

FOSTERING SCHOOL-BASED CURRICULUM DEVELOPMENT IN THE CONTEXT OF NEW EDUCATIONAL INITIATIVES IN SINGAPORE

Introduction

The curriculum landscape in Singapore has been undergoing significant changes recently. While there exist a national curriculum and a central curriculum agency, the Curriculum Planning and Development Division (CPDD) within the Ministry of Education (MoE), there is a movement toward what is termed “school-based curriculum development.” This movement can be seen as a consequence of the implementation of numerous educational initiatives progressively launched since the mid-1990s. Such a movement creates new challenges for schools and teachers, and has far-reaching implications for curriculum development, instructional effectiveness, and teachers’ professional development.

This article explores the meanings, challenges, and implications of school-based curriculum development (SBCD) within the context of current educational initiatives in Singapore. SBCD has been of particular interest to many international scholars. There exists a body of empirical studies examining various aspects of SBCD in terms of teacher roles (e.g., Bezzina, 1991; Elliot, 1997; Keys, 2000; Shoham, 1995), student roles (e.g., Brooker & Macdonald, 1999; Mac an Ghaill, 1992), community involvement (May, 1992; Ramsey, Hawk, Harold, Marriot, & Poskitt, 1993), and processes (e.g., Cocklin, Simpson, & Stacey, 1995; Marsh, Day, Hannay, & McCutcheon, 1990; Willis, 1997). These studies have contributed to our understanding about the complexity and challenges that schools and teachers have to face when engaging in SBCD activities. Some scholars examine the meanings of SBCD in the light of the tension between centralized control and decentralized control. For instance, Brady (1995) explores the notion of SBCD in the Australian context of the simultaneous movement toward centralization (the development of a national curriculum) and decentralization (the shift toward self-managing schools) from the 1970s to the mid-1990s. Reid (1987) examines issues concerning curricular decision-making as the British move toward a nationally mandated curriculum, overturning a long tradition of teachers’ and local control over curricular matters.

Our investigation can be viewed as a continuation of the efforts of Brady and Reid in exploring the meaning of SBCD from the standpoint of centralized and decentralized curriculum development. Nevertheless, our exploration of the meanings of SBCD in the current context of a changing curriculum landscape in Singapore indicates certain unique features and implications. In contrast to the U.K. and Australia, Singapore is undergoing a shift in curriculum decision making from its central agency (CPDD) to schools which, we believe, creates a distinct set of problems and challenges. Through this exploration, we attempt to problematize the notion of SBCD through questioning some of its basic assumptions. This task, it seems to us, has been largely overlooked in the literature on SBCD.

To provide a context for the discussion, we start with describing the current changing curriculum landscape in Singapore. We then scrutinize the notion of SBCD and point out the either-or fallacy inherent in its discourse. What follows is a discussion of what we believe SBCD entails in the current context of Singapore, with the introduction of the notion of “school-based curriculum enactment” which better characterizes its main strategy. We then move to examine what it might take for teachers to effectively undertake school-based curriculum enactment in the context of current educational initiatives. This is followed by the discussion of two conditions that, we argue, can foster school-based curriculum enactment in terms of the development of “educative” curriculum materials and teacher professional development.

Changes to the Curriculum Landscape

Singapore’s changes to the curriculum landscape must be understood in their historical context (colonial period: 1819–1959; post-colonial period: 1959–1987). The colonial inheritance was a school system differentiated along medium of instruction lines (English, Chinese, Malay, and Tamil), and within each section, the curriculum, curriculum materials, and assessment were different. The post-colonial effort was directed toward creating a national curriculum and achieving standardization (Gopinathan, 1974; Lim & Gopinathan, 1990). By the 1980s, Singapore had a national curriculum in place, supervised by the Curriculum Development Institute of Singapore (CDIS), a MoE agency. A high-stakes examination system was also in place. Children who passed the Primary School Leaving Examination (PSLE) at the end of Primary 6 would progress to secondary schools, moving from Secondary 1 through Secondary 4 (Special/Express Stream), or Secondary 1 through Secondary 5 (Normal Stream). Students who passed the GCE ‘O’ Level examination at the end of Secondary 4 or 5 would then have to compete for admission to either a Junior College (2 years), a Polytechnic (3 or 4 years), or a Pre-University Center (3 years). Finally, students who passed the GCE ‘A’ Level examination at the end of Junior College Year 2 or Pre-University Year 3, and students with excellent results at the end of Polytechnic Year 3 or 4, would then have to compete for admission to a local university. It soon became clear, however, that too high a degree of standardization had been achieved and that the system had become inflexible to meet the needs of students with diverse abilities. The only exception to this was the introduction of streaming to meet the needs of weaker students and the Gifted Education Program to meet the needs of talented students.

Singapore has now witnessed about 15 years of curriculum reform, both structural and curricular. At the beginning, the most significant reform was a growing commitment to structural decentralization through the creation of the school cluster scheme. In 1997, then-Prime Minister Goh Chok Tong launched the “Thinking Schools, Learning Nation” (TSLN) initiative, asking schools to use pedagogical strategies that would foster creativity and initiative (Sharpe & Gopinathan, 2002;

Gopinathan, 2005). Changes to the curriculum included content reduction, revisions to language syllabi, new social studies curricula, renewed emphasis on citizenship via National Education, and greater emphasis on the sciences via Life Sciences. Underpinning these changes is a major and expansive initiative launched in 1997 to provide schools with computers, software, and teacher professional development to exploit the power of information and communication technology to enhance learning. Significantly, there was very little substantial change to the high-stakes examinations that dominated pedagogical practice.

Following the acceptance of the recommendations of the Junior College/Upper Secondary Education Review Committee (which was appointed by the Minister of Education and composed mainly of senior MoE officers, professors from post-secondary institutions, school principals, and experienced classroom teachers), more significant structural and curricular changes were introduced in 2004. Up to 10% of the top-scoring students in the PSLE are now able to follow an integrated program in schools that will allow them to skip the GCE "O" level examinations. Some junior colleges have now expanded to take in students at Year 9 while other secondary schools have linked up with junior colleges to offer the integrated programs. A Knowledge and Inquiry syllabus has been introduced to junior colleges (years 11 and 12) that aims at broadening the curriculum, developing thinking skills, and allowing students greater choice in subjects and levels at which subjects are offered. A noteworthy feature of these developments is that much of the curriculum is being developed at the school sites.

Further initiatives have followed, including a chance for schools to develop and offer new subjects in the normal academic and normal technical streams, in conjunction with the Cambridge examination authorities. A review of Chinese, Malay, and Tamil teaching has recommended a modularization strategy for Chinese to enable teachers to cope better with diverse pupil abilities. The most recent "Teach Less Learn More" initiative, announced by Prime Minister Lee Hsien Loong in late 2004, will require changes in both the formal and enacted curriculum.

It should be noted that all the above examples of curriculum change and development will be equally demanding at the school level. When teachers are expected to prune, modify, and integrate curriculum materials, it would seem to be within the reach of experienced teachers with perhaps some support from externally based resource persons. However, having to develop an entirely new subject would most likely be beyond the capacity of most teachers.

At the September 2005 Ministry of Education Work Plan Seminar, the Minister, Mr. Tharman Shanmugaratnam (2005), announced further steps to promote innovative practices from the ground. He noted that it was rare for centralized systems to allow such space for schools to innovate but argued that these initiatives were essential in the quest to increase quality, choice, and flexibility. A commitment was made to further cut curriculum content. An option given previously to schools to offer new subjects had resulted in three schools offering computer studies, seven drama,

and three economics. In the quest to open up alternative pathways to better unlock student potential, the MoE announced moves to achieve better articulation between subjects taught in schools and those offered in the Institute of Technical Education and in the polytechnics. Students in some secondary schools will be allowed to study some polytechnic modules after school and during the holidays. Additionally, more elective modules/subjects are to be offered in the Normal Academic and Normal Technical classes.

Though no specific announcements were made with regard to changes in assessment, a cluster of initiatives will give schools greater freedom to use criteria other than examination results to select students. Secondary schools with integrated programs or niche strengths (e.g., sports) can admit a certain percentage based on non-academic criteria. Also, from next year, students selected by schools can sit for one or two 'O' level subjects at the end of secondary 4 instead of waiting until all subjects are offered at Secondary 5. Top Normal (A) stream students will be allowed to skip the N-level examinations entirely and aim instead for the Secondary 5 'O' levels.

The Ministry recognized that, important as these policies are for students, it would be up to teachers and schools to take advantage of the space offered. Teachers are to be given more time during the school week to prepare, reflect upon, and share ideas to make teaching more responsive to student needs. The Minister also announced the setting up of four Centers of Excellence for Professional Development to enable teachers to discuss and share teaching methods (Shanmugaratnam, 2005).

While the above reforms do not, by any means, suggest the abandonment of the centrally-developed national curriculum, taken cumulatively, they suggest a rapidly changing curricular landscape with major challenges and opportunities for the Ministry, schools, and teacher professional development. They have far-reaching implications for curriculum development, instructional effectiveness, teacher preparation, and professional development.

The Concept of SBCD

Before proceeding further, it is necessary to examine the notion of SBCD, which is central to our discussion. The word "school-based" literally implies that all curricular decisions are made at the school level. When paired with the word "curriculum development," it connotes that all activities associated with the creation of curriculum materials, such as planning, designing, producing, implementing, and evaluating, must be conducted at the school level. As Skilbeck (1984) defined it, SBCD refers to "the planning, design, implementation and evaluation of a program of students' learning by the educational institution of which those students are members" (p. 2).

SBCD can be seen as a product of discontent with externally or centrally based curriculum development. Many SBCD advocates reject any curriculum development activities which are not located at the school

level. They argue that centrally based curriculum developers fail to take into account the diverse needs of students and teachers in a particular school. “Top-down” modes of curriculum development, they contend, ignore classroom teachers and provide them with little incentive, involvement, and job satisfaction (Marsh, 1992). The materials developed thus restrict teachers’ professional decisions about the selection, sequencing, and means and modes for imparting the content (Smith, 1983).

Accordingly, SBCD can be viewed as the opposite of centrally based curriculum development, and as a “rallying cry” for the active involvement of teachers in designing, planning, implementing, and evaluating curriculum materials within a particular school (Marsh, 1990). In fact, the early notion of SBCD has a strong relationship to action research. As Elliot (1997) points out, in the 1960s, action research emerged as a tool for school-based curriculum change, which was tied to the goal of creating curriculum that was more meaningful and relevant to students. Through conducting action research, teachers emancipate themselves and become the creators of curriculum for themselves and students. Advocates of action research and SBCD assert that having the responsibility to develop and implement curriculum is crucial to the professional identity of teachers. SBCD is thus principally a way to develop teachers’ professional competence and empower them.

However, SBCD, although promising in many aspects, is not without problems. Empirical studies have shown that adopting the role of curriculum developers creates tremendous demands on classroom teachers; many teachers are not adequately prepared nor do they have the experience necessary to undertake curriculum design tasks (e.g., Cocklin, Simpson, & Stacey, 1995; Hannay, 1990; Keys, 2000). As pointed out by Marsh (1992), among the common problems they would experience are the following:

- lack of time—to plan, to reflect, to develop curricula
- lack of expertise—knowledge, understandings, skills
- lack of finance—for materials, for teacher relief days
- externally imposed restrictions—by employers, parents
- a threatening school climate—numerous resisters, lack of effective leadership (p. 131)

These problems are very real and are often given as the reasons why many SBCD activities have been reluctantly undertaken or have been abandoned by teachers.

Furthermore, when the curriculum development process is confined to being exclusively school-based, without any external or centralized planning, equality and quality issues will surface and will need to be addressed. Students in different schools could potentially have very different curricula, leading to very different learning outcomes (Morris, 1995). Some schools, due to a lack of necessary guidance, resources, and expertise, would produce curriculum materials that are lacking in depth or breadth, or are biased and outdated. The impact on student learning can be unproductive and even harmful. MacDonald (2003) claims that one consequence of

SBCD is that “what occurred in many Australian states and in the USA were less demanding, poorly resourced and loosely assessed curricula” (p. 141).

Beneath the above problems, we observe, lies the either-or fallacy inherent in the discourse on SBCD; that is, the tendency to confine curriculum development to either “school-based” or “centrally based” efforts. The implication is that when SBCD is embraced, one has to reject any external or centrally based curriculum development activities, and that teachers can only be curriculum developers or creators when the curriculum development is exclusively school-based, apart from any direction and guidance provided by external agencies. Consequently, most advocates of SBCD fail to see the possibility that teachers can be curriculum developers even in the context of centralized curriculum development, and that under certain conditions, schools and teachers can turn the implementation of a centralized curriculum into curriculum development activities that are meaningful and specific to the particular situations of different schools or classrooms. We shall now turn to explore this possibility by examining what SBCD entails in the current context of Singapore.

SBCD in Singapore

At the outset, it is important to point out that there are many variations of SBCD. SBCD may typically involve creating new curricular products, but it can also involve selecting from existing curriculum materials and making various adaptations (Walton, 1978). It can be accomplished by individual teachers, groups of teachers, or a whole school staff. In addition, it can be long-termed, medium-termed, or short-termed (Marsh, 1992).

Within a range of SBCD models, the one adopted in Singapore is far less radical. Instead of being skeptical of centrally based curriculum development, the Ministry holds that the existing national curriculum is relatively well-developed and effective—at least in terms of producing students who are competent in various academic subject areas. Therefore, SBCD is by no means construed as an alternative or replacement for the MoE-directed curriculum development. Rather, it is considered a necessary complement to the Ministry’s curriculum planning and development efforts so as to provide more flexibility and choices, and encourage local initiatives and ownership. It can be seen as a tangible expression of the ability-driven school system that the MoE wishes to create.

In general, Singapore’s SBCD model takes the form of adapting, modifying, and translating the externally developed curriculum materials according to the school context:

Principals and teachers should be encouraged to make full use of autonomy given to schools with respect to modifying CDIS texts to suit the needs of their students. Teachers should be encouraged to actively engage in tailoring the curriculum to the needs and interests of their students. Issues relating to the translation of the curriculum into effective classroom practice can be discussed at regular meetings between Heads of Departments (HoDs) and

teachers. Ministry officials (e.g., subject specialists) can act as resource persons and help teachers brainstorm for ideas on improving teaching and learning. Both the Ministry and the schools should provide a supportive environment to engage teachers to introduce and experiment with innovative ideas. (MoE, 1998)

We call this “school-based curriculum enactment.” The centrally developed curriculum materials can include syllabi, textbooks, and resources which provide information on what to teach as well as how to teach it to students of various school ages. Teachers are expected to interpret and transform these materials to achieve curriculum objectives according to their classroom or school situations. They can reorganize or restructure the content within a particular subject area. For example, as reported in the speech by the Minister of Education, Tharman Shanmugaratham (2004), a secondary mathematics teacher, based upon a careful analysis of the current secondary mathematics syllabus and textbook, identified a “knowledge block” that links advanced and elementary topics together. Such a restructuring of content resulted in more effective learning. Teachers can also organize the content around a certain theme, engaging in curriculum integration that might require the cooperation of teachers from various departments. In short, teachers are encouraged to be flexible and creative in using the curriculum materials.

SBCD also takes the form of teachers’ involvement in the “creation” of a new curriculum product. Project Work and the above-mentioned Knowledge and Inquiry syllabus are cases in point. Both are relatively new subjects, and there are no curriculum materials available. Although the syllabi of these two subjects are provided by the Ministry, schools and teachers are responsible for planning, creating, implementing, and evaluating their own materials.

Overall, school-based curriculum enactment represents the primary approach to SBCD in Singapore. This is, indeed, consistent with the observation of Reid (1987) and Brady (1995) on the form SBCD would take when there is a centrally mandated national curriculum in place. As Brady (cited in Bolstad, 2004, p. 9) suggests, SBCD would take the form of curriculum “adaptation” by individual teachers or group of teachers operating within specified parameters rather than of the “creation” of curriculum which might require whole staff involvement. Reid argues that SBCD is not about giving schools complete and total decision making about what and how to teach, but about giving schools greater responsibility for curricular decision making than they customarily have had.

Several fundamental questions remain when school-based curriculum enactment is adopted as the principal approach. In what sense are teachers curriculum developers? How can school-based curriculum enactment be fostered in a highly centralized educational system? To address these two questions, we examine what school-based curriculum enactment entails and what it might take for teachers to enact externally developed curriculum materials in the context of current educational initiatives in Singapore.

School-Based Curriculum Enactment

From the perspective of curriculum enactment, curriculum is viewed as the educational experiences jointly created by students and the teacher. The externally developed curriculum materials are seen as “tools for teachers and students to use as they construct the enacted experience of the classroom” (Snyder, Bolin, & Zumwalt, 1992, p. 418). A teacher is not simply a conduit for the use of curriculum materials; he/she interprets, modifies, and enacts the materials according to the particular situation of a specific classroom or school. School-based curriculum enactment entails a reconstruction of the curriculum materials that is sensitive and responsive to the classroom and school realities. Teachers are seen as active agents in the planning, designing, and enacting of curriculum experience in particular classroom contexts. They are curriculum developers in the sense that they create their personalized versions of the externally developed curriculum.

The enactment approach, overall, entails a different way of thinking about curriculum, curriculum materials, and the role of teachers from the one that underpins current classroom practices in Singaporean schools. In Singapore, curriculum is widely viewed as what is taught in schools, curriculum materials like syllabi and textbooks as the stuff to be delivered, and the role of teachers as the one of deliverers. In other words, the adoption of the enactment approach calls for a fundamental shift in teachers’ conceptions or beliefs about curriculum, curriculum materials, and the role of teachers.

Furthermore, curriculum enactment is inevitably a complex endeavor. When teachers enact the externally created curriculum materials in and with their classes, they work across five intersecting domains, in terms of students, curriculum materials, instructional resources, learning environment, and school context (Ball & Cohen, 1996). Each of these domains implies a specific challenge to teachers—particularly beginning teachers—if they are to teach according to the expectations of current educational initiatives.

First, teachers start with their understanding of students. They need to know what students already know and what they might bring to instruction—their interests, motivations, possible alternative conceptions, and different ways of thinking. Furthermore, they need to discern and anticipate the needs of students. They also need to know the ways students learn best. Teachers are expected to “discover how each of their students learn and customize the approach for each of them adapting the curriculum provided by MoE HQ [headquarters]” (Lim, 2005, p. 7). In short, knowledge of students provides a necessary starting point for curriculum enactment which takes into account the classroom situation in a particular school. It also provides a necessary condition for achieving the “Teach Less Learn More” initiative, which places a high emphasis on students learning and understanding. It is also essential to the development of learning-centered environments, which is discussed below.

Second, teachers work with the syllabi and instructional materi-

als, interpreting and modifying them in the light of their specific classroom situations. They fashion and transform the materials into learning experiences that are meaningful and cater to the needs of particular students. Most crucially, they need to identify the “big ideas” (i.e., important concepts, issues, and themes) that underlie a particular topic to be taught. They also need to know the interconnections among these ideas and the progression involved in developing a particular idea so that the significance of the topic can be understood by students. This, we believe, is essential to the implementation of the “Teach Less Learn More” initiative. Teaching with a focus on important ideas and relationships underlying the subject matter facilitates students’ understanding of that subject matter and their application of it to different contexts (Bruner, 1960; Prawat, 1989). If this principle is understood, then the pruning of excessive content is more easily undertaken. Being able to identify big ideas and interconnections is also important for planning and designing curriculum integration and project work as well.

Third, in order to design instruction, teachers select tasks and models through navigating various instructional resources, and they are expected to plan instructional activities that are meaningful and relevant to students. Teachers and students are expected to “tap into a growing wealth of educational resources outside the school” (MoE, 1997, p. 1). Teachers need to monitor interactions with students in determining what constitute educationally worthwhile curriculum experiences.

Fourth, teachers create and maintain a classroom environment that is learner-centered and supports higher order thinking and independent learning. They are expected to “move from being constrained to teach by the curriculum to using it as a spring-board for students to explore their interests” (Lim, 2005, p. 7). Teachers and students are encouraged to “communicate and collaborate with other educational institutions, local and foreign, and the community at large” (MoE, 1997, p. 1).

Fifth, teachers need to know the contexts of their schools and the educational system. They cannot be concerned predominantly with action relating to how to teach specific topics; they must be concerned about policy issues as well. Curriculum enactment needs to be informed by their understanding of the issues and trends in the broader community and the context in which they work, and by the expressed ideas and concerns of parents, school administrators, and policymakers. They need to understand and interpret policies about the goals of instruction and about educational initiatives, and their interpretations play a role in the way they enact the curriculum (Ball & Cohen, 1996).

Taken together, school-based curriculum enactment creates significant demands on classroom teachers. It entails the need to develop new beliefs about the curriculum, curriculum materials, and the role of teachers. It requires teachers to work across the five intersecting domains, making informed decisions on what to teach and how to teach it. Helping teachers to develop new beliefs and enhancing their knowledge and understanding in relation to the five domains are crucial for effective curriculum enactment activities. Given the complexity and difficulty of the

task, an essential ingredient is the development of both curriculum materials and teacher professional development programs that take into account the complexity and challenges inherent in curriculum enactment. We turn now to discuss the development of curriculum materials that support, rather than constrain, the active role of teachers in classroom enactment activities.

The Role of Curriculum Materials

It is useful to compare teaching with acting. In acting, an actor or actress can find inspiration and ideas through reading and analyzing a good script, even though the script is written by someone else. The professional identity of an actor or actress rests upon the art of acting, not the art of script writing. Similarly, in terms of teaching, a teacher can gain support from well-developed curriculum materials, even though the materials are not written by teachers themselves. The professional identity of a teacher, in a similar fashion, is centered upon the art of teaching, not the responsibility to write curriculum materials.

Using externally developed materials does not prevent a teacher from acting professionally. Providing schools with educationally sound curriculum materials is crucial since teachers generally do not have the time, resources, and expertise to write their own materials. Teachers need support and guidance, especially in the teaching of difficult topics. Furthermore, centrally developed curriculum materials can “ensure that all pupils have access to a curriculum which has some common elements and that all pupils achieve some minimum levels of competency” (Morris, 1995, p. 95). In contrast to many SBCD advocates, we believe that centrally developed curriculum materials, if they are carefully designed, support, rather than hinder, curriculum development activities which are school or classroom-based. These materials need to be developed with close attention to the complexity and challenges of curriculum enactment by school teachers. By this, we do not mean the kind of teacher-proof materials that provide teachers with detailed prescriptions on how to implement curriculum materials. What we have in mind are materials that have the potential to enhance teachers’ capacity to transform the materials into teaching and learning experiences that are meaningful and educative for students in particular classrooms. The key to this is well designed materials that can narrow the gap between what is intended by curriculum innovation and by teachers’ practices.

Our idea finds support in the works of Ball and Cohen (1996), Brown and Edelson (2003), Collopy (2003), and Davis and Krajcik (2005)—works concerning the development of “educative” curriculum materials that have the potential to promote teacher learning in addition to student learning. According to Ball and Cohen, curriculum materials can be an effective agent that enables classroom teachers to create meaningful and educative experiences in a particular classroom context, if the materials were designed to “place teachers in the center of curriculum construction and make teachers’ learning central to efforts to improved instruction” (p. 7). These materials

need to be designed to contribute in the above five domains essential to school-based curriculum enactment.

Curriculum materials could help teachers to develop a better understanding of who their students are. Characteristics of student intake and views toward subjects, school culture, and expectations, etc., position students in particular ways regarding their readiness for instruction. Materials could provide information on students' common learning difficulties, preconceptions, and typical approaches to particular topics or units. They could also provide teachers with specific methods or techniques that allow them to tap what students already know and what they might find difficult in learning a particular topic. This could help teachers to anticipate what learners might think about or do in response to certain instructional activities. Careful attention to students could be particularly useful in situations where achievement levels in certain subjects are low and teachers struggle with their teaching.

Curriculum materials could also support teachers' understanding of the content they are supposed to teach. This is particularly important in contexts where teachers' mastery of content knowledge is weak and/or where opportunities for professional development are limited. Materials could address issues concerning important ideas and their relationships in teaching a particular topic to students of a particular age. They could also address the development or progression of a particular topic or unit across time, helping teachers to consider ways to relate units during the year (Ball & Cohen, 1996). In addition, they can also provide teachers with necessary background information and different ways or perspectives of looking at a topic to be taught. This, we believe, can support teachers in the process of interpreting, modifying, and reorganizing the curriculum content according to the particular needs of their classroom situations.

The materials can expand and enhance teachers' curricular resources and pedagogical repertoire. They can provide teachers with a wide range of curricular resources such as textbook series, teacher guides, educational software, videos, and internet web sites. They can also recommend to teachers particular pedagogical methods, activities, models, and tasks that may enable effective curriculum enactment in their particular classrooms.

Furthermore, curriculum materials could support teachers in their pedagogical decision-making process. Materials are especially useful when they make visible the developers' pedagogical judgments with respect to particular tasks or activities. They could "speak to" teachers about the ideas underlying particular tasks or activities rather than merely guiding their actions (Remillard, 2000, p. 347). In so doing, the materials could educate teachers while promoting their autonomy, and help them to make professional decisions about how to adapt the materials to their classroom situations (Davis & Krajcik, 2005).

In short, when curriculum materials are designed to enhance teachers' understanding of students and content to increase the curricular and pedagogical resources of teachers and help them to find productive ways of adapting materials in classroom contexts, teachers' abilities to

respond to the particular needs of students are strengthened rather than confined. Their roles as developers of meaningful curriculum experiences are enhanced rather than limited.

We do not yet know much about how best to design these materials. Much research and development work is needed if we are to develop “educative” curriculum materials for classroom teachers. We think the following nine heuristics, identified by Davis and Krajcik (2005, pp. 10–12), provide a useful starting point for thinking about how to develop these materials:

1. Support teachers in engaging students with topic-specific scientific phenomena.
2. Support teachers in using scientific instructional representations.
3. Support teachers in anticipating, understanding, and dealing with students’ ideas about science.
4. Support teachers in engaging students in questions.
5. Support teachers in engaging students with collecting and analyzing data.
6. Support teachers in engaging students in designing investigation.
7. Support teachers in engaging students in making explanations based on evidence.
8. Support teachers in promoting scientific communication.
9. Support teachers in the development of subject matter knowledge.

While they are grounded in science teaching, we believe that these heuristics are useful when designing curriculum materials in all different subject areas. However, the development of educative curriculum materials needs to be accompanied by new and more powerful continuing professional development activities.

Teacher Professional Development

Apart from educative curriculum materials, teacher professional development can play an important role in supporting teachers in undertaking school-based curriculum enactment activities. This requires that school-based curriculum enactment be an essential part of professional development curriculum, and that professional development programs and activities be developed in a way that takes into account the complexity and challenges teachers encounter in the undertaking.

Fostering school-based curriculum enactment demands professional development opportunities for teachers—opportunities that will help them to enhance their knowledge and develop new classroom practices. Professional development programs and activities must enable teachers to understand what is expected of them in undertaking school-

based curriculum enactment, and support them to make necessary adjustments to their classroom practices. It is important to help teachers to develop the skills and procedures entailed in designing, planning, creating, and evaluating curricular experiences through selecting and modifying curriculum materials. In addition to this technical aspect of curriculum enactment, professional development programs and activities need to provide teachers with opportunities to enhance their curricular and instructional resources, and to develop new knowledge and understanding about students, subject matter, the role of teachers, curricular and instructional resources, learning environments, and school contexts, which requires, among other things, having their existing beliefs and assumptions questioned and transformed.

Traditional professional development programs or activities, which focused primarily on equipping teachers with specific skills and procedures through training workshops and short courses, are woefully inadequate for supporting teachers to undertake school-based curriculum enactment activities in the context of current educational initiatives. There is a need to develop programs and activities that focus on helping teachers to develop curricular and instructional repertoires or resources, new knowledge and understanding, and new instructional practices. The development of these programs and activities needs to stand up to the complexity and challenges teachers would encounter. It needs to be grounded in a sound understanding of school-based curriculum enactment driven by current reform initiatives. The analysis presented in this article only represents an initial attempt to think through what it might take for teachers to engage in school-based curriculum enactment activities. There is a need for more research—both conceptual and empirical—that can enhance our understanding of the complexity and challenges of school-based curriculum enactment in Singapore.

Professional development activities need to move from traditional workshops and short courses toward long-term and continuous learning in the context of the school and the classroom. Drawing upon the literature that analyzes the needs and modes of teachers' professional development in the context of educational reforms, we put forth a set of conditions that seem to be crucial to teacher learning in the service of implementing school-based curricular changes in our current context (Darling-Hammond & McLaughlin, 1996; Lieberman, 1996; Little, 1993; McDiarmid, 1995; Nelson & Hammerman, 1996; Talbert & McLaughlin, 1993). We hope that this set of conditions will stimulate thinking about how to develop teachers' professional development programs or activities that can foster school-based curriculum enactment in the context of educational reform initiatives.

- Teachers need to have opportunities to understand clearly the assumptions underlying school-based curriculum enactment and to figure out the implications for their practices. In other words, they need to have an intellectual engagement with the rationales and ideas.

- Teachers need opportunities, especially in a secure and non-threatening environment, to examine their beliefs and practices. Only then will they be able to undergo a fundamental shift in their conceptions about the curriculum, curriculum materials, and the role of teachers.
- Teachers need greater and more varied opportunities to interact with colleagues, both in and out of the school. They need to be part of active, larger communities that can provide support and ideas.
- Teachers need opportunities to observe school-based curriculum enactment activities in accord with the new policy directions. They need mentors or coaches who can teach them in ways that are consistent with the directions.
- Teachers need the support and advice of a principal or a head of department who understands the demands school-based curriculum enactment places on teachers and what it takes to change teachers' roles and practice.
- Teachers especially need time and mental space. While school-based workshops are desirable, there is also a need to experience learning in new and different contexts, and with teachers not from one's own school. Support for professional development must be sustained and long term.

While these conditions are mostly about professional development programs and activities for in-service teachers, we believe many of them can be extended to teacher preparation or initial teacher education programs that aim at preparing teachers to carry out school-based curriculum enactment within the context of current educational initiatives.

Concluding Remarks

In the current context of educational initiatives in Singapore, SBCD does *not* mean changing schools from being places that primarily implement the externally designed curriculum to becoming places responsible for creating their own curriculum materials. Rather, it means primarily that schools have more autonomy in designing, planning, and creating educational experiences through selecting and adapting curriculum materials in the light of their particular situations and needs. This, of course, does not exclude the possibility that schools create their own curriculum materials when there is a need.

For pragmatic reasons, this article has only addressed two conditions—the development of curriculum materials and teacher professional development—that can foster school-based curriculum enactment activities. It is important to point out that school-based enactment activities are embedded in multiple layers of context (i.e., students, departments, school organization and system, parents, community and culture, and assessment/examination policies), each of which has the capacity to shape how

teachers enact curriculum materials (Talbert & McLaughlin, 1993). A fuller and more comprehensive account of school-based curriculum enactment needs to take into account these various contextual factors. We hope that this article serves as a useful starting point for further investigations.

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