A PROFESSIONAL LEARNING MODEL SUPPORTING TEACHERS TO INTEGRATE DIGITAL TECHNOLOGIES

Purpose and Objectives

In 2018, the new Technologies Curriculum (ACARA, 2016) will be implemented into all Australian schools from Foundation year to Year 10. Teachers will be expected to unpack the content descriptors, create authentic learning activities, and assess and moderate students’ work. In elementary schools, where educators generally teach across all learning areas, this has been identified as a challenging task and teachers have indicated that they need quality professional learning and significant support to effectively address this challenge.

This project incorporated the key components of highly effective teacher professional learning to leverage transformational change: on-site, over-time, through a community of practice and building the confidence and competence of teachers to implement the Technologies Curriculum (Jimoyiannis, 2010; Rodrigues, 2005; Wenger, White, & Smith, 2009). This project supported teachers from diverse locations throughout the state of Western Australia to collaborate through a distributed digital learning network or a guided Professional Learning Network (PLN) that was called a “Cluster” to develop and reflect upon their digital capabilities to implement the new Technologies Curriculum.

In 2016, two Clusters in regional Western Australia were formed with 20 teachers from 10 schools to pilot the project, and they were supported over 10 weeks by an experienced digital technologies professional learning facilitator. The data collected and analyzed from the pilot were used to validate a professional learning model and determine its effectiveness in supporting teachers’ professional learning. The pilot study data is the focus of this paper and is significant in the implementation of a wider scale 2017 Deeply Reflective Engagement and Mastery (DREAM) Project. Table 1 outlines the phases of the project.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Who</th>
<th>What</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot</td>
<td>2016 Pilot</td>
<td>2 x Department of Education school clusters 10 schools in each cluster 2 x teachers per school</td>
</tr>
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</table>
Research questions
The research component of the pilot sought to answer the following questions:

1. What levels of confidence and competence in regards to the Technologies Curriculum did the Cluster teachers self-report at the commencement of the pilot?
2. To what extent did the Reflective Identity Formation Model, as a professional learning model, support teachers’ professional learning?
3. What impact did the pilot have on the confidence and ability of the teachers to design, create and evaluate effective learning experiences based on a range of technology tools and the curriculum?

Educational Challenge and Technology
Current students will need to develop and demonstrate high-level competency in their day-to-day use of Digital Technologies (Digital Technologies) to be able to navigate an increasingly complex and information-rich life (International Society for Technology in Education, 2016; Ministerial Council on Education Employment Training and Youth Affairs, 2008). Contemporary teachers have an obligation to support and scaffold students’ learning in Digital Technologies and to do this in authentic contexts. In order for teachers to be successful in this, their own competency in Digital Technologies needs to be high, and their own 21st century learning skills – of communication, collaboration, creativity and problem solving - need to be well honed.

The impact of the recently released 2016 International Society Technological Education (ISTE) standards has not yet been felt in Australia – however this is only a matter of time. These standards move beyond simply knowing about the latest open-source technological gadgets; consideration and focus is on how students are able to solve problems, curate knowledge, demonstrate their creativity and collaborate with their peers. In addition to these skills is the concept of “Information literacy” - an essential set of understandings, skills and dispositions - in today’s information-rich learning and working environments (International Society for Technology in Education, 2016). The quality and relevance of information so effortlessly retrievable will need to be scrutinised and evaluated by those accessing it. Students and teachers must be able to engage with diverse learning technologies efficiently and effectively in the search for the right information at the right time for the right purpose. Teachers are challenged to understand not only the associated digital pedagogical practices and content knowledge, but also to be familiar with how the technology components can be best used to support learning. (Ertmer, Ottenbreit-Leftwich 2010, Ertmer, Ottenbreit-Leftwich 2013).

Teacher Change
It has become clear over the last several decades that professional development innovations are an important in fostering teachers’ continued development as life-long learners (Guskey & Huberman, 1995; Jimoyiannis, 2010; Rodrigues, 2005; Smylie, 1995).
Effective change innovation has been thoroughly researched and consequently attributes of effective professional learning programs have been identified (Jimoyiannis, 2010; Penuel, Fishman, Yamaguchi, & Gallagher, 2007). These attributes include: the ability of teachers to work collaboratively and collegially; an understanding of teachers’ prior knowledge; promotion of experimentation and risk-taking; provision of time for teachers to reflect on their learning experiences, and to seek further clarification where necessary; the involvement of teachers in all aspects of the professional learning; a supply of appropriate rewards to encourage teacher participation; the provision of links to the department, the school, the wider organisation; and the provision of other professional learning opportunities (Guskey & Huberman, 1995; Louks-Horley, Hewson, Love, & Stiles, 1998; Penuel, Fishman, Yamaguchi, & Gallagher, 2007). These attributes correspond with the necessary features of adult learning theories, which promote the best learning system for teachers (Smylie, 1995).

In 1998 Loucks-Horsley et al. reviewed the available research literature and synthesised a vision of effective teacher professional learning. This synthesis formed a framework for effective professional learning based on the following seven principles, and they are still relevant today:

1) have a clear, well-defined purpose of what it is aspiring to achieve;
2) allow teachers opportunities to build on their knowledge and skills;
3) model with examples the strategies to be taken to the classroom and used by the teachers;
4) be part of the continuous development of the learning community;
5) provide opportunities for teachers to lead reform efforts;
6) help provide links to other parts of the education system; and
7) consistently review its success in meeting its objectives and ensuring a positive impact on teachers’ effectiveness and students learning and attitude.

Decades of research into the characteristics of effective teacher professional learning (for example, Fernandez, Cannon, & Choski, 2003; Garet, Porter, Desimone, Birman, & Yoon, 2001; Penuel, Fishman, Yamaguchi, & Gallagher, 2007) have confirmed that transformative learning occurs when instruction and support is: over time, onsite, reflective, and has clearly identifiable links to the curriculum. These are the characteristics that underpin the model used in this pilot.

The affordances provided by the technology throughout the pilot enabled teacher participants to remain connected and continue to participate in reflective and transformative professional learning regardless of their geographical location and that of the professional learning facilitator (Ertmer, Ottenbreit-Leftwich, 2010, Ertmer, Ottenbreit-Leftwich, 2013). In other professional learning events and programs all of the participant support was provided by a cumbersome form of group email or by meeting with teachers onsite – and expensive and time-consuming approach. Having a digital community enabled the facilitator to support the participating teachers, and also enabled the teachers to communicate and share ideas with each other (Ertmer, Ottenbreit-Leftwich, 2013). Whilst some teachers were reluctant to adopt these collaborative technologies, other teachers embraced being part of this digital community and the support to their learning (Buzzard, Crittenden, Crittenden, & McCarty, 2011).
Professional Learning Networks

In recent years, teachers have been able to take control of their own learning using networks to connect and curate new knowledge and, in so doing, demonstrating lifelong learning (Garet, Porter, Desimone, Birman, & Yoon, 2001; Macia & García, 2016). Learners are empowered to be in control of when, how and what they learn through the connectedness of Professional Learning Networks (PLNs). Professional Learning Networks (PLNs) are “uniquely personalized, complex-systems of interactions consisting of people, resources, and digital tools that support ongoing learning and professional growth” (Trust, Krutka, & Carpenter, 2016, p. 35). As Trust et al. (2016) propose, this has led to an increase in the number of these communities through social media (twitter and Facebook) where teachers can work together on a shared idea or themes such as Science, Technology, Engineering and Mathematics (STEM) education, or for pre-service teachers it can be related to a unit of work or a course of study. Professional Facebook groups have become more popular and widely used in the last decade; however there is still a lack of evidence to support a correlation between PLNs and gains in teachers’ professional learning (Macia & García, 2016).

Educators and researchers have been trying to negotiate the complex system that constitutes PLNs, to determine how they can be harnessed for use to support focused, generative learning (Macia & García, 2016). Attempts to guide PLNs may work against the organic nature of an individual’s PLN, which is a reflection of the needs of the individual and of the community it supports. Each teacher has a unique PLN that they have created based on their interests, their colleagues and connections, and their ability to connect with relevant communities. There is a power in the connectedness of communities that has been recognised since the work of Wenger from the early 1980s and then subsequently in a digital frame (Wenger, 1998; Wenger, White, & Smith, 2009). This research has recognised the power of teachers’ communities of practice and the significant role they play in Professional Learning Networks, and this is why there is a strong component of connectedness in the professional learning model used in this pilot.

Models

Teacher Professional Learning Models

Supporting teachers’ practice and helping them enact change in their classroom practice is a complex process and incorporates a number of key elements. Goodrum, Hackling and Rennie’s (2001) Collaborative Secondary Science Program (CASSP) model brought together three distinct elements, including face-to-face support, resources and reflective opportunities, and interwove them to produce a comprehensive approach to teacher professional learning designed to bring about prolonged and sustained teacher change. The current model adapted for this pilot (Figure 1) from the Reflective Identity Formation Model (Sheffield & Blackley, 2016) brings these elements to the fore and includes an acknowledgement of the powerful influence of identity formation and the importance of a collaborative community upon successful sustained professional learning. Scaffolding teachers to reach the space in which the elements align is the goal of this project. However, this model is static and does not illustrate how it can influence transformative teacher change. The key is to acknowledge the iterative nature of transformative learning, and how opportunities for both personal identity development and professional identity development need to be provided. The stages or iterations of the project
This model includes a **Learning by Doing** component; a technical, hands-on workshop where teachers come together, identify a digital technology opportunity and then using create a tailored learning experience using this technology. This enables teachers to demonstrate their creativity skills and become more familiar with the technology and the curriculum.

The next stage is **Personal Reflection** where teachers critically reflect on their personal learning, and then create a learning experience or sequence of learning experiences integrating the tools, the curriculum and also their own understanding of effective pedagogy targeted to their students’ needs. In the third phase, **Implementation**, the teachers implement their created learning experiences in their classroom with their students, and **Professional Reflection** follows this where data are gathered on students’ confidence and understanding and also the teachers’ reflections. During the professional reflection the teachers meet in their cluster (either on-line or face-to-face) to discuss the implementation of the learning experiences in their classrooms. They used their reflections to refine these learning experiences or artefacts, and create modified learning experiences. The strength in these clusters is the building of teacher capacity and the sharing of ideas resulting in a bank of learning experiences on which to draw (Trust, 2012; Wenger, White, & Smith, 2009). This model is underpinned by a systematic distributed learning network that supports the transition from **novice** to **expert** in digital technologies based on aspects of the Communities of Practice and also drawing on the work around PLNs and how teachers create networks, particularly through social media (Trust, 2012; Wenger, White, & Smith, 2009).

**Participants**

The initial participants in the 2016 pilot were teachers from two clusters of schools. Each cluster was composed of ten schools with two teachers per school, consequently there were approximately 20 teachers in each cluster (n = 40).
Methodology

The methodology for this project was a multiple-site case study, incorporating quantitative and qualitative data collection and analyses. The teacher participants were asked to undertake two online, anonymous surveys: pre-program and post-program. Each survey contained two sections: Part A - Self-efficacy to teach technology, and Part B - A personal reflection on their learning. Part A was scored using a 3-point scale (1 = very limited, 2 = well, 3 = very well) and was based upon the study by Carney, Brendefur, Thiede, Hughes, and Sutton (2016). Scores for this part were calculated by averaging across the four items, resulting in self-efficacy scores for both before and after program participation. Two one-way ANOVAs were used to compare the participants from the sites on self-efficacy before and after the program. The surveys used a 5-point Likert scale (5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 = strongly disagree) to determine self-reported professional growth as a result of participation in the program. The free-text elaborations were coded using categories identified and subsequent themes distilled.

During the ten-week professional learning program several platforms were created to help teachers to communicate and collaborate, these reflections and learning experiences were uploaded onto SeesSaw** (a digital blogging site) and initially to the Department of Education Connect site.

** SeesSaw is a free curation and blogging platform that is private and where participants are invited to join. It is free and open-source, yet can be kept private; videos, documents and audio files can be uploaded and shared.

Results

The pre-survey examined the teachers' confidence and competence of skills and knowledge in the Technologies Curriculum.

Teachers in the study were very diverse in their skill and competence level (see Table 2) and consequently were at very different stages within their classrooms and their schools. When asked what aspects, if any the teachers had incorporated into their classroom practice, it was clear that some teachers had not accessed the curriculum documents whereas others felt that they were very competent and reported that they were coding and using makey makey™ in their classrooms.

<table>
<thead>
<tr>
<th>Teachers response</th>
<th>% of teachers</th>
<th>Examples of the digital technology currently implemented in their classrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have little or no understanding of this area of teaching and learning.</td>
<td>25</td>
<td>(1) Design, creation and review.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Planning, designing, making and evaluating an object to solve a problem/meet a need.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) Technology process, ICT</td>
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</table>
I have read and understand the documentation but have as yet have not tried to program a learning journey around this curriculum.

(1) Use of internet for videos, use of e white board for modelling, use of excel for graphing, making and creating tables.

(2) Working on apps on the iPads

Only dabbling in parts of the curriculum, mostly in the Design Technologies area when modelling, engineering and crafting.

(1) Commenced this week, still figuring out school resources/planning, Specific STEM tasks once or twice a week. hands on construction, craft mainly, Robotics.

(2) Explicit teaching of new apps, projects, tech discovery rotations, peer tech teaching

Currently testing out parts of both the Design and Digital Technologies curriculum.

(1) Use of iPads to complete specific tasks. Creating a simple movie. Adding comments and labels to photos using Skitch.

(2) Chaos - no not really but it is active and noisy.

(3) Students participate in term based projects that involve designing and planning, experimenting with different materials, collecting and analysing data from experiments before building their final creation.

(4) Coding.

(5) Computer Lab - coding using Scratch and hour of code, working towards designing and building our own computer games using Scratch.

(6) Sometimes we just do other activities to work on team skills, bridge building, design challenges etc.

Teachers = 28

Teachers were also asked to rate their level of confidence in five key areas (as shown in table 3) and the majority of teachers in this pilot rated their confidence low or basic in many areas. For example, in programming and coding, 78% of teachers reported basic or no understanding, and, in computer systems, 70% of teachers reported basic or no understanding. Teachers reported a higher level of confidence in design and project-based learning, with only 50% of teachers reporting a basic understanding in this area.

Table 3 Teachers’ confidence in digital technologies in the pre-survey at the start of the Professional Learning Program

<table>
<thead>
<tr>
<th>Teachers rating of their confidence</th>
<th>Design thinking &amp; methodology (Process &amp; Production Strand) %</th>
<th>Project based learning and why we do it %</th>
<th>Identifying, collecting and using data for a purpose %</th>
<th>What makes a computer systems and peripheral devices work %</th>
<th>Programming languages, coding and robotics %</th>
</tr>
</thead>
<tbody>
<tr>
<td>No idea</td>
<td>8</td>
<td>0</td>
<td>4</td>
<td>22</td>
<td>41</td>
</tr>
</tbody>
</table>
When asked what specific support teachers felt they needed at the beginning of the pilot many teachers did not respond; however, those who did highlighted general issues around technology, for example: “need for reliable WIFI for successful implementation” and “support to ensure the technologies that we currently have in our school work on a regular basis”. Responses were also elicited at the beginning of first face-to-face training session using sticky notes on the wall. Teachers were asked what they would like to achieve as a result of their participation in the pilot; some teachers demonstrated a limited understanding of the project and the new curriculum. These participants articulated that they needed support but could or did not specify what the support entailed; whereas other teachers, particularly those in administration leadership roles, wanted advice on how to support their colleagues and peers. These comments were analysed into broad themes as shown in Table 4.

<table>
<thead>
<tr>
<th>Comment Categories</th>
<th>%</th>
<th>Comments</th>
</tr>
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</table>
| General            | 14| Better understanding of what we are doing  
|                    |   | Hopefully to gain a deeper understanding of how I can use this journey effectively  
|                    |   | Understand what is required of me what skills to teach/expect  |
| Understanding of DT| 11| Various technologies available and how to use in the classroom  
|                    |   | Deeper knowledge of DT and DT curriculum planning, assessing and teaching  
|                    |   | the language of digital technologies and how to code  |
| Technology issues  | 3 | Best way to teach with small sets of iPads for the whole class  |
| Confidence         | 11| Develop confidence In teaching technologies curriculum  
|                    |   | to make teaching computer skills easy for me and interesting to students  
|                    |   | Confident to teach coding and programming  |
| Lesson Planning    | 3 | To design a lesson plan that all staff may be able to implement as a start  |
| Assessment         | 7 | How do I assess tech skills taught?  
|                    |   | implementing into a curriculum easily with the assessment ideas  |
| Integration        | 7 | Some ideas for how to develop units of work integrating subject areas  
|                    |   | How to implement robotics and coding into the classroom in a meaningful way- links to the curriculum  |
| Scope &Sequence    | 11| develop scope and sequence plan for the school  |
| Misc               | 11| engineering project, project based learning, STEM  |
| Collaboration      | 14| how to best train ECE students.  |
to develop skills/knowledge to argue the case for design and technologies in my school
understand digital technologies better to be able to guide my staff in its implementation
how do we develop/discover teacher competencies

Lesson Implementation

The pilot consisted of a 10-week immersive program where the teacher in the clusters were supported through a series of face-to-face (F2F) professional learning sessions in week 1, week 5 and in week 10, and on-line support in the intervening weeks run by the facilitator. Table six outlines the program that was developed and its focus at each stage.

In Week one teachers were immersed with the Learning by Doing stage experiencing in a face-to-face professional learning session with the coaches. Teachers unpacked the WA Curriculum: Digital Technologies and used a variety of digital tools and apps and expanded on their skills in coding and processing. In weeks two and three teachers were connected through SeeSaw™ and posted their experiences and Connect to post their proposed lesson plans.

In week five the teachers met again face-to-face to discuss their progress in producing a learning artefact that they then mapped to the curriculum. Teachers then returned to their classroom to develop, implement, review and refine their learning artefact in weeks six through eight.

In the final week 10, teachers met and celebrated their learning and the artefact that they had created and implemented and they also planned future learning experiences using the digital tools the technology curriculum. This made tailoring a ten-week program to meet the needs of all the teachers very challenging and relied on the facilitator being flexible enough to change and amend the programme along the way. It has been determined that within the cluster of teachers there is a large variation in teachers’ self-reported skill levels ranging from low levels of skills and limited confidence to high levels of skills and self-identifying as highly competent.

The teachers in the clusters in regional Western Australia who were part of the pilot reported a high level of technical difficulties with connectivity, the lack of digital tools (for example iPads) and general onsite technical support. Whilst this impacted on their ability to participate fully in the project and be part of the distributed learning networks, some creative alternatives were developed by these teachers. For example, “programming unplugged” where a teacher used the children in a physical space to teach the basic concepts of programming using simple yet precise directions to move a peer through a particular space. Students were then able to transfer the experience from the physical space to the digital realm.

Table 5 Professional Learning Program for the Cluster

<table>
<thead>
<tr>
<th>Week</th>
<th>Focus</th>
<th>Mode</th>
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</thead>
</table>
| 1    | Initiation:  
• Unpack WA Curriculum: Technologies (Design & Technologies and Digital technologies)  
• Familiarisation with a range of technical devices and software. | F2F* 1 day |
| 2    | Implementation: | onsite |
| 3    | Learning check: | online |
Post-survey results

When asked to respond to the final survey, only 15 teachers from the two Clusters participated. The researchers speculated it was due to the constraints on the teachers around the end of the year activities, although during the program several teachers reported feeling overwhelmed and had pulled out. When this cohort were asked if their students were spending more time engaged in a Digital Technologies-based activity (not ICT General Capabilities/using computers) now than they did before, 33% (5 teachers) said no they had not spent more time in class yet 66% (10 teachers) reported that they had spent between 30 and 120 minutes per week more than they did previously.

When asked again to rate their confidence at the conclusion of the pilot, the responses showed a positive shift indicating that the teachers were developing a greater understanding and use of the key aspects of the Technologies Curriculum. In the post-survey (Table 6), none of the teachers reported that they had “no idea” in regards to the implementation Design thinking and methodology (Process & Production Strand) of the Digital Technologies Curriculum, and, in the Programming Languages and coding, 40% of the teachers reported that they had now incorporated these aspects into their yearly plan. Coding was particularly successful with 77% of the original team having little or a basic understanding dropping to 20% after involvement in the program.

Table 6 Teachers level of confidence in Digital Technologies areas after the pilot Professional Learning Program.

<table>
<thead>
<tr>
<th>Teachers rating of their confidence</th>
<th>Design thinking &amp; methodology (Process &amp; Production Strand) %</th>
<th>Project based learning and why we do it %</th>
<th>Identifying, collecting and using data for a purpose %</th>
<th>What makes a computer systems and peripheral devices work %</th>
<th>Programming languages, coding and robotics %</th>
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Rachel Sheffield | ISTE 2017
When teachers were asked about their confidence to teach and support colleagues in digital technologies, 80% felt that they were confident in teaching the Digital Technologies curriculum and 80% agreed and strongly agreed felt confident to support the teachers in their school to plan and deliver the Technologies Curriculum (refer Table 7). Seesaw was not a popular tool with the Cluster teachers and they felt that the Connect community, which was already available to them, was a more effective tool. In total, 87% of the teachers who completed the final survey reported (agreed or strongly agreed) that the 10-week program was an effective way to communicate collegially and develop professionally. Whilst this was a positive result, it needs to be pointed out that only 50% of the original Cluster teachers completed the final survey.

Table 7. Confidence levels in teachers subsequent to the participating in the Professional Learning Program.

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree %</th>
<th>Agree %</th>
<th>Neutral %</th>
<th>Disagree %</th>
<th>Strongly Disagree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am confident in teaching the curriculum in Digital Technologies in my classroom</td>
<td>33</td>
<td>47</td>
<td>13</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>I feel confident to support teachers in my school in exploring how to plan and deliver Digital technologies learning</td>
<td>40</td>
<td>40</td>
<td>7</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>The use of Connect was an effective way for me to communicate and develop professionally.</td>
<td>20</td>
<td>47</td>
<td>33</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>The use of See Saw was an effective way for me to communicate and develop professionally.</td>
<td>0</td>
<td>33</td>
<td>40</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>The 10-week Professional learning programme was an effective way for me to communicate and develop professionally.</td>
<td>47</td>
<td>40</td>
<td>7</td>
<td>7</td>
<td>0</td>
</tr>
</tbody>
</table>

N=15

Finally, teachers were asked to examine their self-efficacy to teach technology after participating in the 10-week program by rating their preparedness to Plan and implement learning experiences to address the curriculum in Digital Technologies in the classroom and Participate in conversations at your school around the implementation of Digital Technologies in your school (refer Table 8). For both statements, 93% of teachers rated themselves well prepared or very well prepared to plan and implement learning experiences and to participate in conversations around the implementation of the Technologies Curriculum at their school.
Findings and Conclusions

The 2016 pilot enabled materials and the program, based upon a Modified Reflective Identity Formation Model (Sheffield, Moro, & Blackley, 2016) to be refined, and the feedback received through the pre- and post-surveys enabled the project designers to reflect on the processes. It was recognised that there were only a limited number of participants and therefore caution needs to be taken in drawing generalisations. Data collected was also completely anonymous so identifying and mapping teachers’ pre- and post-survey responses was not possible. However, it does show that a long term, embedded professional learning program is successful in improving the confidence and preparedness of teachers in implementing a mandated curriculum change. Teachers reported feeling more ready to implement a term- or year-wide approach and integrate the Digital Technologies curriculum into their classroom. Teachers in the pilot also reported feeling more prepared and confident to support their colleagues at their school to engage with the new digital materials and curriculum.

As this project was a trial for a wider impacting study in 130 schools in 2017, the researchers and the professional learning facilitator were able to identify some key issues. These included:

- Connecting the community and how this can be refined and improved through on-line connectedness using the Education Department Connect communities rather than introducing teachers, some of whom already felt a lack of confidence with technology, to new technology which in this case was See Saw™. It was recognised that some teachers were less eager to engage with new technology than anticipated and therefore reticent to engage.

- Teachers did seek to increase their connectedness to Digital Technologies, however, felt that time, a crowded curriculum and work demands made a deep immersion challenging. This was exacerbated by the time of year, at the end of terms three and four, which was recognised as being an extremely busy time of year where teachers were often time-poor and tired. This may explain why a limited number of teachers were engaged throughout the 10 weeks and completed the final survey.

**Competence of teachers**

It was determined that the range of confidence and competence of teachers in Digital Technologies made creating a professional learning program, that meets the needs of all...
teachers, challenging. It was identified that in some Clusters there were teachers who have already engaged deeply and enthusiastically with the key aspects of the new curriculum and were sharing this within their schools and with their colleagues. Other teachers were complete novices in regard to aspects of Digital Technologies and apprehensive; consequently they felt that they did not have enough time to make substantial or sustained changes to their practice.

Model evaluation
The modified Reflective Identity Formation Model sought to start with teachers’ personal reflection and then, through a learning by doing approach, teachers develop new skills and understanding, and then they focus through a professional reflection lens on how to teach these new skills and consequently how to assess in the elementary school classroom.

Learning by doing
It was important that teachers were able to do activities as part of the learning by doing approach and this is how they gained competence in aspects of coding such as using Scratch and Scratch Junior™. The learning by doing approach, however, takes time and therefore this extends the time taken for the program to be implemented. The approach also supports the digital pedagogies that they teachers used in their classrooms.

Connectedness and collaboration
Connectedness and collaboration were missing from the original Reflective Identity Formation Model (Sheffield & Blackley, 2016) and so were added as an overarching dimension for this pilot. The research component focused on the importance of creating digital and face-to-face Communities of Practice over the ten-week program. The connectedness of the community, and the ability to support each other, share ideas and resources, has been identified as vital to the success of the program (International Society for Technology in Education, 2017). It was determined that the digital social tool chosen was not successful and was not inclusive of all members of the Clusters. In the 2017 expanded project it was determined that Clusters could either use the Education Department Connect community where each Cluster has its own Community or use another form of social media such as Facebook that presents to members more ‘intrusively’ into individuals’ personal digital identity on phones or tablets.

Long term professional learning
As previously mentioned, a learning by doing approach takes time and so it was recognised that the professional learning program would need to be more than a one-day workshop (Sheffield, 2005). Even a ten-week program, however, was not sufficient for some teachers to make sustained or even significant changes to their practice in Digital Technologies. There has to be a compromise between the time available to teachers and the time necessary to make sustained changes to teachers’ practice. This program sought to balance the available time and the necessary time, and ensure teachers felt connected and supported even in those weeks between the face-to-face experiences.

Distributed Cluster Approach
It was decided for the 2017 expanded project that there needed to be a method to enable a wider approach to the program and so a Distributed Cluster Approach was adopted. This approach helps distribute materials to a large community rapidly and therefore has been an ideal mechanism to bring the new curriculum material to teachers in primary schools across Western Australia. The Distributed Cluster Approach was developed by the research team to
upskill a small group of digital engaged teachers, called *Digital Edge Teachers*. These teachers would be provided with intensive professional learning (over three days), support, materials and resources. These teachers would then facilitate a network of 20 locally based teachers from 10 schools using the Clusters approach. In this way, the project would build capacity in schools throughout the state. A key aspect of this approach will be the timely and ongoing support provided by the Digital Edge Teachers who would be charged with modelling good practice and bringing together the local school community. This would shift ownership of the when, where and why of the professional learning to the Cluster and away from a distant ‘expert’. In 2017 data will be collected around the affordances and limitations of the *Distributed Cluster Approach* including the developing confidence and the role of collaborative networks creating Communities of Practice (Wenger, White, & Smith, 2009).

**ISTE Standards Focus**
The pilot project focused on two of the ISTE Standards for Teachers: *Professional development and program evaluation* and *Content knowledge and professional growth*. The Cluster teachers were teachers from geographical school clusters who have skills and dispositions to develop their own digital pedagogies, technology use and leadership. Their role in this pilot project was to collaborate with industry partners and the research team to lead the professional learning in Digital Technologies of all of the teachers in the Cluster schools. Key components of this role were the use of adult-learning principles to underpin the program, reflective practices, and ongoing evaluation of the program. They led their school and professional community by modelling, promoting and demonstrating the effective use of digital tools and resources.

The pilot project also focused on another one of the ISTE Standards for Teachers: *Design, develop, and evaluate authentic learning experiences*. This was achieved by the Cluster teachers developing and applying their Digital Technologies understanding (software and hardware), such as *Scratch* visual programming, and implement this into their classroom practice in authentic, integrated ways. Teachers also developed computational thinking and programming skills to manipulate digital devices, such as Spheros™, to engage students in their classes.

In regards to the expanded project, the research team will spotlight these ISTE standards to all participants, and use the language associated with demonstrating these standards. The Digital Edge Teachers will be lynchpins in the 10-week professional learning program, and it will be of interest to determine whether this distributed leadership approach will yield positive results in terms of Cluster teacher engagement and improved expertise.

*this project was a collaboration between industry partner Datacom, led by Paul Moro (National Learning Manager) and the research conducted by the Curtin University academic team led by Dr Rachel Sheffield and Dr Susan Blackley.*


Ertmer, P Ottenbreit-Leftwich A (2013) Removing obstacles to the pedagogical changes required by Jonassen’s vision of authentic technology-enabled learning. Computers & Education, 64,175-182


