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DISTRIBUTED LEADERSHIP IN ICT REFORM

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Abstract

Keywords: Distributed, Instructional, Transformational, Technology, Leadership

This study examined distributed leadership in Information Communication Technology reform in a government school in Singapore. The study adopted a naturalistic inquiry approach, involving the case study of a school. The study found that leadership for ICT reform is distributed according to functions of transformational, instructional, emotional and strategic management of resources. The key enabling factors are an official leadership position, access to expertise, support by senior management, and interpersonal synergies amongst the leaders. Transformational leadership is performed mainly by senior management. Instructional leadership is performed mainly by middle management. Both senior and middle management provided emotional leadership.

INTRODUCTION

Singapore's first Information Communication Technology (ICT) Masterplan for Education was launched by the Ministry of Education (MOE) in 1997. This was followed by a second masterplan (mp2) which was launched in 2002 (Ministry of Education, 2006b). The main thinking behind the masterplans is that ICT can be used to engage students in active learning, involving higher order thinking skills and the construction of knowledge, resonating with Jonassen's concept of students using ICT as a mindtool to support learning (Jonassen, 1999a, 1999c).

Despite the masterplans being in place for about a decade, and at least 2 billion dollars (Singapore dollars) of funding provided to date, an internal scan by MOE in February 2006 (Ministry of Education, 2006c) suggested that only 43 schools (12%) were considered advanced users of ICT, with 281 schools (79%) coded as average users of ICT, and 32 schools (9%) coded as basic users of ICT.

A review of literature yielded few studies which focus on leadership for technology reform in schools. Among the studies that reported on the success of technology reform, success is usually defined as integration into the curriculum and the use of ICT to help students construct knowledge (Flanagan & Jacobsen, 2003; Inan & Lowther, 2010). Two key questions remain obscure. The first question is what kind of leadership is required to support ICT reform in schools; the second question is whether it is sufficient for the Principal alone to provide the leadership required.

LITERATURE ON DISTRIBUTED LEADERSHIP

Broadly defined, distributed leadership shifts the focus from leadership performed by individuals in specific roles (in particular the Principal in a school setting) towards viewing leadership from an organisational or task-oriented perspective (Smylie et al., 2002). A good overview of distributed leadership is provided by Smylie et al. (2002) who noted there were three main models of distributed leadership in the literature.

The first model of distributed leadership by Heller and Firestone (1995) views leadership from the perspective of functions performed. Heller and Firestone (1995) observe that the same leadership functions, such as providing and selling a vision of the change and obtaining resources, are often performed by people in different roles. They observed there was "redundancy" (p. 65) in the way the functions were fulfilled: "sometimes in a jointly coordinated manner and sometimes with relatively little communication" (p. 66).

In the second model which views leadership as an organisational attribute, Orgawa and Bossert (1995) argue that leadership occurs not through the actions of individuals but through interactions among individuals. Indeed, Ogawa and Bossert (1995) view social interactions between organisational members as the "building block" of leadership (p. 236); thus, the unit of analysis is not individual roles but the network of interactions amongst different roles which have access to different information and resources (Ogawa & Bossert, 2000).

The third model is also the model applied in this study because it incorporates the essence of the other two models. The medium of leadership is in social interaction as opposed to individual actions. Spillane and colleagues argue that leadership is "stretched over" the practice of two or more leaders in their interactions with followers (Spillane et al., 2004); it occurs "in between" people, between leaders, and between leaders and their followers (Spillane, Camburn,

& Lewis, 2006, p. 16). Spillane (2006) argues that the influence of distributed leadership is more than the sum of the individual leaders' actions because of their interactions in carrying out a particular leadership activity: one plus one leader is more than just adding the individual effort of two leaders.

Thus, Spillane et al. (2001) argue that leadership is distributed in the "interactive web of actors [leaders and followers], artifacts [tools] and the situations" (p. 23). People with access to different knowledge and expertise work interdependently and reciprocally in performing leadership.   Based on such a concept of leadership, the unit of analysis is not individual leaders but leadership activity, which is distributed over multiple leaders, followers and the situation (Spillane, 2005). This possible distribution of leadership is typically found in the school organizational chart as follows:

The Principal: With regard to the literature on technology implementation in schools, when leadership is mentioned, it is either stated or implied that this leadership is provided by the Principal (Creighton, 2003; Flanagan & Jacobsen, 2003; Kincaid & Feldner, 2002; Martinez, 2002; Ng, D., 2005; Schiller, 2003; Yee, 2000). While the concept of the lone, heroic Principal (Hallinger, 2003) is no longer viable today, it is still important to study the role of the Principal in any research concerning leadership in a school context since arguably the Principal is still the school's Chief Executive Officer.

The Vice-Principal: Compared to the vast literature on the role of the Principal, there is scarce literature on the role of the Vice-Principal (also referred to in the literature as Assistant or Deputy Principal) perhaps because it is viewed as a transitional role to Principalship (Venditti, 2002). The bulk of the studies on Vice-Principals involved surveys concerning perceptions of the roles of the Vice-Principals (J. B. Bush, 1997; Gaston, 2005; Ledbetter, 2004; LeMieux, 2000) or

their satisfaction with this position (Armstrong, 2004), rather than studies of their enactment of leadership.

Heads of subject departments: Heads of Department are mentioned both in the literature on middle management (mainly UK-based) and on teacher leadership (Harris, 2003; York-Barr & Duke, 2004). From the literature, the leadership role of middle managers has been identified as important in contributing to and explaining differences in school effectiveness (Brown, Rutherford, & Boyle, 2000; Busher & Harris, 1999). Indeed, Siskin's study in 1991 indicated a high correlation between effective schools and the strengths of their departments (Siskin, 1991).

Teacher Leaders: Similar to findings on the positive impact of Principal leadership, teacher leadership has been shown to be important in achieving both school and classroom improvement (Muijs & Harris, 2003), yet little is known about how teacher leadership is actually enacted and its impact (Kozma & Anderson, 2002; Murphy, 2005). This is particularly true in the case of the literature on leadership for ICT implementation in schools, where the concept of teacher leadership is not prevalent.

In identifying possible sources of distributed leadership in a school setting, the literature did not provide much operational guideline on how to untangle this 'interactive web' of actors, artifacts and the situation. For such guidelines, there was a need to read beyond the literature on distributed leadership, so as to understand leadership functions particularly in ICT reform.

Leithwood and Duke (1999), in their study of all articles on leadership for schools published in four major administration journals from 1985-1995, identified six distinct leadership functions. Of the six leadership functions identified, instructional and transformational leadership were the most predominant functions, in terms of mention in the literature. A comprehensive model of instructional leadership was developed by Hallinger and Murphy (1985).

The scarce literature on leadership for ICT reforms highlighted leadership practices which alluded to instructional and transformational leadership, although the labels were rarely used. For instance, a consistent theme in research concerned with effective ICT use is the use of ICT to support and improve instruction (Chang, Lan & Chang, 2010; Creighton, 2003; Kevin, 2009), which is also the ultimate aim of instructional leadership (Blasé & Blasé, 2004; Grubb & Flessa, 2006). Many of the strategies highlighted for effective technology implementation are similar to the strategies proposed for instructional leadership: envisioning opportunities for teaching and learning (Sheppard, 2000), providing professional development opportunities (Ertmer et al., 2002), promoting a sense of collegiality (Prain & Hand, 2003), modeling (Baylor & Ritchie, 2002), coaching (Ertmer et al., 2002), encouraging examination of one's beliefs about teaching and learning, and experimentation with new instructional approaches (Hughes & Zachariah, 2001).

Besides instructional leadership, transformational leadership is the one most explicitly linked to the implementation of change (Leithwood & Jantzi, 2005, 2006). Similarly, a critical characteristic of leadership for ICT implementation in schools is the ability to develop and articulate a vision of how technology could produce change (Kearsley & Lynch, 1992).

In summary, the literature on leadership is still dominated by discussions on the role of 'the' school leader - the Principal. Heck and Hallinger (1999) observed a "blind spot" in the research literature in that scholars have largely ignored other sources of leadership besides the Principal (p. 141). There is still considerable scope for research that focuses primarily and centrally on distributed leadership in action, and on how such leadership is created and sustained (Harris, 2005a, 2005b).

RESEARCH AIM

  The objective of the study was to provide insight into the following two research

questions:

  1. How is leadership distributed in a reform involving the use of ICT for instruction?

    - What are the leadership actions enacted?

    - Who enacted these leadership actions?

    - What pattern, if any, is there is in the distribution of leadership?

  2. What factors enable or constrain this distribution of leadership?

METHODOLOGY

  As distributed leadership is intimately dependent upon the context and from specific

situations (N. Bennett, Wise, et al., 2003; Spillane, Camburn, & Pustejovsky, 2008), this study

adopted a naturalistic inquiry approach (Creswell, 2005; Lincoln & Guba, 1985) involving the

case study of a school in the process of implementing a reform involving the use of ICT for

instruction.

  Figure 1 (adapted from Spillane et al., 2004) functions as an advanced organiser to

illustrate how the two main methods of observation and interview are related to the theoretical

perspective of distributed leadership and the three research questions:

Situation

Observe leaders in action at meetings & through emails
Interview leaders about observed & unobserved actions, constraints and support provided

1. How is leadership distributed?

2. What factors enable or constrain this distribution of leadership?

3. How does the leadership that is provided influence the teachers

Observe teachers at meetings and in ICT lessons
Interview teachers for their stance on the use of ICT

Leader (s)

Interview teachers for their experience of leadership actions and how these influenced them
Observe the interactions between leaders & followers during meetings and email correspondence
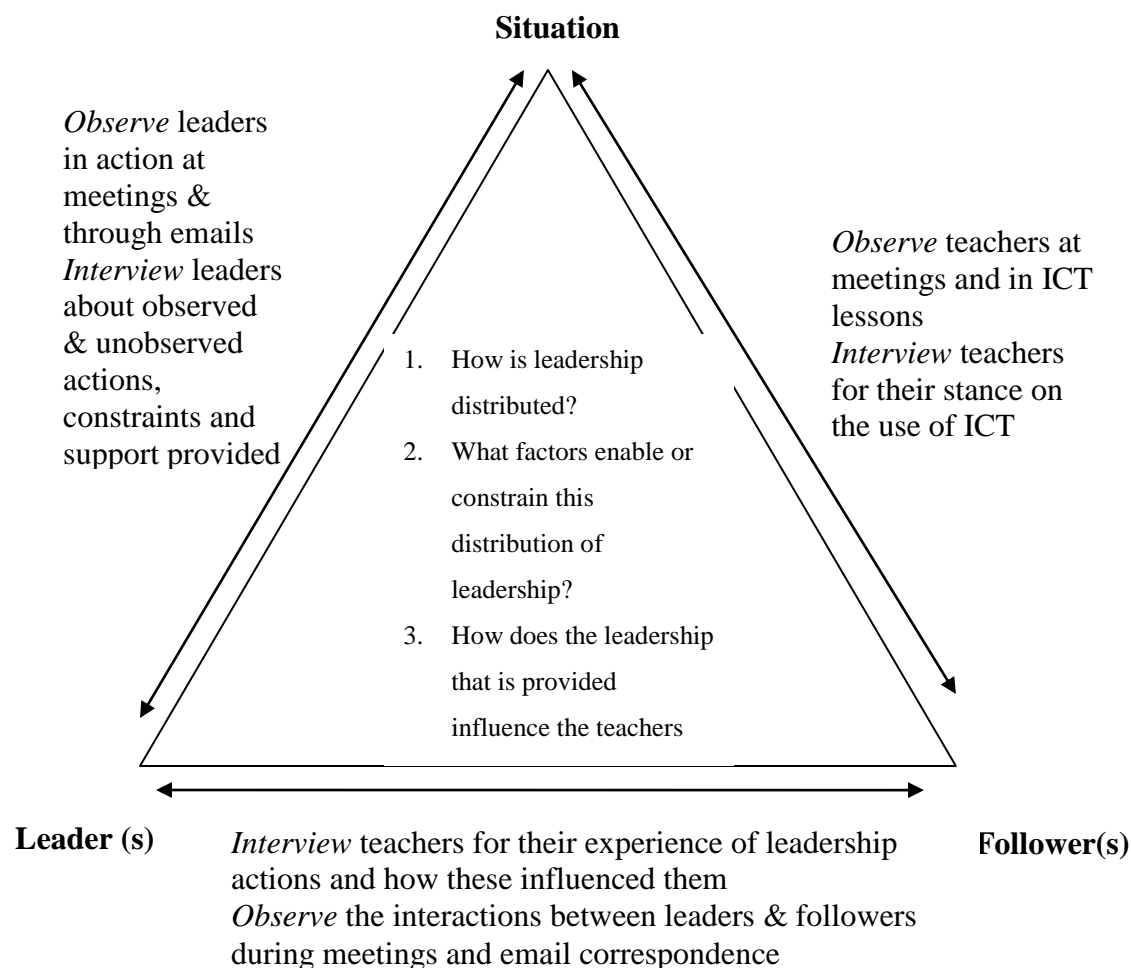
Follower(s)

Figure 1. *Alignment of theoretical perspective, research questions and methodology*

The following table summarises the main methods used for data collection:

Table 1. *Methods of Data Collection*

Method	Data
Observations	- *45 timetabled meetings (approximately one hour per meeting)*
	- *4 meetings involving middle and senior management*
	- *6 workshops*
	- *14 lessons conducted by 4 teachers*

Method	Data
Interviews	- *All Primary 4 teachers (including HOD/Mathematics, Level Manager, Subject Head e-learning, and Senior Teacher who were teaching the Primary 4 students)*
	- *HOD/IT, HOD/English*
	- *Principal and Vice-Principal*
Artifacts	- *Over 150 email correspondence*
	- *Lesson plans and or digital resources for 14 Mathematics topics*

An inductive approach (Patton, 2002) to coding leadership actions was adopted. In coding leadership actions, a deliberate effort was made to use gerunds (verbs ending with 'ing') as advised by Charmaz (2006) to minimise the temptation to impose existing leadership functions (usually translated as noun phases such as 'intellectual stimulation' and 'individualised consideration') onto the data. Examples of themes generated this way included 'aligning with the department or school' (code 1), 'planning ahead for sustainability and scalability' (code 13), and 'creating time' (code 5). It was only after all the data had been coded that the themes generated were compared with the literature to determine how the leadership actions identified were related to existing leadership functions such as instructional and transformational leadership. This comparison of themes generated with the literature enabled the researchers to identify some pattern in the way leadership was distributed.

For the second question on factors which enabled or constrained the distribution of leadership, codes such as 'expertise or formal role' (code 24) emerged from the attributes which participants, both teachers and leaders, associated with specific leaders. For example, Cassie

was referred to by various people as a "guru", "role model", and as possessing expertise in designing spreadsheets and in using ICT.

While the main analysis method was the constant comparative method of data analysis, Activity Theory was adopted as an interpretive framework to help make sense of the discrete codes, and to organise the findings. In Activity theory, human actions are performed within an activity system with the motivation to transform some object or some person (Barab et al., 2002; Engeström, 1999). The activity system includes the subject whose motivation is to transform an object into an outcome, which can be material or intangible in nature (Issroff & Scanlon, 2002).

Selection of Case

In selecting the school and its accompanying ICT reform, the strategy used to choose the school was based on the concept of purposive sampling, with the aim "to maximize information, not facilitate generalisation" (Lincoln & Guba, 1985, p. 202). In selecting one school, the advantage is that the researcher was able to adopt an in-depth and extensive data collection approaches (refer to Table 1). The school chosen for this study, Greenville Elementary, was selected from proposals submitted to the Ministry of Education by 66 schools which were awarded the Lead ICT@Schools scheme end of 2006. This scheme recognises and supports schools that are ready to achieve a higher level of ICT use to bring about active learning.

In Greenville Elementary, the school's stated intention in its proposal was to use ICT as a Mindtool (Jonassen, 1999), which is recognised as a constructivist approach to using technology. As an illustration, the school's intention was to move teachers from using an ICT tool like Geometer Sketch Pad (GSP) to show and tell a geometrical property, to getting teachers to

design a GSP activity which would enable students to work out the geometrical property on their own, guided by the teachers.

Brief Profile of School

Greenville Elementary is located in a relatively poor neighbourhood, with one to two-room rented public housing flats, from which 3.2% of its 1,950 students (2008 cohort) originate. At the senior management (SM) level, the school has a Principal (Ms Wong) and a Vice-Principal (Liz). The Principal is appointed by the Ministry of Education from the educational system (Primary and Secondary Schools). A principal typically leads and manages a school for one appointment cycle (6-8 years) whereupon he/she will be assigned to another school.

Middle Management (MM) in the school included the Heads of Departments (HOD) (Ben Ling as HOD/Mathematics) and Level Heads who were the second line supervisors for specific subjects (Sarah as LH/Science). Similar to senior management, the Heads of Department are also appointed by the Ministry of Education and assigned to schools based on the needs of schools. Besides the various Heads, Greenville Elementary also has a number of Senior Teachers, one of whom was the person officially in charge of the Lead ICT reform (Cassie). The post of Senior Teacher (ST) was created as a parallel teaching track to the Ministry's traditional leadership track. The leadership track is "the track for leadership positions in the schools" while the teaching track provides "advancement opportunities for teachers who make teaching excellence in the classroom the primary focus in their careers" (Ministry of Education, 2006). All the staff are Singaporeans. Table 2 provides brief profiles of the staff who were observed to have provided leadership for the Lead ICT reform:

Table 2. *Profiles of Leaders*

Name	Official Roles	Relevant Details

Name	Official Roles	Relevant Details
Ms Wong	Principal	- 40 years experience - No experience using ICT as a teacher
Liz	Vice-Principal from 2005 to 2007	- 18 years experience - Previously the Head of Mathematics; explored with her dept the use of ICT
Ben Ling (Mrs)	HOD/Mathematics Took over from Liz in 2005	- 15 years - Familiar mainly with PowerPoint
Sarah	Level Head for Science Level Manager for Pri 4	- 15 years
Cassie	Senior Teacher	- 28 years - Appointed as ic of Lead ICT reform

FINDINGS

The objective of the study was to provide insight into how leadership was distributed in a school reform involving the use of ICT for instruction.

How is leadership distributed in a reform involving the use of ICT for instruction?

What were the leadership actions enacted?

It would appear that senior management (SM) at Greenville, was mainly providing leadership for what is referred to as second-order changes, while middle management (MM) appeared to be providing leadership for what is known as first-order changes (Honig, 2003; Leithwood, Jantzi & Steinbach, 2000).

First-order changes refer to changes in the core technology of teaching and learning, including the introduction of constructivist models of learning. Research has indicated that an exclusive focus on first-order changes has led to the failures of many change initiatives. Second-order changes are required to sustain and institutionalise first-order changes, and they generally

involve changes to organisational structure and cultures, *including* the effort to distribute

leadership (Leithwood et al., 2000).

In this study, an example of leadership provided to influence first order changes in

teaching was the modeling by Cassie (ST) and Sarah (Level Head/Science) of both the process

and the products involved in integrating ICT into teaching and learning. It was possible for them

to provide this leadership because of a second order change initiated by senior management: the

introduction of scheduled meetings within curriculum hours, thus circumventing a commonly

mentioned first-order barrier to technology use - lack of time. Thus, the study indicates a link

between first and second-order changes mentioned in the leadership literature and the concept of

first and second-order barriers in the literature on technology implementation in schools (Ertmer,

2005).

Who enacted these leadership actions?

In contrast to the literature on technology implementation in schools where the leader mentioned

is predominantly the Principal (Flanagan & Jacobsen, 2003; Kincaid & Feldner, 2002),

leadership for ICT implementation in Greenville Elementary was distributed among different

sources of leadership. The school has an existing basic organisational structure of departments.

The Principal and Vice-Principal acted as a bridge between the Heads of Departments and other

middle managers such as Sarah (Level Head/Science) and Cassie (ST), as well as teachers, who

were lower in the official hierarchy, ensuring that the priority of using ICT use was supported by

the Department Heads who occupy a "pivotal" position in relation to change efforts in schools

(N. Bennett, Newton, Wise, Woods, & Economou, 2003, p. 3). An example was the Vice-

Principal communicating to the Subject HODs the need to moderate what they normally expect

their teachers to do because of the extra time and effort which the Primary 4 teachers needed to put in to the Lead ICT reform.

What pattern, if any, was there in the distribution of leadership?

The three broad categories (setting directions, developing people, redesigning the organisation) which Leithwood and Jantzi (2005) used to classify transformational leadership can be used to describe the distributed leadership provided by both senior management and middle management in Greenville Elementary.

Setting directions. In setting directions, the leadership provided by senior management was at the strategic school level, while that provided by middle management was at the subject curriculum and project level, which support of the school's overall aim to "get students engaged" (Cassie, Sep 15 meeting). While the Principal and Vice-Principal aligned the use of ICT to the school's strategic thrust of engaging students, middle management focused on aligning the use of ICT to a specific subject curriculum and to the more specific instructional vision of ICT as a mindtool for visualisation and creation of new knowledge.

Besides making explicit their vision for ICT use, senior management also "voiced priorities" (N. Bennett, Wise, et al., 2003) in various ways, such as indicating that completing the mathematics syllabus for examination was not as important as investing the time to engage students in learning with ICT.

Developing people. Instead of the Principal personally providing instructional modeling and coaching, as implied by earlier studies on instructional leadership (Blasé & Blasé, 2000; Southworth, 2002) and on leadership for technology reform in schools (Gibson, 2002; Hughes & Zachariah, 2001), the Principal in Greenville Elementary empowered others to do so by appointing Cassie, Senior Teacher as the official leader of the Lead ICT reform and by providing

scheduled meeting time for Cassie (ST) and Sarah (Level Head/Science) to exercise instructional leadership with the teachers.

Cassie and Sarah, on the other hand, focused on equipping teachers with specific skills and knowledge on technology (such as how to use an Excel spreadsheet and dataloggers), pedagogy (ICT as mindtool, value of using digital mindmaps), subject content and learning theories, through a mixture of conventional workshops, on-the-job, just-in-time 'training' during the scheduled meetings, providing feedback to teachers' lesson plans and conducting demonstration lessons.

In developing people, the leadership provided by senior management is transformational and strategic in the sense of developing the organisation's commitment and capacity to innovate, while the leadership provided by middle management is more instructional in that their focus is on developing teachers to use ICT to directly impact the instruction delivered to students. The two leadership roles are mutually interdependent in that the leadership by senior management nurtures teachers as learners. This in turn supports teachers in their effort to use practical and innovative ICT strategies to nurture their students as effective learners.

Redesigning the organisation and culture. In the original category developed by Leithwood et al. (2000) for transformational leadership, the focus was on modifying organisational structure and on strengthening school culture. This study's contribution lies in differentiating between the roles played by senior and middle management in this category. While senior management had the official authority to redesign time, physical space, and organisational structure, middle management's authority was limited to redesigning their subject curriculum and assessment.

Senior management's redesign of the timetable structure was necessary in order for middle management to have the time to provide instructional leadership to develop the teachers' capacity to use ICT. The lack of time to perform leadership is a problem mentioned by many teacher leaders (Muijs & Harris, 2007; Turner, 2003).

Emotional Leadership

Another leadership function which was performed by both senior management and middle management in Greenville Elementary was the provision of what we have decided to label emotional leadership, for lack of a corresponding term in the leadership literature, the closest concept being emotional intelligence (Barbuto & Burbach, 2006; Goleman, 2006). Emotional leadership consists of different leadership functions found in the literature, including individualised consideration (transformational leadership), providing encouragement and recognition (in both transformational and instructional leadership), presence or visibility (mentioned in instructional leadership and change management) and showing empathy (in change management and emotional intelligence).

We found that senior management created a supportive culture that communicates care and concern for people as individuals, and an understanding of the difficulties faced by the teacher in the process of innovating. As an example, one of the teachers, Mun Fai, said of the VP's chairing of the May 2 meeting, "affirmation" of their effort to use ICT. The findings suggest that senior management's provision of emotional leadership was more significant to the teachers and contributed to a culture supportive of change.

Strategic Management of Resources

Management and provision of resources is also an important aspect of leadership (Divaharan, 2007; Pate, 2006). The Principal and Vice-Principal were empowered to approve the use of the school's budget to purchase resources which were mainly recommended by Cassie. At Cassie's end, her role in providing teachers with access to working ICT resources was mainly a result of her own effort, such as being the first to try out a lesson to iron out technical problems. Both forms of leadership provided teachers with access to the necessary ICT resources.

What factors enable or constrain this distribution of leadership?

Based on the case study, findings on the key enabling factors included the possession of ICT/pedagogy/content expertise, an official position which provides access to resources, the personal working relationships amongst leaders, as well as leaders' access to external expertise to supplement expertise which they lacked.

Division based on Expertise.

The key person providing instructional leadership in terms of ICT use was Cassie. This could be partly attributed to her being officially assigned by the Principal to be "in charge" of the project (Dean, teacher, 2nd interview) but it was also because she had the relevant technological-pedagogical-content expertise (Pierson & Borthwick, 2010) to develop the teachers: she was a very experienced Mathematics teacher who had taught all the six Primary levels, and she had won an MOE award on the basis of her pedagogy and understanding of the value add of ICT. Indeed, the Principal explained that they had "identified" Cassie to lead the Lead ICT reform because "she has the theories behind her" (Principal, 1st interview).

Subject Content Expertise.

However, in terms of subject area, Sarah, Level Head/Science, was perceived to have more expertise in science, and she was considered important in providing leadership for the use of ICT in science. Leadership for the Lead ICT reform, in terms of developing teachers to improve instructional practices using ICT, was mainly shared between Cassie and Sarah, partly due to the differences in their subject content expertise.

Division based on Official Leadership Positions.

When asked about Ben Ling's role in the Lead ICT reform, Dean's reply was revealing: Ben Ling is more on the Mathematics side, *being the Mathematics HOD*. So I think she *is not so much on the IT side*. She's more, *her area is more*, you see during the discussions, she's always focusing on the concept, the Mathematics, ya, not so much on IT. (Dean, teacher, 2nd interview, italics is researchers' emphasis)

It is interesting how Dean's perception of Ben Ling's role is not so much linked to her content expertise but to her official role as the HOD for Mathematics, her position in the organisational hierarchy. While Ben Ling perceived herself mainly "as a teacher participating" in the Lead ICT reform (2nd interview), from the teachers' and senior management's perspective, her main role in the project was as the HOD/Mathematics who was empowered to support teachers in their effort to integrate ICT into the Mathematics curriculum.

Close Working Relations.

There was evidence that the personal relationship between the leaders in the case study impacted how and the extent to which they collaborated in providing leadership. It was interesting that Sarah, Level Head/Science used the word "pakat" to explain that she and Cassie had "arranged beforehand" for her to ask Cassie during a meeting to conduct a lesson for the rest to observe (Sarah, 1st interview). This is a colloquial malay term which is normally used

between children to indicate intimacy in colluding to do something. Cassie confirmed this closeness between her and Sarah in her second interview, in which she shared that she felt "two of us are more on the same wavelength, so sometimes we talk about a lot of things before we get it done, yeah and she is more open lah, yeah."

Leader's Access to Expertise.

Besides possessing technical, pedagogical and content expertise, Cassie, Senior Teacher, was able to provide leadership for the Lead ICT reform because she had access to advanced technical expertise, which enabled her to translate her vision on how to use ICT to enhance learning into actual ICT learning resources.

In developing digital resources, Cassie realised that while she had instructional ideas on how to use ICT to support the learning of Mathematics, she sometimes lacked the technical expertise to translate these ideas into a digital resource. Without access to advanced technical expertise, she would have been "hampered" in her effort to model the effective use of ICT "so as to provide a certain kind of learning experiences". (email from Cassie to researcher, dated July 30).

DISCUSSION

Distribution of Instructional and Transformational Leadership

In the literature there is a scarcity of studies which examined how instructional and transformational leadership are shared by different people (Yukl, 2001). In this study, the researchers summarised the transformational leadership by naming the transformational leadership function performed (such as vision and intellectual stimulation). Although Leithwood et al (2004) differentiated between the effects of the leadership provided by different leadership

sources, such as regional directors and teacher coordinators, they did not explicate the differences in leadership practices. There was no indication of differences between the transformational leadership provided by people who were at different levels in the chain of command.

Distribution of Leadership based on Possession of Expertise

One major factor which determined why and how leadership was distributed in Greenville Elementary was the possession or lack of relevant expertise. As indicated in the literature, the effective use of ICT required a combination of expertise: technical expertise, the ability to identify the affordances of a technology tool, the ability to apply a relevant pedagogy, and content knowledge (Pierson & Borthwick, 2010; Staples, Pugach, & Himes, 2005). Although the literature cited was referring to the expertise required by the teachers using ICT, it is arguable that those who wish to lead the implementation of ICT also need to possess such expertise or at least have access to such expertise, and that such expertise is distributed amongst different people as was found in the findings in this study.

Developing Own Expertise or Drawing upon External Expertise

Expertise as a factor which enables the distribution of leadership presents the possibility of people acquiring this expertise over time and thus contributing to leadership at a later stage. This is a pertinent finding because in the literature on leadership, whether on instructional (Hallinger, 2005), transformational (Leithwood, Jantzi, & Steinbach, 2000) or distributed leadership (Harris, 2005; Timperley, 2005), expertise is usually mentioned as an attribute the 'leader' already possesses. There was evidence in this study that the leadership provided by some of the participants was enhanced by their access to external expertise. Cassie drew upon her husband's technical expertise with Excel to translate her vision for the learning of Mathematics into reality.

<u>Lack of Expertise as a Constraint</u>

As the possession of expertise can enable the distribution of leadership in ICT implementation, the lack of expertise, particularly technological expertise, can also constrain its distribution, which is consistent with and contributes to the literature's finding that leaders must possess the ability to model the use of technology (Gibson, 2002; Kincaid & Feldner, 2002).

In this study, there were several examples in which a lack of technological expertise appeared to have constrained the person's ability to provide leadership, even when the person was officially in a management position or potentially a leader. One example is Mabel, who senior management had hoped would provide instructional leadership for the use of ICT in the teaching of English. However, while Mabel was acknowledged as having expertise in her content area, Liz felt that she was unable to provide leadership for ICT use as ICT was "not her forte" or "strength" (Liz, 2nd interview). Mabel lacked both the technical expertise and the ability to identify how she could use ICT to enhance students' learning of English.

<u>Institutionalised Distribution of Leadership</u>

Another major factor that enabled the distribution of leadership in Greenville Elementary was utilisation of the organisational structure and its corresponding spheres of influence. This is akin to Spillane's concept of the distribution of responsibility by design, through the creation of formal structures or official leadership positions (Spillane, 2006). It is contrary to Copland's argument that distributed leadership "rests on a base of expert rather than hierarchical authority" (Copland, 2003, p. 378). While this study affirms that the distribution of leadership is dependent to a great extent on the possession of relevant expertise, it also suggests that this possession of expertise might need to be reinforced by an official leadership position.

<u>Institutional Hierarchy as a Constraint</u>

Although the organisational structure can be manipulated to distribute responsibility to more people (Spillane, 2006), the structure of an organisation, with its schema of who in the hierarchy has access to what sphere of influence, can also constrain the extent to which leadership is distributed (Harrison, 2005; Turner, 2003). In such a schema, programmes initiated by the HODs are considered distinct from a project initiated by a Senior Teacher, and likely to be considered by teachers to be of a higher priority. As the Principal commented, "The silos, the walls of the silos [referring to department-based silos] are so thick, very hard to break down." (Principal, 1st interview).

That they felt constrained in their spheres of influence and the extent to which they could innovate or push for the use of ICT, in the face of HODs' resistance, was expressed by both Cassie and Sarah, particularly by Cassie whose position as a Senior Teacher was considered lower in the organisation hierarchy than even a Level Head, which Sarah was.

Role of Senior Management in Overcoming Hierarchical Constraints

The constraining effect of the organisational structure was partly alleviated through senior management's exploitation of the same organisational structure and the schema which placed the Principal and Vice-Principal as higher in the hierarchy than the HODs. Whenever needed, senior management would step in on Cassie's or Sarah's behalf to negotiate with the HODs, to influence the HODs to support the Lead ICT reform by doing "the link ups and talk to the person [HOD], and make sure there smooth communication and support needed." (Principal, 2nd interview). In this aspect, the Principal and Vice-Principal were acting as boundary spanners (Coldren & Spillane, 2007) between the HOD community and the community of the rest of the middle managers, just as Sarah was the boundary spanner between the three subject communities

Distribution of Leadership enabled by Interpersonal Synergies

A third major factor which enabled and constrained the distribution of leadership was the presence or lack of synergy amongst the leaders. Although organisational structure can be exploited to 'distribute' leadership in the sense of assigning leadership roles to different people, whether the distribution of leadership results in "conjoint agency" (Gronn, 2002) in which leaders synchronise their actions with that of their peers, depends on the interpersonal relationships amongst leaders. Gronn (2002) identified intuitive working relations as occurring when leaders have a close, mutually dependent working relationship. In Greenville Elementary, such intuitive working relations were observed between the Principal and the Vice-Principal, and between Cassie and Sarah, largely due to their complementary personalities and similarities in their thinking,

Lack of Synergy as a Constraint

While there was no hard evidence that differences in personalities or wavelengths constrained the distribution of leadership in Greenville, there was some indication that it might have inhibited more co-operation amongst the leaders. Cassie shared that she did not feel comfortable working with Ben Ling, HOD/Mathematics, due to perceived differences in their philosophies about teaching and their working styles. While this study suggests that intuitive working relations (Gronn, 2008) could contribute to the complementary redundancy of leadership functions discovered by Heller and Firestone earlier (1995), the study also suggests that the lack of close working relations could potentially result in leaders heading in different directions.

Agency

Finally, although institutionalized structures and expertise were important in enabling the distribution of leadership, it is not our intent to give the impression that people either already

possess the expertise required for leadership or they need to be empowered by the organisational structure to perform leadership. Instead, agency played a key role in the type and amount of leadership provided, which is supported by the literature on leadership (Ogawa, 2004; S. M. Ritchie, Mackay, & Rigano, 2005) and on distributed leadership (Bennett, Wise, Woods, & Harvey, 2003; Harris, 2005).

Personal Motivation to Develop Expertise

A lack of expertise need not permanently constrain a person from exercising leadership, as seen in Sarah's effort to source for readings to increase her expertise in the area of effective use of ICT. Sarah, Level Head/Science, had a refreshingly honest ability to realise that her thinking was "very narrow-minded" (1st interview) which inspired her to explore new ideas and concepts.

Role of Agency in Shaping Structure

As mentioned in the section on Institutionalised Distribution of Leadership, the school had put in place the structure of the Level Manager in its attempt to break the departmental silos. However, it should be noted that simply creating the role of Level Manager might not by itself have led to teachers developing ICT lessons across subject committees. As Cassie pointed out, it was possible for the Level Manager incumbent to "say if English [committee member] ar, you must do English [as in develop only English lesson plans]" (Cassie, Oct 22) since this had been the schema in Greenville Elementary for a long time.

Conclusion

The leadership by senior management and middle management in Greenville Elementary were interdependent and mutually reinforcing in that important leadership functions were distributed amongst two main leadership sources and these leadership functions had impact on one another. Leadership by senior management was critical in enabling and empowering instructional leadership by middle management, while instructional leadership by middle management reinforced the strategic direction set by senior management.

Senior management generally performed transformational, strategic leadership at the school level to effect second order change and to grow the organisation's capacity to innovate, while middle management performed instructional leadership at the project or department level to effect first order change in teaching and learning by developing the teachers' capacity to implement a specific instructional practice. Both senior and middle management were observed to perform emotional leadership and resource management.

Unlike studies which fall into the structure/agency dualism (N.Bennett, Wise, et al., 2003), in which either structure or agency is emphasised, this study's findings suggest that the distribution of leadership requires both agency (existing expertise and the willingness to acquire the necessary expertise, interpersonal synergies, internal motivation, ability to empathise and to transpose existing structures and schemas) and structural support (institutionalized positions with its corresponding spheres of influence and the provision of time), and that neither of these conditions were sufficient by themselves for leadership to be distributed.

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