Professional Development Enablers in Practitioner Networks

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This paper describes the role of a synergistic professional development model in developing networks of practitioners among teacher-leaders to support schools' curriculum innovation efforts. The subjects were 38 teachers from various Singapore schools, invited as research activists (RAs) and attached to the Curriculum Policy and Pedagogy Unit (CPPU) at the Ministry of Education (MOE) for two days a week over 40 weeks to carry out an action research study on their school-based curriculum innovation (SCI) project. In the course of designing and implementing their SCIs, the RAs developed close networks among themselves and built collaborative relationship with curriculum partners from MOE and various educational institutions. The paper discusses the enabling processes provided by the ground-up initiatives from schools

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and the top-down support from MOE, in which professional networks of practitioners emerged organically. The RAs cascaded similar support to their colleagues back in schools, sharing knowledge to sustain and scale-up school-based curriculum. The study also highlighted ways where professional networks could engage other stakeholders to multiply good teaching practices in Singapore schools.

Key words: practitioner networks, school-based curriculum innovation, teacher engagement

Introduction

The pattern from the history of education reform studies indicates that many have started with good intentions but few have sustained and scaled-up (Hargreaves & Shirley, 2009). The keys to sustained success appeared to lie in having coherence and workload balance (Fullan, 2000). The support structure to provide resources, the knowledge work creation to benefit schools and interaction between communities of agencies have been put forth as a viable framework to guide top-down support for ground up initiated reforms.

Capacity building at the teacher level was traced as a critical factor for continued success in education reform (Fullan & Hargreaves, 1992; Giles & Hargreaves, 2006). Increasing studies are affirming work on the use of professional development as an essential factor for teacher learning (Borko, 2004) and for education reform (Spillane, 1999; Wilson & Berne, 1999). Many recommendations have suggested the leverage of learning and knowledge management to support curriculum innovations as a form of education reforms. Reform practitioners are moving away from being passive agents to active learners. Working through a community of practice (CoP) is replacing conventional modes of in-service training workshops to prepare practitioners for school-based curriculum innovations.

Given the more inclusive definition of the early communities of practice (Wenger, 1998), many have attempted to examine the differences that distinguish networks, project teams and work group from community of practice (CoP). CoPs are separated from other forms of group formation by the purpose it serves, membership profile, holding interest and lifespan (Wenger & Snyder, 2000). CoP and networks are situated at extreme opposite ends of the continuum. While networks are informal organic groups with shifting memberships, CoPs on the other hand, are more stable groups that contain different levels of expertise (Johnson, 2001) whose purpose is to develop members' capabilities by building on each other's knowledge. Practitioners within are united by a culture of trust and engages in knowledge building (Hara & Kling, 2002) and people-related factors are considered as sound requirement for success. CoPs have been studied along three different dimensions: at the individual participant, at the interpersonal and at the institutional levels (Rogoff, 1998).

Top-down Support Processes

Networks as Communities of Practitioners

Professional development that sustains curriculum changes was associated with the use of collaboration processes that engaged teachers in active learning in the learning and teaching activities (Doppelt, et al., 2009) to build a family for learning and growth (Ho, 2009). The formation of networks therefore leads to an amalgamation of public and private information for breakthroughs thereby nurturing lively learning communities (Uzzi & Dunlap, 2005). Networks allow insightful exchanges with colleagues within their organized networks (Hargreaves & Shirley, 2009), facilitating them to better implement their ideas, improve teaching and learning based on an informed and concrete understanding (Rodan & Galunic, 2004). Networks have been observed to promote active and ongoing social exchanges and collaborations among multiple learners (Cohen & Prusak, 2001, as cited in Cho, Gay, Davidson, & Ingraffea, 2007).

Partnership and Facilitation

Partnerships that result from the formation of networks are tangible affiliations that foster intangible social relationships. Within a learning domain, the development of strong ties can be seen as a goal to facilitate the sharing of resources and information and extending this further, the co-construction of knowledge (Dawson, 2008). This cross-pollination of ideas is achieved when participants have a genuine passion in the activities and have something at stake for them to build a culture that weaves a tapestry of community interests (Brown, 2006) which revives the passion for learning and ignites personal and professional development.

As such, practitioners should be able to develop a repertoire of well-documented pedagogies for refinement and implementation rather than a microscopic concentration on academic gains (Hargreaves & Shirley, 2009) through thoughtful discussions and cooperative exchanges within their networks (Brown, 2006). As a professional community, it could set the tone for members to take ownership and responsibility in designing learning for their students (Ho, 2009). At the same time, structural diversity networks (Hustad, 2007) would also encourage members from various communities to bring along different perspectives to provide opportunities to create new knowledge through translations thereby ensuring an efficient and powerful sharing of knowledge. As the size and connectivity of the network increases, the cohesiveness among teams in the network increases which adds to the necessary level of credibility in facilitating the spread of potentially fresh but unfamiliar material within the network (Uzzi & Spiro, 2005).

Being loose groups of individuals with homogeneous connection, networks might limit the information members received, the attitudes they formed or interactions that they could otherwise experience (McPherson, Smith-Lovin, & Cook, 2001). The delicate balance between organic collaborative networks within clusters and zones to build closely-knitted networks that enhanced cooperative exchange in the pursuit of common interests (Gargiulo & Benassi, 2000) and structural hole theory (Burt, 1992, 2004) where district superintendents

act as brokers to propagate the efforts of networks, leading to effective district collaboration between districts and states is important.

Capacity Creation Resources

High-quality teachers are necessary to build high-quality learning that is anchored on strong support to provide considerable autonomy to teachers (Hargreaves & Shirley, 2009). Building high-quality teachers requires accredited teacher training programmes for a rigorous practical and intellectual standard that is becoming of a demanding profession.

Teachers become more reflective in practice as they collaborate and disseminate new knowledge within the teaching community (Noffke, 1997; Senese, 1998). Active participation in action research among teachers is necessary in order to support education change and build capacity for engaging learners. The problem at hand is the ability to sustain action research in schools.

Structural Support

To sustain beginning networks of teachers, school leaders need to provide resources to support the research process. Some structural support includes the offloading of teaching duties for practitioners to study their teaching processes and enhancing the physical support by engaging the services of qualified research experts to remove barriers in support of teacher-leaders (Katzenmeyer & Moller, 2001).

Group Dynamic-related Outcomes

The condition for knowledge and learning is the presence of strong group dynamics among its practitioners. Important group dynamic-related outcomes include coherence, reciprocity, value creation and knowledge base.

Coherence is a quality that helps school practitioners to navigate systematic processes that are critical in shaping sustained and scalable

changes. Coherence is achievable through a culmination of informal leadership and distributed leadership. Informal leadership addresses leadership inconsistencies especially those that involve succession issues while "distributed leadership" addresses the pertinent issue of sustainability that anchors on trust for effective collaborative moments between the practitioners. To access "expert knowledge", networks use reciprocity to deliver three distinctive advantages namely private information, access to diverse skill sets and power (Uzzi & Dunlap, 2005).

A distinctive characteristic of CoP is "value creation" for teachers as a professional body to equip them with the right set of tools to bring out the best in their pupils (Ho, 2009). The vast "knowledge base" that is inherent in CoPs, provide opportunities for teachers with strong teaching practices to develop an inclusive curriculum that embraces the spirit for multiple peaks of excellence.

Singapore's Education Landscape — Moving Forward

Singapore's education landscape has been rapidly evolving to accommodate the increasing diversity and flexibility in our schools to prepare our pupils for the test of life rather than a life of tests. In his inaugural National Day Rally speech, Singapore's Prime Minister, PM Lee Hsien Loong (Lee, 2004), called on all schools to "teach less to our students so that they will learn more". The thrust of this *Teach Less, Learn More* (TLLM) movement is best expressed as "engaged learning in every classroom, by every teacher, for every child" (Ho, 2005). TLLM aims to move the education system towards improving the quality of learning by encouraging and supporting school-based curriculum innovations (SCIs) so that good practices could spread across the system. Teachers, therefore, serve as an important catalyst for the way forward for Singapore's education landscape. As such a key feature of the TLLM movement was the establishment of a community of teacher-researchers, known as Research Activists (RAs).

Research Activists (RAs)

RAs were attached to the Ministry of Education (MOE), Singapore over 40 weeks and charged with the task of carrying out an action research study on the design and implementation processes and outcomes of school-based curriculum projects. MOE instead played a facilitative role and provided the necessary top-down support for ground-up initiatives. Learning from the experience of the first cohort of RAs, a more formalized support was provided to subsequent cohorts of RAs (MOE, 2009).

Table 1 groups the seven areas in the TLLM package into four categories of support and four categories of group-dynamic outcomes: Network, Resources (*Training & Funding*), *Project Facilitation*, Curriculum Partnership (*Consultancy*). Group dynamics-related outcomes were in the form of Leadership and Knowledge which were facilitated by *Know-how*. The other outcomes include value creation and reciprocity which were encouraged by the provision of *Sharing* platforms. Figure 1 describes the hypothesized relationship among the variables.

Table 1: Top-down Support and Group Outcomes Variables

Top-down support	Ecosystem enablers	Group outcome variables
Facilitation	Advocacy	Leadership
Resources	Backing	Value creation
Partnership	Capacity creation	Reciprocity
Networks	Demonstration	Knowledge

Top-down Support as Enablers

Five of the seven areas in the TLLM package formed the top-down support, provided in the forms of Project Facilitation, Curriculum Partnership, Resource Provision and Network Groupings.

1. *Facilitation*. Facilitation was provided by MOE officers who were called Project Facilitators (PFs) to help the RAs navigate the

forming, storming, norming and performing stages within the network (Tucker, 1965). PFs were not expected to possess the expert knowledge and skill of the network focus but were to connect the RAs to relevant sources of support and expertise.

2. *Curriculum Partnership (CP).* Partnership was formed based on a common interest in curriculum work. Curriculum specialists and master teachers were invited by MOE to provide timely advice to the RAs on curriculum and instructional matters related to the SCI to maintain the rigor of the discussions.

3. *Network Grouping.* The RAs were invited to join different networks to seed purposeful and constructive collaboration and exchange. Each RA had membership in two networks: subject-based network (e.g., Maths Network) and pedagogy/curriculum model network (e.g., Problem-based Learning Network).

4. *Provision of Resources.* Fixed time and space were allocated for the smooth carrying out of the network meetings, customised training and curriculum materials shared and circulated within the network.

Figure 1: TLLM Top-down Support and Group Dynamic-related Outcomes
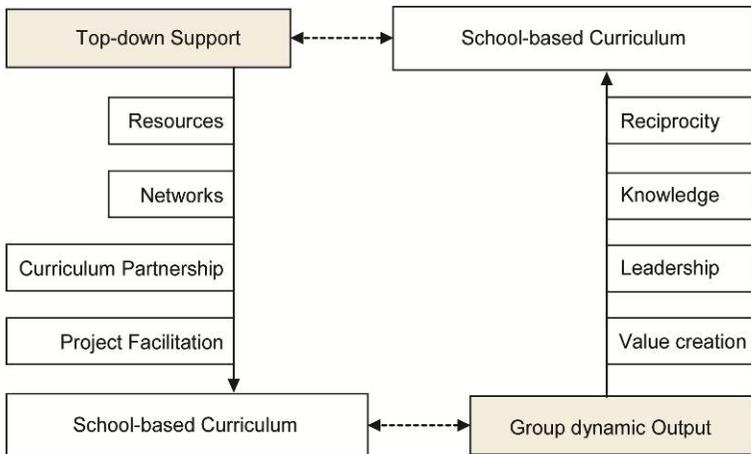
Group Outcomes Variables

The benefit of communities tended to be difficult to value especially when the effect may be delayed or may not be the source (Wenger & Sydner, 2000). Proxy measures were required to assess the value of communities. The level of perceived outcomes present could be indicators of the extent in which top-down support would be enabling the work within these communities of RAs. From research works on education reform, it is conjectured that informal leadership (L), reciprocity (R), value creation (V) and knowledge (K) creation would emerge from the practitioner communities which are supported by purposeful network grouping, facilitation, partnership and resource provision.

1. *Knowledge.* Networks are characterized by the information they received and passed on. Respondents' level of knowledge of one another's strengths and expertise is an important indicator of the dynamic of the group. This indicates the rigor of the content of discussions that RAs have accessed to which they find useful when faced with teething issues.

2. *Value Creation.* Members of a work group are motivated towards being a community of practice when there is value creation for its members. Value creation is the perceived amount of value added to the SCI as a result of the interaction and collaboration with others. Value creation is a key performance indicator of whether the SCI was conceptualised and effectively implemented.

3. *Reciprocity.* Within a network, reciprocity is the level of RAs' willingness to share and adopt the ideas that transpired during discussions within the network. As a proxy measure to the level of trust built up over time, reciprocity ensured sustained engagement beyond cooperation towards collaboration.

4. *(informal) Leadership.* One of the characteristics of communities of practice is the different levels of expertise that are simultaneously

present (Johnson, 2001). Informal leadership could emerge from among the RAs due to the organic maturation of the network.

Context of the Study

The RA Attachment Scheme, as part of the TLLM movement, was started in 2006 with 29 schools. It has become an annual programme available to all schools. This study attempts to frame some of the support processes found in the TLLM movement for professional development enablers within networks in the context of school-based curriculum innovation as a means to sustain and scale-up education reform. A quick Google and Yahoo search using "TLLM and conference" on the internet yielded some 7,950 and 785 hits, respectively, of schools sharing their school-based curriculum innovation efforts at various platforms. These platforms ranged from international and regional conferences to interschool seminars and symposiums. The findings from this study sought to provide insights to the sustained movement since 2006 and to provide policy makers with deeper understanding between the relationship of people-centric professional development resources and informal networks. Our study was designed to address three research questions: (a) Which top-down support processes were well-received by the participants? (b) Which top-down processes were strong predictors of group dynamic-related output in the networks? (c) Is there a difference between perception ratings for subject-based networks and pedagogy/curriculum model-based networks?

Method

Participants

Ministry of Education. To foster the TLLM efforts, MOE adopted a school-based approach to focus resource deployment for school-based curriculum innovation. Schools were invited to receive top-down support. Part of this support included the provision of a Research

Activist (RA) attachment scheme which was set up to complement school leaders' support for their teachers' professional development in the context of curriculum innovation. The RA scheme combined a structured training and consultation programme with collaborative knowledge-building opportunities. By fostering the development of research skills in teachers, teaching practices in schools would be informed by action research through data-driven reflection. A physical workspace in MOE Headquarters was set up for RAs to carry out their work and hold discussions within their networks.

Schools. Eighty-one teachers were identified to represent their 74 schools as RAs. They were attached to MOE for two days a week over a 40-week programme. Each RA was offloaded by the school in terms of teaching and other duties to facilitate their attachment and training. RAs were tasked to carry out an action research study on the processes and outcomes of their school-based curriculum design and implementation.

Research Activists. Eighty-one RAs attended training and coaching sessions as well as participated in research group discussions among themselves. Whilst on attachment, RAs completed preparatory work related to their research, including literature review, research questions scoping and design of data collection instruments, planning for data analysis and synthesis of findings as well as case study and research report writing.

The RAs focused on carrying out planning, development and evaluation work to support the ongoing action research activities in their schools. As these schools were expected to study both the process and outcomes of the prototype, they were also known as TLLM *Ignite1!* Schools. The RAs were chiefly responsible for leading a group of teachers in conducting and reporting on the school's research study and findings. They provided the schools and MOE with case studies and reported on research findings of the prototypes at the end of their 20-week attachment.

The RAs were assigned to two network groupings — based on their SCIs' subject content and pedagogy/curriculum model, respectively. The arrangement allowed the RAs to pool findings, literature searches and learning points. They worked with curriculum partners from MOE and NIE who helped them review their consolidated reports at key

junctures of their research journey. At appropriate stages in their research, they presented their research progress and findings to one another, and received feedback and input to improve or refocus their study.

Procedure

A questionnaire survey was administered to eighty-one participants at the final phase of the RA initiative where their views were collated and analysed. Interviews were conducted with two project facilitators (PFs) and two curriculum partners (CPs), eight female and three male RAs in selective subject-based and pedagogy-based networks to cover a range of issues. The chosen networks were English Language (Primary), Science (Secondary) Learning Theories, Normal Technical (NT) and Differentiated Instruction (DI). These networks were chosen as they were a convenient sample that managed to capture a wide spectrum of diverse views of teachers teaching across the primary to secondary level.

Measures

The construction of the survey questionnaire was guided by the top-down support for ground-up initiatives framework (see Figure 1) where descriptive statistics and correlation indexes were generated. The survey consisted of 40 items across two scales, namely top-down support and group-related dynamics outcomes. Respondents were asked to rate the level of agreement to the statements in the questionnaire on a four-point Likert scale (1 = Strong Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree) in the context of their subject-based networks and pedagogy-based networks separately. Items within the respective subscales were developed jointly by colleagues at the MOE, guided by literature on networks and MOE documents on TLLM. The items had been piloted and results showed acceptable reliability. Table 2 shows the reliability indexes.

Table 2: Reliability Indexes of the Network Questionnaire

Scale	No. of items	Reliability Index
MOE Support		
Project Facilitation	5	0.92
Curriculum Partnership	5	0.92
Network Grouping	7	0.90
Resource Provision	5	0.82
Group Dynamics		
Knowledge	4	0.87
Value creation	5	0.89
Reciprocity	4	0.92
Leadership	4	0.90
Overall satisfaction	1	
Total No. of items	40	

Top-down Support Subscales

The top-down support scale comprised four subscales: Project Facilitation, Curriculum Partnership, Resource Provision and Network Groupings. The *Facilitation (PF)* subscale measures the extent the project facilitators (PFs) played their "brokers" role in the forming, storming, norming and performing stages among the RAs within the network (Tucker, 1965). In the *Curriculum Partnership (CP)* subscale, participants were asked to rate the level of curriculum partnership provided by significant others such as curriculum specialists and master teachers. The *Networking (N) subscale* assessed the participants' perception on the level of common focus among their SCIs and the extent of the purposefulness within their assigned groupings. Five items from the *Provision of Resources (PR)* subscale assessed the resources' relevance and timeliness to the participants' needs within the network. The resources include time and space allocated for the smooth carrying out of the network meetings, customised training and curriculum materials shared and circulated within the network.

Group Dynamics Scale

The group dynamic scale refers to the variable outcomes arising from the interaction and collaboration among the RAs within and across networks. The level of group dynamics was investigated under four areas: Knowledge of one another's strengths and expertise; Value creation; Reciprocity and Leadership. The *Knowledge (K)* subscale asked the respondents to what extent they had knowledge of one another's strengths and expertise. The *Value Creation (V)* subscale assessed the level of value added to the SCI as a result of the interaction and collaboration with others. The four items from the *Reciprocity(R)* subscale examined the level of RAs' willingness to give and take from one another within the network. The subscale ratings could also be a proxy to the level of trust built up over time as the RAs collaborated. Reciprocity ensured sustained engagement within the network. Four items *Leadership* subscale examined the level of emerging leadership from among the RAs. Informal leadership could be developed due to the organic growth of the network. One item (*Overall Satisfaction)* was included to provide a summative response from the participants in terms of their overall satisfaction of the top-down support and ground-up initiatives.

In order to understand the questionnaire ratings and to tap on the tacit knowledge, one-on-one interviews were conducted. The RAs who influenced and were the recipients of the top-down initiatives were asked the following lead questions: (1) their opinions on the ideas shared within their networks, (2) their views on the current structure of networks, (3) their short-term and long-term hopes for their research, and (4) their advice that they would give to teachers interested in becoming an RA. The CPs and PFs who were the craftsmen behind top-down initiatives were asked the following lead questions: (1) their opinions on the ideas shared within the networks, (2) their opinions on the current structure of networks, and (3) their understanding of their role in shaping the RA initiative. The TLLM ecosystem framework guided the scanning of the interview responses for emerging patterns (MOE & ASCD, 2008).

The combination of the questionnaire and interview results assisted the interpretation of the sentiments of the sampled participants had on the various top-down support processes as professional development agents in support of their professional networks and allowed us to correlate these sentiments with the outcomes of the participants' school-based curriculum innovation projects.

Results

The discussion of the findings is organised using the four ecosystem enablers: advocacy, backing, capacity creation and demonstration.

Advocacy: Actions to Inspire and Empower

Advocacy in our context refers to the extent in which RAs influence and lead the school's decision to adopt an innovative classroom practice to inspire and empower others in the conceptualization and implementation of school-based curriculum innovations (MOE & ASCD, 2008, p. 7).

Table 3 shows the mean and standard deviation of the ratings for each of the subscales corresponding to the various MOE top-down support provision. Mean rating was highest for Project Facilitation subscale, followed by Network Grouping subscale. This suggests that the top-down provision of project facilitation is adequate for RAs to help them connect existing and new resources and manage perspectives from their curriculum partners and knowledge experts. However this provision can be further enhanced when school leaders and teacher-researchers both support and facilitate change in curriculum innovation by using existing resources creatively to further enhance the professional development model for practitioners.

Backing: Physical Resources and Emotional Support

Backing can be in the form of a set of observed structures and practices in schools which provide teachers and other members of the school

Table 3: Mean Ratings of Top-down Support Scales

Scale	Combined (N = 42)		Subject-based network		Pedagogy-based Network		Mean
	mean	SD	Mean (x)	SD	Mean (y)	SD	Difference (x − y)
MOE support							
Project facilitation	3.39	0.47	3.54	0.46	3.24	0.43	0.30***
Curriculum partnership	2.98	0.76	2.98	0.85	2.97	0.64	0.01
Network grouping	3.18	0.43	3.30	0.44	3.07	0.41	0.22**
Resource provision	3.15	0.33	3.24	0.33	3.06	0.31	0.18***
Overall satisfaction	3.31	0.58	3.17	0.66	3.10	0.49	0.07

** $p < 0.05$; *** $p < 0.01$

community with support, encouragement and resources in the development and implementation of school-based curriculum innovations (MOE & ASCD, 2008, p. 10). The provisions of curriculum partnership and other resources such as training, equipment and protected time and space, supported the RAs in their journey to improve approaches for classroom learning and allowed the development of communities of practice to emerge. Bringing the teachers together weekly as RAs was necessary to encourage them to grow as a community. As RAs learned the language of researchers and developed behaviors that embed the culture of the CoP, it shaped a "learning community" (Wenger, 1998) for RAs to willingly contribute to the goals of that community. Crucially, the strong backing also broke down predisposed sentiments that action research is only meant for curriculum specialists and not for teachers. This subtle change in perception and culture by the RAs towards educational change at the school level is important for nurturing and sustaining action research by teachers (Katzenmeyer & Moller, 2001).

Positive and Powerful Associations — Partnerships. The higher mean ratings found in the *Resource Provision* and *Curriculum Partnership* subscales shown in Table 3 show that the formation of networks in the RA Attachment Scheme was an innovative approach to encourage the establishment of a community of practitioners with the purpose to learn together and share. Project Facilitators, Curriculum Partners and RAs recognized their stake in both the current and future demands for education in enhancing the quality of teaching. This positive and powerful professional association has built effective partnerships between MOE, curriculum consultants and teachers which translate into a positive sentiment towards the top-down support framework. For instance, a teacher from the Differentiated Instruction (DI) network has deepened her understanding of DI in helping the different kinds of learners in her project class. She opined that:

> ... curriculum partnership is an important support for me as it has helped me to understand how to approach DI with greater clarity and confidence. Although the consultation could have been earlier, nonetheless I was still able to make necessary refinements to the materials I have prepared for my project class that are better aligned to the initiatives of DI.

In a macro perspective, professional partnership has enriched the teacher to reflect on the teacher's teaching strategies to move beyond just engaging the learner but also to question and understand the necessity to engage the learner with the right set of tools. These tangible affiliations between teachers and curriculum partners eventually foster intrinsically motivating social relationships that are drawn together by common interests which was aptly described by a curriculum partner in teacher education:

> I enjoyed the one-on-one consultation session with the individual RAs from the network. The RAs largely have a good understanding of what differentiated instruction as seen from the questions they have asked in today's session. I look forward to future collaborations with them even after their stint in the RA initiative has come to an end.

Lively Learning Communities. Interview responses supported that network relationships have encouraged a greater sharing of ideas between network members and provided an opportunity for personal reflection on their pedagogies. This has been made possible by schools providing protected time and physical space for the professional exchange during network sessions. Such attempts are evidence of strong backing by school leaders in support of the top-down initiated approach. For instance, one head-of-department from the Normal Technical (NT) network who has been in the teaching service for more than ten years reflected that she now has a different set of perspectives on classroom management and teaching strategies to engage the academically weaker NT students better. The cross-pollination of ideas has inspired her to re-invent the pedagogical models that are currently adopted for her NT classes. This refreshing change in her outlook towards professional development models is encouraging for us as it indicates a potential room for top-down support approaches to flourish in Singapore's education landscape and more importantly a positive receptiveness towards this new professional model.

Capacity Creation: Building the Community

Capacity creation is achieved through sustained professional development and should be a meaningful transfer of sound, comprehensive and coherent educational innovations within the school community (MOE & ASCD, 2008, p. 14).

Table 4 shows the mean and standard deviation of the ratings for each of the subscales in the Group Dynamics-related outcomes segment. The "strength" of group dynamics was influenced by the interactions among the RAs themselves and the skilful facilitation of the PFs. Among the four outcomes, the higher mean rating in *Knowledge* and *Value Creation* subscale, suggests that the RAs in their network groupings were able to find common areas of interest for sharing of ideas and resources that added value to their school-based curriculum innovation. This addition of value is pertinent for the sustainability of this RA initiative as a professional development model that stemmed from top-down support to motivate teachers to engage learning in every classroom, by every teacher, for every child (Ho, 2005).

Differentiation and Diversity. With the national curriculum's strong emphasis on holistic education, forming networks based on subjects and pedagogies instead of school academic performances brought schools of varying academic readiness and performances together for sharing of diverse ideas within the network (Ministry of Education, 2011). This delicate balance in the formation of networks was deemed as one of the critical factors in the positive overall experience towards the RA initiative that transpired from top-down support as it shows an unbiased, non-judgment provision of resources to schools from the top level and from the ground, an innate willingness by the teachers to advance the quality of teaching in all Singapore schools and not just a select few.

High Quality Teachers. Meaningful collaborations between PFs, CPs and RAs have resulted in thoughtful exchanges in shaping school-based curriculum innovation to build a new generation of high-quality teachers for a fraternity of professional practitioners. However beyond

Table 4: Mean Ratings of Group Dynamic-related Outcome Scales

Scale	Combined (N = 42)		Subject-based network		Pedagogy-based Network		Mean
	mean	SD	Mean (x)	SD	Mean (y)	SD	Difference (x − y)
Group dynamics							
Knowledge	3.11	0.44	3.21	0.40	3.01	0.46	0.20**
Value creation	3.01	0.28	3.05	0.29	2.98	0.26	0.06
Reciprocity	3.13	0.40	3.20	0.40	3.07	0.40	0.13
Leadership	2.95	0.54	2.98	0.64	2.92	0.41	0.07
Overall satisfaction	3.31	0.58	3.17	0.66	3.10	0.49	0.07

** $p < 0.05$

Table 5: Inter-scale Correlation Indexes

	Facilitation	Partnership	Network	Resource	Knowledge	Value creation	Reciprocity	Leadership
Facilitation	1	0.35***	0.65***	0.56***	0.47***	0.53***	0.63***	0.39***
Partnership		1.00	0.35***	0.27**	0.24**	0.21*	0.22*	0.13
Network			1.00	0.60***	0.65***	0.53***	0.75***	0.39***
Resources				1.00	0.52***	0.61***	0.65***	0.32***
Knowledge					1.00	0.50***	0.70***	0.26**
Value creation						1.00	0.57***	0.38***
Reciprocity							1.00	0.46***
Leadership								1.00

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

just effective partnerships to nurture high quality teachers, the acquisition of skills by the teachers is equally important if we hope to nurture and sustain action research in schools. By equipping RAs with curriculum designing processes for planned educational change, it empowers the RAs with the capability to carry out the demands for action research in the classroom and to competently and confidently lead a team of their fellow colleagues in their schools to perform purposeful action research.

Our findings have shown that RAs are now able to use data to inform rather than to judge. This is an important realization as this suggests a positive shift towards a greater value on the process of learning rather than the outcomes of learning which complements the deliverables of TLLM. Although their SCI efforts might not have translated to immediate academic improvements, the RAs were able to articulate the intangible benefits such as a positive learning attitude of the child that arose from their action research to their school leaders. The development of communities of RAs can as such be regarded as an important milestone as a response to the changing landscape of Singapore's education system.

Sustainable Leadership. Close collaboration between MOE and schools via the *top-down approach, ground-up initiatives* framework aims to provide constant and homogeneous support from the school leaders. Several RAs from the *Learning Theories* network have reflected that the keener involvement of their school leaders has encouraged the RAs and their team to have meaningful discussions on their SCIs has helped to build a shared leadership among the staff. However a homogeneous support for sustainable leadership needs to go beyond just physical intervention. Instead, it requires a change in culture and perceptions of school leaders towards this top-down support framework.

Demonstration: Spreading What Works

Demonstration refers to the measures a school takes to provide opportunities for teachers to spread what works in classrooms. This spreading of reflective practice transfers sound, relevant and impactful learning from classroom to classroom, and school to school, because it

is undergirded by thoughtful reflection and evidence-based findings from teacher-driven research (MOE & ASCD, 2008, p. 19). In our approach, RAs were encouraged to visit the project classes of their fellow network members to gain insightful ideas and to help shape content of ideas discussed within networks to allow the RAs to internalize and compare theory, perception with actuality.

Among the top-down support provided, Table 5 shows that the Network Grouping subscale has strong inter-scale correlations with *Knowledge* (0.65) and *Reciprocity* (0.75) subscales. At the same time, *Resource Support* subscale also shows higher correlation indexes with *Value Creation* (0.61) and *Reciprocity* (0.66) subscales, respectively. It appears that the networks accompanied by resource support in the form of protected time and space facilitated network meetings and training programmes. The willingness to contribute within the network encouraged the establishment of a community of practice. The RAs were able to add value to each other's work as a sign of reciprocity and from reciprocity, informal leadership emerged.

Integrating Networks. RAs from diverse subject-based networks have membership in pedagogy-based networks. This duo membership allowed the RAs to examine different approaches in employing a given pedagogy across different subjects. This duo-network membership premised that while teaching expertise has become more specialized, teaching content and delivery could become more interdisciplinary. Being a member of two different networks, a teacher from the Science (Secondary) network observed that the inclusion of pedagogical discussions in subject-based discussions has enabled her to consider alternate pedagogical models in the teaching of specific content for science for a more effective learning experience for her students. Integrating the area of focus in both types of networks have enhanced the conversations on the role of pedagogy and subject content in engaging the learners to support the schools' strategic direction in multiplying good teaching practices throughout the school community. As a professional development model, the RA initiative bodes favorably in the long-term.

Improvement and Refinement

Hargreaves and Shirley's (2009) "responsibility before accountability" resonates with one of the objectives of introducing the RA attachment scheme as part of top-down support for ground-up initiative movement. The emphasis of the RA scheme is to encourage teachers to be reflective practitioners in relation to what, why and how to what is to be taught in the classroom. The focus is to engage the teachers as they respond to the needs of their students.

Developing and Enhancing Partnerships. A personal curriculum consultant to each RA would be a prudent step forward to better nurture RAs in action research particularly in the early stages of their action research. This should not be regarded as an exclusive partnership but instead should encourage inclusiveness through active collaborations within networks and districts. The high correlation index between *Curriculum Partnership* and *Value Creation* subscales demonstrated the high potential to be reaped in this relationship. A potential synergistic collaboration, which is pertinent for the way forward in Singapore's education landscape, is a stronger partnership with the Education Technology Division (ETD) to encourage RAs to be responsive to the 21st century learner and leverage on ICT to bring forth innovation to their curriculum and existing pedagogical models (Hayes, 2007).

Developing Ownership. Although top-down support provides a considerable amount of autonomy to school leaders and teachers, nevertheless, intrinsic support factors such as personal interest cannot be dictated by the top. In order to sufficiently prepare the RAs for action research, we propose that school leaders induct the teacher-candidate for the RA Attachment and for the RAs to actually carry out their research proposals for a more convincing documentation.

Enhancing School Support. Schools should set aside protected time within curriculum hours to support RAs and their teams in their reflection and SCI-refinement during their implementation of their SCIs. This would require the employment of more support staff within the school which MOE has to provide as an alignment to top-down support.

Enhancing Network Integration. To streamline the structure of organised networks and to keep the network content heterogeneous, we

propose the merging of subject-based network with pedagogy as supported by the interviewed RAs and questionnaire results from the 2009 TLLM *Ignite2!* Network Study. Furthermore, language preference for communication is an important consideration particularly for RAs teaching the Mother Tongue Languages such as the Chinese Language. Through the inclusion of pedagogies within subject-based discussions RAs would be recombining their existing knowledge presupposition to disparate elements of knowledge (Rodan & Galunic, 2004) to contribute to the shaping and enhancing the quality of their SCI through knowledge diversity. Establishing an online forum platform that is grown from social interactions (Dawson, 2008) from existing subject-based network for sharing could address the issue of relevant and timely top-down support for developing professionalism.

Enhancing Lively Learning Communities. A mixed method training approach that balances qualitative and quantitative research models and marries curriculum theory and design with research methodology skills is proposed to enhance the rigor of discussions between curriculum partners, project facilitators and the RAs. Enhancing school-to-school networks for area-based collaboration, as observed in the Centre of Excellence (COE) in the East and North zone, could be a possible follow-up in exploring different models in how different schools enhance the quality of professional sharing for a post-RA Attachment Scheme based on subjects or key pedagogies to change a culture where schools do not work as exclusive entities; but rather as inclusive collaborations. Role evolution for cluster superintendents as brokers for cluster-to-cluster networks may provide valuable information on how, for instance, Differentiated Instruction (DI) and Inquiry-based Learning (IBL) networks could build a pedagogy hub to bring forth greater collective support within clusters to streamline coherence and catalyze other forms of professional sharing and development. This would further provide innovative ways to institutionalize the *top-down approach, ground-up initiatives* framework as a norm for schools to spearhead changes to the education landscape, with MOE providing the necessary support to facilitate these changes rather than the converse.

Developing Sustainable Leadership. Project Facilitation was instrumental in developing informal leadership among the RAs

(correlation index in Table 5). Furthermore, leadership was deemed as the lowest scoring item in the group dynamic related outcome (Table 4). The concern on schools' confidence to continue towards an inclusive whole-school approach is understandable in the context of expectation to sustain their SCIs independently for post-RA schools and to encourage a more scalable model for capacity building and education reforms to take root. Over reliance on MOE top-down support would minimize the benefits arising from careful succession planning among RAs. As societal demand for quality and responsive education increases relentlessly, new insights on the issues of distributed leadership may need to be examined in view of possible rotation of school leadership or when RA's career opportunities take them out of their current role specification (Hargreaves & Shirley, 2009).

By end of 2011, the RA Attachment Scheme would have provided all schools who wanted to have a teacher trained as a RA, the opportunity to benefit from the programme. With the wide spectrum of participants, the study on networks should not be confirmed to current RAs. We should also pay attention to former-RAs and have them to serve as mentors to incoming RAs based on SCI similarities and/or geographical locations to leverage on the "shared activities principle" (Uzzi & Dunlap, 2005) to engender a willing culture for professional sharing (Cho, Gay, Davidson, & Ingraffea, 2007).

Conclusion

The findings from the study show consistent responses from among the three groups of participants: Project Facilitators, Curriculum Partners and RAs. Top-down support which has professional development functions affirms the central role of investing in people's capabilities. Further investigation would provide the details to how the programme could nurture, sustain and grow other professional groups. Nevertheless, a pragmatic approach is important to ensure a manageable balance between the demands of the curriculum innovation and the RAs' responsibility towards students' learning in schools.

The process of building collaborative interactions was enabled by partnerships and supporting structures. Schools should become places

where teachers constantly evaluate their pedagogies and construct interventions through the professional sharing within networks, not for academic gains but for enhancing the learning experience of the child (Hargreaves & Shirley, 2009). The RA initiative is therefore an embryonic step in refocusing the teaching vision as one where each teacher is a leader who strives to care, to inspire and to lead other practitioners in reflective and progressive practices to address the changing professional climate of teachers in Singapore as encapsulated in the fraternity's Vision of Lead, Care and Inspire (Ho, 2009).

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