WHERE RESEARCH, PRACTICE AND THE AUTHORITY MEET: A COLLABORATIVE INQUIRY FOR DEVELOPMENT OF TECHNOLOGY-ENHANCED CHINESE LANGUAGE CURRICULA

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ABSTRACT
This collaborative inquiry project brought together 14 Chinese Language teachers, 4 researchers and 2 Ministry of Education (MOE) curriculum specialists to co-design the Chinese Language curricula with the integrated use of information and communication technology (ICT). Three qualitative data sources – one-to-one interviews, focus group discussion, and the field notes – were collected and comparatively analyzed. The findings indicate when the participants in the three parties (teachers, researchers and ministry officials) brought their own agendas and interests to the project and this resulted in various tensions initially. The participants experienced gradual changes in knowledge, beliefs, attitudes and practice after coming out of their comfort zones. When they reached a consensus to enhance Chinese learning for primary school students, they actively contributed their respective strengths to the project. The findings indicate that the collaborative inquiry model is one possible way to resolve tensions arising from education reforms and to build-on diverse ideas for contextually viable innovations.
Keywords: Collaborative inquiry, Teacher Professional Development, ICT in Education, Language Learning

INTRODUCTION

Teacher professional development continues to be one key issue in educational reform. There is a growing agreement among educators to change the conventional approach of one-off workshop for teacher professional development (Emihovich & Battaglia, 2000; Moon, 2000). Desimone (2009) proposed the "core conceptual framework" of professional development, which includes: (a) content focus, (b) active learning, (c) coherent, (d) duration, and (e) collective participation (p. 184). This is in line with the assertion that collaborative inquiry (Bray, 2002; Darling-Hammond, 1996); a systematic approach that promotes collaboration between researchers and practitioners to engage in active learning for the advancement of both knowledge and practice (Batliwala, 2003), and to make meaning from their experiences (Yorks & Kasl, 2002); is one of the possible answers to such an issue.

This paper reports on a collaborative inquiry project that aims at co-designing Chinese curricula with the use of ICT in Singapore among 14 classroom teachers, 4 university researchers and 2 Ministry of Education (MOE) officials (who represent the authority). This project was designed to address the two major challenges of Chinese teaching and learning in Singapore. First, there is a decline of the Chinese Language standard (Leong, 2001; Zhang & Liu, 2005). This is partly due to the major revamp of the school curriculum in 1984 that reduced the teaching of the Chinese language to an isolated subject. Concomitantly, there is also a dramatic decline of using Chinese among Singaporean Chinese in home environment (see People's Daily Online, February 22, 2004). Second, there is a lack of the innovative use of ICT in Chinese Language teaching in Singapore. For example, in a national study, Liu, Kotov, Rahim and Goh (2004) reported that ICT was only used in 8.1% of the observed classes, and mostly as a teacher-centered presentation tool. It is hoped that through collaborative inquiry, teachers, researchers and MOE specialists could reach a better understanding of the pedagogical use of ICT to enhance Chinese language learning in one school district in Singapore.

The two main research questions for this study are,

1. How do the participants from the three parties negotiate meaning from the conflicting interest and competing agenda?
2. How do they eventually resolve the tension?

LITERATURE REVIEW

A review of teacher professional development literature indicates the growing popularity of collaborative inquiry (Darling-Hammond, 1996) or collaborative innovation (Randi & Corno, 1997). It was suggested that collaborative inquiry can address the common pitfalls of traditional teacher professional development workshops, which are usually one-off workshops that are designed to transmit expert knowledge to the teachers.

They may not account for teachers' work context and beliefs and are unlikely to encourage critical discussion between researchers and teachers on the challenges that teachers encounter (Chai & Merry, 2006).

Conversely, collaborative inquiry is based on the notion that collaboration between research and practice is likely to advance both knowledge and action (Batliwala, 2003). The rationale behind such collaborations is that that diversity of perspectives and expertise helps the teams to reach better decisions (Surowiecki, 2005). This is congruent to many recent developments in learning sciences which emphasize the situated nature of cognition and the distributed characteristics of expertise in authentic work environments (Fishman & Davis, 2006). Hence, collaborative inquiry could serve as a means of teacher empowerment for teachers to take charge of their own growth and resolve their own problems (Keedy, Winter, Gordon, & Newton, 1999; P. M. Short & Greer, 1997; Walter & Gerson, 2007).

Collaborative inquiry is very much valued in the work environment for its characteristic of not following a fixed agenda or prescribed plan. Berghoff, Egawa, Harste and Hoonan (2000) suggested that such a practice requires respect and the positive use of diversity to achieve the desired "democracy" in which participants are expected to arrive at understandings, rather than at answers. Participants could end up more confused, but their confusion reflects new questions that are more complex and based on deeper insights (K. Short, et al., 1996). Therefore, the participants may agree to change the original agendas, research questions or modify the course of actions as the collaboration progresses. However, it will take time for the group members to adapt to this way of working (Bray, Lee, Smith, & Yorks, 2000).

As collaborative inquiry usually involves multiple parties, tension among the parties are often inevitable (Pomson, 2005). Tension arises mainly due to the different perspectives or mismatched agendas (Alkenbrack, 2009) brought to the inquiry by the different participants. The commonly occurring issue is: Whose research questions are being investigated (Kasl & Yorks, 2010; Sachs, 1999)? The paradoxes of democracy versus authority (Ospina, et al., 2004), democracy versus accountability (Rich & Brazer, 2007), or democracy versus equal share of power (Bell-Angus, Davis, Donoahue, Kowal, & McGlynn-Stewart, 2009), are indeed common challenges to collaborative inquiry groups in any context. Somewhat related is the struggling of the question of how much guidance and structure to bring to the conversations, seeking an appropriate balance between presenting information and facilitating teachers' construction of new practices (Putnam & Borko, 2000).

Some of the previous efforts of collaborative inquiry have involved additional stakeholders other than teachers and researchers (or teacher educators) in the western countries, such as school administrators (Huffman, Lawrenz, Thomas, & Clarkson, 2006), teachers' associations (Miller, McDiarmid, & Luttrell-Montes, 2006), community members (European-American Collaborative Challenging Whiteness, 2002), superintendents and curriculum and assessment coordinators, and even students (Huffman & Kalnin, 2003), and asuperintendent, principals and board members (Rich & Brazer, 2007). Nevertheless, collaborative inquiry has yet to be popularized in most parts of Asia (Batliwala, 2003). Asian working adults tend to be more "accustomed" to be submissive toward their leaders' policies and are shy away from making their own decisions (Batliwala, 2003). As such, there seems to be a paucity of research on involving classroom teachers, researchers and educational officers in a collaborative inquiry in the Asian context. This study has the potential to contribute to understanding among researchers who are challenged to work with teachers and officials from diverse backgrounds.

RESEARCH DESIGN

Context and Participants

This study was situated in the context of Singapore's second Masterplan for Information Technology in Education (MP2), which could be summarized in the concept of "Engaged Learning" (Olson, 2008) – to cultivate learners who can manage their own learning strategically, who are self-motivated and who can work collaboratively with others to solve problems (Chai & Merry, 2006). Embracing constructivist learning implies that teachers need to be practical intellectuals, curriculum developers, and generators of knowledge in practice (Feiman-Nemser, 2001). In Singapore, most experienced teachers were educated in the didactic teaching tradition, and are accustomed to teaching to examinations rather than facilitating the process of knowledge construction and innovative pedagogy (Koh, 2004; Looi, Hung, Chen, & Wong, 2006). In addition, teachers' annual appraisal and promotion are closely tied to their performances, which include the examination outcomes of their students. In such an environment, it is relatively difficult to change practices that teachers believe in student-centering learning. This study posits that Singapore teachers need to experience some form of first hand Engaged Learning experiences, reflect upon what it means, and then experiment it in their classroom practice so as to develop the capability that will enable them to achieve the vision of MP2.

The participants of this study consisted of 14 teachers representing 12 primary schools (i.e., 3 teachers came from the same school) in the same school district. The four researchers were from two different departments – Learning Sciences & Technologies (LST), and Asian Language and Culture (ALC) at the National Institute of Education (NIE). There were two representatives from the Ministry of Education (MOE); a curriculum specialist from the Curriculum Planning and Development Division and a technology specialist from the Educational Technology Division respectively.

This half-year study commenced in January 2007 and ended in July 2007. Six face to face meetings with intervals of 2-3 weeks were conducted for the team to co-design ICT-enhanced Chinese Language curricula. The 14 teachers were gradually split into three groups to develop a "radio drama" curriculum (by 3 teachers from the same school), a writing curriculum with peer critiques, and another writing curriculum without peer critiques, respectively. More details about how these three groups were formed will be presented in section 2.1.1.

Data Collection and Analysis

Several data sources were collected: audio recording and field notes of the six face-to-face sessions as well as the focus group interviews took place after each session that involved all the participants. In addition, the two MOE specialists, together with two teachers whom were randomly chosen from each of the three groups, were involved in one-to-one semi-structured interviews at the end of the collaborative inquiry. To protect their identities, we identify the eight interviewees by pseudonyms, which are depicted in Table 1.

Table 1: The pseudonyms of the interviewees

Organization or Collaborative Inquiry (CI) Group	Curriculum project	Pseudonyms
Ministry of Education	-	Celine (curriculum specialist) & Elaine (technology specialist)
CI Group 1	Radio drama	James & Marvin
CI Group 2	Writing with peer critique	Holly & Paul
CI Group 3	Wiring without peer critique	Denise & May

Each interview lasted about 45 minutes and was subsequently verbatim transcribed. Teachers who were not interviewed will simply be identified in the subsequent text as Teacher A, B, C, and so on, in this paper.

The data were then analyzed through the constant comparative method (Strauss & Corbin, 1990). Two of the researchers in the team open-coded the interview data independently, then identified emerging themes, formed categories by grouping the themes, and compared and contrasted the categories to reach an agreement. The field notes and the transcript of the focus group discussions were also analyzed to find the explicate relationships among the data. The qualitative data were triangulated to seek instances of similar input from more than one account to develop categories, before new categories were added when necessary (Marshall & Rossman, 1989). The themes of the interview and observation data are summarized and presented in Table 2.

To establish confidence in the trustworthiness of the findings, the findings reported in this paper were sent to all the interviewees for member checking.

Table 2: Learning gained from the Collaborative Inquiry

	Teachers	Researchers	MOE Specialists
• Gain an understanding of curriculum design principles	□		
• Changes of beliefs in teaching and learning	□		
• Changes of roles in the collaborative inquiry	□	□	□
• Changes of views on using ICT for Chinese teaching	□		
• Extension of the collaborative inquiry beyond the project	□	□	□

FINDINGS

In essence, two major findings are reported in this paper to answer the above-stated research questions. These findings are: 1) Negotiating competing agendas and tensions among the three parties; 2) Resolving the tensions base on common value of enhancing students learning.

Negotiating competing agenda and tensions among the three parties

As the participants of three parties brought their interest and agenda to the project, there were competing demands and tensions at the initial phase of the project, namely, research and practice, process and product, ideals and reality. It was an on-going process to balance the multiple demands and tensions.

For example, the four researchers brought a research agenda into the project with an emphasis on examining the process and viability of co-designing a curriculum through collaborative inquiry in Singapore context. Therefore, they allowed the participants to change the original agendas, research questions or modify the course of actions as the collaboration progresses. However, the two MOE specialists wanted to use this opportunity to design a technology-enhanced national writing curriculum to address the practical challenges of Chinese writing from a macro perspective. This is reflected in the following excerpts:

> We want to design a technology-enhanced writing curriculum which our teachers all over Singapore can '*directly* bring it back to their classes" to deploy. (*Elaine, 25 June 2007 – Interview*).
>
> Very excited about incorporating ICT into teaching of Chinese. We lack this piece in Chinese teaching. ... In primary schools, writing is a big problem. Children do not like to write and don't write well. We have put in a lot of effort in trying to improve the situation. You came in at this time. *(Celine, 25 June 2007 - Interview)*

Nevertheless, the two specialists were not comfortable with the emergent nature of collaborative inquiry. They expected the team to adhere to the initial agenda proposed by the researchers that focused on writing. They were uncomfortable to giving the teachers freedom to design a curriculum that move beyond the framework of the original proposal.

Although all participating teachers showed great interest in "practice" and "product" (i.e., the curricula), their focus was on the micro perspective to meet their local needs, that is, to teach diverse learners across the grade levels. They were interested in implementing prescribed curriculum packages that could make an immediate impact on their students' learning. Since they were required to teach the content determined by the national curriculum, they saw little value in co-designing and implementing their own curriculum prior to the study.

Resolving the tensions by reaching a consensus on promoting student learning

The interview and observational data revealed that the participants of the three parties: the classroom teachers, MOE specialists and the researchers experienced a certain degree of changes in their views and actions in the process of Collaborative Inquiry. They established a "shared ordeal" (Lortie, 1975) in which all members were empowered to struggle with and construct a better understanding in the effective use of ICT to enhance student learning through collaboratively working as a partner.

The following sections of the paper document the learning gained from the collaborative inquiry from the perspectives of teachers, researchers and specialists on co-constructing a better understanding of ICT integration for Chinese learning through collaborative inquiry.

Teachers' perspectives: 'Climbing up the well'

Since teachers are the most important agents in changing classroom practices, the reported Collaborative Inquiry was intended to actively involve the participating teachers in the entire process of curriculum co-design. It was hoped that the involvement of teachers as part of the design team could transform them into knowledge creators for new practices and curricula in school (Gan, 2007). The teachers seemed to demonstrate a change in the level of the participation in the project and their views on using ICT for Chinese learning.

Teachers' perspective I: Learning about co-designing the curricula

Analysis of the field notes revealed that at the first three sessions of the project, the teachers experienced certain degrees of doubt and uneasiness about the nature of the ill-structured, exploratory and generative nature of collaborative inquiry. They expected to receive traditional professional development with focused agendas. They posed as passive information receivers to attentively absorb the knowledge presented by the researchers who had the expertise in a particular topic (e.g., collaborative inquiry, pedagogy for mother tongue teaching, and learning technologies). When they split into small groups to discuss the innovative use of ICT, varied levels of participation were observed among them.

Eleven teachers representing the 11 schools showed a lack of ownership by following the lead of the researcher who facilitated the group discussion. The discussion between them and the researchers focused on articulating the teaching problems that they were facing: students' low interest in language learning, the inadequacy of technology facilities (e.g., for some schools, there were only one or two computer labs shared by more than 30 classes and all subjects within the same school), the pressure to completely cover the standard curriculum, and so on. The focus of their discussions was primarily on how to use ICT to enhance teachers' instruction and address students' learning needs.

The researchers decided to change the structure of the face-to-face meeting from Session 4, in which they intentionally directed the group discussion toward epistemological issue: teachers' cognition of what it means for student to understand (Bereiter, 2002; Bransford, Brown, & Cocking, 2000). The teachers were asked to design the curriculum to match their epistemological beliefs.

From Session 4, the eleven teachers began to demonstrate more active participation in the project. For example, they expressed an interest and urgency to develop a technology-enhanced composition curriculum. After sharing their respective pupils' diversified Chinese Language competency and challenges, they gradually self-organized into two groups. Five of the teachers who were teaching students with relatively high and medium level of competency decided to introduce online peer reviews as a teaching strategy to enhance students' writing performances using wiki. The other teachers who were more worried about their pupils' lower language skills preferred not to include a peer review component in their design. All teachers began to contribute their strengths and provide support to their group. Particularly, they began to develop a sense of ownership and were willing to take responsibility for co-designing and leading the curriculum design. This is reflected in Frances' words, "We design it, and then we implement and define it."

The repeated wordings of 'I' and 'we' signify such ownership and authority as illustrated in the following quotes,

> Originally, I thought this was just a traditional writing workshop. Now I know that collaborative inquiry is the effort of building a group and establishing the team spirit. Rather than focusing on a problem, we seek a solution…It helps us to upgrade. The atmosphere is good. There are no restraints in voicing our opinion… *(Paul, 21 June 2007 - Interview)*

> I didn't expect much in the beginning because I wasn't sure about the aim and the activity. I wasn't sure who the project would benefit. NIE? Our school? Later, I found out that collaborative inquiry is about sharing – we voice our views and we design a plan within the group. *(James, 21 June 2007 - Interview)*

The other group consisted of three teachers who were from the same school and decided to develop a school-based curriculum on creating "radio dramas". They insisted in the importance of using podcasts to address their students' challenge in the fluency in speaking Chinese. Rather than succumbing to MOE officials' advocate of focusing on writing instruction, these three teachers developed a strong sense of teachers' agency. This is reflected in James' argument, "We believe that the verbal skills are more important for our students. If they couldn't even speak well, how could we expect them to write well?" *(James, 21 June 2007 – Interview).* These three teachers began to discuss how to set the instructional goals, choose the topics, and design learning activities, technologies and the instructional strategies to support student activities from Session 2 with the facilitation of one researcher.

After benefiting from the first-hand experience of the collaborative inquiry, the majority of the teachers developed a sense of responsibility to help their colleagues in their own schools by organizing their own collaborative inquiry activities. For example, Frances, a new teacher with less than one year's teaching experience, expressed her interest influencing teaching practice in her school, "I plan to bring collaborative inquiry back to my school. I can lead and organize it in the school." *(Frances, 18 May 2007 – Focus Group).*

MOE specialist Celine's observation summarized and affirmed the process of changes that we observed among the teachers,

> At first, the teachers were not sure at all. Through the early discussions, they explored and planned how to do it. Then they discussed the difficulties they face. Slowly, they warmed up. Then they found the 'feel'. There were more interactions during the last three times and they

> were very involved. They knew they ought to do it and they have obtained some results from it. They had a sense of achievement. *(Celine, 18 May 2007 – Focus Group)*

Teachers' perspective II: Changing views about using ICT for enhancing student learning

Many studies reported that teachers' beliefs could affect teachers' practice and teachers' learning (e.g., Abdelraheem, 2004; Chai, 2010). As argued by Gök and Erdoğan (2010), teachers should have positive perceptions about technology in order to use it effectively in their class room teaching. In the reported project, the 14 teachers demonstrated different levels of changes either in their views on innovative use of ICT for promoting their students' learning. For example, two classroom teachers, Frank and James, who had already been relatively progressive in using ICT for their teaching prior to the collaborative inquiry project, contributed their strengths in technology integration by leading their groups the design process.

The remaining 12 teachers demonstrated a change in their views on the pedagogical use of ICT, which is reflected in the following excerpts:

> We always use ICT, but just for the sake of using it – no target. Now I have learned to use ICT with an aim. *(Frances, 18 May 2007 – Focus Group*).

> I am a traditional person. I used to think that it takes a lot of time to train my students in using ICT and the benefit is minimal. After the collaborative inquiry, I'm more confident to take the first step. I can plan and conduct it. *(Marvin, 21 June 2007 - Interview)*

> You *(the researchers)* have really changed my belief. When I went back to school and told my colleagues that I was going to train my pupils in Chinese computer input *(see below for more about the lesson design of Chinese computer input)*, they told me it was useless. They had no interest. However, after I implemented the lessons, my pupils were very interested in Chinese computer input … Maybe I can speed up my teaching next term and bring more students to the computer lab to learn it. *(Teacher A, 18 May 2007 – Focus Group)*

> We live in a 'micro world'. Someone has to take us to look at the big picture. Before, we only knew that ICT was used in educational games. Now, we know this is the direction to go. *(Teacher B, May, 18 May 2007 – Focus Group)*

The quotes indicate that the teachers had gradually increased their confidence in technology integration after raising and overcoming their concerns, and obtaining advices. Together with fellow participants of the collaborative inquiry, they co-developed concrete, systematic plans to achieve the stated goals. As Frances put it, 'Before, I felt that there was really no time to teach my students in Chinese input. Now that we have a systematic lesson plan, I have more confidence to try it out.' *(Frances, 18 May 2007 – Focus Group).*

In short, the collaborative inquiry project had become a catalyst in changing most of the teachers' (especially those who used to carry a reserved view in the innovative pedagogy) attitudes toward the incorporation of ICT in their teaching at the positive direction. Apart from receiving systematic preparation for using ICT for classroom teaching and learning during their pre-service education (Gao, Choy, Wong, & Wu, 2009; Teo, Chai, Hung, & Lee, 2008), most of the Singapore teachers had prior experiences in attending multiple one-off courses or workshops on the use of ICT for teaching. However, it was not until their involvement in collaborative inquiry that their mindset was challenged, and their confidence and willingness in ICT integration were increased.

'Expanding the career'- MOE officers' perspectives

The two MOE specialists, who were ex-teachers themselves, were pedagogical experts and designers of the national curriculum. They joined this project not only as 'critical friends' as advocated by Angelides and Gibbs (2007), but also as co-designers of the curriculum. They seemed to experience certain changes during the process of co-constructing the curriculum.

The two specialists were interested in designing a curriculum in the use of ICT for Chinese writing. They decided to join the two writing groups respectively. During Session 3, they were supportive to the teachers' leads in the curriculum design and contributed their expertise in this aspect. Since they knew that that most primary school students lacked Chinese computer input skills, which would hinder the practice of computer-mediated writing, they suggested to develop a Chinese computer input lesson as a supplement to the writing curricula, The teachers agreed with them as they recognized that as an area that they had ignored. As a result, the two groups amended their original agendas by developing a lesson plan for Chinese Input training prior to constructing their

writing curricula. Consequently, the time spent on writing curricula was severely shortened. The two MOE specialists realized such an issue toward the end of the design stage, as they had put it, "We spent a lot of time on input training, which is a very small problem. We missed out on the big picture – writing." *(Elaine, 25 June 2007 – Interview)*. This was identified by the researchers as a tension pertaining to the mismatched agenda – which target "product" (Chinese computer input lesson or writing curriculum) should be given a higher priority?

Nevertheless, similar to the participating teachers, the MOE specialists were new to collaborative inquiry and had also experienced positive *changes* in their attitudes toward the approach. As Celine put it, "Collaborative inquiry is much better than theory-based programs… for upgrading of the teachers." *(Celine, 25 June 2007 – Interview)*. Furthermore, Elaine said,

> I'm new to educational research. I find collaborative inquiry a good avenue to expand my career … Our department will launch a similar collaboration but we haven't chosen any concrete approach. This is a good opportunity for me to accumulate some experience. We may adopt collaborative inquiry. *(Elaine, 25 June 2007 – Interview)*

Celine later informed the researchers *(telephone conversation – 7, July, 2008)* that the Curriculum Planning and Development Division had been conducting several theme-based collaborative inquiry groups to develop new pedagogies or learning resources (e.g., technology game-based Chinese Language learning) that involved teachers from multiple schools in the subsequent year. Before they participated in our project, they involved teachers only at the pilot run stages after their own team had completed the curriculum development. Since early 2008 (after this project had wrapped up), they had been involving in-service teachers working in collaborative inquiry groups to co-construct new lessons or resources.

'Walking out of the Ivory Tower' —Researchers' perspectives

The four researchers from the two NIE departments were also new to conduct an inquiry project as a team. They valued this opportunity for building a cross-disciplinary (LST's technology-enhanced learning and ALC's language education) understandings which would benefit both groups' future research and teaching. For example, one researcher in the Learning Sciences and Technologies Department acknowledged, "I appreciated the opportunity of working with the colleague who had the expertise in Chinese teaching from another department, because we can build on each others' strengths to better address the challenges of effectively using ICT for Chinese teaching and learning in the classroom." *(One-to-one interview)*

The researchers met on a fortnight basis to discuss how to contribute to the project and how to seek an appropriate balance between presenting information and facilitating teachers' construction of new practices (Putnam & Borko, 2000). They posted challenging questions and designed the learning activities during these meetings. They were willing to modify the structure of the face-to-face sessions to meet the needs of teachers, which was discussed in the previous section. They had also changed their roles from initially the content delivers to gradually co-designers, and further into consultants.

For example, during each of the first three sessions, two researchers and the other two working as a team chose to present a topic in their area of expertise, such as using ICT for Chinese learning, the introduction of curriculum design models and how to facilitate student Chinese writing. From Session 4, they chose to work with a particular group and began to adopt a new role in the collaborative inquiry—a facilitator from the fourth face-to-face session onwards. One of them who worked with the three teachers in the "radio drama" group further changed his role into a consultant. Rather than providing the answers to the teachers' question, he kept answering questions, "How can we obtain evidence of student learning?" "Why is it important for students to using podcasting?" to stimulate teachers' thinking. Reflecting on his learning from the collaborative inquiry, he commented:

> This is the first time for me to collaboratively work with classroom teachers and MOE specialists over a prolonged period of time. I have learned the importance of changing my roles from controlling the content of profession development to firstly co-designing and eventually facilitating teachers to take more ownership and authority for their own learning. At the same time, I am a follow learner.

As for the other three researchers, this study gained a better understanding of the challenges and constraints of the teachers in their teaching practice, their students' capacities and attitudes, all situated within the real-life school ecology as one of them had put it, 'It had been a great opportunity for us to walk out of the ivory tower and better appreciate what it takes to conduct effective school-based research." Although the researchers were

under the pressure to follow the proposed timeline to complete the curriculum design, they became comfortable to end up more confused rather than finding a solution, as they began to appreciate that their "confusion reflects new questions that are more complex and based on deeper insights" (Short et al., 1996).

DISCUSSION AND IMPLICATIONS

The tri-party collaborative inquiry that involved researchers (or teacher educators), classroom teachers and government education officials is rarely reported in the literature on teacher professional development. This paper reports that collaborative inquiry can be an effective means for the professional development of the participants in the three parties. The uniqueness of the project provides some insights on the professional development of teachers, researchers and government specialists involving in ongoing efforts for meaning negotiation and the establishment of shared understanding of co-designing the curricula among them. As presented in the previous session, the participants from the three parties involved collaborative problem solving by complementing one another to advance their knowledge and construct a better understanding of integrating technology into Chinese learning. They extended the learning from the project into their future actions. The theoretical meaning of the Collaborative Inquiry can shed insights about how the classroom teachers, researchers and MOE specialists developed their expertise and contributed their strengths into their professional development of the tri-parties. The practical meaning of this project can shed insights about how to deal with tri-party tensions and reach one consensus: to enhance student learning in a collaborative inquiry.

There were some limitations in this project. The researchers initiated and interviewed the teachers and MOE officers, which would possibly have affected some of the participants' thoughts and reports. In addition, due to the time constrains, follow up study on the enactments of the co-designed curricula was not carried out. This is one direction for the future research.

While the joint venture had shown its value in the curriculum co-construction practice due to the synergy of the expert knowledge from the three parties, conflicts and tensions arose from the diverse perspectives and expectations were also inevitable. The researchers' findings echoed the research findings on this issue (Graham, et al., 1997; Pomson, 2005). The participants experienced tensions initially as they encountered fundamental issues such as which party's agenda should take the priority (the products) and what course of action should they embark on (the process). The multiple tensions that the participants experienced reflect the prevailing tensions among the MOE, the schools and the educational researchers in the Singapore context.

Conversely, interacting with members from varying backgrounds, experiences, schools, enabled the participants to appreciate one another's perspectives and their challenges. This led to mutual understanding, reassurance, and increased confidence in designing/ implementing plans.

A model was developed to display the sources of the tensions and multi-directional interrelations of the consensus that may occur in such researcher-teacher-specialist collaborative inquiry (see Figure 1).

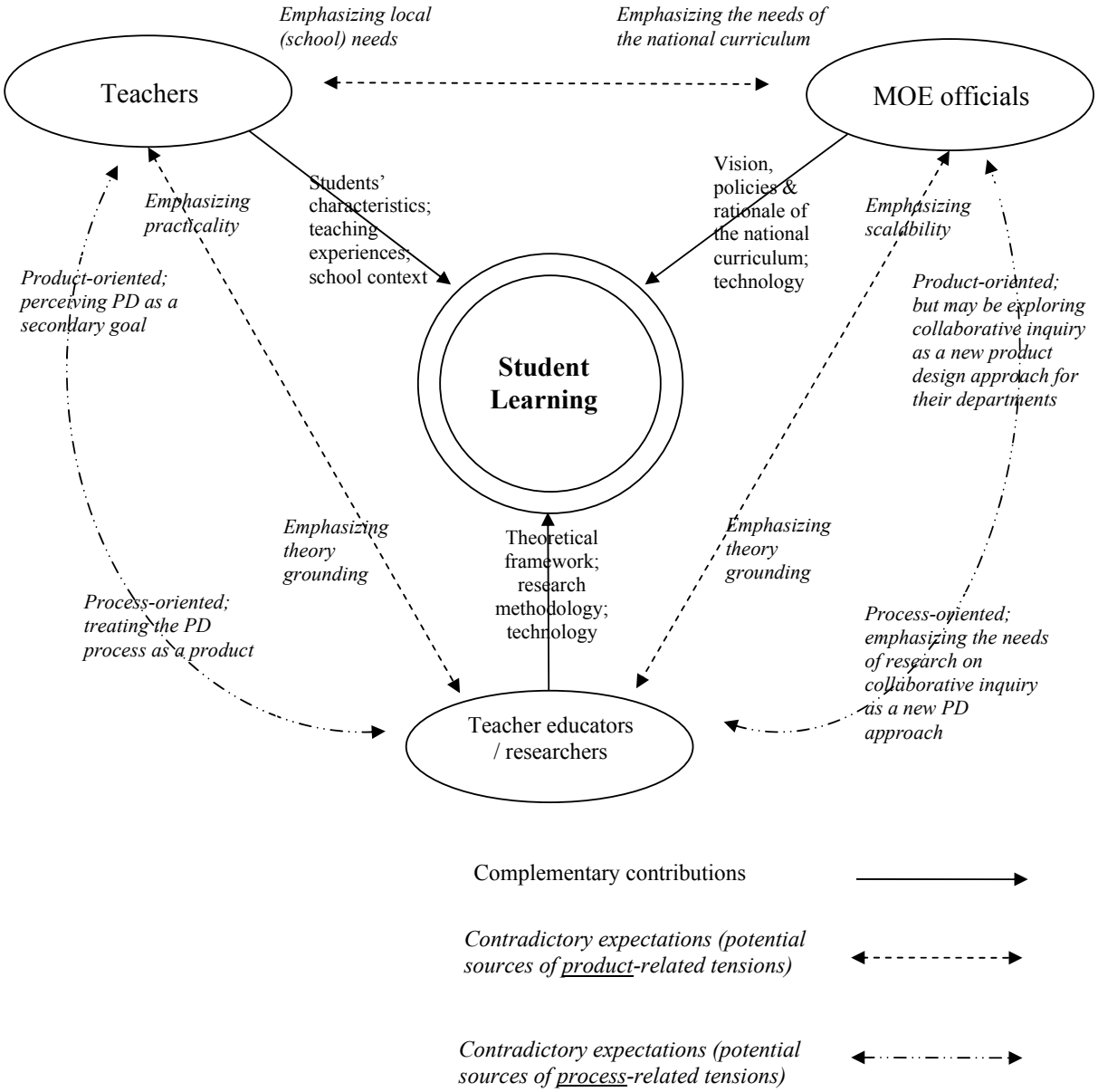

Figure 1: The synergy and the potential sources of tensions in the tri-party collaborative inquiry project

In this model, the researchers outline the *complementary contributions* by individual parties with diverse expertise and experiences that has facilitated a synergy in the inquiry. In addition, *contradictory expectations* among the participants were identified, which were the potential sources of tensions. Such contradictory expectations were classified into two categories – the diverse expectations that may cause product- or process-related tensions.

Product-related tensions are usually the consequences of mismatched emphases of different parties in what and how the project deliverables should be – researchers focusing on theory grounding, teachers stressing practicality and local needs, and MOE officials calling attention to scalability to suit the needs of the development of the national curriculum. In terms of the sources of the process-related tensions, the teachers and the MOE officials initially carried a similar stance – being product-oriented. Although at the personal level, the teachers appreciated the nature of the collaborative inquiry and found it potentially value-adding to their career, most of them had to answer to their school administrators' demand of bringing back a useful curriculum or technology by the end of this project. Therefore, they were inclined to treat the professional development aspect of this

project as a secondary goal. In contrast, the researchers, who were also teacher educators, were keen to explore collaborative inquiry as a new professional development approach for Singapore teachers.

Guided by the model and other challenges that the researchers had experienced in the project, three suggestions were made for the future collaborative inquiry projects.

First, it is important to prepare all the participants for the nature and process of collaborative inquiry approach. Rather than following the researcher's proposed agenda, it is better to empower teachers to choose their own interests and their own inquiry projects. As teachers are the key agents of change, their commitment towards the designed curriculum is the most important factor for the project to be implemented in the classroom.

Second, the collaborative inquiry model may be modified to progressively ease the teachers into an empowerment process. The teacher empowering process can start with relatively well-planned professional development activities such as 'traditional' workshops, and then gradually move to the less-structured domains. This will reduce the teachers' and MOE officials' anxiety and the sense of lack of direction at the early stage of the process as well as equip them with necessary basic skills for subsequent empowerment.

Third, it is advisable for the participants to put away the mindset of 'one-size-fits-all' as the only means to achieve scalability, and instead aim for co-developing point-at-able lesson models that facilitate adaptability as advocated by Learning Sciences literature (e.g., Dede, 2004; Fishman & Krajcik, 2003; Wong, 2009). In turns, teachers would be able to customize the models and design their own customized curriculum to suit the needs of their own students. Therefore, future teachers' professional development-oriented collaborative inquiry projects should play a part in nurturing or enhancing the in-service teachers' adaptability in curriculum design and development, and assessment for learning.

CONCLUSION

This half-year project involved classroom teachers, researchers and MOE specialists in actively co-designing and revising technology-enhanced Chinese curriculum to be coherent and consistent to school, district and national reforms. It shared the features of the effective professional development proposed by (Desimone, 2009) :- (a) content focus, (b) active learning, (c) coherent, (d) duration, and (e) collective participation (p.184). It illustrated a dynamic, on-going, and continuous and embedded nature of professional development for the participants of the three parties to learn from each other. There seems to have a stable change pattern among the participants, showing an increase in all participants learning and potential for changing practices to achieve the ultimately consensus for improving student learning through technology-enhanced solutions. Future research can focus on the longitudinal study on the assessment of and for learning after the revision of the co-designed curriculum.

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