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Author(s)	Ping Gao, Angela F. L. Wong, Doris Choy and Jing Wu
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# **Beginning teachers' understanding performances of technology integration**

Ping Gao\*, Angela F.L. Wong, Doris Choy and Jing Wu

*Learning Sciences and Technology Academic Group, National Institute of Education, Nanyang Technological University, Singapore*

\*Corresponding author. Email: ping.gao@nie.edu.sg

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As part of a 2-year, mixed methods study, the focus of this paper reports the qualitative findings that are related to nine beginning teachers' learning to teach with Information and Communication Technology (ICT) during their first year of teaching. It aims to explore how these teachers deepen their understanding performances of technology integration in their first year. They demonstrated consistent, varied perceptions, frequency and ways of using ICT for classroom teaching and learning from their initial teacher education to their first year teaching. They developed diverse understandings of technology integration from their own practice, and chose to play different roles, such as, follower, doer and emerging teacher leader for technology integration. Suggestions to schools on providing beginning teachers with ongoing technical and pedagogical support and capitalizing on their tech-savvy strengths are discussed.

Keywords: beginning teachers; technology integration; qualitative methods; understanding performances

## **Introduction**

For the last two decades, the preparation of teachers in the effective use of Information and Communication Technology (ICT) has become a key component for most educational reform efforts (National Council for Accreditation of Teacher Education, Task Force on Technology and Teacher Education, 1998; Singapore Ministry of Education, 2002; US Department of Education, 2002). Even though today's pre-service and beginning teachers possess essential information technology knowledge and skills and positive attitudes and beliefs about using ICT, repeated findings suggest that most pre-service and beginning teachers are unable to translate their increased ICT skills and knowledge to effectively promote students' higher order thinking (Andersson, 2006; Koehler, Mishra, & Yahya, 2007; Russell, Bebell, O'Dwyer, & O'Connor, 2003; Swain, 2006; Wright & Wilson, 2005). Emerging

evidence suggests only a limited number of exemplary beginning teachers are able to create opportunities for student-centred use of technology, and develop their own identity as users of information technology (Gao, 2005; Goos, 2005; McGee, 2000). We are interested in how beginning teachers develop their understanding of technology integration through their own performance of teaching in their classrooms, and this is the aim of this paper.

### **Literature review**

Our inquiry is guided by the socio-cultural framework of teacher learning, which suggests that “learning should be viewed as both a process of active individual construction and a process of enculturation into the...practices of wider society” (Cobb, 1994, p. 13). Our views about the use of ICT for classroom teaching and learning are influenced by Brown, Collins and Duguid (1989), who articulated the relationship between learning and teaching, and tools as follows:

People who use tools actively rather than just acquire them, by contrast, build an increasingly rich implicit understanding of the world in which they use the tools and of the tools themselves. The understanding, both of the world and tool, continually changes as a result of their interaction. Learning and acting are interestingly distinct, learning being a continuous, life-long process resulting from acting in situations. (p. 33)

We start by presenting literature on the relationship between pre-service teachers’ belief and practice in general. There is extensive investigation about pre-service teachers’ beliefs and practice. According to Richardson (1996), beliefs are “psychologically held understandings, premises, or propositions about the world that are felt to be true” (p. 103). Beliefs are often firmly entrenched and resistant to change (Pajares, 1992). Often changes in practice precede changes in beliefs (Guskey, 1989; Rokeach, 1968). Thompson, Palacios and Varela (1992), however, argued that beliefs and practice exist in a dynamic, two-way relationship where beliefs are influenced by practice, and practice is also influenced by newly established beliefs.

Next, we present the literature review about pre-service and beginning teachers' knowledge, beliefs and practice of ICT. Similarly, there are extensive studies that investigated the strategies for preparing these teachers for use of ICT. It is found that these teachers possess essential pedagogical knowledge, skills and positive attitudes/beliefs towards using ICT after taking a course(s) in technology integration (Andersson, 2006; Clausen, 2007; Goos, 2005; Mayo, Kajs, & Tanguma, 2005; Wright & Wilson, 2005). However, Andersson (2006), Pierson and Cozart (2005) and Russell et al. (2003) observed that there is less use of ICT as a cognitive tool in which students are engaged in active, authentic, self-directed, collaborative and constructive learning activities (Jonassen, Peck, & Wilson, 1999).

On the other hand, the paper reported the first-year phase of this study suggested that the participants demonstrated a variation of their beliefs, frequencies and ways of using ICT for classroom teaching and learning during their student teaching (Gao, Choy, Wong, & Wu, 2009). It suggested that learning to teach with ICT is not only the accumulation of knowledge, skills, and change of beliefs. Pre-service teachers continue to develop a better understanding of technology-based pedagogy from their own performance.

Perkins (1998) and Perkins and Blythe (1994) proposed the notion of *teaching for understanding*. They argued that acquired knowledge and skills in themselves cannot guarantee the development of understanding. Rather, learners need to go beyond the knowledge and skills given to create something new by reshaping, recruiting, managing and expanding repertoires of understanding from one's own performance. For the purpose of this paper, we used Perkins and Blythe's definition of understanding performances to investigate the beginning teachers' learning of teaching with ICT:

Understanding something is a matter of being able to carry out a variety of “performances” that show one’s understanding of a topic and, at the same time, advance it. We call such performances “understanding performances” or “performances of understanding”. (pp. 5–6)

The purpose of the paper is to find out how the beginning teachers deepen their understanding performances of technology-based pedagogies in their first year of teaching. The results presented are part of a 2-year mixed method study where we followed the selected participants for 2 years, from the beginning of their 1-year teacher education programme to the end of their first year of teaching. The research questions that focused on the beginning teachers for this paper are as follows:

- 1) Why do beginning teachers choose/not choose to use ICT for classroom teaching and learning during their first year of teaching?
- 2) What kinds of ICT applications do they use?
- 3) How and why do they integrate ICT in their teaching?
- 4) What have they learned from their own performances of teaching with ICT?

### **Mode of inquiry**

The participants for this 2-year study were 310 pre-service teachers enrolled in a 1-year Postgraduate Diploma in Education (Primary) initial teacher education programme at the National Institute of Education (NIE), Singapore. There were two phases for our inquiry. The first phase —Year One—was related to the participants’ learning to teach with ICT during their teacher education programme. The second phase—Year Two—was related to their first year of teaching as full-fledged teachers.

We adopted a mixed method to investigate this complex inquiry from different directions to ensure methodological triangulation (Denzin, 1984). We collected the survey data at four points (before and after the ICT course, after student teaching, and after the first year of teaching) to gain a big picture about the changes in perceptions and self-reported use of ICT of the participants (Choy, Wong, & Gao, 2009–10). Concurrently, we used qualitative research methods as a dominant method to get in-depth insights on how the purposefully selected focus participants constructed their

understanding about using ICT for classroom teaching and learning from their own practice.

We purposefully selected ten participants to participate in the qualitative data collection. Our selection was based on their self-reported the level of technology skills from the first survey. We also took age, major, and gender into consideration. Five of them were female and five of them were male. After the confirmation from the first interview, each participant was assigned a pseudonym. Names beginning with the letter L represented those who admitted having a low level of technology skill, while those with the letter M had a medium level, and those with the letter H had a high level. Lily, Michele, Molly, Mandy, Max, Henry, and Harold were being trained to teach Chinese Language while Helen, Mike, and Ming, were trained to teach general subjects like English, Mathematics and Science in primary schools (Grades 1–6). Their ages ranged from early 20s to 40s. As Ming dropped out of the study before the second phase, we will report the findings of the remaining nine participants during their first year teaching in this paper.

### ***Data collection***

The research project was reviewed for the protection of human subjects and approved by NIE's research review board. We followed the standard procedure of NIE's research ethics. During the first interview, we asked the participants to sign the consent form in which we explained the nature of the study, the responsibilities and rights for the volunteer involvement. We also got consent from the principal and the co-operating teachers of the schools they were assigned to for their teaching practicum.

We used multiple sources of evidence to ensure construct validity. Each participant was interviewed 4 times, every 6 months, in 2 years. Each interview lasted

around 30–50 minutes, and was audio recorded and verbatim transcribed. We conducted three group discussions—after the ICT course, the 10-week student teaching, and the first year of teaching. The data collection details of the 2-year study are presented in Table 1.

(Table 1)

During the first year of teaching, we managed to observe and video-record the lessons of six focus participants to get a general overview of their teaching. Each lesson observation lasted 60–90 minutes. We got the approvals from the participants, their principals, co-operating teachers, and their students before all classroom observations. Three participants were not observed and video-recorded because we were unable to gain permission from all the parties concerned. However, they participated in the interviews and group discussions. We conducted a one-unit observation across grade levels for the five Chinese Language participants (Lily, Mandy, Max, Harold and Henry), and across content areas for one participant (Mike) who taught English, Math and Science. We also conducted one surprise lesson observation for each of these participants on a monthly basis to get an authentic picture of their regular teaching. In order to ensure consistency of the observation results, we ensured that at least one researcher conducted multiple observations of each participant. We used a self-developed observation protocol to focus on behaviours of the teacher and students (who was doing what) rather than evaluating the construct (how well they did it). We kept field notes for each observation. Additionally, we collected artefacts, such as, their lesson plans, online reflection journals, and samples of their students' work for data triangulation.

### ***Data analysis***

We attempted to ensure investigator triangulation (Denzin, 1984) by involving two researchers in the data analysis. We used the *NVivo 7* software to analyse the interviews, group discussions and other artefacts. We adhered to the three major categories—Perception, Decision Making and Action—established in the Year One study (Gao, Choy, Wong, & Wu, 2009) to code the data and answer the four research questions. We also added more sub-categories into each category when analysing the data. The constant comparative method of data analysis (Strauss & Glaser, 1967) was used to make sense of the meaning from triangulating the data. We firstly analysed each focus participant as a case, and then across cases for pattern matching (Yin, 1994). We sent the interview transcripts and profile write-ups to the participants for member check to establish confidence in the trustworthiness of the findings (Patton, 1990).

### **Results**

The purpose of the paper was to investigate how beginning teachers deepened their understanding performances of technology-based pedagogies during their first year of teaching. More specifically, we examined how they used ICT in their teaching and what they learned from their own performances.

We sorted the learning process of the nine participants into three main categories: occasional use to support didactic instruction, regular use to enhance didactic instruction, and regular use to enhance student learning. Our sorting was based on the participants performance, such as what ICT tools they used, their main reasons for using the tools, and the ways they used the ICT tools (Table 2). It was also based on the role that they chose to play for technology integration: follower, doer and emerging teacher leader. We interpreted the role of a follower as one who

imitates the established practices by choosing to occasionally use ICT to support his/her own didactic instruction, a doer as one who frequently used ICT to enhance his/her teaching within the classroom, an emerging teacher leader as one who changed the interaction between a teacher and students in the classroom and extends his/her influence beyond the classroom to lead other colleagues in technology integration. In the subsequent sections, we present the three roles of the nine participants' use of ICT in their first year of teaching.

(Table 2)

***Occasional use to support didactic instruction: a follower***

Lily (late 30s), Helen (early 40s) and Michele (early 30s) varied in age, entry level of technology competencies, comfort levels for using ICT for classroom teaching, and frequency of using ICT during the 10-week student teaching. However, during their first year of teaching, they showed a stable pattern for the occasional use of ICT to support their didactic instruction. They also chose to demonstrate the role of a beginning teacher as a follower.

For example, Lily self-reported possessing a low level of technology competency and a low comfort level for student-centred approaches in the first interview. During the 10-week student teaching, she once spent hours to embed a flash object into the PowerPoint presentation for teaching Chinese idioms that she received from her peers. She noted that although she and her students interacted more, there was hardly a difference whether she taught with or without ICT. From such experiences, Lily became even more reluctant to use ICT during her first year of teaching. In fact, she did not use ICT during the 14 lesson observations conducted during her first year of teaching. She reported that she occasionally used Flash

animations as tuning-in activities. She explained that her decision making for not using ICT as her routine practice is because:

Firstly, it is still my mindset, because I have difficulty in convincing myself to accept ICT. Secondly, I have low technology skills. Thirdly, I choose to give my top priority to lesson planning and classroom instruction rather than wasting time in learning something that I may not use. Of course, I had to do it occasionally to meet the school's requirement. (Lily, 4th interview)

In contrast, Helen reported having a high comfort level for using ICT for student centred approaches and viewed ICT as “a powerful tool for increasing interactivity in the classroom and facilitating the change of paradigm from teacher-centred to student-centred learning” (Helen, 2nd interview). However, she reported that she only occasionally used *PowerPoint* presentations to teach English and Mathematics during her ten-week student teaching because she needed to teach the basic content to her low ability class. She followed the same pattern in her first year of teaching. As a form teacher of a Primary 4 low ability class, she made her instructional decision as follows:

In my classroom I cannot stretch them, and I cannot use a lot of ICT because I have curriculum to complete, there's no way that I can slow down. So I have to move as fast as I can, just to complete the curriculum... I find that I'm using less and less ICT during my first year of teaching. (Helen, 4th interview)

Michele was the only participant who significantly changed her beliefs and practice among the nine focus participants. She went from being very idealistic to realistic, and from assertive to less assertive after encountering various challenges during the first year of teaching. She lamented,

I thought that we could change the students ... But now, I find that I cannot even get teaching itself under control... My biggest challenge is lack of support. It is impossible for me to do it alone. The school administrators seem to value ICT a lot, but in reality, teachers do not... I think the computer station in the classrooms is outdated. As a form teacher, I have so many other commitments. I do not have time to plan my lessons or integrate ICT in my teaching. (Michele, 3rd group discussion)

Although Michele frequently used Flash, PowerPoint presentations and streamed videos during her student teaching, she reported that during her first year of teaching, she only showed her students “the MOE (Ministry of Education) website

once in a while...Flash animations twice after the examination” (Michele, 3rd group discussion).

When Lily, Helen and Michele focused their attention on surviving the demands at the early stage of their teaching career, they did not develop their mindset into leading technology integration. Towards the end of the study, they expressed their concerns, reservations, and frustrations regarding extending their influence beyond their classrooms as a first year teacher,

*Lily:* I am not strong in information technology. I am happy enough to help out with other projects at my grade level. I don't think that I am capable enough to be involved in technology projects. (Lily, 3rdgroup discussion)

*Helen:* There are a lot of young people who have the energy to do it. My contribution will not be exhaustive in the area of leading technology integration... I don't have to think about how to stand out. (Helen, 4th interview)

*Michele:* How can I, a new, young teacher, expect the senior teachers to listen to me? (Michele, 3rd group discussion)

In sum, these three participants chose to become followers—to follow the flow that ICT is occasionally used to support teacher-centred instruction.

***Regular use to enhance didactic instruction: a doer***

Growing up with digital resources, Molly, Mike and Mandy (aged late 20s to early 30s) reported having a medium comfort level for using ICT for classroom teaching. They tended to be optimistic and held constructivist beliefs about teaching and learning. They used PowerPoint presentations, animations, and streamed videos from YouTube as an “instructional tool” on a regular basis during their 10-week student teaching. During their first year of teaching, they followed the same pattern—using a PowerPoint presentation with animation or streamed videos to introduce their lessons and MOE online resources to introduce the content. For example, Mike practised this consistently in all 10 lesson observations, and Mandy showed similar practices in 9 out of 13. Mike explained that,

I used ICT more often when I am teaching Mathematics as it is easier to use *PowerPoint* slides to showcase some of the Mathematical concepts... ICT helps me to make the virtual manipulates move and “interact” with the pupils. The pupils are more engaged... With a remote control, I am able to give my pupils more eye-contact rather than looking at the whiteboard. This brings about better classroom control. It allows me to complete my lesson at a faster pace. (Mike, 4th interview)

Although Molly, Mike and Mandy thought about adopting student-centred learning approaches, they failed to implement them extensively. For example, when Mike made the additional effort to bring his students to the computer laboratory for five of the lesson observations, he spent most of his time presenting the mathematical concepts using PowerPoint presentations and left little time for students to practise on the computer as he had originally planned.

Similarly, Molly hardly used ICT to implement student-centred learning approaches, because of being “too busy with the syllabus” and “did not really arrange to bring the 20 laptops in” (Molly, 3rd interview). She continued to explain uncertainty: “Actually I would like to use ICT to help me adopt student-centred approaches. But sometimes I am not sure of what are the other forms of ICT” (Molly, 4th interview).

Mandy made two attempts for involving students in group activities in the 13 Chinese lesson observations. For example, she allowed her students to work in groups to read, re-arrange topic sentences and check the answers presented on the PowerPoint slides in her first attempt. In her second attempt, she asked her students to work in groups to compose a handwritten passage based on a picture. Then she typed one group’s passage into a Word document and discussed it with the whole class. She observed that her students were more engaged in the group activities. During the last interview, she shared a sense of frustration of not being able to draw a connection between her beliefs and her practice:

I believe in constructivist learning and ICT is a way to cater to their [students’] needs and their level. But for the different classes I really don't know how... As a new teacher, whatever I tried to do become irrelevant because I have to handle administrative duties, I

have a higher teaching workload [in comparison to student teaching], and more books to mark. So I fall back on the old method...that is the safest way because I have seen it and I experienced it. So probably subconsciously I have brought out all those conventional methods. (Mandy, 4th interview)

Additionally, Mandy, Molly and Mike felt a lack of support and school culture for using ICT. Moreover, they felt a sense of enculturation, consciously or unconsciously, adopting the behaviour and belief systems of the social groups (Brown, Collins, & Duguid, 1989, p. 34) as shown below:

When it comes to ICT, a lot of them [my senior colleagues] are quite resistant. In my first year of teaching, actually I have questions instead of having answers, because there are a lot of things that I cannot derive an answer from my senior teachers. I can't get an answer from my peers and I have been thinking very hard about it. (Mandy, 4th interview)

They [my senior colleagues] are not very comfortable with and confident in ICT. It is only the new teachers that will try out everything. (Molly, 4th interview)

Although they intended to try out everything that they learned from their teacher education programme, as beginning teachers, they chose to become doers, showing their reservation about making an impact for technology integration within their school:

I think I will continue to use ICT in my lessons. I would like to share with some colleagues. But I am not sure if other colleagues would think of it as something that I want to pursue. Because when it comes to technology integration, a lot of them are quite resistant. So I don't want to be someone who is being cut off from the main circle... So probably, I will be in a position where I will keep asking questions. (Mandy, 4th interview)

Likewise, Mike shared, "My role in the school is a classroom teacher. My attention goes to my classes. As long as my classes do well, I am really happy" (Mike, 4th interview). Although Molly felt comfortable sharing her use of ICT with colleagues in her department as part of the school culture, she did not see herself making an impact in the school at this stage. She would do so "in future if given a chance, maybe the way of using ICT can be applied to other subjects" (Molly, 4th interview).

***Regular use to enhance student learning: an emerging teacher leader***

The remaining three participants, Max, Henry and Harold, seemed to be able to develop responsive teaching approaches and use ICT as cognitive tools to cater to

their students' needs in the different classes. They showed that they took initiative and risks in trying out a variety of ICT tools to enhance student learning. They began to establish, recruit and expand repertoires, to become more flexible in using a variety of ICT tools to allow their students to take responsibility for their own learning. For example, Max used ICT to go beyond covering the syllabus:

I had to admit that if I was to complete the syllabus, I had little time to allow my students to visit [the computer laboratory]. But teaching should go beyond covering the syllabus. Whenever there is an opportunity, let them [my students] use the technology. (Max, 2nd group discussion)

In addition to using PowerPoint presentations, streaming video and the MOE website on a regular basis, Max, Henry and Harold carried out a variety of activities to engage their students in using ICT. For example, Max frequently built concept maps on the PowerPoint presentations to document his students' ideas. He occasionally let them use MSN and Google Chat to familiarize them with new modes of communication. As such he created a collaborative learning environment and assigned them either to co-write a Chinese essay or to communicate with their peers about the findings of their chosen topics. He encouraged his students to continue their sharing beyond in-class discussions.

Henry used the *Inspiration* software for his students to generate ideas, *Hot Potatoes* to conduct self-assessment, and blogging to provide him with feedback. He took his Primary 4 students to the computer laboratory on a weekly basis to allow them to choose stories for self-paced learning from his self-developed online reading programme. Furthermore, he designed a learning activity for his high ability students to research for online information "to represent a travel agency and introduce a place they want to travel to" (Henry, 4th interview). He created a *PBwiki webpage*, an online collaborative website, for his Primary 4 students to give an update on their projects once every 2 weeks. During the fourth interview, he shared his choice:

I tend to reflect more on students' learning for whatever I have implemented... My interaction with my students provided me input on whether my ICT use was useful... It gave me a better idea whether what I have done is effective. (Henry, 4th interview)

Similarly, Harold took advantage of the easy access to ICT to create active learning opportunities for his Primary 2 students. For example, he learned from his students how to use the Interactive WhiteBoard and used it regularly. He invited his students to present their ideas as a kind of informal assessment using the Interactive WhiteBoard. Rather than providing didactic instruction, he asked his students to use the touch screen to answer the questions created by *Hot Potatoes*: "I did not explain or comment. Instead I asked my 'little teachers' [fellow classmates] to comment... They would have the lesson on their own" (Harold, 3rd interview). He stressed that teachers should "focus on their students ... especially those who need extra attention or have discipline problems" (Harold, 4th interview). He brought these students to the computer laboratory on a weekly basis and incorporated ICT into his teaching. Harold confessed that he did not use ICT extensively for his other two classes because he lacked preparation time.

Furthermore, Max, Henry and Harold advanced their understanding performances by extending their influence beyond their classrooms by demonstrating leadership potential. For example, Max shared his experiences of involving his students in the online mode of communication within his school. Henry uploaded the assessments that he created using *Hot Potatoes* onto the school server to share with his colleagues.

Henry and Harold began to demonstrate their leadership potential in ICT practice. Appointed as members of the ICT committee in their respective schools during their first year of teaching, they went the extra mile to provide support and lead their colleagues in technology integration. For example, Henry worked collaboratively with his colleagues, tapping on their strengths, to initiate another

online reading programme for the whole school. Harold also created an online reading programme for his school, and supported more than 20 teachers in his department. He commented: “I want to share whatever I know with my colleagues and friends, and hope to share and discuss ways to improve ICT use” (Post-lesson reflection). Harold received the Best Beginning Teacher Award after only 6 months of teaching, partly because he took the lead in several school initiatives, one of which was the online reading programme in which he was in charge of formulating the school-based curriculum and developing the lesson materials. He provided support to his peers and other beginning teachers by sharing his resources through their own Yahoo! learning community.

### **Discussion and implications**

Our study is limited to a small number of voluntary participants in one teacher education programme. We were only able to observe six out of the nine focus participants. However, our study provides a new perspective on beginning teachers’ process of learning to teach with information technology. We highlight two merits of our study. First, this study bridged the gap by investigating beginning teachers’ technology ability, their attitudes and use of ICT (Kay, 2006) from the participants’ perspectives across their initial teacher preparation and first year of teaching. Second, the study found the different roles that the nine beginning teachers choose to play for technology integration—follower, doer and emerging teacher leader—primarily by documenting their actions.

Based on the findings, firstly we argue that technology competency, beliefs and the comfort level of using ICT are not the key factors in determining one’s use of ICT for classroom teaching and learning, because even though these characteristics

were different, a similar pattern of using ICT to enhance didactic teaching was observed. Particularly, the majority of the participants cannot translate their constructivist orientation into practice because they are often held in check by personal and institutional habits and feel a sense of enculturation to fit into the school culture. Therefore, they choose to become a follower or a doer. However, three participants started to develop understanding performances (Perkins, 1998) by using information technology in ways advocated by constructivist reform efforts. They stretched their minds, seeking opportunities to explore new teaching practices that focused on student learning and development, and building up a better understanding of technology integration through a sequence of practice. They carried out a variety of performances—trying out new ways of using of different technology applications to engage their students in using ICT within and beyond the classroom. They advanced their understanding performances of technology integration by developing leadership potential to impact their students' learning, and then expanding their influence beyond their classrooms. As a result, they demonstrated commitment to lead beyond the norm by exerting their leadership potential to influence their colleagues and college peers. These empowering experiences have the potential for strengthening first-year teachers' position and helping them to settle down in their career (Andersson, 2006; Clausen, 2007; McGee, 2000). In brief, this finding suggested that beginning teachers can learn to teach with ICT and lead in technology integration simultaneously (Gao, 2005; Gao & Tinto, 2006; Goos, 2005).

Therefore, we conclude that learning to teach with ICT is not only an event of accumulating knowledge and skills, and changing perceptions, attitude and beliefs, but a process of negotiating and constructing personal meaning and developing a better understanding of technology integration from their own performances. To a

certain extent, this finding is aligned with the argument that beginning teachers' instructional thinking and decision-making are not only deeply situated in classroom practice (Brown, Collins, & Duguid, 1989; Suchman, 1987), but other multiple sources that they can draw upon: self-concept, investment of mental capacity, imitation, reasoning, and scaffolding and other social support (Desforges, 1995, p. 395).

Secondly, our analysis across the nine participants allowed us to examine the complex and dynamic interplay of personal and institutional contexts on the impact of instructional thinking and decision making in the use of ICT for classroom teaching and learning. Teaching with ICT requires beginning teachers to make many more decisions than that without ICT. They become more conscious of the discrepancies between their intent and what actually happens in the classroom, and learning from experience to develop understanding performances. Hence, we recommend that there are some things that schools can do to promote the use of ICT.

Liesveld, Miller and Robison (2005) argued that the first 2 years or so of a teacher's career provided constant education in what they did not cover in college about real-world teaching. This study suggests that schools need to establish a shared vision and common goal among the administrators and the classroom teachers for using ICT to enhance student learning so that they can provide ongoing technical and pedagogical support for beginning teachers before they are able to establish their routine practice. They can utilize some beginning teachers' tech-savvy strengths to share their practices, support and lead other teachers. Therefore, the potential of ICT can function as a tool to strengthen the beginning teachers' positions and help them to settle down in their careers (Andersson, 2006; Clausen, 2007; McGee, 2000).

Third, we make recommendation for the future research. Studies with a larger sample size and a longer time frame could help to validate the findings of this study. Future studies can investigate how beginning teachers learn to teach with ICT, how their practices affect the construction of a deeper understanding of technology integration, how teachers' practices change the way students learn in class, and how pre-service and beginning teachers can be better prepared as emerging leaders for technology integration.

## **Conclusion**

The purpose of the paper was to examine how the beginning teachers deepen their understanding performances of technology-based pedagogies in their first year of teaching. The results of the interviews, focus group discussions and classroom observations of nine beginning teachers suggested that beginning teachers could be categorized into followers, doers, and emerging teacher leaders in ICT integration. The role of their choice was not directly related to their self-reported ICT comfort level for classroom teaching and learning. Based on the observations, beginning teachers with medium ICT comfort level also demonstrate leadership potential for technology integration.

The results of the study also suggested that learning to teach with ICT is a developmental process in which beginning teachers negotiate and construct personal meaning and understanding performances. One finding in particular confirmed the findings from other studies (Gao, 2005; Gao & Tinto, 2006), that when beginning teachers discover and teach with their strengths, they become catalysts for ICT integration for both classroom teaching and collaborations in the teacher community.

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Table 1. Data collection.

	<b>Survey data</b>	<b>Individual Interview</b>	<b>Group discussions</b>	<b>Lesson Observations</b>	<b>Artefacts</b>
<b>Year One of Study</b> (June 06–June 07)	1st survey (Aug 06): Before ICT course	1st interview (Sept 06): Beginning of ICT course	1st discussion (Feb 07)	Not applicable	The final project of ICT course
	2nd survey (Oct 06): After ICT course	2nd interview (May 07): After 10-week teaching apprenticeship	2nd discussion (May 07)	13 lesson observations for the 7 focus participants	Lesson plans, reflections, samples of students' work, informal discussion
	3rd survey (May 07): After 10-week student teaching				
<b>Year Two of Study</b> (July 07–July 08)	4th survey (Apr 08): After the first of year teaching	3rd interview (Dec 07): After half year of their teaching	3rd discussion (Jun 2008)	56 classroom observations for the 6 focus participants	Lesson plans, reflections, samples of students' work, informal discussion
		4th interview (July 08): After the first year teaching (Jul 08)			

Table 2. Multiple dimensions of participants.

Category	Pseudonyms and major	Tools used	Main reasons for using tool	Ways tool was used	Role
Occasional use to support didactic instruction	Lily* (Chinese Lang) Michele (Chinese Lang) Helen (General Ed)	<ul style="list-style-type: none"> <li>• <i>PowerPoint</i></li> <li>• <i>Flash</i></li> <li>• MOE online resources</li> </ul>	<ul style="list-style-type: none"> <li>• Engaging students attention</li> <li>• Increasing efficiency and effectiveness</li> <li>• Satisfying the requirement</li> </ul>	As instructional tool <ul style="list-style-type: none"> <li>• To deliver content</li> </ul>	A follower is one who imitates the established practices and occasionally uses ICT to support his/her own didactic instruction
	Regular use to enhance didactic instruction	Molly (Chinese Lang) Mike* (General Ed) Mandy* (Chinese Lang)			<ul style="list-style-type: none"> <li>• Same as above</li> <li>• Streamed movie</li> <li>• Microsoft Word</li> </ul>
Frequent use to enhance student learning	Max* (Chinese Lang) Henry* (Chinese Lang) Harold* (Chinese Lang)	<ul style="list-style-type: none"> <li>• Forum and MSN (Max)</li> <li>• <i>Hot Potatoes</i> (Henry)</li> <li>• Interactive Whiteboard (Harold)</li> <li>• Designing online reading programmes for school (Henry &amp; Harold)</li> </ul>	<ul style="list-style-type: none"> <li>• Same as above</li> <li>• Preparing students to be successful beyond the classroom</li> </ul>	As part of learning environment <ul style="list-style-type: none"> <li>• To generate students' ideas</li> <li>• To create opportunities for students' use of ICT so as to extend learning beyond the classroom</li> </ul>	An emerging teacher leader is one who uses ICT to enhance student learning and extends his/her influence beyond the classrooms

\* belonged to the lesson observation group