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In 2012, a research project was implemented to investigate the possibility and effectiveness of instituting a personalised and virtually networked mode of professional development to promote teacher confidence and competence with Information and Communications Technology (ICT) and its use as a key component of teachers' pedagogy. The aim of the project was to examine an online mode of professional development where a network of teachers was built without any face-to-face contact and where the approach for professional development was personalised and self-directed. Six geographically dispersed schools in Queensland were involved, with twelve teachers participating over the school year supported by a mentor. Findings reveal that teachers operated in an independent manner, acknowledging community but taking from rather than contributing to the generation of co-created knowledge. Implications drawn from the case studies suggest that greater milestone setting, multiple levels of leadership and special interest groups are required to support interaction between users and content while still maintaining an agile approach.
  Keywords: professional development, social networking, ICT pedagogy

Worldwide, teachers are gaining access to ICT, online tutorials are available, and digital curriculum resources are accessible and are continually being developed - the digital classroom is a reality. However, teachers' ability to use digital tools in their classrooms, that is, practicing the digital pedagogies required for the effective implementation of ICT, is not yet in evidence amongst the majority (Al-Zaidiyeen, Mei & Fook, 2010; Dunn & Rakes, 2010; Ertmer & Ottenbreit-Leftwich, 2010). Teachers are expressing the need for effective professional development that will enable them to create new visions, teaching practices and learning spaces that are technologically enhanced (Goldman & Lucas, 2012). They are requesting a move beyond the 'one size fits all' model to ensure divergence in teachers' interests and leveraging of local histories and cultures in schools (Phelps, Graham & Watts, 2011). Additionally, educators' professional learning landscape has shifted greatly with web-based technologies offering the opportunities for any-time, self-generating and on-demand learning (Simonson, Schlosser, and Orellana, 2011).

A shift in teacher professional development from training or workshops held on school sites or in school cluster groups to online spaces first utilised the traditional models of professional development (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009). These approaches shifted the content online, mirroring university courses that included discussion forums to support teacher engagement. These were further supported by face–to-face site or cluster meetings creating a learning community (Henderson, 2007). A move to online spaces for professional development that are not limited by the need for face-to-face contact or location restraints are emerging with the growth of social networking and ease of use of web 2.0 tools (Author, 2015; Vu, Cao, Vu, and Cepero, 2014). With these tools the move from online course work to self generating on-demand learning shifts the approach to professional development from content delivery to content generation, such that, the participant teachers are generating the content through collaboration and independent inquiry. Such inquiry-based professional development is grounded in teachers' intentional investigation and reflection on one's own practice in light of other teachers' practices, associated theories, knowledges and the larger educational, social and political contexts (Cochrane-Smith and Lytle, 2009). Shih-Hsiung

(2013) claims that teacher professional development that is classroom situated and supported by a school-based learning community is most effective. Would leveraging an online networked learning community provide a greater advantage? Elements of such opportunities and approach to inquiry based professional development will be explored further in the forthcoming literature review.

With regard to online professional development that enables teachers to generate content, approaches such as The Pathways for Learning, Anywhere, Anytime- Network for Educators (PLANE) website was trialled in 2011, as an environment for teacher collaboration through sharing portfolio evidence (see Maher, 2013). Also real time webinars have been found to benefit teacher learning and content generation as they offer spaces for reciprocal authentic dialogue that network worldwide teacher participants (Albers, Pace, and Brown, 2013). Theses studies indicate individual components such as an online 'environment' or a 'chat tool' but they do not represent the complexity of providing an online program of professional development that is not coursework but rather self-generating based on independent learning pathways. Enabling teachers across Australia to collaborate, communicate and create together, regardless of time and place, is significant and innovative for a country where the population is geographically diverse and separated by vast physical distances. To understand the opportunities for self generating online teacher professional development underpinned by social networking, the following research questions were formulated:
1. How do teachers engage in online self-directed professional development?; and
2. What are the enablers to support a model of professional development underpinned by social networking?

By moving professional development into a context that is not limited by time or place, or the need for face-to-face communication, it is anticipated that professional development can become an embedded part of teachers' everyday practice and provide greater opportunities for and from learning communities. Literature for review will include an exploration of elements of effective professional development as well as an exploration of professional learning through social networking.

Background Literature

Elements of professional development

There are many similarities in the research identifying the essential elements of professional development. First and foremost, when professional development is concerned with transformative outcomes, that is, enabling a change in teacher beliefs and practices, teachers' current mindsets need to be made conscious so that through professional activity these beliefs can cause tension to enable reformation and inform new practices. Teacher change (in belief and practice) occurs during professional development when teachers' verbal reflection, supported by written reflection, is actioned with critical discourse that is based in collegial formations. Teacher action is best embedded within an investigative context such as a classroom-based inquiry. These core elements of investigation, reflection and constructive dialogue are represented in action research models of teacher professional development (Bannan-Ritland, 2008; Herbert & Rainford, 2014; Markauskaite and Reimann, 2008; Author, 2013; Subahan Mohd Meerah et al., 2010).

Conceptually, investigation centralises professional development in the classroom context. Teachers' classrooms become sites for inquiry for making conscious 'knowledge-of-practice' (Cochran-Smith & Lytle, 2001). Essentially, opportunities for professional discourse

that are structured and derived from personal investigation acknowledge the value of teacher-constructed knowledge. The generation of knowledge through professional inquiry that is focused on a teacher's daily work has the ability to influence change in a teacher's beliefs and practices and is imperative to effective professional development (Day & Gu, 2007). Reflection supports this inquiry through the process of 'sense-making', providing a lens through which re-conceptualisation of practice can occur (Watson & Wilcox 2000). Finally, the interdependent process of constructive dialogue infers that teachers require both collegial and critical discourse to engage in professional development activity. Collegial discourse is required to build a networked community, which supports the development of social presence or a social context whereas critique or critical discourse supports the learning, the interrogation of established beliefs for the reformation of ideas (Author, 2009). Engagement in all three core elements-investigation, reflection and constructive dialogue, provides the space for teachers to challenge and rebuild their beliefs and practices.

In understanding the process of teacher change within a processual professional development model, the seminal work of Guskey (2002) proposes the temporal sequence of events such that teachers participate in professional development activity, they trial something new in their classroom, there is a change in student learning which then affects a change in teachers' beliefs and attitudes. The three core elements are in a dynamic interplay in that the teacher draws upon at any given time during the professional activity (see Figure 1). Teachers' beliefs and attitudes remain in an evolving state for re-engagement with further professional learning and development (Clarke & Erickson, 2003). Underpinning this action is the central role of the mentor or leader of professional development. Mentors play significant roles in the formation of a community of learners (Di Mauro & Jacobs, 1995); in challenging beliefs and ideals, acting as a critical friend (Author, 2013); enable independent learning pathways (Evans, 2014); and winning over hearts and minds (Watson, 2001) in the pursuit of new knowledge and new ways of thinking about teaching and learning.

Finally, some of the key findings of professional learning indicate that it is a messy unpredictable process that can be an unconscious incidental event (Smylie, 1995), unanticipated through social activity (Adger, Hoyle & Dickinson, 2004), implicit (Eraut, 2007), but usually situated (Hoekstra, Beijaard, Brekelmans & Korthagen, 2007). What could be considered professional learning has been conceptualised by Evan (2014) as encompassing behavioural development- processual, procedural, productive and competential change; attitudinal development- perceptual, evaluative and motivational change; and intellectual development-epistemological, rationalistic; comprehensive and analytical change. Drawing core elements, mentorship, change processes and professional learning outcomes together in a framework, Figure 1 provides one representation of teacher professional development that is considered complex, diverse and ongoing.

Figure 1. Professional development model
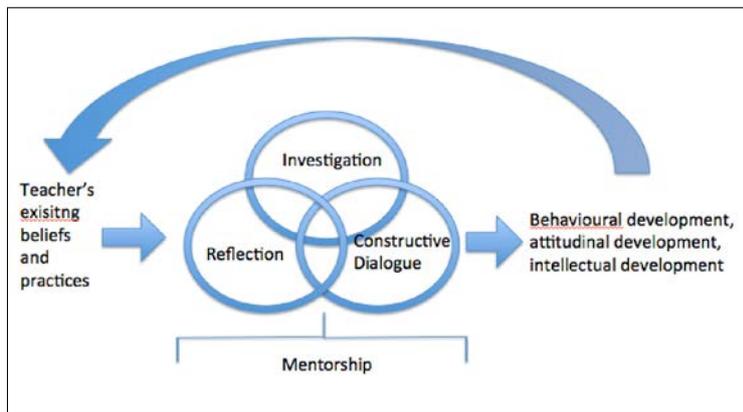
Social networking sites

The advent of Web 2.0 tools has generated, among other things, social networking sites (SNS). Boyd and Ellison (2007,) provide a clear definition: "SNS are web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (p. 211). The term 'network' carries with it an important disposition to the way communication tools are used within sites. Networking does not necessarily mean that people are looking to meet new people; rather, they are primarily communicating with people who are a part of their extended social network or professional circle. What is important about SNS is that people are able to make visible their social connections and, therefore, provide potential connections between individuals that would not otherwise have been made (Haythornewaite, 2005).

In regard to schooling and education, one of the first moves to learning online has been to employ a learning management system (LMS) because of its use in the higher education sector. LMS like the Blackboard platform direct students to engage in ways that are different to SNS. LMS serve as management systems that support administrative concerns and use communication management tools more frequently than interactive tools (Dalsgaard, 2006). LMS also engender teacher-centred pedagogies for distributing course content. This has impact on how content and user interaction occurs. In a LMS the instructor provides the content, which is central to activity, whereas in a SNS the content is generated by the user and interaction is the central activity (Mott, 2010). Interaction with content and other users is considered engagement in professional development.

Engagement between user and the content is also different. For example, an instructor in a LMS may pose a question in an online discussion board and each student posts a response, replicating traditional question-and-answer mode. In contrast, discussion in a SNS is self-directed or student-centred (Brady, Holcob & Smith, 2010). Veletsianos, Kimmons and French (2013) suggest that a SNS fosters the use of participatory pedagogies and is able to support interactive discussions. Interaction and content are more free-flowing and therefore are more difficult to control. This is why tensions arise when SNS have been used in higher education, as personal and professional boundaries for instructors collapse (Marwick & Boyd, 2010) and the sites are not conducive to teacher-centred pedagogies.

Developing a sense of community is critically important to engagement in any online learning environment – LMS or SNS – especially if participants do not meet face to face. The

tools used in a SNS facilitate the sharing of information. This, plus personal profiling and a user's sense of social presence are key factors that promote a networked community (Cobb, 2009; DeSchryver, Mishra, Koelhler & Francis, 2009). LMS have been described as tools that fail to provide users with the social presence necessary for more robust and valuable networking experiences that are essential for learning (Minocha 2009; Velesianos, Kimmons & French, 2013). Therefore, engendering and enabling teachers to develop a social presence through personal profiling and sharing of information is important in teacher professional development through SNS.

A range of studies on the use of SNS in higher education with a coursework orientation provide direction and insights for teacher professional development mentors. Velestsiano and Navarrette's (2012) study employed learner-centred approaches whereby the instructor frequently commented on students' blogs and employed the use of alerts to direct learning. Dron and Anderson (2009) highlight the idea that engagement in activities demands some form of requirement or only the innovators or early adopters will participate (Rogers 1962; 2003). Wong, Woo, Quek, Yang and Lie's (2011) study has highlighted the fact that there needs to be a change in the mindset of teachers using a SNS, in that it cannot be compared to a LMS and its functionality. Interacting through a SNS is self-directed which requires the employment of learner-centred pedagogies by the mentor to help support self-directed learning. Lastly, Brady, Holcomb and Smith (2010) identify the need for staff- student support and time for a new technology to be implemented before benefits can be measured. This suggests that the mentor of professional development in an SNS needs to employ participatory pedagogies that are in response to teachers' professional needs and directions, not to dominate or lead professional activity.

In concluding this section, the professional development potential for teachers supported by SNS is evident in the opportunities for self-generation and shared creation of knowledge, experimentation and participatory learning. There are challenges associated with SNS implementation such that they require the mentor to give greater support for teachers to use, as they, unlike the more familiar LMS, are a more dynamic system of interconnected tools. Most importantly, there needs to be a mind-shift for some teachers to conceptualise SNS as opportunities for substantive professional development and for mentors in these environments to use learner-centred pedagogies to facilitate interaction amongst teachers rather than direct sequential professional development tasks.

Potential for SNS for professional development- drawing ideas together

The rise of the SNS with its disposition for a sharing and knowledge-producing exchange logically suggests a set of tools to support teacher professional development. Teachers are not restricted to time and place, their classrooms can be the sites of investigation with reflection and constructive dialogue enabled through tools embedded in a SNS. Teachers can create their own social presence through personal profiling and interest groups can be formed that enable further social networks to develop. A networked community has an opportunity to grow within the SNS through participatory pedagogies offered by the mentor. The merging of SNS with professional development has been pictorially represented in Figure 2. The key ideas presented in this literature identifies the complexity of enabling teachers in professional reflection, investigation and constructive dialogue the purports teacher 'engagement' not 'staged tasks', 'free flowing learning pathways' not 'sequential activites', 'demand drive' by the teacher that is 'not controlled' by the mentor, and the need for a sense of social presence and community to

establish the professional development as an entity. These features of professional development supported through SNS will be examined in the remainder of this paper in relation to how teachers in this study engaged or interacted with content and users and what were considered the enablers to sustain engagement in professional development activity.

Figure 2. Professional development underpinned by SNS
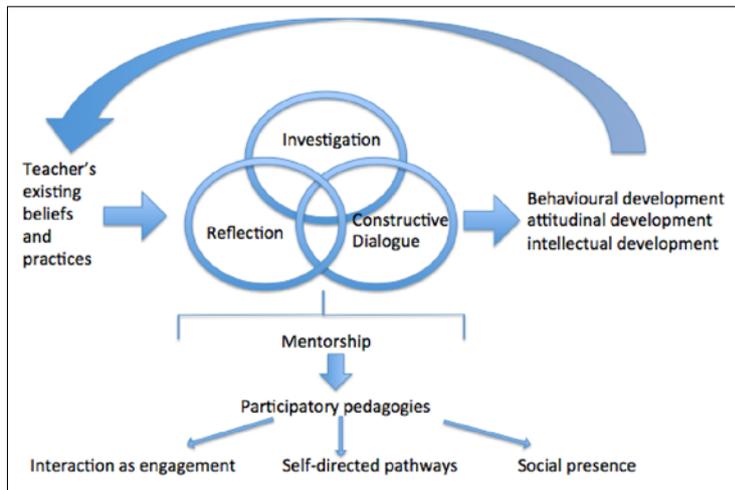
Method

This paper drew upon data from the 'Virtual Professional Development: enabling teachers to engage with digital pedagogies' project funded by an Australian University and six Queensland schools as Industry Partners, ethical clearance number: EDN/16/12/HREC. The project investigated the possibility and effectiveness of instituting a personalised and virtually networked mode of professional development to promote teacher confidence and competence with ICT and its use as a key component of the teachers' pedagogy. The aim of the project was to examine online modes of professional development where a networked community was built without any face-to-face contact and where the approach to professional development was personalised and directed by the teachers. This project aligned with the implementation of the Australian Curriculum, which was used as a premise for examining teachers' technological pedagogical content knowledge (Koehler & Mishra, 2009). The schools were chosen to represent all educational levels, from primary to secondary and included independent and Catholic colleges, single sex and multi-campus sites and were located across Queensland. Twelve teachers chose to participate over the school year. At any point in time teachers could withdraw from this research-based activity as required by ethical procedure.

The professional development program was underpinned by elements of investigation, reflection and constructive dialogue. These three elements were actualised in a year-long program. Teachers were asked to develop an Action Learning Project where ICT was considered a central tool in the learning phase. The professional development program was designed to support the flow of the school year. Term 1 required teachers to make conscious their beliefs and practices about ICT through an online Likert scale and short answer survey; Term 2 involved the introduction of a SNS with opportunity to develop and plan individual Action Learning Projects with an online mentor; Term 3 involved each teacher implementing and monitoring their Action Learning Project with the help of the online mentor; and Term 4 involved the redesign of their project and reflection on their professional outcomes. The

mentor's role was to establish a sense of community within the group of teachers, to encourage engagement with and among the teachers online, to guide and direct each teacher's pathway for learning associated with their project, and to challenge and make teachers think deeply about how their students learn and their own ICT beliefs and practices. There was no coursework to engage in nor was there assessment required. Table 1 presents examples of teachers' Action Learning Projects across educational levels:

Table 1 Action Learning Projects

Prep/year 1	Use of iPads with specific apps to support literacy and numeracy development in the early years.
Year 5	Use of Twitter as a collaborative tool to build students' knowledge about communicating globally.
Year 7	How can student blogs be used as a reflective tool during the planning of Kids Connect Project?
Year 10	Does the use of an online class environment to support student engagement at any point support their learning of subject matter?
Years 11 and 12	Create a connected Learning Community so students can receive peer and community feedback on their films in development stage to inform production.

A range of communication and Web 2.0 tools were used to implement the online professional development. These included email, a discussion list through Google Groups, Skype for one-to-one teacher and mentor discussions and wall.fm as the project SNS. Wall.fm provided an environment in which both public and private online communities could be created (see Figure 3). This became the central site where teachers profiled themselves, published and shared curriculum materials and blogged their Action Learning Project progress as well as commented on each other's reflections (see Figure 4). These contributions to the project site were considered the 'content' of the professional development program, that is, self-generating content. Requests of teachers were made term by term and encouragement was given by the mentor on engaging in online activities. In this way the professional development was considered self-directed.

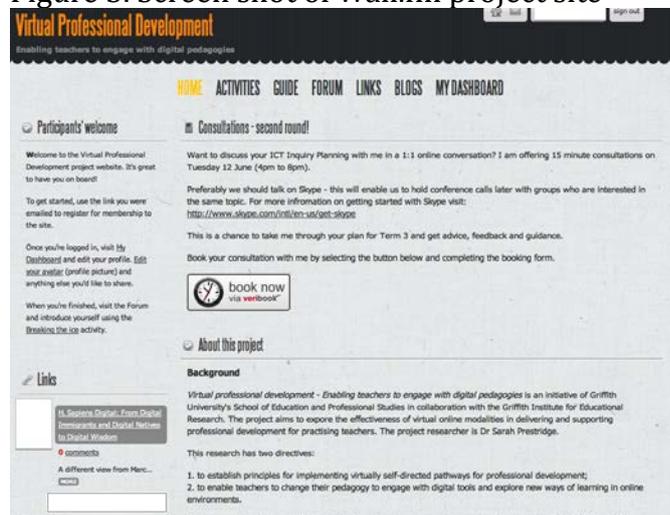Figure 3. Screen shot of Wall.fm project site

Figure 4. Example of early forum discussion topics in Term 2

Case descriptions were the primary form of data collection to study teachers' engagement over the year in the professional development program. Case study offers the opportunity to describe from the teacher's perspective how they were responding to the contextual conditions (Yin, 2009), in this case, the online professional development. Case study is well recognized as an approach to support the investigation of particular phenomenon (such as professional development) within a real-life context while employing multiple sources of evidence. It provides a framework for allowing researchers to "engage with and report the complexity of social activity" and "to represent the meanings that individual social actors bring to those settings and manufacture in them" (Stark & Torrance, 2005, p. 33). A collective case study approach (Creswell, 2013) was employed where three teachers were purposely chosen as independent cases. These teachers were chosen based on Asmussen and Creswell's (1995) sampling strategy to select unusual cases with maximum variation within representative clusters. To fully describe multiple perspectives about these cases, multiple sources of data are required (Yin, 2009) and were drawn from pre- and post- open question survey responses, teachers' Action Learning Project planning documentation, and teachers' final reports written as a reflection on their learning journey.

Following transcription of all data sources, a rich description of each teacher's progression through the professional development period was completed. After this description key elements of professional development underpinned by SNS (represented in Figure 2) were employed to help analyse the data, these being: investigation, reflection, constructive dialogue, and further drilling down for collective terms such as 'inquiry'; 'comment, 'believe', 'post', 'idea'. During this process attention was paid to the identification of levels of interaction with content and users in online professional development activities and the progress of the Action Learning Projects. Similarities and differences across the cases were identified. This resulted in a deeper engagement with the data to support a greater understanding of the complexity of the process of professional development (Creswell, 2013). Additionally, attention was paid to the identification of when, why and if teachers' beliefs and pedagogy changed through the implementation process. This analytical procedure did not attempt to quantify engagement by the number of 'comments' to the forum or blog 'posts'. It also does not attempt to analyse the 'comments' or 'posts' for levels of reflection or types of discussion. Rather this analysis provides a descriptive approach to understanding how teachers engaged in professional

development. Lastly, anonymity is gained through the use of pseudonyms for all teachers. The three teachers' journey through the professional development program will now be presented.

Analysis and Results

Case study 1- Working with the mentor

Amy was a Year 4 teacher who described her use of ICT as embedded in all facets of her teaching. She believed strongly in the use of ICT as it "changes how and what students learn". She felt confident to try new approaches and rated herself as highly competent. She described the way she used technologies:

> I would use ICT daily in my classroom for a variety of things – research, blogging, Imovie, podcasts, and everything else in between. We have recently invested in a 'green screen' which I'm excited to test out and use in the classroom. This year and last year my class made and updated a web page, which was a big success. The students uploaded work samples and podcasts, made videos that posted to Youtube which then embedded into their page, uploaded photos, wrote weekly blogs and commented on other students' pages.

In this excerpt Amy is confident to try new technologies and uses ICT to enable students' to present their work with some evidence of student collaboration. This would be considered as supporting existing curriculum outcomes (Downes, et al., 2001) through the use of a mix of teacher-centred and student-centred pedagogies (Ertmer, et al., 2012). Through this professional development opportunity Amy wanted to try something different, she wanted to authentically use communication tools as she felt this was missing from her ICT pedagogical approaches. Her Action Learning Project was to:

> …move towards more collaboration through ICT in my teaching for the students to not just 'post' or 'find' information, but to share, work with and engage with the digital world through the global community.

In her planning documentation, Amy expressed an interest in using Twitter (a new tool) in the context of the 2012 Olympics games, as this could be leveraged for communication on a global scale. She had no idea on how to set up a Twitter account and thought it would be like an email account.

Her approach to the professional development program could be considered as being underpinned by the mentor. Amy was quick to provide her planning material and posted it on the wall.fm site. She was focused on using Twitter, which helped her limit and direct her engagement with her colleagues online and or with further materials and opportunities. She engaged with the mentor though regular Skype sessions to re-develop her plan and once the connection was made with an Australian Olympic diver, worked in unison with the mentor on how best to facilitate the Twitter exchange with her students. There was a period of intensity where Amy, the mentor, and the diver worked as a triad to ensure the communication with the students was effective. This involved the use of hashtags and Twitter handles to filter conversations from the rest of the Twitter stream. Through Amy's refection on the project outcomes, her professional learning was not solely about Twitter, and surprising herself, it was about the development of students' substantive questioning techniques:

> We learnt about open and closed ended questions, which I didn't predict would come from the inquiry. We learnt to ask questions that didn't have a yes or no response. I also learnt about using Twitter or other social media mediums to ask questions that kids are asking in the classroom.

It can be seen that Amy engaged in all elements of professional development- investigation, reflection and constructive dialogue with the support of the mentor who used participatory pedagogies. However, she did not take advantage of the social networking opportunities. She preferred to engage in substantive dialogue with the mentor.

> I enjoyed having an online community. I liked reading what projects other people did. I looked at all of them, but didn't feel the need to comment. I thought it was very valuable and it was good to get ideas from. I also felt less pressure than other professional development.

Planning documents from other teachers gave her ideas but Amy did not feel the need to comment or build connections with other colleagues in the SNS. Her sense of a networked community came from her contributions about her project and gaining of classroom ideas. Overall, she "felt less pressure" with this mode of professional development as there was no face to face meetings as it fitted into everything else she had to do.

Case study 2- School approach

Led by Wilma, the Teacher Librarian, supported by Kate the school curriculum co-ordinator, a whole school approach was adopted for this online professional development opportunity. As the key driver for the Action Learning Project, Wilma situated the project within her teaching context, the school library and engaged in collaborative planning with classroom teachers. She considered herself as moderately confident with implementing ICT with some technical competencies. Her main goal for using ICT was for "developing student content understanding, extension activities and information gathering". This would be considered as using computers as an information tool (Tonduer, et al., 2007) primarily driven by teacher-centered pedagogies (Ertmer, et al., 2012). With this leadership direction, a collaboratively constructed Action Learning Plan was submitted to the mentor and posted on the SNS for peer review. The goal was:

> Does a library wiki encourage engagement with reading and lead to improved student learning outcomes? This will be achieved through collaborative curriculum planning with classroom teachers to link the use of Web 2.0 tools with the learning intent of the Australian Curriculum that has been planned for the term. A particular focus will be developing a library site that students and teachers can contribute to in order to promote reading and literature in the library.

Wilma and her team expressed an interest in building a library wiki that would be a repository for student work. Her plan was to "explicitly teach literature content from the year level planned units of work incorporating appropriate ICLTs during library lessons and establishing the library wiki/blog so that staff and students can post work". This evidences her current ICT beliefs and practices for productivity outcomes (Author, 2012).

Their approach to the professional development program was different to Amy. The team formulated the plan, posted it on the SNS and sought both the teachers' and the mentor's help mainly for refining their initial planning and getting some technical help during implementation. The mentor led two Skype sessions for this refinement process. The main advice provided by the mentor and teachers online was on the use of wikis to create opportunities to transform student learning, particularly by building a sense of community among students and enabling students to co-create knowledge rather than using the wiki as a transactional tool.

Originally, Wilma intended the wiki to be more or less a broadcast space that the library staff would use to promote books, reading activities etc., with student interaction limited largely to rating and commenting on books particularly for Book Week. This intent was enacted and in Wilma's words:

> This inquiry enabled students and teachers to engage in the study of literary texts. They examined literature by analysing the ways in which authors use particular devices and techniques to influence readers. They then responded to literature using a variety of online tools to represent their ideas, experiences and opinions. These were displayed on the library wiki to be shared with the whole school community. They included book trailers, book reviews and photo galleries. Through participation in these experiences, students were enthusiastically engaged with literature.

Evidenced here is the implementation of ICT that matches Wilma's existing beliefs and pedagogies. It has been established that teachers' adopt ICT into their teaching without changing their practice (Donnelly, et al., 2012; Ertmer et al., 2012; Kim, et al., 2013). The project outcomes shows some level of transformation about the wiki tool based on the fact that Wilma and her colleagues had never created or managed a wiki before. However, the greatest outcome for Wilma came at the end of the project evidenced in her final reflection. She stated that:

> Towards the end we explored the idea that wikis can be used to give learners both agency and ownership (individually and collectively) of learning particularly if they can be supported to develop and publish more sophisticated forms of responses to texts and even have ownership of the structure, policies and publishing processes for the wiki.

It can be shown here that once Wilma had experimented with the wiki tool and gained more confidence and competence, she began to open up to the idea that the mentor and teachers had seeded in the planning refinement phase, that is, the wiki as a collaborative knowledge building space.

With regard to professional development, Wilma and her school team made some use of the social networking opportunities, benefiting from the sharing of project ideas and opinions, and for Wilma the solving of technical problems during implementation. She states:

> I found it very helpful to be able to read the opinions and ideas of other teachers undertaking this virtual PD, as well as the fact that I was able to base my research on an area that was of interest to me and something that I was able to use in my day-to-day teaching in the library. Although there were many technical issues along the way, we spent a great deal of time was spent trying to **sought** these out. I found that my goal of planning collaboratively with teachers to embed the use of ICLTs in literacy learning was very successful. Most teachers responded positively and would like to continue to implement this type of planning in the future.

This excerpt acknowledges evidence of community through the sharing of ideas and opinions as well as investigation as self-directed and relevant. The main orientation of the social networking opportunities was to gain knowledge and understanding to refine their Action Learning Project in the planning phase, and as a form of on-going technical support during implementation. For Wilma, as the leader of her school team, the ideas and discussion online helped validate her ideas on using ICT. She became a pedagogical leader of her school team.

> Yes, I became much more confident in the beliefs and ideas which I was initiating among the school staff and was able to guide staff members in their teaching practice with regard to using ICT in the teaching of literature.

Wilma like Amy, acknowledged that "there was a community type atmosphere" but she "did not take full advantage of this". Her school team or 'community' leveraged her pedagogical engagement through the implementation phase while the online community leveraged pedagogical refinement embedded in her project and provided on-going technical help.

Case study 3- Independent approach

Coming into this project and being a recent graduate, Jackie sees herself as a competent and confident user of ICT who tries to embed technologies into all aspects of teaching and learning. She states that she uses "teacher-directed tasks that require students to analyse, experiment and think about the concepts under study". Her goal for this project was to extend her pedagogies by focusing more on student use and specifically reflective task. Her Action Learning Project and description follow:

> How can blogging be used as a reflective tool during the planning of Kids Connect? Each week students were asked to write a blog post reflecting on their learning experiences during the planning of Kids Connect - a 2 day ICLT conference completely organised and run by the students and attended by around 200 teachers and students from schools around Queensland. The aim was for students to reflect upon the challenges they faced each week and how these were overcome, as well as the new knowledge and skills that they were developing each week.

There are two items of interest here. Firstly, based on Jackie's competency with her use of ICT in her classroom and even though she was a recent graduate, she was asked to take on this major role for an ICT conference. Secondly, the use of reflection to support the learning process through blogs could be considered innovative based on the fact that the major task is management/administrative. Jackie's pedagogy and underlying ICT beliefs represent Mama and Hennessy's (2013) diversifying approach in that it encourages autonomous learning and reconceptualises the teacher's role in view of students' needs.

This confidence in both her competency and pedagogy enable Jackie to be an early adopter (Rogers 1962, 2003) in the professional development opportunities. She was a key participant in the SNS through dialogic activities such as the forum discussion and comments on other teacher's projects. She affirms that:

> Early on in the project, I looked at others' planning documents and blog posts as a point of reference before creating my own. I commented here and there. The most valuable bit was talking to (the mentor). It definitely did make me rethink what I was doing. Although I use ICT all the time, in a range of different ways, I realised that I hadn't been providing the students with opportunities to use ICT as a tool for reflection at all. This is something that has changed in my planning and pedagogy.

She had a Skype session with the mentor to further develop her plan. This was mainly focused on the difference between blogs and other authoring spaces (e.g. wikis) and what kinds of blogging models would support the kind of student participation she had in mind. At the beginning phase Jackie was concerned with how to enable student reflections, seeking advice on how to direct, monitor and provide feedback on blog posts. In this planning phase she was actively connecting with the teachers in the SNS, but once it got to implementation, she took an independent route.

During the implementation phase Jackie preferred to blog about what was happening in her classroom, stating that these blog posts were "fairly good" as it "kept me on track, as I

completed this PD independently". Jackie's blog posts could be considered engagement in the SNS, as a contribution to the collective knowledge, not co-created knowledge. She states at the end of the project she was able to authentically use ICT to engage students in real world issues and solve authentic problems that inquire into student generated questions:

> I found some students were keen bloggers and others were more reluctant. Similarly, some students were very open and honest in their reflections, while others were somewhat superficial. However, I believe that overall, the students were successfully engaged in reflecting on their learning and experiences.

Her reflection indicates a diversifying pedagogical approach and reaffirms the beliefs and pedagogies she used prior to this professional development. Exploring ideas with the other teachers online though comments and blog posts, as well as critical discussion with the mentor was the key to Jackie's engagement and helped her think more deeply about her use of ICT. She stated that the online professional development fitted well into her "regular school and PD activities". Jackie's described her approach to the professional development as an "independent" approach, in the fact that she was actively giving her ideas in SNS at the planning phase then quickly tapering off during implementation when engagement became self reflection through blog posts. This may be due to her confidence and competence with ICT.

Summary

In response to research question one, *How do teachers engage in online self-directed professional development*, consideration derived from the literature, needs to be given to interaction with content and users. Presented above, teachers' pathways through the online professional development were different in the way they interacted with self-generating content and the teachers. Amy came with an idea, planned collaboratively with the mentor and took ideas from the community with little contribution. She requested the mentor's assistance through the implementation process of her Action Learning Project, in that, a collaborative triad was created to support her students leveraging Twitter as an effective communication tool underlined by constructive questioning techniques. In regard to social networking, her journey could be described as working closely with the mentor amongst the online community. She could be considered a social 'lurker'. This idea aligns with the findings of Brantzaeg and Heim's (2011) study into users of SNSs. They found five distinctly different types of users: Socialisers, Debaters and Actives are considered early adopters while Sporadics and Lurkers are late adopters. Sporadics and Lurkers have low levels of participation, with Lurkers making up the largest user category. However, low participation for contributing may not indicate what Garber (2004) suggests as a requirement of group membership as Author (2009) found that there is still learning value associated with viewing and listening to group communication.

Wilma led a school team approach to create a library wiki and utlilsed the mentor and the teachers in the refinement of her project at the planning phase. Through implementation on-going technical help was provided by the teachers online. The ideas on how to use a wiki for collaborative knowledge building that were provided by the mentor and teachers helped Wilma to rethink her use of this web tool. Wilma, like Amy was focused on her project seeking ideas rather than contributing to the collective knowledge. Whereas Amy relied on the mentor, for design and implementation, Wilma **sought** ideas from the community, and leveraged her school team for pedagogical help during implementation. Both made little contribution to other teacher's projects. On the other hand Jackie approached the online professional development as a confident, competent user of ICT providing comments and sharing ideas on other teachers' projects and using feedback from the mentor to constructively implement, monitor and reflect

on her project independently. Each teacher progressed through the professional development program in varying ways, at different times they were intensive or inactive, and engaged by lurking, contributing via feedback on projects or forum discussions, planning with the mentor or blogging progress. They each acknowledged a sense of being apart of an online community, the value in self directing their professional learning based on their own needs and interests, and the benefits of no time or place limitations to the program. It has also been established through each of the case studies that professional learning occurred in regard to ICT beliefs and practices.

It is evident in the approach taken by these three teachers' to the online professional development program that they did not commit to or maintain a high level of social networking activity. Amy curated ideas and worked one on one with the mentor. Wilma **sort (sought)** feedback from the mentor and the other teachers but made little contributions herself. Her idea of community was based more at the school level than online as she shared work and ideas gained from online discussions with her school colleagues. Jackie, on the other hand, was active in connecting with peers online through comments and discussions mainly around teachers' Action Learning Projects, but tapered off as she implemented her project. Blogging her progress, as an independent activity, she considered contributing to the collective community knowledge. These teachers could be considered 'self-directed' and had produced 'self-generated' content, however, they were also more social inactive within the community rather than socially interactive within the community. User-user engagement was between mentor and individual teacher. There was no evidence of community created knowledge. These findings are similar to other studies in this field, with researchers suggesting external incentives to increase user - user and user - content interactivity (Dron & Anderson, 2009; Velestsiano & Navarrette, 2012).

Consequently, in answering question two, *What are the enablers to support a model of professional development underpinned by social networking,* conclusions can be drawn from these teachers approaches as suggestions to reshape the design of online professional development. Three enablers are suggested here: milestones setting, multiple levels of leadership and special interest groups. Particularly for those teachers who required more explicit guidance in operating in a virtual modality, clearer and more granular negotiated milestones for key activities, if established early, may have provided a model that responded more to individual needs while still maintaining an agile approach. For example, setting key requirements with regard to social networking activity, may have directed greater social engagement. Furthermore, to maintain the integrity of personal agency it would be critical to ensure teachers felt a sense of ownership over the milestones and expectations, that these belonged to them, not to the mentor. One way to achieve this may be for each teacher to propose his or her own milestones as part of their Action Learning project plan. With regard to enabling multiple levels of leadership greater responsibility could be given to teachers who are confident in an area of pedagogy or technology, who could take on a peer mentoring role. This may lead to a more horizontal leadership model that would be more community oriented and aligned to social networking. Lastly, special interest groups could be formed to support this leadership model where teachers' personal agency would allow for movement in and out of groupings as required for their project plan. This would help contribute to the mentor's role as an organisational, facilitator role rather than being the lynch pin for social activity. These enablers are considered elements of effective professional development (Davis, Preston & Sahin, 2009; Hutchison & Colwell, 2012; Moore, 2007) but open up directions for further research into online professional development.

Conclusion

This study has investigated a model of professional development that had two innovative components: the use of a SNS as a platform and underlying process for professional development, and the opportunity for self-generating content rather than modulised content. The professional development model appropriated core elements of professional development, through teachers' engagement in investigation, reflection and constructive dialogue. Each teacher designed and implemented an Action Learning Project based on their own pedagogical needs and interests and situated within their school based curriculum and constraints. An online networked community was established virtually through teachers' engagement in forum discussion, Skype sessions, emails and profile pages that included reflective posts, professional information and planning documentation. In responding to the two key research questions, it was found that the content free demand-drive model of online professional development enabled teachers to engage in ways that were responsive to their needs and interests and professional school contexts and sustained teachers' involvement to varying degrees without any face to face contact. The opportunity to enable professional development without limits of time and place was considered beneficial. This agile model influenced both the nature and timing of the support activities and mentoring provided as the onus for endorsing and authorising activities was on the teachers rather than on the mentor. Activities and services could be offered but not mandated and teachers' responses were critical to informing decisions about what further activities and services were to be offered.

This study contends that professional development can effectively be implemented in a SNS where a networked community is established to support the elements of investigation, reflection and constructive dialogue and the development of social presence to enable teachers to embrace the advantages of online networking without the need for face-to-face communication. Online professional development can be considered a mechanism for self-renewal where teachers' beliefs and practices become the focus and influence of the design of professional development through self-generating content and self-directed pathways for learning.

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Table 1 Action Learning Projects

| Prep/year 1	Use of iPads with specific apps to support literacy and numeracy development in the early years.
Year 5	Use of Twitter as a collaborative tool to build students' knowledge about communicate globally.
Year 7	How can student blogs be used as a reflective tool during the planning of Kids Connect Project?
Year 10	Does the use of a online class environment to support student engagement at any point support their learning of subject matter?
Years 11 and 12	Create a connected Learning Community so students can receive peer and community feedback on their films in development stage to inform production.
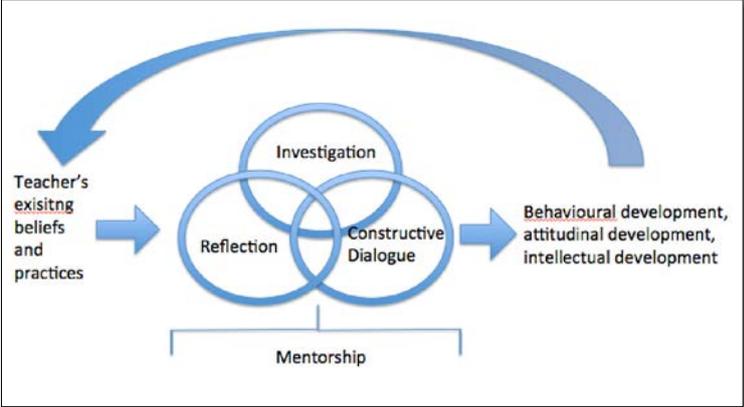
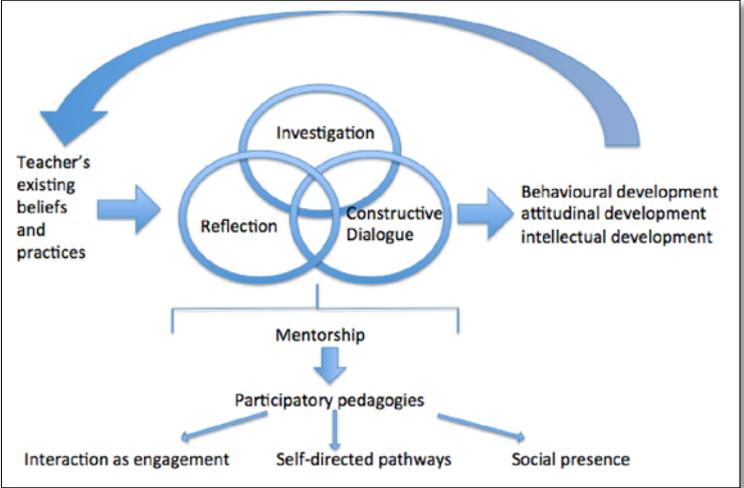Figure 1. Professional development model

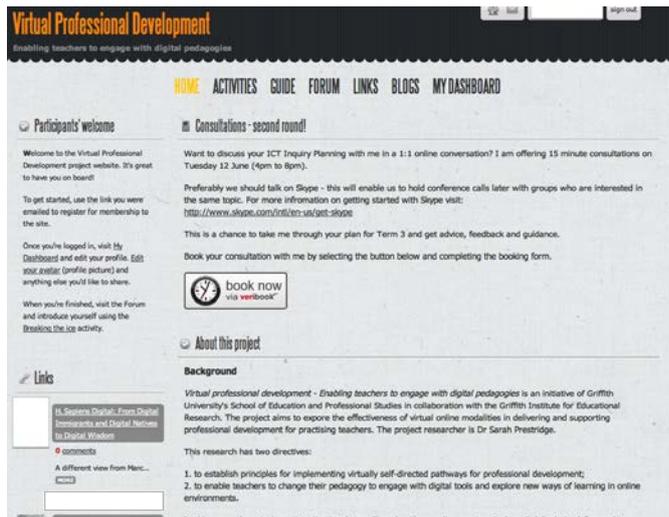Figure 2. Professional development underpinned by SNS
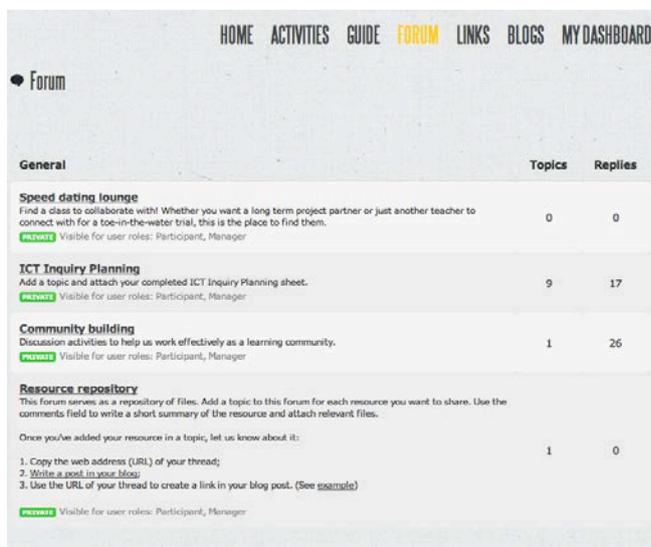
Figure 3. Screen shot of Wall.fm project site

Figure 4. Example of early forum discussion topics in Term 2