as recently as 2010 it has been readily adopted in educational settings and informal sharing of teachers' experiences through social media is widespread. State education authorities in Victoria (<http://www.ipadsforeducation.vic.edu.au>) and elsewhere in Australia have engaged in trials and reported encouraging levels of success. The Victorian trial found that, when implemented in a supportive environment and by technologically competent, innovative teachers, iPads were effective in enhancing learning outcomes for students. The devices were particularly well used in primary school settings and optimal use was attained when students were able to use the device for content creation, rather than content consumption (Murray & Olcese, 2011).

Although the iPad provides the potential for transformative use of the device in educational settings, an overwhelming number of software applications being developed and marketed through the "education" category within the Apple iTunes Store do not take full advantage of the features which would allow for collaborative and creative use (Murray & Olcese, 2011). Hoover & Valencia (2011) classify iPad apps using three categories: interactive, reference and productivity. Their preliminary research into the use of iPads with tertiary students showed that productivity applications were most beneficial in enhancing learning and that, when students used the iPads collaboratively, learning outcomes were significantly improved, compared to students exclusively using the devices independently.

Lack of both technical knowledge and pedagogical knowledge has contributed to the limited success with iPads in some settings (Hoover & Valencia, 2011; Gasparini, 2011). There is a need for research to expand the pedagogical knowledge for the use of iPads (Gasparini, 2011).

Method

This paper reports selected results from a Master of Education project (Batham, 2014) designed to investigate and describe pedagogies using iPads that develop creative and collaborative skills in young children. The overarching question guiding the research was: *How can teachers use iPads to facilitate the development of creativity and collaboration in early learners?*

The study was conducted in a Year 2 classroom where the first author was one of two teachers in a job share arrangement, with access to 6 iPads for use by the 25 children. Data were collected by the first author, who was also responsible for planning and implementing a series of ten learning activities in which children in small groups used the iPads to create products in response to set tasks.

The primary source of data was a reflective journal maintained by the first author throughout the period of the study. It was guided by a set of questions intended to prompt reflection relevant to the focus of the study on creative and collaborative activity and provide rich qualitative descriptions of classroom practice. The creativity checklist (Proctor & Burnett, 2004) was modified to record observations of children's creative traits during each teaching episode and the creativity of products produced by the children was assessed using the consensual assessment technique (Amabile, 1996). Collaborative skills of the children were measured using a checklist developed by the first author based on the Creativity Checklist published by Proctor & Burnett (2004), the KSAVE model of the ATC21 Framework (Binkley et al., 2012), Friendly Kids, Friendly Classrooms (McGrath & Francey, 1996) and the Personal and Social Capability Learning Continuum developed by ACARA (2013).

Data were used to guide the development of case narratives for each of the ten learning activities with iPads that formed part of the study. The narratives were examined for patterns that might be used to inform recommendations about pedagogical approaches to using iPads to develop creative and collaborative skills in early learners.

Findings

Three vignettes are shared in this paper to illustrate the study's findings. The first teaching episode, "Mealworms", was successful in promoting creativity and moderately successful in supporting students in working collaboratively. The second teaching episode, "Earth's Resources", did not provide the same opportunities for creativity in spite of the students' successful collaboration. The third teaching episode, "Contractions", was unsuccessful in promoting either creativity or collaboration. Together these three examples illustrate the range of results from the study and provide material for further reflection and analysis.

Meet the Mealworms

Students "adopted" mealworms to care for and to observe as part of a science study of how living things grow and change. An introduction was followed by a closer observation using both handheld magnifying glasses and the iPad cameras. Students used the iPads to record and share their thoughts, observations and questions.

Students were organised into six groups of four. Each group was assigned an iPad, but was subsequently broken into two pairs. As this was an early experience for the students with using iPads for recording ideas, the activity was quite structured.

The teacher used the data projector to demonstrate the use of the iPad, showing students how to access the PicCollage app and import their photographs into the app. They were also shown how to crop a photograph to remove the background, how to add text to the image, and how to rotate and resize the objects. Students were told that there were other features in the app such as being able to add background colours and change the font type and colour but these were not demonstrated. Strategies for sharing the iPad among four students were discussed with the class and turn taking was identified as a useful strategy. It was made explicit that all students needed to be involved in the activity and different parts of the task were identified by the students so they had a clear understanding of the different opportunities to contribute to the group task.

The instructions given to the students were to create two PicCollage images, one by each pair, that contained a photograph of a mealworm and some text showing what they knew about mealworms from their observations. They could add other features to their image provided the first two criteria were met.

All of the groups worked together successfully with little extra guidance required. Most pairs who were not actively involved in the creation of an image at the time were still keen to provide advice and suggestions to the rest of their group. Students naturally explored the features of the app and once one group had discovered the ability to add "stickers" such as moustaches and sunglasses, this newfound skill was rapidly shared among the groups. The teacher recorded in her journal:

At one point, I noticed a group who appeared to be off task, taking photographs of inside of one boy's mouth. My initial instinct was to interrupt the group but closer observation revealed that they had discovered that they could layer the images and were creating the appearance of a mealworm being eaten. Their caption read: "Mealworms make a great meal". An interesting insight into their divergent thinking!

All groups managed to successfully fulfil the criteria of the task and the range of final products reflected their ability to be creative and add their own ideas to the completed product. More than one mealworm had grown curly moustaches and developed French accents and groups experimented with patterned

backgrounds and different fonts.

Earth's Resources

As part of the Earth and space sciences for Year 2, the students investigated the various ways that resources are used in the school environment. After some initial learning, the students went on a discovery walk around the school to identify how different resources from the Earth were used. Students worked in an assigned mixed ability group of four to take photos of resources they encountered on their walk. Each group was given a particular resource to look for and needed to take at least four photos, of which three would be selected for inclusion in their presentation. Captions were added using PicCollage and exported to the camera roll.

Once the images had been gathered, students were given very specific roles for creating a collaborative presentation about how the resources were used in the school. Student A was to insert the first image (a standard resource image provided to the students), then Student B (photo taken by students with caption), C (photo taken by students with caption), and D (photo taken by students with caption). A structure was provided for the audio recording: Student A was to introduce the resource and source, including other information the group had learned from previous activities. Student B described the second picture, Student C the third and Student D the fourth.

Most groups followed the instructions to produce a quality product fulfilling the task requirements (Amabile, 1996). A few groups also added their own touches such as synchronised greetings at the beginning or end to say who had worked in their group. Some groups had edited the images to enhance them using features of PicCollage. The students worked co-operatively with little disagreement as they all had very specific roles. A few students did need redirection or encouragement to remain patient when it was not their turn. Some members of the groups displayed leadership in co-ordinating their group to add greetings or other personal touches to their presentation.

Contraction Surgery

Following a learning experience called “contraction surgery” in which students donned rubber gloves and masks and “operated” on words to surgically remove letters, students were asked to use the photographs they had taken to explain their understanding of the process of joining words to form contractions. Students could use iMovie, Explain Everything or SonicPics to create a movie showing what they knew about forming contractions. For this activity, the students worked in pairs using the iPads. This necessitated half the class being involved in a different activity until they swapped activities. Using AirServer to project the iPad onto the interactive whiteboard, a brief demonstration of how to sequence the pictures and how to add an oral explanation was given in SonicPics.

The task had a high cognitive load as many students were still unsure of the process of combining words into contractions. A large number of photos had been taken during the previous activity and these were not sorted in any way for the students. The relative complexity of the task and content knowledge meant that many students were confused about the sequence of photos and they did not explain the process of making a contraction clearly. The students who were successful produced very pleasing results but many students did not complete the task.

Even though a number of apps had been suggested as options for this task, all of the students elected to use SonicPics, a familiar app that had been used in the demonstration. SonicPics does not allow the inclusion of extra creative touches such as sound effects, backing tracks or video. The focus of the teacher was split across monitoring two distinct activities during this session. Students needed a lot of guidance to work together on this task as they were often confused about the content. Their level of frustration with the content may have affected their ability to work together. The pairs were involved in a lot of discussion about the selection of photographs and the noise level impacted on the quality of other groups' recordings. The students not involved in the iPad activity were distracted and needed consistent redirection to remain on task.

The complexity of the task, the difficulty of the concept and the high level of teacher focus on classroom management issues, which distracted from supporting students in learning, are all likely to have been contributing factors to the failure of this experience in promoting creativity or collaboration.

Conclusions

The findings of the research, of which the three preceding vignettes are a sample, suggest that iPads can be used with young students to promote creativity and collaboration but the pedagogy the teacher employs can affect the level of success. This echoes the findings of Jamieson-Proctor & Larkin (2012) who found that the ways in which teachers allowed the device to be used had a significant effect on the level of creativity displayed by students.

In the ten teaching episodes in this study, it was found that the most successful activities were well facilitated by the teacher and the subject content of the lesson was readily understood. The most successful teaching episode, involving hand shadows, was closely facilitated by the teacher and was not cognitively difficult for the children. When the teacher was heavily involved with the supervision of other tasks, students tended to have more difficulties collaborating successfully. During the least successful teaching episode, the contractions lesson, the teacher was working with half of the class completing another task. This task was also cognitively challenging.

Analysis of the ten learning sequences revealed that the children exhibited fewer signs of creativity as the cognitive load increased and were more successful at collaboration when teacher guidance was stronger. The level of teacher direction and the rigidity of the structure were considered. As anticipated from the results of other studies (e.g. Jamieson-Proctor & Larkin, 2012), highly structured tasks were found to impede creativity but they were found to facilitate collaboration. It was hypothesised that creativity typically requires divergent thinking and collaboration requires a degree of convergence. Requiring both in the same learning activity challenges young learners and it will take time for them to learn how to balance or switch between divergent and convergent thinking at appropriate times.

During the ten teaching episodes examined in this study, students were given the opportunity to work in different sized groups using the iPads. Often the students worked in groups of four or with a partner, but sometimes they had their own iPad. The iPad to student ratio did not have a clear effect on the students' collaboration. When they worked individually with an iPad, they often spontaneously supported one another by sharing ideas and assisting each other with technical skills. The iPad to student ratio appeared to have some effect on creativity, with the highest creativity scores being seen when the students worked in groups of four. While this study serves to demonstrate that students are able to work creatively and collaboratively when using iPads, it cannot be stated conclusively that one iPad shared between four students is an optimum ratio for promoting creativity.

Overall this study has demonstrated the importance for teachers of considering pedagogical decisions related to level of cognitive complexity, task structure, level of student support, peer groupings and ratio of students to devices when planning to facilitate the 21st century skills of creativity and collaboration, especially with young learners.

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