

**SUPPORTING TEACHERS TO ENACT
INTEGRATIVE PRACTICAL ACTIVITIES IN CHINA**

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DISSERTATION

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PREFACE

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CHAPTER 1

Introduction and overview of the study

This chapter introduces a study about supporting teachers in the enactment of 'Integrative Practical Activities' in China. Section 1.1 explains the origins of the study. Section 1.2 describes the context of the study. The aim and research questions are presented in section 1.3. The research approach adopted in the study is explained in section 1.4. Section 1.5 provides an overview of the subsequent chapters.

1.1 ORIGINS OF THE STUDY

This study is about the design and implementation of the course on *Integrative Practical Activities* (IPA) in the city of Guangzhou (Guangdong Province), as part of the recent curriculum reform in the People's Republic of China (China). The study focuses on the use of exemplary curriculum materials as a major component of a professional development arrangement to prepare teachers for the implementation of this curriculum innovation. In this section, both the practical context (the curriculum implementation of IPA) and the research background (the use of exemplary curriculum materials in teacher professional development) will be briefly introduced. More elaborate information about these origins will be offered later on.

1.1.1 Curriculum implementation of IPA

A major problem in basic education in China is that recitation prevails over inquiry. Students are taught to receive, to memorize and to imitate. To change this situation, one of the objectives of the recent curriculum reform, launched in 2001 by the Ministry of Education (MOE), is to advocate students' active participation in learning activities and to foster students' exploration and hands-on activities. Students need to obtain abilities in collecting and processing information,

acquiring new knowledge, analyzing and solving problems, as well as communication and cooperation (MOE, 2001a). Another aim of the curriculum reform is to strengthen the comprehensiveness, flexibility and diversity of the curriculum structure. For this reason, “inquiry-oriented” courses such as IPA are added to the curriculum so as to make the content of the courses more integrative in primary and secondary schools. The course Integrative Practical Activities evolved from the course “Activities” that the “*National Curriculum Plan of Nine-year Compulsory Education*” promulgated by the State Education Commission in 1992 required in the primary and secondary schools (SEC, 1992). It is a practical course which is based on students' direct experience, closely linked with social life and the lives of students themselves, and reflecting on the comprehensive application of basic knowledge and skills. The design of IPA is not only suited to meet the needs of personality development of students, but also meets the needs of social development. It is an important feature of curriculum reform in basic education (for the ages 6-17 years).

To illustrate the concept of IPA, an example of ‘good’ IPA practice is provided below:

“Investigation on issues of mobile population in Babaoshan area” (Beijing Jingyuan School, 2003)

Some schools carried out integrative practical activities with strong local characteristics and practical significance. The following introduces an example from Jingyuan School in Beijing.

A group of ten students in Grade 10 of the school noticed that there was a large and varied group of people working in construction sites, vegetable markets, hotels and restaurants, and hair salons. They lived in every corner of the city and were inextricably linked with the daily life of the urban residents. However, the floating population did not have the identity of urban residents. What kind of people are they? Why do they leave their homes to the city they were not familiar with? How about their life? What effects do they bring to our city? With interest in this series of questions, students tentatively approached them and started their investigation on the living conditions of floating population.

They undertook IPA through questionnaires, interviews, and on-line access to information. During three months, they went outside the campus five times to visit farmers market, restaurants, hair salons, street vendors. They interviewed 174 persons and sent 200 questionnaires. Also, they interviewed the deputy director of the Babaoshan police station in charge

of the management of floating population about the situation. Moreover, before writing their research report, they accessed online to collect information about floating population under the guidance of the teacher. From the investigation, the students concluded that the migration of rural labor force to cities was a universal social phenomenon, and that this trend will increase. A large number of rural labor force migrating to cities will help to promote rapid economic growth of our country. The floating population supplements the urban structural labor shortage effectively. It was conducive to narrow the gap between urban and rural population, and it was expected to gradually solve the long-standing fundamental (unfair and unjust) opposition of urban and rural isolation. Students also put forward proposals to solve the existing problems of the floating population. Students realized that they got to better understand the importance of population issues in the geography class. Students had a relatively clear understanding of the causes of the floating population and development trends. They truly felt the living conditions of the floating population, and their sense of social responsibility was enhanced. Students learned how to engage in social surveys, how to write a report, how to select and collect information. They learned how to interact with strangers, how to cooperate with the classmates to complete a task, and how to overcome difficulties. Students did experience and master a new way of learning - inquiry learning.

According to the requirements of the new curriculum reform, IPA should be offered for the students in primary and secondary schools from 2005 on. As IPA is a new course, teachers are not well-prepared and have a lack of experience in teaching IPA. They therefore need support to implement IPA.

Although MOE (2001b) provides schools with the curriculum standards for IPA, there is no concrete content and no textbooks are provided for teachers and students. Teachers need guidance about how to decide on the topics and contents for students, how to organize and supervise group work, how to guide students to work out plans and design questionnaires, how to lead students during out of school activities for conducting investigations and interviews, how to direct group students to write a research report and to design and deliver a presentation. Thus, teacher professional development seems urgently needed. This study aims to investigate how teacher professional development can be arranged to support teachers in the implementation of IPA.

1.1.2 The use of exemplary curriculum materials to support curriculum innovation

How to support teachers for successful implementation of new curricula, is a central issue in the research program of the Department of Curriculum Design and Educational Innovation of the Faculty of Behavioral Sciences of the University of Twente, the Netherlands. The research program studies the design and use of exemplary curriculum materials as a way to prepare teachers for implementation of an innovation. An evolving strand within the research program has been the use of exemplary curriculum materials embedded in teacher professional development. Exemplary curriculum materials refer to curriculum materials designed to support the initial implementation efforts of teachers. The design and classroom use of exemplary curriculum materials is regarded as an effective component of teacher professional development. Van den Akker (1988) started to explore the potential of exemplary curriculum materials with regard to the implementation of primary science education. He indicated that curriculum materials with clear and concrete guidelines helped teachers to deal with anticipated problems during the initial phase of implementation of innovations. Procedural specifications for lesson planning and execution should focus on the essential but vulnerable parts, namely: lesson preparation, subject matter, teaching patterns, and evaluating learning effects.

Many studies have followed on this research theme. For example Voogt (1993) investigated exemplary curriculum materials in the implementation of courseware in secondary physics and social science respectively. Voogt integrated ICT into inquiry-based physics teaching. She found that teachers who used teacher guides with student materials performed considerably better than those who used only student materials for preparation of their lessons. Van den Berg (1996) and Roes (1997) studied the integration of exemplary curriculum materials in-service education. Van den Berg stated that providing only curriculum materials was not enough for teachers to implement innovations. Curriculum materials systematically embedded in teacher professional development could inspire teachers to try new things and facilitate them to change their beliefs and behaviors. The potential of exemplary curriculum materials has also been investigated in the context of Africa. Thijs (1999) explored peer coaching for supporting science curriculum reform in Botswana. Ottevanger (2001) investigated the effects of curriculum materials with procedural specifications for supporting the new science curriculum implementation in Namibia. Mafumiko (2006) investigated

exemplary curriculum materials supporting teachers with implementation of micro-scale chemistry teaching in Tanzania. Teclé (2006) explored the potential of a professional development arrangement with curriculum materials for supporting biology teaching in Eritrea.

These series of investigations (which will be discussed more extensively in chapter 2, also in relation to other literature) have aroused my interest in the potential of exemplary curriculum materials in the context of curriculum reform in China. So I embarked on a project to investigate the potential of a teacher professional development arrangement including the use of exemplary materials for supporting teachers in the curriculum implementation of IPA.

1.2 CONTEXT OF THE STUDY

1.2.1 Overview of Chinese education system

Education in China comprises of four sectors: basic education, occupational/polytechnic education, higher education and adult education.

Basic education comprises of pre-school education (3 years), primary education (6 years), junior secondary schooling (3 years) and senior secondary schooling (3 years). Pre-school education is for children between 3-5 years and takes place in kindergartens. Primary education is for children between 6-11 years. Primary schools are usually supervised by local educational authorities, although there are some private schools owned by enterprises and individuals.

The nine-year compulsory education in basic education covers primary and junior secondary schooling. Since the Compulsory Education Law of the P.R.C. in 1986, governments at all levels have actively promoted nine-year compulsory education and made remarkable achievements. As Fang (2009) reported the population coverage of nine-year compulsory education was more than 99%. The gross enrollment rate increased and the dropout rate reduced, especially in underdeveloped western regions.

Vocational education mainly consists of secondary specialized schools, vocational secondary schools, and vocational technical colleges.

Higher education has junior colleges, and includes bachelor, master and doctoral degree programs. The junior college program usually lasts 2-3 years; the bachelor program is 4 years (but 5 years for medical and some engineering and technical programs); the master program lasts 2-3 years; and the doctoral program 3 years.

China's higher education is characterized by various forms, which encompass basically all branches of learning, combines both degree-education and non-degree education and integrates college education, undergraduate education and graduate education. Figure 1.1 presents the structure of the education system.

		Age	Grade				
Higher education		22		University (4-5 years)			
		21					
		20		Junior College (3 years)	Vocational Technical College		
		19					
		18					
Secondary education		17	12	Senior secondary school (3 years)	Secondary specialized school (3 years)	Vocational secondary school (3 years)	
		16	11				
		15	10				
		9 year compulsory education	14	9	Junior secondary school (3 years)		
			13	8			
			12	7			
			11	6			
	Primary education		10	5	Primary school (6 years)		
			9	4			
		8	3				
		7	2				
		6	1				
		5					
Preschool education		5		Kindergarten (3 years)			
		4					
		3					

Figure 1.1 Structure of the Chinese education system (MOE, 2003)

1.2.2 Recent curriculum reform in China

Since the founding of the People's Republic of China in 1949, several curriculum reforms have taken place in basic education. The most recent curriculum reform began in 1999. The reform brings about fundamental changes in goals, structure, content, implementation and evaluation, which will be explained in the remaining part of this section. It is called the most profound reform in recent 60 years in China. The experimental new curriculum was first piloted in 38 cities and counties in 2001. Until 2005 the new courses were popularized throughout the country. From 2005 to 2010 the new system has been gradually put into operation on a nationwide scale.

Background of the new curriculum reform

From the early 1990's, several developed countries realized that the knowledge economy and technological development are very important for the international economic competition in the future and have impact on the comprehensive national strength (OECD, 1996). They began to launch curriculum reforms in basic education, which orientated education to the 21st century.

These international developments were a major reason for China to reform basic education. The new curriculum reform aims to meet the requirements of the era. Although there have been major developments in basic education in China since 1980s, some problems remained. The first one is overemphasizing knowledge acquirement while neglecting the development of students' ability to apply knowledge and skills to solve problems. The second one is that recitation prevails over inquiry. Students are taught to memorize for tests and cram their heads full of references. This dampens students' creativity. The third one is that schools throughout the country use a set of unified textbooks with contents that are numerous, difficult, inaccurate and outdated (MOE, 2001a).

Objectives of the new curriculum

The current curriculum reform is designed to bring forth a new generation of citizens, who are competent enough to serve China's modernization drive. The objectives of the new curriculum reform (MOE, 2001a) are the following (see Table 1.1):

- *Goals.* To shift from a narrow perspective of knowledge delivery in classroom instruction to a perspective towards the development of students' all-round abilities, desires and abilities of life-long learning.
- *Structure.* To reform the weakness of overemphasizing the independence of disciplines, too many subjects, and lack of integration, so as to strengthen the comprehensiveness, flexibility and diversity of the curriculum structure. The emphasis will be put on the integration of subjects in teaching at the primary and junior middle school level whereas teaching at senior secondary school level will be carried out according to the divisions of the subjects.
- Some "inquiry-oriented" courses will be added to the current curriculum system to make the content of the courses more integrative for primary and secondary schools. The new courses including integrative practical activities (IPA) will bring a brand-new course schedule for the students and teachers.
- *Content.* To shift from out of date and very abstruse curriculum content to the basic knowledge and skills in relation to the lifelong learning of students.

- *Teaching materials.* To reform teaching materials so that they take into account: differences in region and culture, students' social, physical and mental development, and the development in science and technology. In addition, the diversity of teaching materials will be increased and the development of scientific and adaptable teaching materials will be promoted.
- *Learning and teaching process.* To reform the tendency of overemphasizing reception, memory and imitation in the teaching process; to advocate students' active participation in various learning activities, such as communication, cooperation and inquiry; to improve the ways of learning, and to enable students to become the masters of learning.
- *Evaluation.* To reform the tendency that evaluation and examination overstress knowledge memory, and focus on the functions of selection and discrimination, while ignoring the function of improving students' development. To establish an evaluation system, which not only focuses on the results, but also on the process.
- *Management.* To shift from centralization in curriculum management to a more decentralized structure at three levels of curriculum management at the state, provincial and school level in order to improve the adaptability of curriculum. Besides courses regulated by the state, provincial education administrative departments can also develop or select suitable courses depending on the situations in local social and economic development. Local and school-selected courses can occupy 16 to 20 percent of the total class hours, compared with 84 to 80 percent of state-selected courses.

Table 1.1 *Comparison between old curriculum and new curriculum*

CURRICULUM	Old	New
Goals	Knowledge delivery	Student development in three dimensions: knowledge and skills, process and methods, affective and value
Structure	Subject-centered, isolation among subjects	More integrated, life-oriented, comprehensive, flexible and diverse
Contents	Difficult, complex, partial, old	Relevant to the development of modern society and technology, and student life
Teaching materials	Unified	Diverse, scientific and adaptable
Ways of learning	Passive receiving knowledge	Active, inquiry learning and problem solving
Evaluation	Knowledge and memory	Multiple indicators and methods
Management	Centralized	Three levels: national, regional and school

Implementation of the curriculum reform

In recent years some have criticized that the ideas of the curriculum reform are overly "idealistic" and not suitable for China (Wang, 2006). For example Jiang (2005) indicates that the new curriculum standards of math in compulsory education are in the wrong direction. Compared to several mathematics syllabuses before, the total level of the new curriculum standards is substantially reduced. According to the 'new curriculum standards', it is difficult to cultivate students the abilities of analyzing problems and logical reasoning, not to mention innovative ability (Jiang, 2005). Teachers report that they do not know whom they should listen to because of the different sayings of different experts (Li, 2005). Guo (2010) states that the new curriculum reform "*wears new shoes to walk on the old path*". Some acknowledge the achievements of the new curriculum reform, but also point out the existing problems and put forwards strategies for improving the new curriculum reform. For example, Liao (2010), reviewing the new curriculum reform in senior secondary schools, acknowledged the innovations in curriculum rationale, curriculum system and student learning assessment.

Reflecting on the implementation of the curriculum reform, some issues are worth considering:

- The theoretical basis of the new curriculum reform blindly copied foreign educational theories, such as post-modernism and constructivism. They do not meet the reality of Chinese education. The curriculum reform is lacking a clear theoretical support (Guan, 2010; Hou, 2010; Wang, 2004, 2006, 2008, 2009; Zhang, 2006).
- If the examination and evaluation system reform does not change simultaneously, it becomes the bottleneck of the curriculum reform. As the college entrance examination is the baton of evaluation, static knowledge is still the center of the curriculum contents and the way of course learning is mainly to accept static knowledge, which makes the notion of the new curriculum reform "to change the tendency of too much emphasis on knowledge" and the target of cultivating students of various abilities very hard to accomplish (Hou, 2010; Liao, 2010).
- There exists imbalance between urban and rural areas in the process of curriculum implementation, differences between primary and secondary schools (Hou, 2010; Ma, 2009). These imbalances and differences are mainly in the funding, the quality of faculty, and the provision of curriculum resources.

- The education of pre-service teachers does not connect with the new curriculum. Teacher training emphasizes concepts and theories, and does not provide effective guidance and exemplary examples for teaching; the effects of in-service teacher training are limited, irrelevant and ineffective. And there is lack of good practice cases, materials and curriculum resources to support classroom teachers (Guan, 2010; Hou, 2010; Ma, 2009).
- Teacher professional qualities do not meet the requirements of the new curriculum reform (Guan, 2010; Hou, 2010; Zhang, 2006). For example, the attitudes of some teachers are not positive to the new curriculum reform, sometimes even negative. They are unwilling to make adjustments and changes in their teaching practice.. The curriculum reform requires teachers to develop curriculum resources, but in fact a lot of teachers lack the capacity to do so. IPA is the new course offered by the curriculum reform, but it faces the problem of shortage of appropriate competent teachers.
- Some of the textbooks do not really reflect the required curriculum standards (Hou, 2010; Liao, 2010; Zhang, 2006). Some knowledge offered in the textbook is too difficult and not close to the real life, however, the learning time arrangements of the textbooks is unreasonable, they are difficult for students to understand and accept.
- The expansion of curriculum reform experiments in senior secondary schools has been too quick. Some reform ideas have not been tested in practice and failed (Liao, 2010). The involvement of stakeholders in decisions about curriculum reforms is lacking (Liao, 2010; Zhang & Ren, 2008).

Some suggestions for improving the curriculum reform put forward by several researchers can be summarized as follows:

- The government should increase the financial input in rural issues (Guan, 2010; Hou, 2010; Ma, 2009). Especially to improve the professional qualities of rural teachers, for example, to increase the development and utilization of network resources, providing teachers in rural areas with the successful experience of curriculum reform and demonstration of outstanding teachers teaching through various media.
- Reform the college entrance examination system (Hou, 2010; Ma, 2009; Zhang, 2010). Entrance examinations should stress quality assessment, which is comprehensive, and addresses the goals of the curriculum reform, i.e. to be able to solve practical problems and the awareness of the problem discovery.

- Revise the textbooks. Writers of textbooks should listen to the views and suggestions of teachers and students from the front-line so that the textbooks could meet the requirements of curriculum standards as much as possible.
- Readjust teacher training according to the curriculum reform and focus more on school-based research and training. Experts should enter classroom, work together with teachers, and study the classroom practice in depth (Guan, 2010; Hou, 2010).
- Increase the cultural environment construction of the school and advocate the construction of learning communities (Guan, 2010; Hou, 2010). Hou (2010) proposes schools should establish a culture of cooperation, participation and change. First, the school community members need all-round cooperation, more exchanges and communication, more sharing and dialogue, more understanding and caring, so as to reach mutual understanding and consensus. Second, school leaders should encourage the school community members to actively participate in the new curriculum reform. Third, schools should try to build a culture of self-change. If schools can form a top-down and bottom-up change in the combination mode, the effectiveness of the new curriculum reform will be better.
- Adjust the curriculum programs (Hou, 2010; Liao, 2010; Ma, 2009). Hou (2010) and Ma (2009) propose that the designers and implementers of curriculum reform programs should maintain regular communication with stakeholders resulting in better and more feasible curricula.

1.2.3 Integrative Practical Activities (IPA) as a new course

Properties and characteristics of IPA

IPA has its own unique function and a relative independent value; it is complementary to other courses. Compared with other courses, the characteristics of IPA (Guo, 2001; Tian, 2007; Zhang, 2007) are as follows:

- *Integration.* The themes of IPA come from the individual life and social life of students. The themes that are selected for IPA must embody the integration of individual, society and nature, as well as the integration of science, art and moral. IPA must be based on the integrated world of human life and individual integrity, based on the overall development of each student.
- *Practicality.* IPA probes the curriculum resources on the basis of real life and the social practices of students. It does not construct curriculum on the logical sequences of subject knowledge. IPA stresses first-hand experiences of students. It requires students' active participation in various activities, such as 'hands-on',

'investigation', 'experiment' and 'inquiry' etc. It also requires students to observe and learn from real life to develop practical and creative abilities.

- *Openness.* IPA devotes to the development of each student's character and respects the special needs of every student's development. Its objectives and contents are open. For the different students in different classes, schools and districts, their contents of IPA are not specified but various. IPA orientates to the living world of students. It focuses on the colorful learning experiences and the individual creative performance of students in the process of activities. The criterion of its evaluation is diverse.
- *Generation.* The generation of content is determined by the process-orientation of IPA. Each class and each school makes its own overall plan for IPA. On the one hand, there is a well-conceived overall design for implementing IPA. On the other hand, teachers and students are asked to take own initiatives in the design and implementation of IPA. Each activity is an organic whole and is not a mechanical assembly process based on the intended targets. The new objectives and new themes are generated jointly with the continuous development of the activity. Students are interested in the process of learning and deepen their recognition and experience gradually. Creativity is encouraged.
- *Autonomy.* IPA respects the interest and preference of students, which provides wider space for students to fully develop their autonomy. Students choose their objectives, the content, the modes of learning and their teachers. They determine the ways of presenting the outcomes of activities. Teachers only give necessary guidance to the students and do not overtake students' responsibilities.

Main content of IPA

The main content of IPA consists of inquiry learning, community service and social practice, labor (work) and technology education, and information technology education. The following explains the four aspects in detail:

- *Inquiry learning.* Under the guidance of the teacher students choose their inquiry topics from nature, society and their own life, based on their own interests, and they actively obtain knowledge, apply knowledge and solve problems. Inquiry learning stress that students strengthen their awareness of inquiry and innovation, learn scientific research methods and develop the abilities of applying knowledge comprehensively by practice. Through the learning activities, students experience an active, cooperative and inquiry approach to learning.

- *Community service and social practice.* Students actively participate in the community and in social practice activity in order to obtain direct experiences, develop practical abilities and enhance their social responsibility. Through community and social practice, the linkage between school and society can be improved, and the spiritual state, moral awareness and practical abilities can be continuously promoted so as to improve student character.
- *Labor and technology education.* The aim is to help students obtain positive work experiences and develop good technology literacy. IPA emphasizes that students engage in operational learning, and the combination of hands and brains. Students understand necessary common technology and professional division of labor, and develop their initial technical awareness and technical abilities in practice.
- *Information technology (IT) education.* IT education in IPA aims at helping students to develop information literacy skills needed in the knowledge society. It includes developing students' awareness and abilities of using IT, the ability of identifying the tremendous information available through IT, and the development of healthy information ethics. IT is not only an important means of effective implementation of IPA, but also an important content of IPA.

In addition to the four designated domains described above, IPA also includes a large number of non-specific domains, for example, the activities of the class and Young Pioneers, the traditional activities of the school (science and technology festival, sports festival, and arts festival), communication between students, individual or group psychological health activities etc. These activities may integrate with the specific activities; they may also be offered alone.

In sum, the designated domains and the non-specific domains complement each other. They together constitute the rich content and various forms of IPA.

In the new curriculum system of basic education, IPA and each subject area form an organic whole. Both of them not only have relative independence, but also have a close relationship. Specifically, there are three relationships between IPA and subject areas. First, knowledge of each subject field may be extended, synthesized, reorganized and promoted in IPA. Second, the problems found in IPA and the skills obtained in IPA may extend and deepen the process of each subject teaching. Third, IPA may be taught together with other subjects. Therefore, to manage the relationship between IPA and other subjects properly is a significant and creative task.

Evaluation of IPA

Evaluation is an important part of carrying out IPA. It aims to promote the development of students.

- *Rationale of IPA evaluation.* The evaluation should take the course, teaching and evaluation as a whole. Teachers and students could be the evaluators of IPA. The students' performance in IPA and products could be as the basis for evaluation. Focus on the process evaluation of student activities in order to promote the development of students.
- *Methods of evaluation.* Evaluation methods are various. Teachers should record and describe the performance of students in IPA by observation. This is the basic requirements for adopting a variety of methods. The methods are portfolio assessment, works demonstration, report etc.
- *Contents of evaluation.* Contents are composed of the following aspects: the attitude and behavior of students to participate in IPA, the development of the innovative spirit and practical ability, the mastery of learning and research methods.

Table 1.2 summarizes the main aspects of IPA (Guo, 2001; MOE, 2001b, 2001c; Tian, 2007; Zhang, 2001, 2007; Zhong, 2008),

Table 1.2 *Main aspects of IPA*

	Main aspects
Overall aims	Through student practice, students enhance their sense of exploration and innovation, learn scientific research methods, develop the abilities of applying knowledge comprehensively, to enhance close ties between the school and society, to foster the social responsibility of students
Characteristics	Integration, practicality, openness, generation, autonomy
Contents	Inquiry learning; community and social practice; labor and technology; information technology
Ways of learning	Dynamic and diverse, developing the ability of independent learning, cooperative communication and coordination
Evaluation	Focus on process, combine student self-evaluation with mutual evaluation of students and teacher evaluation , authentic assessment, portfolio assessment

Principles about the implementation of IPA

Teachers and students cooperatively develop and implement IPA. The follow principles guide the implementation of IPA (Guo, 2001; Zhang, 2007):

- *To handle the relationship between the autonomous choice and active practice of students with effective and proper guidance of teachers*

Students choose themes autonomously, and active practice in IPA is the key. First, students need to develop problem awareness and be able to find problems of interest from daily life. Second, students should be able to choose topics. Third, teachers adopt various ways of organizing activities in the phase of development of the topics, such as: personal independent inquiry, team cooperative inquiry, class cooperative inquiry, cross-class and cross-grade cooperative inquiry, cross-school cooperative inquiry and cross-region cooperative inquiry. Fourth, during the process of topic inquiry, IPA advocates to follow the principle of “experiencing practice, exploring in-depth”. It proposes that students learn methods from personal experience and teachers guide students to carry out persistent and in-depth exploration.

Teachers should guide students’ activities effectively. The guidance on the content of IPA is to create situations so that students find relevant problems and to guide students to choose inquiry topics suitable to them and related to the problem situation. The ways of guidance on IPA advocates team guidance and cooperative teaching. It should not bestow the right of guidance only to teachers in some subjects, or the teacher in charge of the class, or the teacher specialized in undertaking the guidance of IPA. It should bring the wisdom of all teachers together to guide the IPA cooperatively.

In short, teachers should not “teach” IPA and pass the buck or let students alone. Teachers should combine their guidance with encouraging students’ independent choice and active practice organically.

- *To handle properly the relation between the schools’ overall plans of IPA and the generation of objectives and topics in the process of activities*

IPA should focus on embodying the characteristics of a school. The school should make overall plans. It is suggested that each school push out three types of interlinked plans on the basis of the features of the school and the community where the school is located, that is, “the school plan of IPA”, “the grade plan of IPA” and “the class plan of IPA”.

Together with the development of IPA activities, students may give rise to new objectives, new problems, new value and the new design of results in the process of inquiry.

- *To be flexible in the use of class hours for IPA*

The arrangement of class hours of IPA should be flexible. The three class hours of IPA per week can be arranged flexibly according to the requirements of the activity. Class hours can be put together or divided into several parts. For example, the class hours can be put together in one time unit, or collected for

several weeks together to use them in one day, or the time for IPA and certain subject can be put together to be used according to needs.

- *To integrate the school curriculum with extramural curriculum*
 IPA should break the bounds of school and classroom, integrate the school curriculum with the extramural curriculum, merge formal education with informal education, and encourage schools and students to make use of two-day weekends, festivals and holidays to carry out IPA.
- *To design and implement the four designated domains in the way of mergence*
 To design and carry out the four designated domains of inquiry-based learning, community service and social practice, labor and technology, and IT education, is the primary requirement of IPA. Each school should merge the four domains together in integrative themes or integrative programs according to the curriculum resources of region and school, and the contents of four domains penetrate mutually so as to reach the ideal state of integration.
- *To integrate IT with the contents and the process of IPA*
 IPA should merge IT with the content and the process of IPA organically. It should integrate the content of IT with other content of IPA. Next, within IPA information means should be applied, such as network technology, to extend the scope of time and space to promote the implementing level of IPA. Thirdly, the design and application of IT should devote to create a learning and problem situation which promotes student reflection and cooperative inquiry so as to avoid falling into pure skill training.

1.2.4 Studying IPA enactment through a curriculum lens

A useful lens to study IPA is offered by the typology of curriculum representations as distinguished by Goodlad, Klein and Tye (1979), and later adapted by van den Akker (1998, 2003). Box 1.1 provides an overview of those curriculum representations.

Box 1.1 *Linkage between typology of curriculum representation (van den Akker, 2003)*

Curriculum representations		
Intended (policy makers and designers)	Ideal	Visions (rationale underlying a curriculum)
	Formal	Intentions as specified in curriculum documents (e.g. textbooks, teacher guides)
Implemented (teachers)	Perceived	Interpreted curriculum
	Operational	Actual instructional process
Attained (students)	Experiential	Perceived learning experience
	Learned	Learning outcomes

Clarifying the various representation forms of curriculum (and analyzing their discrepancies in practice) is especially useful for understanding the problematic efforts to change the curriculum. The following will explain the typology by taking the IPA curriculum at the secondary school level as an example.

IPA is a new course in the new curriculum reform. It fully embodies the ideas behind the new curriculum reform, which is to cultivate student's abilities of hands-on activities, expression, association and organizing in order to improve the all-round development of students. It is favorable to realize the shift from "examination-oriented education" to "quality-oriented education", and to change the educational situation of "high scores with low ability" of students. Although IPA is a national required course, it has not the curriculum standards and the unified textbooks national courses usually have. It seems inevitable that these ambitions are confronted with great difficulties in the implementation of IPA.

Ideal curriculum

The ideal curriculum refers to the original assumptions and intentions of the policy-makers and designers, culminating in new goals for students to be learned in the school. The Ministry of Education (2001a, 2001b, 2001c) outlined the objectives of the new curriculum reform and goals of the IPA curriculum (see section 1.2.2 & 1.2.3).

Formal curriculum

The formal curriculum refers to the written curriculum documents and the concrete curriculum materials, such as student materials and teacher guides that are developed, based on the ideal curriculum. The curriculum guides (MOE, 2001a, 2001b, 2001c) outlined the aims of the IPA curriculum for the primary and junior secondary schools (Grades 3-9) and senior secondary schools. These goals aim at that students:

- obtain the experience of participating in inquiry personally;
- acquire the ability of discovering and solving problem;
- can collect, analyze, and make use of information;
- learn to share and cooperate;
- develop scientific attitude and scientific ethics;
- have social responsibility.

However, the topics are not specified, and curriculum materials need to be developed by schools and teachers themselves. When asked what kind of guidance documents (issued by the state) are most needed, the answers of the principals were: curriculum standards and guide for curriculum implementation (Feng & Wang, 2009). Cui and Yu (2004) reported that about 2/3 teachers who had used the IPA curriculum guide did not think it was helpful. It is more helpful to provide typical examples for teachers (Cui & Yu, 2004). About 72% teachers thought it was necessary to provide a teacher's guide and 60% of the teachers felt it was necessary to provide curriculum materials for students.

Perceived curriculum

This perceived curriculum represents the curriculum as it is interpreted by the teachers in the schools. Teachers' interpretation of the innovation can be the start for professional development activities related to the innovation. Teacher professional development needs to align with teacher's learning goals, the students' learning goals and the local school environment. According to the curriculum guide, it is presumed that teachers and students should find problems available for student inquiry, design and develop lesson plans as well as curriculum resources. These plans and resources are critical since students do not have their own textbooks. However, due to the lack of quality materials, resources, and an accompanying teachers' guide, it becomes the teacher's responsibility to arrange for all the requirements in the lesson plan (Sheng & Li, 2009; Zhang, 2006). Feng and Wang (2009) indicated from their investigation that principals and teachers reported a shortage of IPA curriculum resources. Except a few key schools in developed areas that have produced some curriculum resources, other schools (especially those in underdeveloped areas) are short of curriculum resources in varying degrees. It is urgent to develop available curriculum resources in various forms (Hu, Han, Wen & Li, 2005; Zhu, 2004).

Based on the report of Cui and Yu (2004), nearly half of the teachers who had guided IPA did not attend the IPA training of teachers. Feng and Wang (2009) stated that about 38% had never participated in any training programs and the majority of them require different forms and contents of training. Therefore, the majority of teachers did not clearly understand what the intended curriculum means. Some teachers perceived that the goal of IPA is simply to arrange some activities for their students to take part in.

Operational curriculum

The operational curriculum expects teachers to adopt teaching methods to inspire students to be actively involved in their learning process. The outline of the new curriculum reform (MOE, 2001a) and the IPA curriculum guide (MOE, 2001b) emphasized the guiding role of teacher in the implementation of IPA. The guide suggested that teachers timely find out difficulties students encounter during the activity and their demands in order to provide targeted guidance. At different stages of learning, the focus of the guidance by the teacher will be different. The IPA implementation poses serious challenges to teachers. It requires teachers to adjust instruction based on various factors. As the limitation of teachers' quality and teachers' lack of systematic professional development, some of them do not know how to implement the course and how to provide appropriate guidance to students (Feng & Wang, 2009; Guo & Jiang, 2006; Hu, Han, Wen & Li, 2005; Zheng, 2009; Zhou & Ye, 2004). It leads to poor effects and students gain little from it.

The new curriculum reform advocates a new rationale for evaluation, such as combining formative evaluation with summative evaluation, the adoption of portfolio and rubrics etc. However, how to use the various forms of evaluation in practice is a crucial problem for teachers (Guo, 2010; Guo & Jiang, 2006; Hu, Han, Wen & Li, 2005; Zhou & Ye, 2004).

Cui and Yu (2004) reported that about 20% teachers did know how to guide students to conduct research. Teachers mainly employed lectures, leading students to existing conclusions instead of providing information, enlightening on questions, introducing methods and clues. Feng and Wang (2009) also stated a similar conclusion. As some teachers could not distinguish IPA from an activity course, they confined the activity inside the school and students had not the opportunity to go out of their classroom and school for field observations, investigations and interviews etc. Therefore, there is discrepancy between the formal curriculum and the operational curriculum. Teachers need to be supplied with exemplary curriculum materials, and need to be trained and get practice on how to use these materials in their classroom.

Experiential curriculum

The experiential curriculum relates to the curriculum as it is experienced by the students. As there was no practical IPA curriculum materials offered for students, students often did not understand IPA and did not know how to participate. Cui and Yu (2004) reported that some students felt that the greatest difficulty they

encountered was that they did not know how to undertake the research activities. Because of insufficient time arrangements for IPA and because of safety considerations, students normally were required to search information online and then make slides for a presentation based on the information found. Hence, the students perceived IPA as a bored and inutile subject, and their way of learning did not change.

Feng and Wang (2009) reported that more than half of the students (57%) in their study liked IPA very much, while 40% of the students liked IPA. Only 3% of the students disliked IPA. With regard to the reasons they like IPA, 46% of the students thought they could discuss the problem they were interested in, while 45% of the students indicated the hands-on activities. Students stated that their interest in learning was increased, they liked to explore problems, and they were more willing to cooperate with classmates.

Attained curriculum

This type of curriculum primarily refers to learning outcomes (knowledge, skills, attitudes, experience and development) of students. The IPA curriculum guide (MOE, 2001b) mentioned that teachers should adopt formative evaluation and place emphasis on the process and methods of learning in order to determine the outcomes of students. The content of evaluation should fully focus on attitudes towards learning, methods of learning, communication and cooperation, and hands-on practice. However, Jiang (2007) stated that most teachers did not pay close attention to formative evaluation, but only focus on the final products of students (summative evaluation). Thus, the learning outcomes such as changes in attitudes, experience, learning methods and practice ability were not taken into consideration.

Based on the analysis of the IPA curriculum for the China primary and secondary level, it can be concluded that there are large discrepancies between the intended and the implemented curriculum, as well as between the implemented and the experiential an attained curriculum. This also means that there is discrepancy between the ideal IPA curriculum and the attained curriculum of the students. For this reason it is important to pay specific attention to the implemented curriculum in order to reduce the gap.

This study intends to investigate how the gap between the intended and the implemented curriculum can be reduced by introducing exemplary curriculum materials embedded in a professional development arrangement.

1.3 AIM OF THE STUDY

The purpose of this study is to explore the potential of a teacher professional development arrangement that aims at supporting teachers in the implementation of IPA in educational practice. It focuses on supporting the teachers with exemplary curriculum materials for promoting students' inquiry skills and IT skills in secondary education. The main research question that guided this study was formulated as follows:

What are characteristics of a teacher professional development arrangement, in which curriculum materials are embedded that adequately support teachers in the enactment of IPA?

To answer this research question, the study has been guided by the following sub-questions.

1. What are the characteristics of exemplary curriculum materials that support teachers in the enactment of IPA?
2. How should a teacher professional development arrangement (that includes such materials) be structured?
3. What is the impact of the professional development arrangement on teachers' teaching of IPA?
4. How does teachers' teaching of IPA impact students' learning of IPA?

1.4 METHODOLOGY OF THE STUDY

Design research approach

This study adopted a design research approach by designing and evaluating exemplary materials embedded in a professional development arrangement to support teachers' enactment of IPA. Design research is a problem-oriented, utility-oriented and theory-oriented research methodology aimed at reducing the uncertainties in designing and developing educational interventions in dynamic situations and at generating concrete recommendations for quality improvement. The design research is specified by its two purposes (Plomp, 2009; van den Akker & Plomp, 1993; van den Akker, 1999, 2009; van den Akker, Gravemeijer, McKenney & Nieveen, 2006): i) supporting the development of prototypical

products; and ii) generating methodological directions for the design and evaluation of such products.

Van den Akker (1999, 2009) declared that design research approach is particularly relevant and appropriate for educational development in developing countries because of its potential impact on the professional development of participants and its capacity to build on that development. Studies adopted design research in developing countries (Mafumiko, 2006; Motswiri, 2004; Ottevanger, 2001; Teclé, 2006) show great promise in enhancing the effectiveness of the education interventions.

Design research appears to be a promising and appropriate approach in China where in most cases research does not emphasize the usability of its findings. Most studies have weak links with educational practice. These research results are not useful for the implementation of innovations and for guiding educational practice.

Overall design of the study

By following the design research approach, this study progressed through three main stages: preliminary investigations, prototyping and summative evaluation. Figure 1.2 presents the overall research stages and the research activities of the study. The white parts indicate the development process of curriculum materials. And the grey parts show the development process of the professional development arrangement.

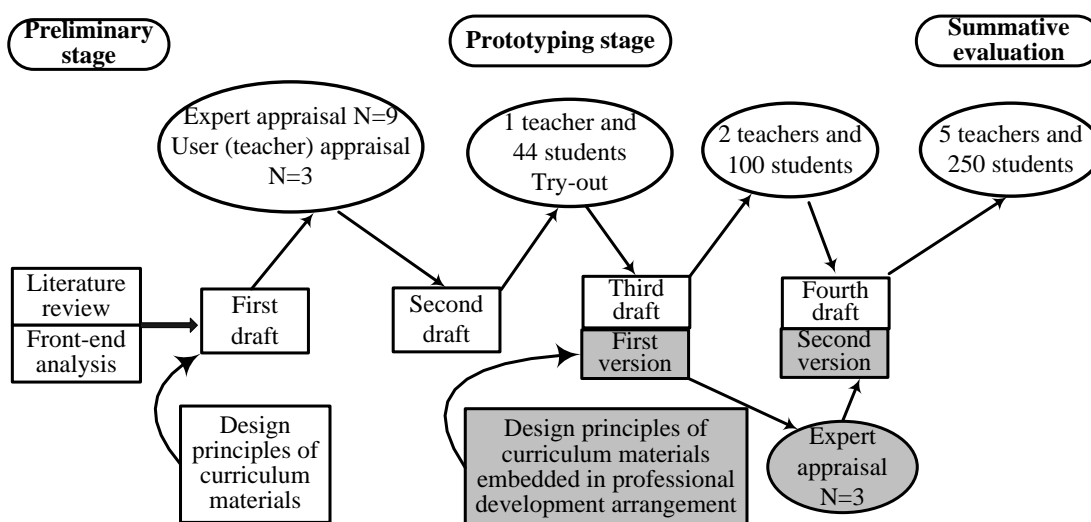


Figure 1.2 The design and evaluation process of curriculum materials embedded in professional development arrangement

Preliminary stage

Several preliminary investigation activities were conducted before the start of the actual development of the exemplary curriculum materials embedded in the professional development arrangement. First, a literature review was performed on IPA, inquiry learning, student and teacher learning, exemplary curriculum materials and professional development. Second, a front-end analysis on the situation of IPA implementation in secondary schools was undertaken. Third, expert consultations were conducted. These activities led to the initial design guidelines for the development of the exemplary curriculum materials embedded in the professional development arrangement.

Prototyping stage

This stage primarily focused on the development and formative evaluation of the successive prototypes of the exemplary materials embedded in the professional development arrangement. During the prototyping process, a number of cyclic and iterative activities of design-evaluation-analysis-revision were conducted to improve the validity and practicality of the prototypes. Expert appraisal, user appraisal, try-out and field testing were applied during formative evaluations in the prototyping stage.

Summative evaluation

In this stage, the potential impact of the final version of the exemplary materials embedded in the professional development arrangement was empirically assessed with participating teachers and students by employing the Guskey (2000) model of evaluation. The impact study enabled the researcher to make an overall judgment about the usefulness and impact of the exemplary materials embedded in the professional development arrangement.

More specific information about the research methods applied will be offered in the forthcoming chapters.

1.5 OVERVIEW OF FOLLOWING CHAPTERS

The research activities and findings of the study are presented in the subsequent chapters. Chapter 2 reviews literature on curriculum enactment, exemplary curriculum materials and teacher professional development. These provide

state-of-the-art knowledge for the development of the exemplary curriculum materials and the professional development arrangement. Chapter 3 describes the front-end analysis of the study. Chapter 4 reports the design and formative evaluation activities of the exemplary curriculum materials. Chapter 5 describes the design of the professional development arrangement. The design and results of the first field test is reported in chapter 6. Chapter 7 and 8 presents the design and results of the second field test. The latter two chapters report the summative evaluation of the professional development arrangement. Finally, chapter 9 discusses the main findings of the study and reflects on the research methodology and intervention, and gives recommendations for further study.

CHAPTER 2

Teacher learning with a view to curriculum enactment

This chapter presents an overview of relevant literature and implications for developing the intervention – exemplary curriculum materials embedded in a professional development arrangement. The chapter commences with a brief discussion of perspectives about curriculum implementation and the role of the teacher. Section 2.2 analyses teacher learning from the perspective of curriculum enactment. Section 2.3 discusses how teacher professional development can be arranged to prepare and support teachers in the enactment of curriculum reform. The potential of curriculum materials for teacher curriculum enactment is explored in Section 2.4. Section 2.5 presents the implications for the intervention.

2.1 PERSPECTIVES ON CURRICULUM IMPLEMENTATION

Perspectives of the teachers' role in curriculum implementation have undergone several changes in the last decades. The "enactment" perspective is increasingly replacing the "fidelity" perspective on implementation. This trend puts even more emphasis on teachers' key role in curriculum change.

Initially curriculum implementation has been viewed as the process of strict application of a proposed curricular change. It stresses teachers to adopt the planned use and to faithfully follow curricular prescriptions from external sources (Fullan & Pomfret, 1977). This perspective is called the *high fidelity* approach.

Next, the mutual adaptation perspective can be distinguished (Bermin & McLaughlin, 1974; McLaughlin, 1987; Reiser, Spillane, Steinmuller, Sorsa, Carney, & Kyza, 2000; Snyder, Bolin & Zumwalt, 1992). *Mutual adaptation* represents a midpoint in the continuum of implementation. It is seen as that "process whereby adjustments in a curriculum are made by curriculum developers and those who actually use it in the school or classroom context" (Snyder et al., 1992, p.410). Teachers make adaptations of the intended curriculum to the context.

The third perspective is curriculum enactment (Ben Peretz, 1990; Clandinin & Connelly, 1992; Craig & Ross, 2008; Snyder et al., 1992). *Curriculum enactment* views the curriculum as the educational experiences jointly created by students and teachers. Teachers and learners together create their own curriculum realities.

In the enactment perspective the teacher is seen as an integral part of curriculum construction and enactment in and outside the classroom. Regarding the teachers' role in curriculum implementation, Ben-Peretz (1990) pointed out that teachers are essential for the implementation of curriculum materials. Teachers are actively involved in the process of curriculum implementation as adaptors and modifiers of curriculum materials according to their specific situation, which is crucial for successful implementation of innovations into the educational system. The interpretation how to use curriculum materials is a vital stage in teachers' lesson planning. Teachers interpret and reconstruct curriculum materials for specific classroom situations and for particular students. As Shulman (1990, viii) said: "Teachers must be prepared to serve as acute critics, analysts and adaptor of curriculum." Teachers are creatively and reflectively involved in the curriculum process. In the enactment perspective of curriculum, teachers are regarded as curriculum makers (Clandinin & Connelly, 1992; Craig & Ross, 2008). It calls for researchers to work with a group of teachers engaged in a collaborative study of their practice in classroom and listen to teachers' voice and stories.

This study adopts the term "curriculum enactment" to highlight the autonomy of teachers and students in their classroom practice when they carry out IPA. It underlines that teachers need to be actively engaged in the design and enactment of curricular interventions. Their involvement in the design process leads to their deep engagement with both the content and the pedagogical issues of IPA teaching.

2.2 TEACHER LEARNING

The teacher is the main influential factor affecting the enactment of curriculum changes in the school context (Fullan, 2007). For changing the acting and thinking of teachers a learning process is needed. Changes are needed in three dimensions (Fullan, 2007): (a) use of new teaching materials; (b) adoption and demonstration of different behavior, in a didactical, pedagogical, and organizational sense, and the consequential 'unlearning' of existing roles and routines; (3) changing views and attitudes concerning the profession, the student's role, and the own role.

2.2.1 Student learning and the role of the teacher

Over recent decades the emphasis in literature on learning and learners has been shifting from traditional behaviorism to constructivism (Bransford, Brown & Cooking, 1999; Brown, Collins, & Duguid, 1989; Merrill, 1991). Research on student learning highlights the following key characteristics:

- Learning is a process through which learners construct their knowledge by modifying or revisiting existing ideas (Bransford et al., 1999; Cobb, 1994). Knowledge is individually constructed and socially co-constructed by learners based on their interpretations of experiences in the world. Since knowledge cannot be transmitted, instruction should consist of experiences that facilitate knowledge construction.
- Learning is situated and should occur in authentic settings (Merrill, 1991). The knowledge is situated in the activity of the learner and is a product of that activity and the context and the culture in which it occurs (Brown et al., 1989; Greeno, 2006; Henning, 2004). Learning tasks that are situated in meaningful real-world tasks are not only better understood, but also more consistently transferred to new situations.
- Learning is a collaborative process in which meaning is created by integrating different perspectives. Vygotsky (1978) held that learning takes place in a social context and relies on communication and interaction with others. Collaboration and conversation is essential for student learning. Collaboration involves students building shared understandings of ideas and of the nature of the discipline as they engage in discourse with their classmates and adults outside the classroom.
- Learning is an active process in which understanding is developed from experiences (Merrill, 1991). Learners need to find solutions to real problems by asking and refining questions, designing and conducting investigations, gathering and analyzing information and data, making interpretations, drawing conclusions, and reporting findings.

Constructivist learning has implications for the role of teachers. As Anderson et al. (1994) stated, constructivist teaching involves understanding students' existing cognitive structures and providing appropriate learning activities to assist them. The studies (Anderson et al., 1994; Collins, 2006; Kintsch, 2009; Schuell, 1996) assume the following tasks for teachers in student-centered pedagogical approaches:

- Teachers must focus on helping students construct understanding of concepts themselves. Instead of spending time memorizing material, filling in blanks on worksheets, and repeating large numbers of similar problems, students need to solve novel problems, integrate information, and create knowledge for them. The teacher's role is to foster this work on the part of the student.
- From someone who transmits knowledge to student to one in which the teacher creates and orchestrates complex learning environments, engaging students in appropriate instructional activities so that the students can construct their own understanding of the materials being studied and working with students as partners in the learning process.
- The appropriate level of guidance that teachers provide differs depending on the background of the learner, the stage of learning, and the nature of the materials. The level of guidance should support the goal of keeping the learner focused on the topic of interest and actively engaged.

2.2.2 Perspectives on teacher learning

Teacher learning focuses on teachers learning to teach, underlining the links between teacher learning and student learning. Holland (2005) analyzed two waves on teacher learning and student achievements. The first wave, starting in 1960s, primarily focused on generic teaching skills, such as classroom demonstration, classroom management and organization, and classroom assessment. The second wave, beginning in the early 1990s, focused on subject matter and student learning. This second wave is based on Shulman's (1986) concept of pedagogical content knowledge (PCK) as the feature that qualifies the teacher's profession: teachers are able to blend subject matter content with appropriate pedagogical approaches, so that learners are able to understand the subject at stake. PCK is considered key to successful teacher learning and curriculum improvement (Borko & Putman, 1996; Shulman, 1986).

Literature on professional development emphasizes to involve teachers actively in their own learning in classroom practice (Darling-Hammond & McLaughlin, 1995; Loucks-Horsley, Stiles, Mundry, Love, & Hewson, 2010). Teacher learning is viewed as a process of engaging teachers as learner, through a sustained, active, authentic, job-embedded, collaborative process (Darling-Hammond & Richardson, 2009; Garet, Porter, Desimone, Birman, & Yoon, 2001; Guskey, 2000; Weiss & Pasley, 2006). Putnam and Borko (2000) argue that teacher learning is situated within the context of classroom and teaching. According to corresponding views

(Brown, Collins, & Duguid, 1989), knowing and learning are situated in physical and social contexts. This situative perspective implies that teacher learning has to be developed in classroom settings.

Learning is both an individual and a social process (Vygotsky, 1978). In the last decade, the perspective on teacher learning shifts from the individual level to the community level. These two levels are in continuing interaction and mutually determining (Shulman & Shulman, 2004).

Learning in professional communities is an important influential factor in the school context. Fullan (2007) asserts that the degree of change is often determined by the extent to which teachers interact with each other. Collegiality among teachers within the school is a strong indicator of implementation success. McLaughlin and Talbert (2001) found that a collaborative community of practice in which teachers share instructional resources and reflections in practice seems essential for their persistence and success in innovating classroom practice. Change occurs as teachers learn to describe, discuss, and adjust their practices according to a collectively held standard of teaching quality (Little, 2003). It is reported (Dunne, Nave, & Lewis, 2000) that the process of learning with colleagues in small, supportive, trusting groups makes the difference.

Learning in classroom settings can be supported by discourse communities where community members can draw upon and incorporate each other's expertise to create rich conversations and new insights into teaching and learning.

Shulman and Shulman (2004, p.259) stipulated that "*An accomplished teacher is a member of a professional community who is ready, willing, and able to teach and to learn from his or her teaching experiences.*" They proposed a model of teacher learning, which composed of Vision, Motivation, Understanding, Practice, Reflection, and Community.

However, not all forms of teacher collaboration are considered to be conducive to educational change. Little (1990) and McLaughlin and Talbert (2001) note that strong teacher communities reinforce effective curriculum change while weak professional communities reinforce ineffective practice.

2.3 TEACHER PROFESSIONAL DEVELOPMENT STRATEGIES: A CURRICULUM ENACTMENT PERSPECTIVE

Professional development plays a critical role in the success of education reform. It serves a link between where teachers are now and where they will need to be

tomorrow to meet the new changes in guiding students to enhance the learning and development of students and teachers themselves. The definition of professional development and the relevant knowledge base for designing a professional development arrangement is described in this section.

2.3.1 Defining professional development

Fullan (2007) defines professional development as the total sum of formal and informal learning experiences throughout one's career from pre-service teacher education to retirement. Loucks-Horsley et al. (2010) expand the definition of professional development to denote those opportunities offered to educators to develop new knowledge, skills, approaches, and dispositions to improve their effectiveness in their classrooms and organizations. Guskey (2000) elaborated the definition of professional development further. He refers to those processes and activities designed to enhance the professional knowledge, skills, beliefs and attitudes of educators so that they might in turn improve the learning of students. He regards professional development as a systematic effort that eventually results in improved learning opportunities for students. Teacher professional development in this study involves all processes and designed activities that enable teachers to acquire knowledge, skills, and attitudes and behaviour enhancing their abilities to enact IPA effectively in their teaching practice in order to improve student learning.

2.3.2 Components of effective professional development

Recently, researchers have increasingly focused on what makes professional development effective. Borko (2004) and Fishman et al. (2003) explore the complex links between the design of professional development, teachers' learning during professional development activities, and subsequent changes in classroom. Researchers also began to take up the challenge of designing studies that can help identify the linkage between the design and implementation of professional development and student learning outcomes (Fishman et al., 2003; Loucks-Horsley & Matsumoto, 1999; Penuel, Fishman, Yamaguchi & Gallagher, 2007). The research of Joyce and Showers (2003) suggested that workshops alone are not sufficient to bring about change in the classroom. Their findings indicate that workshops need follow-up by coaching, study groups, or peer visits in order to yield a high return on investment. Joyce and Showers (2003) mention four, incremental, categories of staff development: (a) presentation of theory, (b) theory

and modeling or demonstration, (c) theory, demonstration, and opportunities to practice the skill with low-risk feedback, and (d) theory, demonstration, practice, and follow-up through coaching, study groups, or peer visits. Research shows that when it comes to application in the classroom only the fourth category is truly effective (NSDC, 1995).

There is a broad consensus among teacher learning researchers that curriculum-linked (or reform-oriented, or high-quality) professional development tends to be more effective than traditional professional development (Darling-Hammond & Richardson, 2009; Garet et al., 2001; Guskey, 2000; Kubitskey, Fishman & Marx, 2004; Loucks-Horsley et al, 2010; Penuel et al., 2007; Putman & Borko, 2000). The traditional professional development refers to the old model of “teaching training” or “in-service,” in which experts impart new techniques in drive-by workshops. Those workshops remain fragmented, poorly aligned with curricula, and inadequate to meet teachers’ needs. The curriculum-linked professional development emphasizes to prepare teachers more effectively to enact curricula. It allows teachers to explore new concepts and teaching strategies in depth, and use their colleagues for mutual assistance. Based on a review of the literature, the features of the traditional professional development versus curriculum-linked professional development are summarized in Table 2.1.

Table 2.1 *Overview of traditional professional development versus curriculum-linked professional development*

Aspect	Traditional professional development	Curriculum-linked professional development
Theory foundation	Lack	Be grounded in research and clinical knowledge of teaching and learning
Purpose	Focus only on training new rationales, techniques, and behaviours	Focus on improving teaching practice and student learning
Context	<ul style="list-style-type: none"> - One-shot workshop model - Isolation and without support 	<ul style="list-style-type: none"> - Integrated with school improvement - Collaborative and collegial learning environment
Content	Focus on general pedagogical strategies	Focus on pedagogical content knowledge and skills
Model	Provide in-service presentation, or one-day workshop, or guest speakers at the beginning of an initiative	Besides workshops, provide follow-up support at school, using approach such as coaching, video demonstration, reflection
Strategies	<ul style="list-style-type: none"> - Discard local context, take place outside of classroom or school context - Convey information, provide answers to question - Passive learning - Isolated individual to enact changes in their practice - Fragmented, offer disconnected in-service training sessions - Unconnected to deep curricular issues 	<ul style="list-style-type: none"> - Contextualization, classroom- or school-based - In-depth engagement, allow teachers to explore new concepts and teaching strategies - Active, hands-on learning - Facilitate teachers' collaboration both within and across schools, include garner principal support - Integration, provide teachers with learning opportunities to integrate new knowledge into practice - Focus specially on how to enact pedagogical strategies, use curriculum materials, and administer assessments associated with particular curricula
Duration	Single, one-time session, short of duration	Longer duration, intensive and sustained over time
Outcomes	Limit effect	<ul style="list-style-type: none"> - Significant changes to teachers' knowledge and practice in multiple area, teachers' experiences are integrated and connected - Students' learning improved - Changes in school and district culture

Research (e.g. Loucks-Horsley et al., 1999, 2010; Guskey, 2000; Joyce & Showers, 2003; Penuel et al., 2007) indicates a number of components that are essential for effective curriculum-linked professional development. These components are summarized below.

Align a variety of professional development strategies with goals and contexts

Loucks-Horsley et al. (2010) describe sixteen strategies for the design and implementation of the professional development, such as workshops, coaching, case study, and curriculum implementation. They also indicate eight contextual factors (Loucks-Horsley et al., 1999, 2010) including student learning needs, teacher learning needs, practices and learning environment, organizational culture, leadership, policies, resources, and families and communities. It is suggested that the goals of professional development, the cycle of implementation, and the contextual factors need to be considered when selecting and combining the strategies. The developers of professional programs must carefully analyze and study their own contexts in which the teachers teach and their students learn.

Use exemplary curriculum materials as operationalization of the curriculum innovation

There are various forms to offer support for teachers. Support for change can take the form of exemplary curriculum materials systematically incorporated into professional development (Teclé, 2006; van den Akker, 1988; van den Berg, 1996). Exemplary curriculum materials with procedural specifications help direct teachers to the intended change and aid them in executing tasks they might have had difficulty with.

Provide ongoing school follow-up support.

Professional development should involve follow-up and support for further learning -- including support from sources external to the school (Guskey, 1986, 2000; National Education Association, 1995). As teachers put into practice what they have learned from professional development, they often discover that they need to know more to be effective. Meeting the needs of teachers for learning will likely increase both their professional competence and student achievement; they will probably also be more motivated to pursue other professional development opportunities. Research on professional development (Cohen & Hill, 2001; Elmore, 2002; Teclé, 2006; Weiss & Pasley, 2006) indicate that on-site follow-up support aligned with curricular content can produce significant changes in classroom practice and benefits for students. A workshop alone is not sufficient for effective professional

development. Teachers also need opportunities to practice what they learned and follow-up support for the continuous and ongoing professional development.

Coaching is a specific form of follow-up support (Guskey, 2000) and is found to be a promising approach to help teachers change their instructional practices (Poglinco & Bach, 2004). It provides one-to-one opportunities for teachers focused on improving teaching by reflecting on one's own or another's practice. Poglinco and Bach (2004) stated that coaches have three major functions: in-class modelling of instruction, facilitating study groups, and leading teacher meetings. Coaching may involve ongoing classroom modelling, supportive critiques of practice, a preconference-observation-postconference cycle, and on-site observations, which help teachers extend their understanding of the content, instructional strategies, and develop effective lessons (Loucks-Horsley et al., 2010; Noyce Foudation, 2007; Shanklin, 2006).

Create professional learning communities for sharing expertise

Support for changes could take the form of organizing professional learning communities to promote successful implementation (Garet et al., 2001; Loucks-Horsley et al., 2010; Penuel et al., 2007). Professional learning communities focus on collective participation which build trust and support relationships. Teachers participating as a group in professional development can give focus to collegial interactions and motivate working through problems of practice together (Little, 1993). Teachers participate along with colleagues from their school and district. Through collaboration, teachers get help from colleagues, gain important new information, and share expertise and insights with each other. A variety of learning communities can improve teacher practice and student learning, such as peer observations of practice, study groups, and analysis of student work and student data.

Hord and Sommers (2008) identify a set of characteristics of professional learning communities: (a) shared vision and values; (b) collective learning and its applications; (c) shared and supportive leadership; (d) shared personal practice; (e) supportive conditions for maintenance of the community.

Provide sufficient time

There is broad consensus that the professional development activities should provide a sufficiently long time span and follow-up in order to facilitate teachers to comprise the kinds of learning opportunities necessary for integrating new knowledge into practice (Borko & Putman, 1996; Brown, 2004; Fullan, 2001, 2007;

Guskey, 2000; Joyce & Showers, 2003; Loucks-Horsley et al., 1999, 2010; Penuel et al., 2007, 2008). Longer duration of professional development, closely aligning with enactment, is more likely to produce better outcomes for teachers and students (Garet et al., 2001; Penuel et al., 2008).

Provide administrative support

Support from school and district administrators is crucial to the success of professional development. The principal is a very important actor in school context (Elmore, 2002; Fullan, 2001, 2007; Newmann, King, & Youngs, 2000). Principals can facilitate the implementation process by showing an active interest in the innovation, motivating teachers, and providing psychological and resources support for implementation. Garnering administrative (especially principal) support is conducive to involve teachers in professional development and develop a supportive environment for reform in school.

Evaluate the effects of professional development

The best evaluations involve analyzing multiple sources of information on both student outcomes and the implementation process (Guskey, 1986, 2000; Joyce & Showers, 1995, 2003; Little 1993). The evaluations emphasize the improvements in teaching practice and student outcomes. Through systematic evaluation, developers get to know the extent to which professional development has influenced student achievement and teacher learning and make contribution to the design of further professional development.

2.4 THE POTENTIAL OF EXEMPLARY CURRICULUM MATERIALS IN PROFESSIONAL DEVELOPMENT ARRANGEMENTS

Exemplary curriculum materials are an essential component of an effective teacher professional development arrangement. In this section, the studies on the curriculum materials and the exemplary curriculum materials with curriculum enactment are analyzed and connected.

2.4.1 Curriculum materials and curriculum enactment

Curriculum materials are (print and/or non-print) materials used to support teachers in the implementation of curriculum and to facilitate the learning process.

They may include textbooks, worksheets, teacher guides, reference materials etc. As Brown and Edelson (2003, p.1) pointed out: “Of all the different instruments for conveying educational policies, curriculum materials exert perhaps the most direct influence on the task that teachers actually do with their students each day in the classroom.”

Ball and Cohen (1996) point out that, unlike frameworks, objectives, assessments, and other mechanisms that seek to guide curriculum, curriculum materials are concrete and daily. Materials of lessons and units often reflect what teachers and students do.

Remillard (2005) discussed the teachers’ interactions with curriculum materials. She viewed teachers as active users of curriculum materials and shapers of the enacted curriculum. She indicated that the process of using curriculum materials is complex and dynamic and is mediated by teachers’ knowledge and beliefs. Teachers require substantial support in learning to use new curriculum materials. They need to learn about the content, goals, approaches, and underlying assumptions of the curriculum they are being asked to use. Teachers would benefit from opportunities to read and examine a new curriculum with colleagues, making their interpretations and decisions explicit to themselves and others if teachers actively engage in participating with curriculum materials. Remillard (2005) asserted that it is crucial that curriculum developers pay careful attention to the multiple ways that their materials communicate with the teacher. Curriculum developers must consider how they are addressing the teacher through the design of their materials, how they expect the teacher to respond to their suggestions, and how they represent what it means to use their resource.

2.4.2 Exemplary curriculum materials with a view to enactment

Traditionally, curriculum materials are designed to help implement curricula. However, recent attention is given to the value of materials that are specifically designed to help teachers in the enactment of the curriculum (Ball & Cohen, 1996; Davis & Krajcik, 2005; van den Akker, 1988). Van den Akker (1988) uses the term *exemplary* curriculum materials, while Davis and Krajcik (2005) use the term *educative* curriculum materials. Although they are different in name, they stress the function of curriculum materials to support teacher learning in educational innovation. Exemplary materials play a crucial role in teacher learning, because they are considered as an important support tool for teachers attempting to change their practice (Ball & Cohen, 1996; Beyer & Davis, 2009; Davis & Krajcik, 2005; Ottevanger, 2001; van den Akker, 1988). Van den Akker (1988) argued that

exemplary curriculum materials could support the initial implementation efforts of teachers when they have neither the familiarity nor prior commitment to the new change. Exemplary curriculum materials assist teachers in getting a clear picture of the new curriculum, help them to see the goal of their learning and support them while enacting the curriculum.

Video materials can be considered a special form of exemplary curriculum materials (Loucks-Horsley et al., 2010; Roes, 1997). Video can serve as a way to bridge the perceived gap between the theory and practice (Bencze, Hewitt, Pedretti, Vaillancourt, & Yoon, 2003). Video can be very helpful in providing concrete examples of what the curriculum innovation looks like in classroom practice. Video recordings of exemplary lessons can serve as demonstration of the 'ideal' performance but also illustrate typical problems in practicing the lessons. Video demonstrations implemented alone or in combination with other strategies are an effective way to increase collegial and reflective interactions on teaching and learning (Loucks-Horsley et al., 2010).

Based on studies (Ball & Cohen, 1996; Beyer & Davis, 2009a, 2009b; Davis & Krajcik, 2005; Ottevanger, 2001; Thijs & van den Akker, 2009; van den Akker, 1988), the functions of exemplary curriculum materials could be summarized as follows:

- help teachers in getting a clear picture of the goal of their learning and provide teachers with necessary background information about the rationale behind the intended change;
- provide opportunities to practice during the in-service sessions and in their own classes and support their practice;
- offer a basis for the exchange of experiences, feedback, discussion, and reflection.

Encouragement of teachers' involvement in developing or redesign their own curriculum materials would facilitate the implementation of curriculum innovations.

Beyer, Delgado, Davis, and Krajcik (2009a) provided recommendations for the design of educative curriculum materials: 1) Educative curriculum materials that contain rationales for principles may help teachers understand the importance of attending to these principles in their classroom practice. 2) Embedding strong examples of educative supports that are relevant, pedagogically useful and sufficiently in depth within curriculum materials may help teachers continue to learn about curricular analysis through their experience as teachers. 3) Existing

curricular programs need to include more support for some facets of PCK for (science) topics. 4) Some of the educative features within existing materials can provide developers with high quality examples of support. Teachers need space to draw upon their own personnel resources to make productive changes and local adaptations to curriculum materials. Electronic media may enable teachers to select only the support they need.

Van den Akker (1988) argued that teachers needed procedural specifications to be able to enact the curriculum. These 'procedural specifications' should focus on essential but vulnerable elements of the innovation. His set of procedural specifications has been validated and refined in several research and development projects in curriculum and courseware development in the Netherlands and the African countries (Mafumiko, 2006; Motswiri, 2004; Ottevanger, 2001; Voogt, 1993).

These studies indicate that exemplary curriculum materials with procedural specifications could help teachers overcome initial implementation problem and help them behave differently towards desirable changes. The same studies suggest that in order to bolster the efficacy of exemplary materials, they have to be systematically embedded into professional development arrangements in ways that robustly facilitate change in teachers' beliefs and the reflections needed for transforming the intended change into classroom practice.

Based on the findings of these studies, Thijs and Van den Akker (2009) have articulated how "procedural specifications" should be addressed in effective exemplary curriculum materials as follows:

- a modular and flexible design and structure;
- specify the essential but vulnerable of elements of the innovation concerning the *lesson preparation* (estimation of time; list of resources and provisions; suggestions for task orientation; stimulation to study the lesson description actively), the *subject matter* (concise and clear information about central elements; outlines of concepts and activities; possible questions and answers; suggestions about how to deal with knowledge), *teaching sequence* (suggestions for grouping and for the distribution of tasks, roles and materials; sequence of activities, including suggestions for starting up, for the selection of topics, for discussion; possible variations in the instructional process), and the *assessments of learning effects* (exemplary descriptions of potential learning effects in the students; suggestions for assessing and evaluating those effects);

- provide concrete suggestions, procedural specifications, and strong examples of educative support for teachers in the initial stages of implementation while avoid exhaustive regulations to encourage active adjustment.

The exemplary curriculum materials have proved to be especially effective if applied in combination with more comprehensive professional development programs. Such materials require time, embedding in school development, and support as well as pressure from the part of school management, the board, and the government.

2.4.3 Exemplary curriculum materials as part of a professional development arrangement

Van den Berg (1996) reported that the integration of exemplary materials with procedural specifications into an in-service program helps stimulate teachers to try new ideas in their classrooms and provided a successful first-time experience. Studies by Roes (1997), Ottevanger (2001), and Tecle (2006) showed that the exemplary curriculum materials embedded in teacher in-service can prepare teachers for the implementation of curriculum innovations. The professional development arrangement consisted of workshops in which exemplary curriculum materials were used; that was conducive to prepare teachers for student-centered education and for the use technology. Roes and van den Akker (1993) illustrated the functions of the exemplary materials in a professional development arrangement. Exemplary materials can be used to provide teachers with:

- A clear explanation of the ideas behind the intended change, e.g. the improvement of the teaching repertoire or curriculum innovation. The materials provide background information about the rationale behind the intended change;
- Concrete examples of what these ideas look like in classroom practice, e.g. written exemplary lessons or video recordings. Exemplary lessons in the materials serve as demonstrations of the 'ideal' performance but also illustrate typical problems in practicing the lesson;
- Opportunities to practice during the in-service sessions, in the teachers' own classes. The materials can support teacher practice skills by means of the procedural specifications of teacher behavior in lesson examples;
- Opportunities for both structured feedback and informal exchange of experiences;
- Follow-up support and coaching in adapting instructional materials or developing new ones.

In addition to these functions, exemplary curriculum materials need to stimulate reflection on implementation process and teachers' role as well as any possible adaptations of the teachers' attitudes towards the innovation (van den Akker, 1988).

Ball and Cohen (1996) suggest curriculum materials can be educative for teachers by offering support for teachers in thinking about: (a) content beyond the level suggested for students, (b) underlying pedagogy, (c) developing content and community across time, (d) students, and (e) the broader community. Schneider and Krajcik (2002) designed curriculum materials based on Ball and Cohen's (1996) five domains that need to be considered during the process of curriculum materials development as well as known challenges to an inquiry-based curriculum (Marx et al., 1998). The educative curriculum materials that were designed as part of a professional development program for supporting teacher and student learning included the following features (Schneider & Krajcik, 2002): (a) addressing each area of knowledge necessary for exemplary practices – content knowledge, pedagogical knowledge, and pedagogical content knowledge (PCK), (b) situating teacher learning by meshing the content of the support to lessons for students, (c) linking different knowledge areas within lessons, (d) making knowledge accessible to teachers by including short scenarios in the language of teachers or students involved in the lesson to illustrate or model the intended practice when possible, and (e) addressing immediate needs for understanding as teachers plan lessons that will be enacted within a short time. Curriculum materials designed include detailed lesson descriptions to assist teachers in enactment. Features to address the learning needs of teachers offer information to explain content and pedagogy, as well as specific information about strategies, representations, and students' ideas (PCK) embedded within lessons.

Opportunities for professional development that include a focus on assessing student work increase the likelihood that teachers will develop expertise in implementing an inquiry-based learning approach (Barron, & Darling-Hammond, 2008). Curriculum, instruction, and assessment are integrated around meaningful performance in a real-world context. Formative assessment is especially important in the context of long-term, collaborative work (Barron, & Darling-Hammond, 2008). The assessment plays significant role in shaping the cognitive demands of the work students are asked to undertake and supporting improvement in the quality of teaching (Black & Wiliam, 1998a). Frequently using formative assessment help students examine how they learn and how they can perform better, and help teachers make wise instructional decisions.

Encouraging teachers' involvement in developing or redesign their own curriculum materials would facilitate the implementation of curriculum innovations, such as a student-centered approach to education (Ball & Cohen, 1996; Beyer & Davis, 2009a; Borghi et. al, 2003). Remillard (2000) proposed the curriculum materials to include "space" in the materials in order to provide teachers with the flexibility to make their own contextualized decisions. Teachers could modify their materials—for example, for specific contexts, students' needs, teaching styles, and learning goals. Curriculum materials might include rationales that make clear the purpose of particular instructional approaches in order to help teachers understand why curriculum developers included these approaches, and in turn, help them make informed decisions if they choose to make modifications (Beyer & Davis, 2009a; Davis & Krajcik, 2005; Remillard, 2000).

2.5 IMPLICATIONS FOR THIS STUDY

This section summarizes the findings and describes the implications for the design of exemplary curriculum materials embedded in a professional development arrangement aiming to support teachers in the implementation of IPA. It first points out the tension for teachers to enact IPA. Next, it summarizes the characteristics of the teachers' role in IPA followed by the implications of this role for exemplary curriculum materials and professional development. The section concludes with implications for the exemplary curriculum materials and professional development for IPA enactment.

2.5.1 Curriculum enactment and IPA

There is some tension in this study. At one hand, teachers are proposed to follow the exemplary curriculum materials (high fidelity) to experience good IPA teaching so that they are able to make informed decisions about the way they want to enact the IPA curriculum. On the other hand, Ben-Peretz (1990) advocated the design of curriculum materials that are not rigid frameworks for the teachers as users of curriculum materials. She emphasized the interpretative abilities of teachers in this respect. Also Fullan (2007) stated that change is a highly personal experience. Teachers need to work through the change themselves. In this sense, teachers and students develop and enact their own curriculum in their context with the exemplary curriculum materials. They are in charge - together with their students - to determine content of IPA.

2.5.2 New roles for teachers in IPA enactment

A common characteristic of all integrative learning initiatives described above is that inquiry learning is considered as a guiding pedagogical approach to realize integrative learning. Inquiry learning is promoted as a student-centered pedagogy. Students are the subject of IPA learning and IPA learning requires teachers and students change their way of teaching and learning (Bransford et al., 2000). This study focuses on the changing role of the teacher in particular. To ensure that IPA implementation goes smoothly and effectively, teachers should play a leading role in order to promote the all-round development of students. Three roles for teachers can be distinguished: designer, guide, and participator.

Teacher as designer

Teachers are the designers of IPA learning. This implies that the teachers need to plan the process of IPA and organize students' group work. The teachers need to design the learning environment to provide opportunities for the students to exchange their ideas, experiences and comments to each other in order to improve their work and enhance their abilities. Teachers also need to create situations to arouse the interest of students and inspire them to think.

Teacher as guide

A good topic is half the success. While guiding students to select topics, the teachers should direct students to explore the topics of interest and worth. Teachers need to stimulate students thinking and to discuss the feasibility of topics with students. The teachers need to guide students, so that they learn the principles of topic selection, research methods and items for attention, then direct them to formulate plans for activities. When students go outside the school for investigations, the teachers need to explain safety precautions and how to conduct interviews or surveys. It is necessary for the teacher to contact with relevant departments and staff in advance so as to ensure the quality of investigation and interview. The teachers also need to help students with the analysis of the data they collected, and with the writing and presentation of the research report. After all, IPA learning is a long process of learning. In the IPA learning process, some students will inevitably encounter some unexpected problems. However, teachers should encourage them and provide necessary support so as to ensure the smooth progress of IPA learning.

Teacher as participator

The teachers should play the role of learners and explore the topics and find solutions with students. Teachers and students teach and learn from each so as to form a true “learning community”. The teaching process should not restrict teachers and students to faithfully implement the curriculum materials, but that they develop and enrich the curriculum. Teachers and students work together to create the teaching and learning process. The teaching process becomes into a dynamic and developing process.

2.5.3 Implications for the professional development arrangement

The professional development arrangement should provide teachers with active learning opportunities. By offering teachers active learning opportunities to apply new knowledge and skills to their teaching practice, their understanding of the new knowledge and skills will be developed and their students’ learning will be facilitated. There is broad consensus that professional development activities need duration to provide teachers with ample opportunities in order to be able to new knowledge and skills. The findings reported above also indicate that professional development can only have an impact when follow-up activities to workshops are provided. Therefore, an arrangement needs to be designed which includes exemplary curriculum materials, workshops, continuous follow-up through feedback, coaching and reflection, and administrative support.

In the study, the workshop format should incorporate effective professional development, curriculum materials (including video recording), and follow-up support (including feedback, coaching, and reflection). The professional development arrangement aims at help teachers implement IPA and change their instructional practices.

2.5.4 Implications for the exemplary curriculum materials

The development and use of curriculum materials is important to support teachers in the implementation of IPA. Several researchers (Cui & Yu, 2004; Feng & Wang, 2009; Zhang, 2006) showed that there is a lack of relevant curriculum materials for IPA. For the design of curriculum materials that support teachers’ learning of IPA – here referred to as exemplary curriculum materials. The exemplary curriculum materials should include the procedural specifications focusing on essential but apparently vulnerable elements of curriculum that can reduce teachers’ initial implementation problems so as to enable them to enact

successfully. The problems with the implementation of IPA suggest that the following aspects are particularly vulnerable in implementation: activity preparation, activity procedures and teacher's role, group work, assessment of learning effects.

Video materials are considered a special form of exemplary curriculum materials. Video recordings of exemplary lessons may serve as demonstration of the 'ideal' performance but can also illustrate typical problems in practicing the lessons. Video recordings seem particularly useful to provide teachers with concrete examples of what IPA lessons look like in and out the classroom when teachers enact IPA in their practice.

These implications will be elaborated further in the coming chapters.

CHAPTER 3

Front-end analysis

This chapter describes the front-end analysis that will be used as the context base for developing the intervention. Section 3.1 gives an overview of the front-end analysis. The research questions, data collection instruments and respondents are described. Section 3.2 describes the international background of curriculum development of integrative learning. The actual situation of IPA enactment and teacher professional is depicted in section 3.3. Section 3.4 outlines the results of a teacher survey, including the actual situation of IPA implementation, teacher perceptions, IPA teaching, student gains, and difficulties encountered in the IPA implementation. The results of the survey are compared with other studies on the situation of IPA enactment are discussed in section 3.5. Section 3.6 draws implications for designing the intervention of the study.

3.1 INTRODUCTION

The function of the front-end analysis is to provide a knowledge base that could be employed for developing the interventions, through determining the symptoms of problems that exist, the cause of the problems, and the solutions of those problems. The results of the front-end analysis will be used to specify the requirements, the contextual factors affecting the gap between intended curriculum and implemented curriculum, and to offer recommended interventions for eliminating the gap.

3.1.1 Research questions

Even though the design of the professional development program is sound from a theoretical perspective, the impact of professional development highly depends on the combination of contextual factors and enactment practice. Effective professional development needs to fit into the unique context in which teachers

teach and students learn (Blank, de Alas & Smith, 2008; Fullan, 2001, 2007; Guskey, 2000; Sparks, 1996)). Loucks-Horsely et al. (2003, 2010) suggest developers to develop awareness of current practice and culture, and anticipate problems in order to design professional development that fits the context. This study focuses on seven contextual factors: international background of IPA, national and provincial policies of IPA, available teacher professional development of IPA, teachers' perceptions about IPA, current IPA teaching practice of the teachers, the gains of students from IPA, and difficulties the teachers encountered when enacting IPA teaching. The main question that guided the context analysis is formulated as follows:

What are the contextual factors that influence the design and enactment of curriculum materials embedded in a professional development scenario for IPA teachers?

To answer this research question, the following specific questions were stated:

- What is the international background of IPA?
- What are the national and provincial policies for IPA teacher education?
- What is the current state-of-practice in IPA enactment and professional development?
- What are the teachers' perceptions about IPA?
- How is the actual IPA teaching practice of the teachers?
- What do students obtain from IPA?
- What difficulties do the teachers encounter when enacting IPA teaching?

In order to answer these questions, various methods have been used: document analysis, expert interview, literature review, and questionnaires.

3.1.2 Data collection instruments and respondents

Document analysis

Relevant documents and publications of the Ministry of Education were analyzed. It focused on the policy of in-service education and the state-of-practice of Chinese IPA education.

Interview

Interviews were conducted with the teacher in charge of the IPA teaching and research in Guangdong Province, and with the expert who had planned and

organized the IPA teachers training at senior high schools in Guangdong Province from 2004-2006.

The interviews aimed at exploring the current situation of IPA enactment in Guangdong Province. The interviews were organized around the following themes: the current situation of IPA enactment in Guangdong Province, experiences and constraints in organizing in-service education, and issues related to the evaluation of in-service education in Guangdong Province.

The researcher conducted face-to-face interviews with the two interviewees. The interview conversations were taped-recorded and transcribed for analysis. The analysis of the interview transcripts involved summarizing participants' responses into two themes: current situation of IPA teachers' in-service education and constraints for organizing IPA teachers' in-service education.

Teacher questionnaire and respondents

A teacher questionnaire was designed to investigate the current situation of IPA enactment in secondary schools. It gathered information about teachers' perception of IPA, the actual situation of IPA enactment in schools, the gains of students from IPA, difficulties the teachers encounter when enacting IPA teaching, and their suggestions for the future design and enactment of IPA.

The questionnaire consisted of four sections: general information about the respondents, actual situation of enactment of IPA in the schools where the teachers work, teachers' perception of IPA and the teaching of IPA (including teaching methods, ways of collecting information, main difficulties they encountered in the enactment, students' gains from IPA, topics they taught and the most satisfying learning activities). The questionnaire contained yes/no, multiple choice and open-ended questions. A panel of experts in the field reviewed the questionnaire. The questionnaire was revised based on the panel's comments and suggestions.

The survey was conducted in September, 2005. Descriptive analysis was conducted to compute percentages, means and standard deviations.

The respondents were teachers who participated in the implementation of IPA in Guangzhou (including Yuexiu, Haizhu, Liwan, Tianhe and Huangpu, 5 districts altogether). The teachers came from 29 secondary schools, among which 11 were key schools and 18 were ordinary schools. Normally, the conditions and the quality of the teachers and students in key schools are better than those in ordinary schools. Key schools get more financial support from government.

In total, 180 questionnaires were distributed and 146 were completed and returned, among them 143 were valid. Among the 143 teachers who completed the survey, 30.8% of teachers were male and 69.2% were female. 57.3% of the teachers taught in junior secondary schools, 39.2% of the teachers taught in senior secondary schools and 3.5% of the teachers taught both in junior and senior secondary schools. Table 3.1 presents an overview of teachers' demographics.

Table 3.1 *Demographic characteristics of the participants (N=143)*

Characteristics	Participants
<i>Gender</i>	
Male	44 (30.8%)
Female	99 (69.2%)
<i>Educational background</i>	
University	123 (86.0%)
Postgraduate	10 (7.0%)
Junior college	9 (6.3%)
Technical secondary school	1 (0.7%)
<i>Professional titles</i>	
High-grade	18 (12.6%)
First-grade	66 (46.2%)
Second-grade	59 (41.3%)
<i>Teaching years</i>	
5 or less	47 (32.9%)
5-10	41 (28.7%)
11-20	35 (24.5%)
21-30	12 (8.4%)
30 or more	8 (5.6%)

The age distribution (as illustrated by teaching years) shows that most teachers were younger than 40 year olds. The majority of teachers (N=133, 93%) received university or postgraduate education. Sixty six (46.2%) teachers are first-grade teachers, 59 (41.3%) participants are second-grade teachers. And there are 18 (12.6%) high-grade teachers. Most teachers had between 5-10 years of experience. About one third of the teachers (32.9%) had less than 5 years of experience.

3.2 TRENDS IN CURRICULUM DEVELOPMENT OF INTEGRATIVE LEARNING AND REFORM INITIATIVES

3.2.1 Integrative learning and curriculum reform

The knowledge-based economy and information society raises new demands on the quality of citizens in skills, abilities, attitudes, and habits. The development of 21st century skills (Ananiadou, & Claro, 2009; CEO Forum, 2001; Dede, 2010; European Commission, 2002; OECD, 2005; Voogt & Roblin, 2010) is critical to the success of students. These 21st century skills include digital literacy, inventive thinking, effective communication and high productivity abilities. Students are required to be able to search for and select relevant information; interpret and analyze data; effective communication and collaboration, solve problems; create high quality products; and develop capabilities to learn new skills and knowledge as needed.

From 1990's, many countries initiated curriculum reforms to meet the challenge of the 21st century. One of the common trends is to advocate the children's experience and return to real life, and to pursue the integration of subject domains.

The integration of subject domains is not only to change the curriculum structure. It is in essence the in-depth change of the values of curriculum. As Ellis and Stuen (1998) argue, the traditional curriculum model is the outcome of the enlightenment movement of the 18th century. It pursues the instrumental logos. The subject itself is the focus of attention. It becomes an end in itself rather than a means to some other end. The disciplines are taught separately with unrelated pieces, and the students are deprived of the opportunity to explore the relationships necessary to the development of deeper, fuller understanding of content, connected to the world where they live. These subjects cast the mind of students in isolation. Curriculum integration is a useful way for teachers and students to make the necessary connections between and among key ideas of the various academic disciplines. The times demands that humans live in harmony with the world and the culture of disciplines return to the living world as well as the overall development of personality, thus, the curriculum integration reflects the dual needs of social development and personal development (Ellis & Stuen, 1998; Xiong, 2001; You, & Zhong, 2002).

3.2.2 Examples of integrative learning from Asian countries and regions

In the late 20th century and early 21st century, some Asian countries and regions have launched a new round of educational reforms to meet the challenges of globalization, informatization and the knowledge economy. These educational reforms emphasize to foster with students practical ability and the skills of discovering and solving the problems, and to develop their personality and creativity. To this end, they advocate the provision of the integrative learning activities for students in primary and secondary schools. Analyzing these examples of integrative learning in Asian countries and regions contributes to the design and implementation of curriculum materials for integrative practical activities in China.

Japan offers 'integrated studies period' in the new curriculum system of 2002/2003. Chinese Taiwan puts 'integrative activity' as one of the seven learning domains in the new curriculum of 2001/2002. The Hong Kong Special Administrative region provides 'life-wide learning' since 2002. Although they are different in name, they have similar meaning. These different courses are briefly discussed in the next sections.

Integrated studies period in Japan

Background and purpose of integrated studies period

At the end of the 20th century there were some phenomena in Japanese students, such as intense examination competition, lower learning ability, absence from school, lack of extracurricular social experiences, bullying vulnerable groups, which concerned the Japanese society (MEXT, 1996). In the new century, Japan pays extremely close attention to technology development, internationalization, informatization, and environment problems. In addition Japan is facing the implications of an aging society and low birth rate, and has therefore to reexamine school education. The goal of education has changed to seek harmonious coexistence between human and nature, between people, pay attention to character development, and fostering perfect humanity. Thus, new measures were taken to further promote the guidance of cross-disciplinary comprehensive studies, and the integrated studies period was presented to offer in primary and secondary schools. Integrated studies period is a new subject in Japanese schools. It became a required subject in primary and lower secondary schools in 2002 and in upper secondary schools in 2003. It differs substantially from the former discipline-based curriculum (MEXT, 1998).

A specific feature of integrated studies period is that every school develops its own educational activities and cross-disciplinary learning based on the practical situation of the environment: the community, the school and the students.

The purpose of integrated studies, according to the *“Essentials for Learning Guidance”*, is to nurture in children the ability and disposition to become better problem-solvers by encouraging them to determine problems on their own, and to actively study, think and make judgments. In this way, schools can foster the skills needed to learn and think independently and creatively. (MEXT, 1998). This approach requires the integration of knowledge and skill from various disciplines, with ample attention to the society and the real life of students.

Contents of integrated studies

The characteristics of integrated studies (IS) assume decision-making power of schools and teachers, which affects school management routines. In IS, teachers and students get together to discuss integrative issues such as human and nature, human and human, human and culture in order to enlighten students' recognition of nature and humankind.

The learning content of IS period is prescribed as part of the general principles in *“Essentials for Learning Guidance”* (MEXT, 1998). The first principle is a focus on transversal and cross-disciplinary topics, such as international understanding, information technology, environment, welfare and health, human right and peace etc. The second principle is based on the selection of topics in accordance with the interests and needs of children. The last principle is based on the selection of topics that are relevant for the district and the school. There is neither a detailed description of learning content, nor provision of teaching materials.

There are two types of IS: experiential learning and topic inquiry learning. They enable students to understand, experience and explore the nature and society through observation, experiment, visits, investigation, discussion and production to develop social practice ability and social responsibility.

In the activities for IS students can take part in cooperative learning in a group, they can also participate in IS across grades or through individual study.

IS is compulsory from third grade and gets more emphasis than any subject, except Japanese and math. Third-graders, for example, get 235 hours of Japanese instruction, 150 hours of math and 105 hours of integrated studies per year. Fifth-graders get 180 hours of Japanese, 150 hours of math and 110 hours of IS. In lower secondary schools students get 70-130 hours of integrated studies per year.

In upper secondary schools students get 105-210 hours of integrative learning in each of the three years. IS can be massed in one period of time or distributed in the whole year in each school.

Effects of implementation of integrated studies

Teachers reported that their students have benefited from the opportunities they have been given to study ideas that interest them. IS lessons often stimulate students' interests well beyond the extent that is generally seen in core academic subjects (MacDonald, 2006). The IS program has led to the outcomes envisioned by its architects: heightened student interest in learning, more stimulating instructional approaches, and opportunities for children to develop abilities that had previously been neglected in their classes.

Some educators criticize the IS program and point to the lack of effort to control the quality, noting that the effectiveness of lessons depends on the particular skills and efforts of individual teachers. Although teachers were advised to incorporate more hands-on activities, problem-solving exercises, and student-centered learning into their courses, they often struggle in their attempts to play a less central role in classroom discussion and activities. Teachers do not have textbooks they can refer to when they have questions about designing and delivering IS lessons. Teachers need to be provided professional training on IS implementation. Some teachers and parents worry that IS takes too much time away from the 'major' subjects. Forced by public pressure, the new "*Essentials for Learning Guidance*" (MEXT, 2008) decreased the hours of integrated studies period in primary schools and secondary schools; at the same time academic learning time in the major subjects increased correspondingly.

Integrative activities in Chinese Taiwan

The Ministry of Education of Chinese Taiwan released a "*Curriculum Outline of 1-9 Year National Education*" in 1998 and the new curriculum started with trials in 1999. The primary schools and middle schools formally implemented the new curriculum in 2001 and 2003 respectively. The new curriculum highlighted to cultivate students ten basic essential abilities, emphasized through curriculum integration of learning domains. The existing learning contents are integrated into seven learning domains, namely: Chinese, Mathematics, Society, Nature and Life Science and Technology, Arts and Humanities, Health and Physical Education, and Integrative Activities.

Integrative Activities is a new learning domain and it occupies 10%-15% of the total learning hours. There are two reasons for setting up Integrative Activities. One is to protect activity time from being occupied by other courses. The next is that several school activities primarily meet the needs of adult politics and administration, while integrative activities mainly consider the needs of student growth and the realization of the educational meaning of activity.

Basic rationale of integrative activity

“Integrative” refers to various kinds of knowledge that are naturally linked. “Activity” refers to both the mental activity and the behavioral operation activity. If a person wants to gain further understanding on everything he/she learned, he/she needs to construct in-depth understanding through practice, experience, and reflection. The Integrative Activities is the learning domain set up to realize this rationale (Ministry of Education, 2001).

The curriculum change focuses on integrated curriculum and school-based curriculum. Each school could develop integrative activities with its characteristics based on practical demands of the school.

Aims of integrative activities

The aims of Integrative Activities are (Ministry of Education, 2001, p. 394):

- Facilitate self-development: Explore self-potential and develop self-worth, improve self-management knowledge and strengthen self-responsibility, respect for themselves and other people's lives and then realize the value of life.
- Implement life management: Practice and manage personal necessary life skills, be aware of the changes in life, adapt to innovations, explore, apply and develop resources.
- Strengthen social participation: Use interpersonal communication skills to participate in various group activities, social service and caring people; have respect for different ethnic groups and actively participate in cultural diversity.
- Protect self and environment: Identify risks in life situations so as to solve problems, improve life skills and live in harmony with nature, protect or improve the environment in order to promote environmental sustainability.

To realize the above objectives, teachers need to guide students a) practice and experience what they have learned; b) develop personal meaning through reflection; c) expand learning experiences; d) participate in various activities and respect for the experience of others (Ministry of Education, 2003, p. 19).

Scopes and contents of Integrative Activities

The scope of Integrative Activities (IA) includes all the activities that could help learners to experience, reflect and practice, and verify and apply what they have learned (Ministry of Education, 2003). Existing coach activities, scouting, domestic activities, and group activities are all included in IA.

There are four themes in IA: self-development, life management, social participation, self and environment protection. The twelve core specified contents of IA are: self-exploration, life management, interpersonal interaction, crisis identification and settlement, self management, respect for life, life adaptation and innovation, social care and service, respect for multiple cultures, resources application and development, outdoor recreation and exploration, environment protection (see Table 3.2).

Table 3.2 *Content framework of Integrative Activities*

General objectives: Cultivating students for the ability of life practice				
Four themes	Self-development	Life management	Social participation	Self and environment protection
Twelve core literacy	Self-exploration	Life management	Interpersonal interaction	Crisis identification and settlement
	Self-management	Life adaptation and innovation	Social care and service	Outdoor life
	Respect of life	Resources application and development	Respect multiple culture	Environment protection

Effects of the implementation of integrative activities

Based on various studies (Huang, 2003; Qiu, 2006; Wu & Yang, 2004; Zhou, 2004), the implementation situation of integrative activities in Taiwan can be summarized as follows.

Some teachers could adopt innovative teaching methods. They could design and select integrative activities based on student life experience. The majority of teachers could apply multiple subject assessment. Students performed well in integrative activities with a positive attitude and great interest, particularly students in primary schools.

Although IA belongs to one of the seven learning domains in 1-9 year curriculum, its disciplinary status is still not as good as the main (tested) subjects such as Chinese language, mathematics, science and technology. IA is seriously appropriated by other subjects, particularly in senior high schools. There are some implementation issues: teachers are not familiar with the curriculum guidelines; teachers lack professional knowledge and skills for enacting IA;

teacher lack time to prepare IA; large numbers of students; heavy burden on assessment; lack of administration support; difficult to arrange schedule; IA occupied by other courses.

Qiu (2006) suggests the need to strengthen the university-school partnership, in order to establish communities of practice between researchers and teachers.

Life wide learning in Hong Kong

Background of life wide learning

For keeping up with the environment and needs of society in the 21st century, the Education Commission (EC) submitted to the Government the "*Reform Proposal for the Education System in Hong Kong*" in September 2000. It aims at life-long learning and the whole-person development of students. The scope of the reform covers curricula, assessment mechanisms as well as the admission systems for different stages of education. According to the report of Curriculum Development Council (CDC, 2001), the overall aims of the school curriculum are:

- The school curriculum should provide all students with essential life-long learning experiences for whole-person development in the domains of ethics, intellect, physical development, social skills and aesthetics, according to individual potential, so that all students can become active, responsible and contributing members of society, the nation and the world.
- The school curriculum should help students to learn how to learn through cultivating positive values, attitudes, and a commitment to life-long learning, and through developing generic skills to acquire and construct knowledge. The school curriculum must take into account nine generic abilities: collaboration, communication, creativity, critical thinking, the use of information technology, numeracy, problem-solving ability, self-management and study (CDC, 2001, p.26). These qualities are essential for whole-person development to cope with the challenges of the 21st century (CDC, 2001, p.8).

The reform highlights that the life-wide learning enriches student learning through providing authentic experiences for whole person development.

Definitions of the life-wide learning

Life-wide learning (LWL) refers to student learning in real contexts and authentic settings (CDC, 2001, p. 33). It requires teachers to make good use of resources and settings available at their schools and in the communities, in order to create suitable learning contexts (combinations of time, place and people) for particular educational purposes. Such experiential learning enables students to achieve certain learning goals that are more difficult to attain through classroom learning

alone. It helps students to achieve the aims of whole-person development and enables them to develop the life-long learning capabilities that are needed in our ever-changing society.

Life-wide learning is not a new thing, but instead, it offers a new definition for all out-of-classroom or out of school learning opportunities, by focusing on learning and by linking with the school curriculum. The over-arching notion covers a wide range of learning activities, such as extra-curricular activities, co-curricular activities, community service programs, career-related experience and museum visits. Schools should cautiously implement life-wide learning in accordance with their own capacities.

Aims of life-wide learning

Life-wide learning enables students to achieve certain learning goals that are more difficult to attain through classroom learning alone. For instance, the development of problem solving skills in daily life, and certain positive attitudes towards the improvement of society and mankind in general, requires contact with a lot of different people and a variety of environments and situations. The experiential learning acquired through life-wide learning helps students to achieve the aims of whole-person development and enables them to develop life-long learning capabilities that are needed in our ever-changing society.

In short, life-wide learning aims:

- to motivate students to become effective, life-long learners;
- to offer students a balanced whole-person development
- to extend, enrich and enable students' classroom-based learning.

Content of the life-wide learning

Traditionally, it refers to school-based learning opportunities offered beyond normal lessons. Activities include: museum visits, educational trips, educational camps, interest clubs, field studies, community service, extra-curricular activities, thinking skills courses.

For many years, schools have recognized the importance of LWL-related activities and it existed in many forms and names. Its uniqueness is summarized as follows, when compared with traditional classroom learning: resourcefulness; feeling special (by students and teachers); related to self or real world; relatively informal & relaxed (LWL stands in between the formal and informal ends of learning); better teacher-student relationships; more flexible (i.e. wider choice in contexts, methods and people); quick and unambiguous Feedback.

All students should be provided with life-wide learning opportunities to help them to gain the following five essential learning experiences:

- Intellectual development (mostly through classroom learning in knowledge learning areas); laying a firm foundation of knowledge, enjoyment in learning;
- Moral and civic education (character formation): developing personal character, and interpersonal skills, respect for others, perseverance, national identity;
- Community service: developing commitment and responsibility;
- Physical and aesthetic development: leading to healthy living styles and appreciating aesthetic qualities;
- Career-related experiences: linking studies with career aspirations and job opportunities.

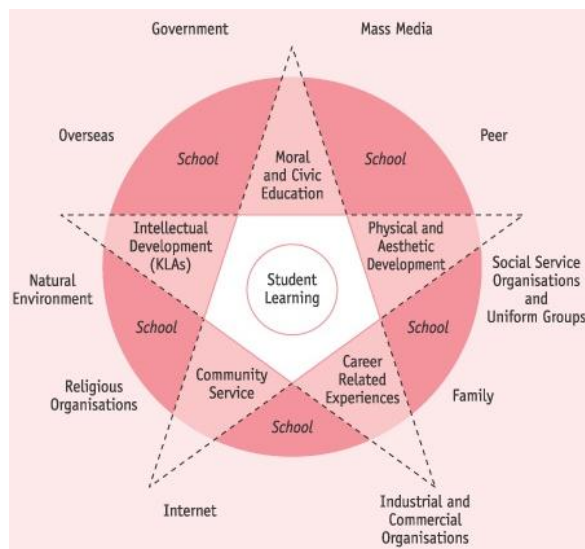


Figure 3.1 *Five essential learning experiences of LWL in different contexts (CDC, 2002, p.3)*

Figure 3.1 shows that life-wide learning for the five essential learning experiences can take place outside the school in different contexts, and different organizations may offer related learning opportunities.

As the students' range of subject knowledge and social contacts gradually widens, the contexts for life-wide learning can also be broadened to accommodate a greater range of learning opportunities; therefore, at different key stages, emphases of life-wide learning for whole-school curriculum are different.

Assessments of the life-wide learning

Assessment in LWL should aim to promote ownership of students' own learning. Strategies such as self-assessment, portfolio assessment, diaries/student logs are

all recommended, depending on the nature of activities. Any assessment tools that could empower students to evaluate the whole learning process freely with their teachers (rather than just self-assessing their own learning) have a unique impact to student learning.

Effects of the implementation of life-wide learning

According the annual report of 2006-2007 academic year (Education Bureau, 2008), schools can arrange a variety of activities to extend and enrich classroom learning and promote students, but the driving force level there may be different.

Schools generally agree with the direction of life-wide learning, and try to develop more learning space for students. Schools make good use of internal and external resources to provide a variety of learning activities; most of the schools are able to mobilize parents or alumni or the professional support of outside organizations to promote school activities.

Schools generally lack overall planning of life-wide learning and do not design the priorities of life-wide learning progressively to meet the needs of students. Different groups in the school are rarely compatible with one another in order to promote life-wide learning. Only less than twenty percent of the schools examined life-wide learning as a whole; this prevented schools from overall understanding and follow-up. Schools need to enhance the overall planning of life-wide learning, to promote and deep integration and interdisciplinary team collaboration.

Although teachers have considerable experience in the organization of activities, if they would further develop clear learning objectives in line with curricula, linking closely with classroom learning, more schools will effectively promote life-wide learning at group level.

3.2.3 Similarities in integrative learning in Asian countries and regions

The design and implementation of integrative learning in Asian countries and regions show a lot of similarities. A common characteristic of all integrative learning initiatives described above is that inquiry learning is considered as a guiding pedagogical approach to realize integrative learning. In addition the following similarities were found.

Characteristics of integrative learning

Some common characteristics of integrative learning are: highlighting the autonomy of school, teachers and students; emphasizing that learning occurs in authentic settings; paying close attention to experience, practice, and reflection; stressing the integration of subjects; facilitating change in the ways of learning.

Objectives of integrative learning

Common objectives are: focusing on problem awareness and problem solving ability; highlighting methods of and interests in analyzing and solving problems; paying attention to the application of information technology.

Curriculum values of integrative learning

Common values are: integrative learning is a kind of critical, reflective, inquiring and interactive practice in which students learn independently, but under the guidance of teachers; integrative learning emphasizes the importance of direct experience together with the learning of indirect experience; integrative learning embodies that students are the subject of education and the subject of self-development. The fundamental curriculum objectives of integrative learning are: to cultivate the integrative practice abilities; to develop an inquiry and innovative spirit; to develop social responsibilities; and to lay foundations for students to establish correct values, good emotion and attitudes.

Learning approaches of integrative learning

Common learning approaches are: inquiry learning, with choices of themes; social practice learning: social investigation and visit; application learning: design and manufacture; practical learning: social participation.

Assessment of integrative learning

Assessment of integrative learning should pay attention to assess the development of students, and therefore: focuses on the progress of students, based on the performance of students in the process of activity and the quality of their products; combines formative evaluation with summative evaluation; provides constant feedback on student work for reflection and revision; adopts multiple subjects to participate in evaluation and multiple ways of evaluation.

Implementation of integrative learning

It is necessary to consider factors such as local and regional differences, curriculum resources of community and school traditions when designing and implementing integrative learning.

Common problems for implementation are: quality of teachers; development of curriculum resources; guarantee of activity hours; operation of assessment; lack of mutual supports from school, parents, and social organization etc.

3.3 IPA ENACTMENT: ACTUAL SITUATION

3.3.1 National and provincial policies for in-service education of IPA teachers

The Ministry of Education released the Outline of Integrative Practical Activities (MOE, 2001b) and Guide on the Implementation of Inquiry Learning in Senior High Schools (MOE, 2001c). The Department of Education of Guangdong Province also released Teaching Guidance on Integrative Practical Activities in Compulsory Education in Guangdong (DEGDP, 2003) and Teaching Guidance on Integrative Practical Activities of New Curriculum Experiment in Senior High Schools in Guangdong (DEGDP, 2005).

These documents sketch the roles of teachers in IPA and the importance and purpose of teacher training to prepare for IPA. It pointed out that teachers' in-service education is key for the implementation of IPA. Despite its recognition of the importance of IPA teacher in-service education, little is said about the content and forms of IPA teacher professional development.

3.3.2 The state-of-practice in IPA education

The IPA curriculum

The state-of-practice was one of the contextual factors need to be taken into consideration for professional developers. In a study Yin (2008) conducted in Zhejiang Province, he reported that 94% of senior high schools had already carried out IPA. Among these schools, about 27% had specialized IPA teachers. Yin (2008) found that 95% of the teachers considered that IPA could broaden students' vision and enhance students' responsibility for their learning.

A survey of Feng and Wang (2009) carried out in China revealed that 86.9% of the teachers investigated thought that IPA was necessary. And 65.8% principals considered that offering IPA could promote the overall quality of students. The majority of the principals and teachers were positive about the value of IPA. Nevertheless, a small number of schools were forced to offer IPA by the state. Although most teachers could respect the desires of students and guide them appropriately in the choice of themes, the formation of groups, research methods, and the process of activity implementation, some teachers tended to 'teach' students activity and did not pay attention to the guidance of methods. Principals perceived teacher training, policy support, provision of curriculum resources and materials, and strengthening supervision as priorities for IPA implementation. When asking teachers what kind of curriculum resources they needed most, their

answers were: practice base, a teacher's guide, supporting facilities, a collection of cases representing what IPA is, student materials, and classroom record. A survey carried out by Han (2009) show that 87.9%, and 77.6% of teachers expected to provide teacher training and curriculum resources, 55.2% and 51.7% of teachers thought they need policy support and the provision of curriculum materials. The regions and schools were quite different in management efforts and implementation level of IPA. Few schools conducted IPA very well and set examples for other schools. However, some schools could not guarantee one teaching hour for IPA per week.

School context

The document analysis and the interviews revealed that it is clear that the vice-principal or the director in charge of teaching assumes a role in academic duties: regularly supervising classrooms in order to understand the situation of teachers' teaching and students' learning, superintending teachers' weekly lesson plans, providing teachers with pedagogic support, leading teaching reform to improve teaching and learning.

The class size of each school was different. Some schools had less than 25 students per class, while others had over 66. The average class size in China secondary schools was about 55 (MOE, 2009). Normally, a smaller class size is more convenient for teachers to guide IPA. Teachers teaching load ranged between 15-25 periods per work. Teachers had little time to engage in lesson preparation and collegial collaborations.

Quality of the teaching force

As IPA is a new course in the new curriculum reform and there was no major course in IPA provided by the teacher education colleges, future prospective teachers at the secondary education level are not qualified for IPA teaching. As several studies (Xie, 2010; Wang, 2009; Zhang, 2008) revealed the existing curriculum system of normal universities did not offer pre-service teachers courses related to IPA. The expert interviewed also indicated that IPA was not part of the education of pre-service teachers. Also, most in-service teachers did not receive any IPA training at all. Liu (2007) found that there were no specialized IPA teachers in current junior high schools in Changsha city and teachers generally did not received special training of IPA. The quality of teachers could not meet the needs of IPA implementation. This raised a great problem for IPA implementation.

3.3.3 Teacher professional development in IPA

The teachers' professional development commences in teacher education programs at teacher education colleges or universities. Pre-service teachers receive their education in preparation of their professional career, but no attention is paid to the preparation for IPA. To prepare for IPA two types of in-service education were offered for secondary school teachers. One type exists of workshops organized by state, provincial educational sectors. Small amounts of teachers were invited to join these workshops. As outlined in the Guide on the Implementation of Inquiry Learning in Senior High Schools (MOE, 2001), teacher in-service education is key for the implementation of inquiry learning. In-service education for IPA teachers was launched in 2004 in Guangdong Province. From 2004-2006, five provincial workshops were arranged for senior high school teachers and about 680 teachers attended the workshops. The aims of these workshops were as follows (Li, 2005):

- to understand the background of the new curriculum reform, the rationale of IPA and its significance for students' development;
- to learn the current international and domestic situation of IPA implementation;
- to understand the guidance on the process of topic selection, planning IPA, research methods, investigation and interview, report writing and presentation;
- to learn from examples and experiences of IPA implementation from teaching practice;
- to reflect on their own rationale of instruction and teaching behaviors in the process of IPA implementation.

The second type exists of in-service activities organized by the IPA teaching and research group at the district or municipal level. Normally it consisted of observing an IPA lesson, interaction between the teacher observed and the other teachers, and drawing conclusions. Teachers had opportunities to exchange ideas and experiences. However, teachers were rarely provided the opportunities to practice, let alone school follow-up support.

A lack of skilled trainers was one main constraint in the organization of in-service education for IPA. Trainees expected that trainers had received more training so as to be qualified for training. Most trainers were from universities and their lectures lacked examples, therefore, the content of their lectures was inadequate to guide and operationalize IPA teaching practice. Trainees proposed to provide concrete and visual teaching cases to support them in IPA implementation. Another main

problem was that the professional development activities were not systematically planned and implemented. Some trainees pointed out that they were not provided with school follow-up support to practice what they learned in the workshops.

3.4 IPA ENACTMENT: RESULTS FROM THE TEACHER SURVEY

3.4.1 Teacher preparation of IPA

As IPA is a new and cross-disciplinary course, there were no specialized teachers. As shown in Table 3.3, the teachers involved in the teaching of IPA have a background in 11 different subjects. The teachers from Information Technology, Chinese and Biology teach IPA most often. They account for 18.9%, 18.2% and 14.0% respectively.

Table 3.3 *Disciplinary background distributions of teachers*

Subjects	Information					
	technology	Chinese	Biology	Geography	History	Physics
<i>N</i>	27	26	20	13	11	10
<i>%</i>	18.9	18.2	14.0	9.1	7.7	7.0
Subjects	Politics	Mathematics	English	Chemistry	Art	
	<i>N</i>	9	9	9	6	3
<i>%</i>	6.3	6.3	6.3	4.2	2.1	

As Table 3.4 shows, 64 (44.8%) teachers had received in-service education in teaching IPA. Among them, 2 (3.1%) teachers had taken part in national-level training, 13 (20.3%) teachers had attended provincial-level training, 24 (37.5%) teachers had taken part in city-level training, 13 (20.3%) teachers had attended local-level training and 12 (18.8%) attended school-level training. However, 79 (55.2%) teachers had not received any in-service education in teaching IPA.

Table 3.4 *Type of in-service education received by teachers (N=64)*

Type of in-service education	N	%
National level	2	3.1
Provincial level	13	20.3
City level	24	37.5
District level	13	20.3
School level	12	18.8

3.4.2 Teachers' perceptions about IPA

Importance of IPA

Teachers were asked which goals of IPA they considered important. The results presented in Table 3.5 show that the importance of developing practical abilities and innovative spirits of students ranked first, then transforming the way of learning and cultivating students' abilities to apply knowledge comprehensively.

Table 3.5 *Importance of the goals in implementing IPA in each school (means and standard deviations) (N=143)*

Goals in implementing IPA in each school	M	SD
To develop the practical abilities and innovative spirits of students	2.4	0.11
To transform the way of learning	2.3	0.13
To cultivate students' abilities to apply knowledge comprehensively	2.3	0.15
To develop the social responsibility of students	2.2	0.20
To develop students' awareness and abilities in IT	2.2	0.22
To promote the close link between student life and social reality	2.1	0.17

Note: * Legend: Unimportant=1; Important=2; Very important=3.

Main content of IPA

According to the documents released by MOE, the main content of IPA in compulsory education (including primary and junior secondary schools) includes four domains. They are inquiry learning, community service and social practice, labor and technology education, information technology education. The main content of IPA in senior secondary schools includes three domains: inquiry learning, community service and social practice, labor and technology education. In this survey, only 5 (3.5%) teachers considered content similar to the content suggested by MOE. It shows that the teachers need further in-service education on IPA.

3.4.3 IPA enactment in schools and in teaching practice

Number of IPA class hours

Although the subjects of this survey were teachers who had implemented IPA, there were still eight teachers (6%) who had chosen not to offer IPA to their students. As shown in Figure 3.2, there were only eleven (7.7%) teachers who chose to offer three class hours every week, which met the requirement of MOE. Most teachers (75, 52.5%) offered IPA two hours per week, followed by 49 (34.3%) of the teachers who taught IPA one hour per week. It appeared that some schools offered Information Technology, school or class meeting and IPA respectively, each subject one class hour every week. They offered school or class meeting,

military training and spring outing instead of IPA for coping with the higher education authority inspections. These teachers did not actually teach IPA. The main reason was that the school leaders and teachers thought IPA was not as much important as major subjects such as Chinese, Mathematics and English and it was not related to national college entrance examination.

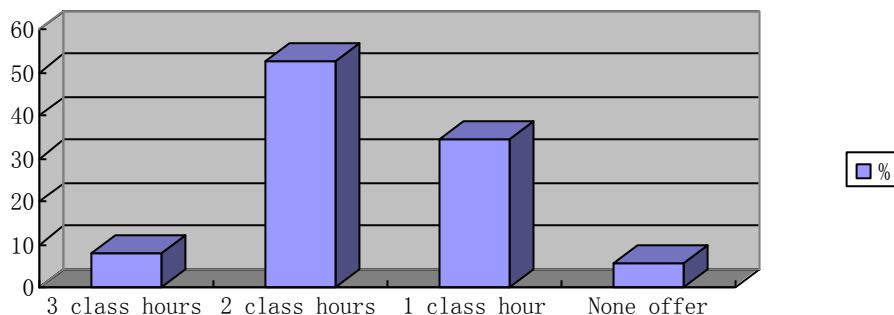


Figure 3.2 Class hours offered for IPA in the classes (N=143)

Infrastructure in schools

The teaching facilities in schools are prerequisite for a successful implementation of IPA. To meet the requirements of the new curriculum reform, all the schools actively raised funds to improve the technology infrastructure. Among the 29 schools surveyed, all the schools had constructed a campus network that has access to Internet. All the schools had multimedia classrooms, computer rooms, laboratories and library. Only three schools did not have activity rooms for students. Nevertheless, there is a large difference in the quantity and the quality of the infrastructure among the schools.

Teachers' experience in teaching IPA

About 135 (94.4%) teachers were involved in the implementation of courses related to IPA, such as inquiry learning and extracurricular activities. Among them, 25 (18.5%) teachers had taught IPA less than one year. 70 (51.9%) teachers had between 1 to 2 years experience, and 40 (29.6%) teachers had between two to three years of experience in teaching IPA. The findings also revealed that the majority of teachers taught the course alone and did not collaborate with other teachers.

Teaching methods

Because IPA is a new course with specific objectives and content, teachers are required to adopt a variety of teaching methods. Table 3.6 presents an overview of the teaching methods that teachers adopted. Next to lectures, the teaching

methods that the teachers adopted were collecting information online, hands-on activities, discussion, reading books, field observation and investigation. These findings show that teachers used a variety of teaching methods to teach IPA.

Table 3.6 *Teaching methods of IPA (N=143)*

Teaching methods	N	%
Collect information online	126	88.1
Hands-on	102	71.3
Discussion	101	70.6
Read related books	100	69.9
Field observation and investigation	75	52.5

Main ways of collecting information for lessons preparation

As there are no state curriculum standards for IPA, teachers have to determine the leaning content with the specific situation of the school and the students in mind. Therefore, it is particularly important for the teachers to collect information relevant to possible topics. Table 3.7 shows which sources teachers used to collect information about possible topics for IPA. The findings show that the main ways of collecting information were web resources, textbook and reference books, communicating with colleagues and suggestions offered by students. The 'others' include collecting information from newspapers, journals and magazines, and videos. With the development of information technology, web resources gradually become rich and convenient for collection, and they were an important source in the process of topic selection. The importance of web resources may be explained by the fact that nearly 27 (19%) of the teachers teaching IPA had an information technology background. About one third of the teachers obtained information from students about topics for IPA.

Table 3.7 *Main ways of information collection (N=143)*

Main ways of collecting information	N	%
Web resources	124	86.7
Textbook and reference books	123	86.0
Communication with colleagues	85	59.4
Offered by students	53	37.1
Others	9	6.3

Themes taught in IPA

90 (62.9%) teachers provided themes to be taught in IPA. These themes were broad and related to a number of subjects. Often the topics the teachers provided were closely related to the subjects they taught. For example, the themes that

biology teachers offered were air pollution and environment protection, Chinese herbal culture, green food, non-soil cultivation, urban greening and how to turn waste into wealth etc. Geography teachers mentioned themes about development of my hometown, environment protection and urban development. The other themes were for instance a survey on text messages of mobile phones, a survey on street culture in Guangzhou, a survey on the extracurricular reading books of students in secondary schools, a survey on the student interest in cartoons, a cultural comparison on China and western festivals etc.

Inquiry learning themes with local characteristics

About one third of the teachers (51, 35.7%) reported that they wished to teach local topics which lend themselves for teaching through inquiry learning. For example, the themes put forward by the teachers from Liwan District were the cultures and customs of Liwan, diet in Liwan, traditional building in Liwan, traditional dress and fashion in Liwan, air pollution and environment protection in Liwan, impact of foreign culture on the Liwan, situation and development of Qingping Traditional Chinese Herbal Medicine Market. Teachers from Huangpu District presented the themes such as investigation on tour resources in Huangpu, investigation into the impact of Line 5 underground on the economic development in Huangpu. Teachers from Haizhu District listed their themes such as urban planning and construction of Haizhu District, change of geology and topography in Haizhu District.

3.4.4 Difficulties encountered in the enactment of IPA

As IPA is a new course offered to students in secondary schools, teachers are exploring how to teach it well. At the initial stage of implementation, they inevitably encountered various problems and difficulties. The teachers were asked to report the difficulties they experienced in teaching IPA. The difficulties which were reported by more than half of the teachers were: lack of time and energy (90, 62.9%), lack of curriculum resources (83, 58.0%), shortage of funds (75, 52.5%) and student safety (74, 51.8%). As most teachers not only teach IPA, but also teach other courses, they lack energy for the preparation of IPA. About 42.0% (60) of the teachers felt that they lacked teaching facilities. One third of the teachers (51, 35.7%) reported that teaching IPA was a great demand and difficult to enact in practice. Other difficulties the teachers reported were: students did not adapt to IPA teaching (29, 20.3%) and teachers did not get the necessary support from school leaders (11, 7.7%) (see Table 3.8).

Table 3.8 *Main difficulties encountered in the implementation of IPA (N=143)*

Difficulties encountered in IPA teaching	N	%
Lack of time and energy	90	62.9
Lack of curriculum resources	83	58.0
Short of funds	75	52.5
Safety of students during off-campus activities	74	51.8
Lack of teaching facilities	60	42.0
Great demands on teachers, difficult to enact	51	35.7
Students are not adaptive to it	29	20.3
No support from school leaders	11	7.7

3.4.5 Most satisfying learning activity in teaching IPA

Teachers were asked to provide the most satisfying learning activity when teaching IPA. Less than half of the teachers (59, 41.3%) answered this question. The contents of these activities were rich and wide-ranging, and related to the disciplinary backgrounds of the teachers. One physics teacher reported that his activity was making a model plane. A biology teacher mentioned that her topic was survey on greening in Tianhe District. She took students out of the school to three typical places such as Tianhe sports center, campus of South China Normal University, and Shipai village to investigate the greening areas and the degree of satisfaction of residents to the greening. Another biology teacher reported that she led students out to collect acid rain, guided them to test the components of acid rain in laboratory, analyze data, and write research reports. An information technology teacher organized students to investigate the situation of extracurricular reading books of secondary school students. Students learned methods of investigation, designed and revised their questionnaire, carry out questionnaire investigation in and outside the school, analyzed the data and wrote a report.

Teachers reported that information technology applications most frequently used by students in these activities were: presentation (48, 81.4%), followed by word-processing technology (47, 79.7%), information-retrieval technology (such as WWW, encyclopedias on CD-ROM) (39, 66.1%), and then spreadsheets (35, 59.3%) (see Table 3.9). These findings show that teachers paid attention to cultivate students' abilities of applying information technology applications to their learning activities.

Table 3.9 *Information technology (N=59)*

Information technology	N	%
Presentation	48	81.4
Word-processing technology	47	79.7
Information-retrieval technology	39	66.1
Spreadsheets	35	59.3
Drawing and graphics	26	44.1
Communication technology	23	39.0
Web page design	16	27.1
Others	3	5.1

Table 3.10 shows a variety in the ways students learn. Group learning was very common and 58 (98.3%) of the activities adopted it, then information-processing activities (52, 88.1%) and production activities (such as publishing, the creation of texts and drawings, and presentation of findings) (38, 64.4%).

Table 3.10 *Way of student learning (N=59)*

Way of learning	N	%
Group learning	58	98.3
Information-processing activities	52	88.1
Production activities	38	64.4
Individual learning	26	44.1
Other	2	3.4

The teachers were asked how their way of teaching had changed (see Table 3.11). They reported that their role changed: 47 (79.7%) of the teachers chose a role as facilitator of students' learning; 43 (72.9%) of the teachers chose the role of collaborator of teaching; 34 (57.6%) chose to be a curriculum developer and 28 (47.5%) chose the role of researcher.

Table 3.11 *Changes of teachers' role (N=59)*

Role of teachers	N	%
Facilitator of students' learning	47	79.7
Collaborator of teaching	43	72.9
Developer of curriculum	34	57.6
Researcher of teaching	28	47.5

The teachers' reported about what - according to their perception - students acquired from the activities (see Table 3.12). More than half of the teachers reported a gain in the following student outcomes: increase in collaboration and communication (52, 88.1%), growth of knowledge and skills (43, 72.9%), increase in autonomy (41, 69.49%), increase in interest (39, 66.1%), increase in creativity (36, 61.0%) and growth in problem-solving (33, 55.93%).

Table 3.12 *Gain for students (N=59)*

Students gain	N	%
Increase in collaboration and communication	52	88.1
Growth of knowledge and skills	43	72.9
Increase in autonomy	41	69.5
Increase in interest	39	66.1
Increase in creativity	36	61.0
Growth in problem-solving	33	55.9
Increase in scientific attitude and spirits	29	49.2
Motivation enhanced	25	42.4
Sense of responsibility enhanced	24	40.7
Other	1	1.7

3.5 DISCUSSION WITH OTHER STUDIES ON SITUATION OF IPA ENACTMENT

In Section 1.2.3 and Section 3.3 studies on the situation of IPA have been described. And in Section 3.4 the results from the teacher survey have been analyzed. The common conclusions and problems can be summarized as follows.

- *Perceptions of IPA.* The majority of the teachers had recognized the importance of IPA and perceived IPA as a significant way for developing the practical abilities and innovative spirits of students. They felt that students obtained the ability of collaboration and communication, and problem solving. However, some teachers confused IPA with former activities. They did not understand the rationale of IPA fully.
- *Situation of IPA provision.* Most junior high schools could offer IPA for students, while some school did not offer it at Grade 9 as they worried it would affect the secondary school examination results (Feng & Wang, 2009). Cui and Yu (2004) also reported senior high schools did not provide inquiry learning for students at Grade 12 because of the pressure of national college entrance examination. Similarly, the teacher survey showed that 6% teachers chose not to offer IPA for students in their class. Some schools only offered IPA for coping with the inspection of the educational administrative departments.
- *Teacher professional development.* IPA is a comprehensive course and it requires teachers to have highly comprehensive quality and ability. The IPA enactment poses serious challenges to teachers and it requires teachers to adjust instruction based on various factors. However, about half of the teachers had not received teacher training on IPA (Cui & Yu, 2004; Feng & Wang, 2009). Similarly, the teacher survey revealed that 55.2% of the teachers had not received any in-service education on IPA.

- *Students' gains from IPA.* Significant changes have taken place after students participated in IPA. Students felt that they prefer to explore problems more, their interest in learning increase, they are more active in classroom learning than before, are they are easier to get along with others and more confident.
- *Assessment of IPA.* Who assess the performance and products of students and what are the criteria for assessment, these are not easy to handle. IPA assessment requires multiple subjects to participate in and the criteria are not fixed. Teachers need to spend much time to observe the performance of students and collect their products, which increased the workload for teachers.
- *Difficulties encountered in IPA enactment.* The main difficulties teachers encountered in implementing IPA are lack of curriculum resources and materials, lack of energy and time, lack of effective training, inability to guide IPA as proficiently as subject teaching, the problematic safety of students during off-campus activities, unfair evaluation and rewards from school, students not actively involved.

3.6 IMPLICATIONS FOR THIS STUDY

Based on the results of the front-end analysis, the following implications could be drawn for the design, implementation, and evaluation of the exemplary curriculum materials embedded in a teacher professional development arrangement.

1. The design of curriculum materials and the professional development arrangement should be consistent with national policies about the enactment of IPA.

The documents from the Ministry of Education (MOE, 2001a, 2001b) have sketched background, rationale, contents, and objectives of IPA. The design of exemplary curriculum materials should be in line with the reform demands. And the documents from the Ministry of Education (MOE, 2001b, 2001c) and the Department of Education of Guangdong Province (DEGDP, 2003) have outlined the purpose, the importance of teachers' training, and the roles of teachers in IPA. It is necessary for the professional development arrangement to pay attention to the policy implications and be consistent with these policies.

2. In-service education on IPA is needed, including the provision of curriculum materials, and related curriculum resources.

About 44.76% of the teachers surveyed had received training on IPA. Although 94.41% of the teachers were involved in the IPA teaching, they did

not understand the content of IPA completely. Thus, teachers need more in-service education on IPA. The survey results showed a shortage of specialized teachers of IPA. At present, teachers undertake the teaching of 2 or 3 subjects. They lack the energy and time to prepare for IPA lessons, let alone to study and research it. They also lack of the opportunities to receive in-service education on IPA. It is necessary to provide in-service training and professional support on IPA for teachers.

With regard to curriculum resources of IPA, there were few provided by publishers, and the teachers were lacking time and energy to develop them. Therefore, about 60% of the teachers thought that lack of curriculum resources was one of the main difficulties they encountered in the implementation. The provision of curriculum resources of IPA also needs to be included in the design of the professional development scenario.

3. All the schools surveyed had constructed a campus network, multimedia classrooms, computer classrooms, laboratories and a library. These provided the basic conditions for the implementation of IPA.
4. It is necessary for the study to garner as much as support from the school leaders and ask them provide necessary support for the IPA implementation. From the survey and teachers' interviews it was found that some schools did not provide IPA course for students and did not arrange IPA in school timetable, because of the pressure of entrance examinations. Even if they offered the course, it only lasted one or two periods to cope with the higher level of inspection perfunctorily. School leaders attaching importance to IPA has significant influence on its implementation.

These implications will be considered for designing the intervention in Chapter 4 and 5.

CHAPTER 4

Design and formative evaluation of exemplary materials

This chapter focuses on the design and formative evaluation of exemplary curriculum materials for Integrative Practical Activities. Section 4.1 introduces the chapter with an overview of the context and aim of the study. In section 4.2 the design guidelines that guide the development of prototypes will be presented. The overall development process of prototypes is described in section 4.3. Section 4.4 reports the design of the exemplary curriculum materials. The evaluation of the first prototype and the trial of the second prototype are described in section 4.5. Conclusions and implications for further development are summarized in section 4.6.

4.1 INTRODUCTION

In the previous chapter IPA has been introduced as a new course in the new curriculum reform for basic education in China. The literature review presented in chapter 2 revealed state-of-the art knowledge about the potential and characteristics of exemplary curriculum materials to support teacher in the enactment of IPA. In addition, the knowledge base for the teacher professional development in enacting new curricula was also explored. The front-end analysis provided information about similar initiatives in other Asian countries and a clear image of the current status of secondary IPA education in China. Based on a literature review and results of the front-end analysis, constraints and opportunities to support teachers in the initial enactment of IPA were identified. The findings of chapters 2 and 3 helped to formulate design guidelines for exemplary curriculum materials to support teachers in the enactment of IPA. This chapter will focus on the design and formative evaluation of the exemplary curriculum materials.

4.2 DESIGN GUIDELINES FOR THE IPA EXEMPLARY CURRICULUM MATERIALS

In view of the information obtained from the front-end analysis (chapter 3) and literature review (chapter 2), the following guidelines are formulated to guide the design and formative evaluation of curriculum materials prototypes.

The exemplary curriculum materials need to

1. *Be consistent with national curriculum reform policies*

The documents from the Ministry of Education (MOE, 2001a, 2001b, 2001c) have sketched the background, rationale, content, and objectives of IPA. To support teachers with the enactment of IPA, the design of exemplary curriculum materials should be aligned with the reform demands. The rationale of IPA and clear learning objectives need to be provided.

2. *Include procedural specifications*

Procedural specifications focus on essential but apparently vulnerable elements of IPA and provide the teacher with concrete 'how-to-do' suggestions for the implementation of IPA. The following elements are found vulnerable for the implementation of IPA: activity preparation, activity procedures and teacher's role, group work, assessment of learning effects.

- Activity preparation

Concrete support in the planning and timing of specific learning activities (e.g. van den Akker, 1988; Voogt, 1993), as well as the provision of (online) resources (background information and other references) required for the activity (including worksheets for students), and information about possible problems students may encounter during the activity and how to cope with them (e.g. Thijs & van den Akker, 2009).

- Activity procedures

Active in-depth learning through well-designed tasks focuses student around central questions and engages student in doing the work (Darling-Hammond, 2008). Focusing on student-centered approaches and the goals of IPA, exemplary curriculum materials are designed to involve students actively in the learning process through topic selection and definition, conducting investigations and observations, collecting and analyzing data, making explanations about evidence, report writing and presentation. The activities are designed with an emphasis on inquiry around topics and active engagement of students.

- Teacher's role

Studies (Beyer & Davis, 2009; Davis & Krajcik, 2005; Mafumiko, 2006; Ottevanger, 2001; Schneider & Krajcik, 2002; Tecele, 2006; Van den Akker, 1988; Voogt, 1993) show that curriculum materials need to provide concrete suggestions for teachers on how to guide students in their learning process.

- Group work

Collaboration and conversation is considered essential for IPA learning. Collaboration involves students building a shared understanding of ideas and of the nature of the discipline as they engage in discourse with their classmates and adults outside the classroom (Krajcik, Blumenfeld, Marx, & Soloway, 1999). The exemplary materials need to pay careful attention in the design of the collaboration activities so that both teachers and students can engage in them productively (Singer, Marx, & Krajcik, 2000). Exemplary curriculum materials are designed to provide support on teaching strategies of group work and suggestions for teachers to involve students, teachers, and members of society in a community of inquiry as they collaborate about the topics.

- Assessment of learning effects

Curriculum, instruction, and assessment are integrated around meaningful performance in a real-world context. Performance tasks are central to the work of IPA and are selected to represent the ideas and modes of inquiry in IPA. Research suggests that inquiry-based learning demands thoughtfully structured performance assessments both to define the task and to properly evaluate what has been learned (Black & Wiliam, 1998a). Research on formative assessments suggests that feedback is more productive when it is focused on student process and keyed on the quality of the work, offering comments for students to consider (Black & Wiliam, 1998b; Shepard, 2000). The exemplary materials designed need to provide teachers with evaluation criteria and suggestions on ways of assessments.

3. *Use exemplary video clips*

Video clips demonstration could be seen as a special form of exemplary curriculum materials (Loucks-Horsley et al., 2010; Roes, 1997) and as valuable pedagogical tools in teacher education (Borko, Jacobs, Eiteljorg, & Pittman, 2008; Maher, 2008; Sherin, 2004). Video clips are also used as a way to bridge the perceived gap between the theory and practice (Bencze, Hewitt, Pedretti, Vaillancourt, & Yoon, 2003). Video recordings of exemplary lessons serve as demonstrations of the 'ideal' performance but also illustrate typical problems

in practicing the lessons. Exemplary video clips would provide teachers concrete examples of what IPA lessons look like in and out the classroom when teachers enact IPA in their practice.

4.3 DESIGN AND FORMATIVE EVALUATION OF PROTOTYPES

4.3.1 A prototyping approach

In developing exemplary curriculum materials, successive prototypes were created. According to Nieveen (1999) prototypes are all products that are designed before the final product is constructed and fully implemented in practice. The development process involved a series of design, formative evaluation and revision steps (see Figure 4.1). The first draft of the exemplary curriculum materials was based on the design guidelines and was appraised by nine experts and three teachers. The second draft was developed and used in a classroom try-out by one teacher and her students. The third draft was developed and used in a field test (and reported in chapter 6). The evaluation results of each draft were used for the development of the next draft.

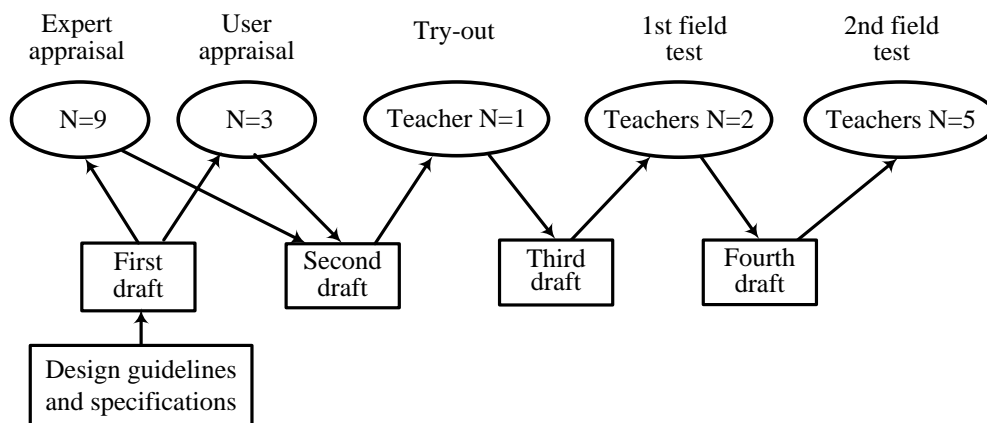


Figure 4.1 *The development process of curriculum materials*

In the design and formative evaluation of prototypes as illustrated in Figure 4.1, the aim was at obtaining information for improving the quality of the exemplary curriculum materials.

4.3.2 Quality focus of prototypes

In developing each of the prototypes the main focus was to increase the quality of the prototypes. The quality of a prototype can be described by its validity, practicality and effectiveness (Nieveen, 1999):

- *Validity* implies that the design of the exemplary materials is based on the state-of-the art knowledge (content validity) and the various components of the material are internally consistent (construct validity).
- *Practicality* implies that users (teachers and students) consider the curriculum materials as appealing and usable under normal circumstances.
- *Effectiveness* implies that the experiences and outcomes with the exemplary materials are consistent with the intended aims and user's task performances are improved.

The three criteria of quality are related to the typology of curriculum representations as initially developed by Goodlad, Klein and Tye (1979), and elaborated by van den Akker (1998, 2003).

In this chapter the validity and the practicality of the exemplary materials is the focus of the formative evaluation of the first and second prototypes. The effectiveness of the exemplary materials will be the focus of the summative evaluation and is dealt with in chapter 8.

4.4 OVERVIEW OF THE MAIN PARTS OF THE EXEMPLARY CURRICULUM MATERIALS

Explanation for the teacher

With a particular focus on practically oriented activities, this part of the exemplary material introduces teachers to the theory and rationale underpinning the student-centered approach. It also outlines what the exemplary material should achieve, the sequence and content of activities, reference books and online resources.

Activity series

The activity series describes the exemplary activities. It consisted of the following six sub-activities:

- Activity 1- Grouping, deciding the topic for each group and outlining the research proposal for the group
- Activity 2- Collecting and analyzing relevant information

- Activity 3- Preparing investigation/interview scheme
- Activity 4- Data collection (field survey/investigation/interview)
- Activity 5- Data processing and analyzing, report writing and preparation
- Activity 6- Group report, results presentation and evaluation

Each activity has three distinct sections. The first section provides teachers with an activity overview, activity objectives, references and online resources. The second section focuses on activity preparation, required media and materials, and tips. The last part is devoted to the execution of the activity. This section offers teachers with a variety of scenarios and suggestions for the introduction of an activity, the activity body, and the activity conclusion. Table 4.1-4.4 illustrates how the procedural specifications were elaborated throughout the activity series.

Background information

This section provides teacher information on the content of the activity and on how to form groups.

Assessment

This section of the exemplary material offers teachers general information on the evaluation of the activity and guidelines for portfolio assessment.

Table 4.1 Description and examples of elaborations for activity preparation

Components	Examples from the materials										
Activity overview	<p><i>What the activity looks like?</i></p> <p>This activity is meant as an inquiry learning of the social problems related to environment protection. The topic is <i>Pollution Brought by the Tourism in Liwan District in Guangzhou</i>. It is meant for the Chinese Integrative Practice Activity for secondary school (Grade 9) in Liwan District. Four sub-topics constitute this topic namely <i>garbage bin and pollution, public lavatory and pollution, one-off tableware and pollution, and interloper (Peddlery do not get the official license) by the roadside and pollution</i>. The content of the materials covers these sub-topics. It aims to promote active learning through integrative learning in and outside the classroom. The main activity will be investigation and interview.</p>										
Estimation of time	<p><i>Activity plan and timing</i></p> <table border="1"> <thead> <tr> <th>Activity</th> <th>Approximate time (Mn.)</th> </tr> </thead> <tbody> <tr> <td>Topic introduction</td> <td>15</td> </tr> <tr> <td>Grouping and group topic selection as well as dividing the work</td> <td>15</td> </tr> <tr> <td>Discuss the group research proposal</td> <td>30</td> </tr> <tr> <td>Report on group research proposal in the class</td> <td>20</td> </tr> </tbody> </table>	Activity	Approximate time (Mn.)	Topic introduction	15	Grouping and group topic selection as well as dividing the work	15	Discuss the group research proposal	30	Report on group research proposal in the class	20
Activity	Approximate time (Mn.)										
Topic introduction	15										
Grouping and group topic selection as well as dividing the work	15										
Discuss the group research proposal	30										
Report on group research proposal in the class	20										
Suggestions for task organization	<p><i>What to do before the class?</i></p> <ul style="list-style-type: none"> <li>▪ Use brainstorm, let students discuss what topics they are interested and write down on the sheet. Analyze the results of the discussion and decide the topic of inquiry learning for this term. <li>▪ Prepare background information of the topic and sub-topics for the students. <li>▪ Prepare paperboard and require each group write down research proposal on it. 										

Table 4.2 *Description and examples of elaborations for activity content*

Components	Examples from the materials
Activity objectives that specify desired outcomes	<p><i>What you are trying to achieve in this activity</i></p> <p>By the end of the activity students should be able to:</p> <ul style="list-style-type: none"> ▪ Collect, process and evaluate relevant information by making use of the Internet, newspapers, journals and carrying out investigation; and on the basis of these activities, form one's own ideas. ▪ Learn the phenomena of pollution in tourism district and the causes by field survey, investigation, interview, and the application of information technology so as to gain personal experience of inquiry. ▪ Cooperate with others and share the productions by group work. ▪ Apply acquired knowledge to solve practical problems, and enjoy the pleasure of inquiry learning. ▪ Experience the scientific attitude and methods.
Outline of student activity	<p><i>Activity</i></p> <ul style="list-style-type: none"> ▪ Introduce the topic decided by teacher and students. ▪ Provide suggestions for grouping and how to carry out cooperative learning. ▪ Students in group discuss their topic and write down their research proposal on the paperboard or input into the computer. ▪ One student on behalf of their group report the research proposal in the class.

Table 4.3 *Description and examples of elaborations for teaching role*

Components	Examples from the materials
Scenarios for activity start	<p><i>Start of activity</i></p> <p>You will start the activity by introducing the topic. Ask students in group discuss following questions: What's your favorite sub-topic? What sub-topic we are going to inquiry? How to specify roles of each member needs to play in the activities? What's the research proposal of our group?</p> <p>After you have observed the students' group discussion and listened to their report, make brief conclusions as the following:</p> <ul style="list-style-type: none"> ▪ State the objectives to be achieved in this period. ▪ Make suggestions for the improvement of group research proposal. ▪ Make an arrangement of the activity for the next period.
Grouping students for an activity	<ul style="list-style-type: none"> ▪ You will start the activity by introducing the topic for this term. It is good to ask students grouping according to their interest and 3-5 students per group. While running the activity, help students to think and express their ideas fully and deeply. ▪ Be patient. Group work takes more time, so you will have less time to cover things. There will also be students who are not fully up to the task. The main thing is not to give up the first time you try something and it does not work the way you intended.

Table 4.4 Description and examples of elaborations for learning effects

Components	Examples from the materials
Performance tasks	<p><i>What students are expected to do in this activity</i></p> <p>At the start of the activity you may require students:</p> <ul style="list-style-type: none"> ▪ Participate in the activity earnestly. ▪ Make contribution to your group, such as put forward your proposal, share your ideas with group members etc. ▪ Divide into groups and use brainstorm to think about the topics they would like to explore. ▪ Write down your interested subtopics and then discuss with group members. ▪ Group discussion and decide the subtopic of your group. ▪ Apply acquired knowledge to discuss the objectives, content, methods, and work division of the research proposal.
Formative assessment	<p><i>About the research proposal</i></p> <p>You may ask the following questions to help students improve their research proposals:</p> <ul style="list-style-type: none"> ▪ Are you clear about the objectives of your research? Can you specify them further? ▪ Are you clear about the content of each activity? Can you specify them further? ▪ Do you know what methods and devices are appropriate to the research? Can you specify them further? ▪ Is the work division of group members reasonable? Please give your reason.

4.5 FORMATIVE EVALUATION OF THE 1ST AND 2ND PROTOTYPE

4.5.1 Introduction

The formative evaluation aimed to improve the validity and the practicality of the exemplary materials. The evaluation activities of the first prototype included consultation with experts and user appraisal. The data collection procedures involved asking experts and users to walk through and comment on the first prototype of the exemplary curriculum material. The evaluation activities of the second prototype included teacher interview, researcher's logbook, student questionnaire and interview as well as portfolio checklist. The outcomes of expert appraisal and user appraisal are summarized in next section, and the outcomes of the second prototype are presented in section 4.5.4.

4.5.2 Evaluation of the first prototype: Expert and user appraisal

Expert appraisal

The expert appraisal (see Appendix C) (n=9) involved six curriculum and instruction experts, two instructional design experts, and one educational design expert. Among them, two experts (one in curriculum and instruction, one in educational design) were from the University of Twente, the Netherlands. The other experts were from China and were also experts on integrative practical activities. Some of them were in charge of national and provincial educational research projects on integrative practical activities and had published books and articles on IPA. Two of them were in charge of the teaching and research of IPA in Guangdong Province and in Liwan District in Guangzhou. The experts were provided with a complete prototype, and a description of the user context. Aiming at ascertaining the validity of the material the experts were asked to look at both teacher support materials and student worksheets and provide comments on the various aspects of the materials, such as objectives of the activity, student context, the student worksheets, timing of learning activities, and what they thought could be changed to improve the materials.

In general, all experts commented positively on the idea of exemplary curriculum materials intended for IPA. They commented that the learning activities were structured to adequately achieve the formulated learning objectives. As for the student worksheets, experts commented that they will be helpful for students to finish their tasks. They suggested that not so many worksheets are needed and that students can make some worksheets themselves.

Two experts in instructional design and educational design suggested that it would be helpful to create independent material for the students including the process of topic definition and expression, research methods (esp. the investigation method), independent assignments for each activity with worksheets for the students, and accessible resources and supports. This was realized in the 2nd prototype.

User appraisal

The first prototype was evaluated by three teachers at the same time. The teachers were asked to walkthrough the material and to grant an interview.

The overall, analysis of the interview indicated that teachers' opinions of the material were positive. All of them thought that the content of the material was helpful for teachers to carry out integrative practical activities and increase

teachers' knowledge of curriculum material design. They particularly appreciated the material for its support in student worksheets which would help teachers to carry out assignments and guide students' activities in a structured way.

Two teachers indicated that the materials needed suggestions on how students can report their progress within the group or among the groups. One teacher suggested that it should provide more concrete suggestions on how to draw conclusions for each activity and how to evaluate students' activity. Another teacher pointed out that the materials should emphasize that students have to solve problems by field investigations and personal experience so as to prevent students from merely download related online contents from web sites. Although they thought that the time allocation was reasonable, they suggested that teachers should deal with it flexibly as time for integrative practical activities were scattered sometimes.

Revision decisions after expert and user appraisal

After receiving the comments from the experts and the users, the first version was revised incorporating all the necessary corrections and suggestions. The revision of the first prototype comprised the first cycle of the formative evaluation and resulted into the second version, which was used in a classroom try-out.

The outcome and revision decisions from expert and user appraisal are summarized in Table 4.5.

Table 4.5 Overview of the revision decisions from expert and user appraisal

Teacher guide part		
Objectives of the activity	Suggestions	Revision decisions
Objectives of the activity	<ul style="list-style-type: none"> More precise and concrete 	<ul style="list-style-type: none"> Rephrasing of objectives; some objectives were added and others omitted
Time allocation	<ul style="list-style-type: none"> More flexibility for teachers 	<ul style="list-style-type: none"> Teacher could deal with it in flexibly way according to school situation
Tasks of the activity	<ul style="list-style-type: none"> Activity focus on field investigation Examples of investigation should be provided for students Teacher should effectively regulate and control the development of student activity Students provided with more opportunities to exchange their ideas and share experiences within or among the groups Teachers need more concrete suggestions on how to draw conclusions for each activity and how to evaluate students' activity 	<ul style="list-style-type: none"> Allocating more time on investigation Specifications on how to conduct investigation Text and video examples of how to make investigations were provided Requiring student to communicate and report their progress Requiring students to exchange their ideas and share experiences within or among the groups each activity Providing tips for evaluating students' activity
Other support	<ul style="list-style-type: none"> To make sure that the activity goes according to plan, teacher should gain support from personnel concerned 	<ul style="list-style-type: none"> Requiring teacher to gain the support from the head of the school, students, parents, and personnel from the community
Student guide part		
Worksheets	Suggestions	Revision decisions
Worksheets	<ul style="list-style-type: none"> More student worksheets supplemented to help students to carry out assignments in a structured way 	<ul style="list-style-type: none"> Providing more independent worksheets for each activity for students
Resources	<ul style="list-style-type: none"> Providing accessible resources and supports 	<ul style="list-style-type: none"> Providing some resources and supports

4.5.3 Classroom try-out of the second prototype: design of the study

The expert and user appraisal has been instrumental in improving the validity of the exemplary material by generating valuable suggestions. Most of the suggestions proposed by the experts and users were incorporated into the second prototype and a few (e.g. time estimations) were considered during the try-out.

The second cycle of formative evaluation activities involved a try-out of the second version of prototype curriculum material in the classroom. The main aim of the try-out was to explore the practicality of the exemplary curriculum materials. It specifically intended to find out whether the teacher was able to use the exemplary material to enact IPA with his/her students in and out the classroom as an essential characteristic of the IPA curriculum. In particular the try-out aimed to collect information about the following questions:

- a. What are the teacher's perceptions of the exemplary curriculum material?
- b. How is IPA executed?
- c. How do the students experience IPA?

Participants: teacher and students

The try-out was conducted in an urban government school in Guangzhou. The school is an average junior secondary school. Table 4.6 shows a summary of the characteristics of the teacher and the students who participated in the classroom try-out of second prototype.

Table 4.6 *Summary of characteristics of participants of the try-out*

Participants			
<i>Teacher</i>		<i>Students</i>	
Gender	Female	Grade	9
Qualification	B.Ed	Age range	14-16
Diploma	B.Ed	Class size	48
Teaching subjects	Integrative practical activities		
	Information technology		
Teaching experience (years)	5 (IPA: 2)		
Teaching load	9 hours/week		

Note: B. Ed: Bachelor of Education.

The teacher was well qualified (possessing B.Ed. and a teaching diploma) and had teaching experience in integrative practical activities for 2 years. The teacher had also experience in developing materials for the secondary school integrative practical activities curriculum. The teacher not only taught IPA for the class and IT for grade 8, but also took care of the audio-visual equipments and software in the school.

There were 48 students in the class. A total of 44 (21 boys and 23 girls) students took part in the try-out. One group of four students played online games or chatted with others by MSN or QQ during IPA hours. Although the teacher and the researcher tried to engage them to fulfill their tasks, this group of four

students ignored them. As the four students were not involved in IPA, their data could not be collected for analysis.

Instruments

The instruments developed for use in the try-out were adapted from the instruments that were used the study of Ottevanger (2001). These instruments include a teacher interview, a student questionnaire, a student interview, and the researcher' log book. A description of the data collection instruments is presented in the following paragraphs.

Teacher interview

The instrument was aimed at assessing teacher perceptions of and experiences with the exemplary lessons. The teacher interview questions included the following: general impressions about the material; aspects of the materials he/she liked (disliked) most; possible problems related to timing; practical problems during execution of the activity execution; and suggestions for improvement of the material.

Student questionnaire

Data regarding students' views and experiences with exemplary lessons was collected with the help of a semi-structured questionnaire. The questionnaire consisted of 18 closed items and open-ended items. In the first section, a scale of 1 to 5 was given for each statement item (1=strongly disagree, 5=strongly agree) for students to indicate their response. The closed items were expressed in descriptive statistics (means, standard deviation, percentage). The open-ended questions included the following topics: what activities students liked and disliked and for what reason; whether the integrative practical activity was different from the former integrative practice activity; and what comments and suggestions they had to improve the activity. The responses of the open-ended items are summarized. The student questionnaire was completed by 44 students.

Student interview

The student interview used semi-structured questions to get insights in students' views and experiences with the exemplary lessons. The student interview can be characterized as structured because it was focused mainly on specific activities guided by their teacher. Questions featured in the interview included the following: what activities students liked most in the integrative practice activity this term and for what reason; what students gained from the activity; what

content should be added or cut down in the activity; differences between the integrative practical activity in this term and former activities. The researcher conducted the face-to-face interviews with eleven individual students.

Student portfolio checklist

To get an impression of how well the students understood IPA the quality of the portfolio produced by students after they completed each stage of IPA was examined. The portfolio of student groups included the research proposal, the information collection plan, the investigation scheme, notes of the investigation, and the research report.

The portfolio assessment was intended to ensure the acquisition of important knowledge, skills and attitudes in IPA. It contributed to the monitoring of the performance and progress of students in IPA and judgment towards IPA. The teacher provided feedback on the products of student groups and students modified their products based on teacher's feedback.

A checklist was prepared and referred to when analyzing the portfolio in order to gain a general impression. Table 4.7 illustrates the examples of checklist statements for research proposal. A scale of 1 to 5 was given for each statement item (1=very poor, 5=very good) for teachers to indicate their response.

Table 4.7 *Examples of portfolio checklist statements for research proposal*

Item	Grade
Objectives are explicit	
Contents are concrete and integrated	
Methods are appropriate	
Research procedures are feasible	
Work division of group members is reasonable	

Note: * Grades: 5=very good; 4=good; 3=medium; 2=poor; 1=very poor.

Researcher's logbook

The researcher's log book was used to maintain a record of activities and observation notes associated with the use of the exemplary curriculum materials by the teacher during the introductory and activity preparation sessions and the material teacher experienced during the preparation sessions and he/she suggestions for improvements. On activity execution, running notes were kept on the way the teacher introduced the topic, student participation in the activities and their progress. The notes were also made on the observed general response of students while performing different activities, and the difficulties they encountered.

Preparation

In preparation to the try-out the researcher distributed copies of the teacher support materials and student worksheets one week before meeting with the teacher in a preparation session. The try-out process involved an interactive preparation workshop (half-day) with the teacher. The researcher introduced the teacher to the material and the purpose of the study being carried out. The integrative practice activities were conducted by the teacher with the researcher as facilitator and participant observer. At the end of the integrative practice activity, a semi-structured questionnaire was administered to students to find out their views and experiences about the activity they took part in. As stated earlier, the main purpose of the try-out was to get formative feedback from users about the practicality of the exemplary curriculum materials in real practice. Therefore the teacher was requested to execute the activity, making use of the materials not as a finished product, but as a product that is in the process of development and could further be improved. At this stage of development of the curriculum materials the researcher was interested in how the teacher was able to translate the idea of IPA into his/her teaching practices and in generating additional ideas for further improvement of the material. The teacher was therefore encouraged to offer alternatives wherever he/she felt an improvement was needed, but paying attention to the new teaching approach. By allowing flexibility it was hoped that the try-out could provide insights in the feasibility of IPA as well as additional ideas for the curriculum materials, which could be incorporated into the next version.

4.5.4 Results of the classroom try-out

Classroom observations

The classroom observations were conducted to explore how IPA was executed. During the try-out the researcher participated both as observer and facilitator. The general observations as noted by researcher during try-out are summarized under activity preparation, activity execution, and conclusion of the activity.

Activity preparation

The teacher prepared some parts of the activity during the interactive preparation session with the researcher. The teacher used the teacher support materials to prepare the activity for the class without many difficulties. Before each activity, the teacher discussed anticipated problems with the researcher by phone/email, or face to face.

Activity execution

The teacher was well prepared for the start of the activities. She started the class by introducing the topic of the activity, or by introducing methods of investigation and interview, or by analyzing the group assignments which the students had finished in the last class session, or by making assignments for the students.

Then she required students to work in groups or individually to do their assignments. Sometimes she made an inspection tour in the classroom and answered questions students posed or provided them guidance and suggestions.

Like their teacher, students' motivation and involvement in all the activities in school or outside school was very good. Students were concentrated on the tasks in small groups most of time.

It should be noted that as most of the activity took place in the computer classroom, some students couldn't focus on their tasks while others were chatting through MSN or QQ and played online games.

Conclusion of the activity

The teacher concluded the activities based on students' performance and suggestions were given to students. Then she assigned homework for students and required them to prepare for the next activity.

Perceptions of the teacher

The results from the logbook and interview indicated that teacher's overall impression was positive about how the exemplary materials supported her with the enactment of integrative practice activity in her class. The teacher reported that the exemplary materials provided her enough support to teach in a more student-centered pattern. What she liked most were the student worksheets. She also liked the good examples of students' artifacts from other schools, which were provided by the researcher. However, the teacher did feel that parts of the activity could be difficult for some of the students because of their poor foundation of knowledge and skills.

The teacher thought that the majority of the students liked the activity. Because the content of the activity was rich, students could learn the knowledge and skills of questionnaire design, street investigation, personal interview, paper writing and performance etc. The teacher indicated that she liked the student worksheets most, because they were easy to handle and had played an important role in the activity.

In the interview the teacher mentioned that it was not easy for one teacher to organize IPA, because there were too many students in the class had to be divided

in twelve groups. The most disappointed thing for the teacher was that one group of students had not achieved the activity objectives. According to the teachers the ideal number of students for IPA would be around 30. The teacher pointed out a number of problems in achieving the objectives of the activity. The students' abilities were relatively poor, i.e. writing and expression. These lowered the effects of the activity. Moreover, as students did not know the personnel they were going to interview, they were much dependent on the assistance of the teacher when they carried out activities outside the school.

Student experiences

Students' opinions and experiences with IPA were measured by a questionnaire and an interview. The results are presented under the following themes: attitudes to and experiences of the activity, aspects increased after taking part in the activity, aspects of the activities students like most and those they liked least, the differences between the try-out integrative practice activity and former integrative practice activities, and suggestions.

General impressions of students on integrative practical activities

The teacher pointed out that most of students were interested in IPA. Throughout the try-out, the students appeared very attractive and excited about street investigations and interviews and by being asked to form and work in groups. The information extracted from the questionnaire and interview indicated that students liked the activity, and their attitudes towards it were positive. The general impression of students on IPA was positive. The majority students wished to carry on with more activities to improve their abilities. The following comments illustrate how students had enjoyed participating in the activity and their positive attitudes towards the activity.

- *I think the activity was of much importance and very interesting. It broadened the range of my knowledge.*
- *The activity was rich and colorful.*
- *The activity was challenging.*

Attitudes to and experiences of the activity

Table 4.8 presents an overview of students' attitudes to and experiences with IPA. Overall, students reported that they were interested in and satisfied with the activity. They stated that they actively participated in every activity and fulfilled the tasks they undertake in earnest. As a result they were satisfied with the learning effects. They declared that they benefited a lot by taking part in IPA.

Table 4.8 *Students' attitudes to and experiences of the activity (N= 44)*

Item	M *	SD	Agree or strongly agree in %
I benefit in many aspects from participating the IPA	4.6	0.69	88.6
I fulfill the tasks I undertake in earnest	4.5	0.79	93.2
The student worksheets are helpful for me to fulfill tasks	4.4	0.49	100.0
I actively participate every sectors of the activity	4.3	0.75	88.6
I am interested in the learning about the topic	4.3	0.78	90.9
I find my knowledge is not complete by IPA	4.3	0.76	86.5
I am satisfied with the effect of the topic learning	4.3	0.92	88.6
I showed my talents that have not been exploited in the classroom situation	4.1	0.85	81.8
IPA facilitate me like to study subjects I did not like before	3.9	0.89	75.0

Note: *M: 5=strongly agree; 4=agree; 3=not sure; 2=disagree; 1=strongly disagree.

Increase in ability after taking part in the activity

Table 4.9 presents students' self-reported data about the increase in their abilities after their involvement in IPA. The results showed that the majority of students who had fulfilled their tasks earnestly reported that they benefited a lot from the activity. They felt that many abilities enhanced after participating in the activity, viz. applying knowledge comprehensively to solve practical problems, cooperating with classmates, communicating with others, oral and written expression, exploiting information and communication technology in their study, collecting and analyzing information. Besides, students added that more abilities were increased, such as analyzing problems comprehensively.

Table 4.9 *Aspects increased after taking part in the activity (N=44)*

Item	M *	SD	Agree or strongly agree in %
Pay close attention to the issues in society and life	4.6	0.49	100.0
Ability to apply knowledge comprehensively to solve practical problems	4.5	0.82	95.5
Ability for cooperating with others	4.5	0.66	95.5
Ability to communicate with people	4.5	0.73	90.9
Handle affairs in a planned way	4.4	0.54	97.4
Struggle with difficulties and frustration	4.4	0.57	95.5
Ability in oral and written expression	4.3	0.61	90.9
Ability of exploiting ICT in learning	4.2	0.76	88.6
Ability to collect, analyze and arrange information	4.2	0.84	88.6

Note: *M: 5=strongly agree; 4=agree; 3=not sure; 2=disagree; 1=strongly disagree.

Aspects of activities the students like most

The majority of students liked the activity in which they made investigations on the streets and interviewed the personnel in charge of the city management. They explained that they found it enjoyable, that they liked the experiences of practice in society and learned to know what happens in society. In addition they appreciated to practice communication, team cooperation and independent learning. They also mentioned that they liked to fulfill tasks with group members because it could exchange opinions and increase cooperation spirits. Moreover, students indicated that they like to analyze the data of investigation and made conclusions because those would develop their judgment and ability of writing and expression. One student wrote: *'The investigation improved my eloquence. And I got to know how to communicate with others by street investigation. I had a sense of success.'*

Aspects of activities student do not like

The students listed some activities they liked least. Fourteen students (31.82%) stated that they did not like to interview strangers on the streets because they were mainly afraid of being refused by others. They also thought it took too much time to do so and sometimes an interviewee didn't know how to answer questions. Ten students (22.73%) indicated that they did not like to sort out data and draw conclusions of the investigation, because the data were rather messy and their poor ability of writing expression. Four students felt that they did not like to discuss problems with group members because each member insist on his/her own views and it was not easy to reach a consensus.

Differences between the try-out of IPA and former practice activities

Students appraised positively the differences between their regular practice activity and the exemplary activity, which they had experienced during 12 weeks. The following quotes capture student perceptions on the differences:

- *Normally the integrative practice activity were relatively confined to classrooms. In this activity we went out to the streets to do the investigation to get to know the citizens opinions on the interloper by the roadside.*
- *We benefited a lot from personal investigation and paper writing. And we learned the knowledge which can't be acquired in the classroom.*
- *The topic was more open and the contents were more vivid. All the group members participated in activity positively.*
- *The activity was of much significance to help us to enhance the environment awareness.*
- *The activity was much difficult than ever.*
- *We had more opportunities to practice.*

- *It gave us more room to carry out the activity according to our own ideas.*
- *During the IPA we worked in groups and the group members had to solve the problems by cooperation. And we went out to interview the persons in charge of the city management and got to know their opinions on the interloper by the roadside.*
- *It was lively and appropriate. The street investigation let us to get the most real information.*
- *We needed to apply multi-aspects of knowledge and it tested our ability.*
- *I finished the tasks with classmates. It strengthened our relationship.*

Students enjoyed the activity and expressed their desire to carry on more activities like this. Students noted that they needed plenty of time to make good preparation for the investigation to get more opinions from the investigated people.

Analysis of student product portfolio

The portfolio assessment intended to ensure the smooth completion of the various tasks at each stage and to provide information on the important skills gained in the research proposal, the information collection plan, the design and implementation of survey schema, and research report writing and presentation.

Table 4.10 reports the portfolio assessment of each student group that took part in the classroom try-out. The results show the total scores of four groups are over 80, they performed better than other groups. And one group performed least.

Table 4.10 *Portfolio assessment of student groups (N=11)*

Rater Group	1	2	3	4	5	6	7	8	9	10	11
Teacher	74	73	62	84	69	69	80	51	61	82	80

The qualities of group portfolio were consistent with students' performance in IPA. Those groups which engaged actively and worked diligently produced a portfolio of high quality, and the students in these groups also reported that they obtained a lot from IPA.

4.5.5 Revision decisions

The results of the try-out provided data on teacher perception, in and out of classroom practice, and students experience with the activity. The insights and suggestions for improvement that emerged from the results are outlined below:

- Teaching suggestions for tips to assist teachers how to guide group students to revise their research proposal, questionnaire, and research report.
- Specifications on group work. Teachers are suggested to explicitly divide roles.
- To provide learning materials for students on research methods, questionnaire design, suggestions for making investigations, and report writing.
- To provide examples of student products such as research proposal and report as a model for teachers.
- To include the video clips of the try-out teacher as practical examples of IPA in order to provide an image on how to introduce the topics, how to guide student group work, how to lead students to make investigations, and how to give suggestions based on students' performance and their products. These video clips are prepared for use in a professional development arrangement (see Chapter 6 and 7).

4.6 CONCLUSIONS AND IMPLICATIONS FOR FURTHER DEVELOPMENT

This chapter has dealt with the design and formative evaluation of exemplary curriculum materials to support teachers with IPA implementation in the class. The design of the materials was based on design guidelines that emerged from the literature review and the front-end analysis. The focus of evaluation activities was on exploring the validity and practicality of the exemplary materials for IPA. The evaluation activities were conducted through expert appraisal, user appraisal and classroom try-out.

The results from both the expert and teacher appraisals indicated that the content of the exemplary curriculum materials were based on state-of-the-art knowledge on IPA and helpful for teachers to carry out integrative practice activity and increase teachers' knowledge of curriculum material design. Teachers and experts commented that the learning activities were structured to adequately achieve the formulated learning objectives. They particularly appreciated the material for its support in student worksheets which help the teachers to carry out assignments and guide students' activities in a structured way.

The results from the try-out demonstrated that the teacher support materials and student worksheets designed for IPA showed potential of its validity and practicality. The teacher's overall impression was positive about how the

exemplary materials supported her with the implementation of IPA in the class. The teacher reported that the exemplary materials provided her with adequate support to teach in a more student-centered way. Particularly the student worksheets helped her a lot. However, the teacher did feel that parts of the activity could be difficult for some of the students with regard to their poor foundation of knowledge and skills. The teacher was able to use the teacher support material to prepare the activity for the class and successfully try-out the experiment. After the initial successful experience, the teacher gained the confidence to apply the materials in her further IPA teaching with students. The teacher thought that the majority of the students liked the activity. Because the content of the activity was rich, students could learn the knowledge and skills of topic choice, questionnaire design, street investigation, personal interview, paper writing and performance etc. The teacher mentioned that it was not easy for one teacher to organize IPA because of the large class size.

Students appreciated student-centered approach as well as the exemplary materials used for IPA teaching and learning. The majority of students stated that they actively participated in each activity and that their attitudes towards IPA were positive. Students indicated that they had enjoyed participating in the activity and benefited a lot from the activity. They were excited about street investigations, personnel interviews, and group work. Students noted that they needed plenty of time to prepare themselves for the investigation to get more opinions from the investigated people. Most of students wish to carry on more activities like this to enhance their abilities.

These results suggest that the curriculum materials to a great extent are valid and practical for use in secondary schools. Moreover, the formative evaluation results also suggested positive learning experiences for students.

CHAPTER 5

Design of the professional development arrangement

This chapter focuses on the development of the professional development arrangement. Section 5.1 gives an overview of the design iterations and formative evaluation activities that have been conducted to improve the arrangement. Section 5.2 formulates the design principles guiding the professional development arrangement. The experience with parts of the professional development arrangement during the try-out of the exemplary curriculum materials is described in section 5.3. Section 5.4 provides an overview of the professional development arrangement. The formative evaluation of the first complete version of the professional development arrangement will be presented in the next chapter.

5.1 INTRODUCTION

The design principles for the professional development arrangement were derived from the literature review (chapter 2) and the front-end analysis (chapter 3). These design principles were discussed with the teacher who participated in the try-out of exemplary curriculum materials (see chapter 4) and based on her feedback slightly adapted. Parts of the professional development arrangement were evaluated during the formative evaluation of the exemplary curriculum materials (see chapter 4). Together, these inputs resulted in the design of the professional development arrangement, which is described in this chapter. In the next chapter the formative evaluation study of the first version of the complete professional development arrangement will be presented.

5.2 DESIGN PRINCIPLES

Based on the findings of the literature review (chapter 2), the front-end analysis (chapter 3), the following preliminary guidelines were formulated to guide the design and the formative evaluation of the professional development arrangement.

1. *The professional development addresses teachers' needs and concerns*
Teachers' needs and concerns about IPA enactment are considered (see Chapter 3) for the design of the professional development program (Hall & Loucks, 1978; Loucks-Horsley et al., 2010). The appropriate support needs to be provided to address teachers' concerns.
2. *The professional development arrangement provides teachers with active learning opportunities.* Active learning opportunities allow teachers to transform their teaching (Snow-Renner & Lauer, 2005). These opportunities often involve modeling the new strategies and constructing opportunities for teachers to practice and reflect on them (Garet et al., 2001). By offering teachers active learning opportunities to apply new knowledge and skills to their teaching practice, their understanding of the new knowledge and skills will be developed and their students' learning will be facilitated.
3. *The professional development arrangement has an appropriate time span necessary for change in practice.* There is broad consensus that professional development activities need duration to provide teachers with ample opportunities to practice new knowledge and skills (Borko & Putman, 1996; Brown, 2004; Fullan, 2001, 2007; Guskey, 2000; Joyce & Showers, 2003; Loucks-Horsley et al., 1999, 2010; Penuel et al., 2007).
4. *The professional development arrangement consists of four components: exemplary curriculum materials, workshop, school follow-up support and organizational support.* These four components combine and promote each other in such a way that they facilitate the effective professional development, teacher learning, student learning, and the implementation of innovation.

Exemplary curriculum materials

Exemplary curriculum materials are embedded in the professional development arrangement. Studies revealed that exemplary curriculum materials systematically embedded in teacher professional development has the potential of supporting teachers' adopt innovation in teaching practice (Ottevanger, 2001; Teclé, 2006; van den Akker, 1988; van den Berg, 1996). The exemplary curriculum materials should effectively demonstrate what the IPA lessons look like and support the teachers' learning and practice about such lessons during workshops and later in the school. The exemplary curriculum materials have been described in Chapter 4.

Workshop

Workshops are structured opportunities for participants to focus intensely on topics of interests (Loucks-Horsley et al., 1999, 2010). They provide opportunities to understand the learning content, address real problems, explore and reflect, share participants' knowledge, and support. Workshops can use the "training" model, which assist teachers learn new behaviors that contribute to improved student learning (Joyce and Showers, 1995, 2002). A workshop for the professional development of IPA implementation includes the following steps: theory study, video demonstration and lessons preparation.

School follow-up

The professional development provides school follow-up support necessary for change in practice. Teachers need opportunities to practice what they learned from the workshop (Joyce & Shower, 1995, 2002) and need follow-up support for ongoing and job-embedded professional development. The school follow-up support would have the following characteristics:

- To support teachers in the enactment of IPA in their teaching practice, coaching is a necessary component of the school follow-up activities in the professional development arrangement. Coaching involves providing teachers with technical feedback based on classroom observation or video watching, assisting them to adopt new practice to their unique context, providing flexible coaching forms on the basis of individual teacher's concerns, helping them to examine and reflect the effects of their efforts, and encourage them to continue in spite of minor frustration and fault.
- The concept of professional learning community (DuFour, 2004; Newmann et al., 1996) is taken as a main component of follow-up support in the professional development arrangement. Professional development experiences should strengthen the collaborative aspect of learning in an environment that is supportive, collegial, and integrative (Borko, 2004; Wallace & Louden, 2002). Through professional learning community, teachers could share expertise and learn from each other. They can design and plan lessons collaboratively. They can watch each other and get feedback on their practice, and reflect on their teaching. They can also discuss problems encountered and find solutions.

Organizational support

The professional development arrangement should gain the necessary support as much as possible from the district and school organization so as to accelerate the enactment of the innovation in the school. It is recognized (Fullan 2001, 2007; Loucks-Horsley, Stiles, Mundry, Love, and Hewson, 2003, 2010; Joyce and Showers, 1995, 2002) that leadership is one of the most important factors in promoting teacher and student learning, the professional development arrangement should consider to engage principals and district leaders in supporting teachers' professional development.

5.3 EXPERIENCE WITH PARTS OF THE PROFESSIONAL DEVELOPMENT ARRANGEMENT DURING TRY-OUT OF EXEMPLARY CURRICULUM MATERIALS

Some components of the professional development arrangement, the theory study (workshop), school support, and coaching were applied during the try-out study, which primarily focused on the formative evaluation of the exemplary curriculum materials. See also chapter 4 for an extensive report of this study. Feedback about the theory study (including exemplary curriculum materials), school support, and coaching of the professional development arrangement were acquired in the interview with the try-out teacher. The main components of the professional development arrangement and the teacher's suggestions are described as follows.

Theory study (workshop)

The background information, such as the files of the Ministry of Education concerning IPA and inquiry learning, a book about the theory of IPA and examples as well as the exemplary curriculum materials were provided to the try-out teacher. The researcher explained the rationale of IPA and the operational procedures of IPA to the teacher.

School support

Before the enactment, the researcher talked about IPA enactment with the director in charge of teaching affairs in the school of the try-out teacher, and asked him to provide necessary support for the teacher, such as a networked classroom and class periods for IPA, and to assist the teacher and students to make contact with the interviewees in advance.

Coaching

Before or at the end of each lesson, the researcher exchanged ideas face to face or by email with the teacher, discussing to which details should be paid attention and what materials need to be prepared.

After the try-out, the researcher conducted an interview with the teacher. The teacher considered the *theory study* important for her to understand the rationale of IPA. She thought the *exemplary curriculum materials* were practical as well as the student worksheets, which helped in arranging students' work. With regard to the *school organizational support*, such as providing computer room for students and helping to contact the interviewees in advance, the teacher thought it was necessary for guaranteeing the smooth enactment of IPA. Regarding the *coaching*, the teacher thought the suggestions and feedback provided by the researcher were very helpful for her enactment.

The teacher suggested that the researcher provides more examples of excellent student artifacts in IPA as part of the exemplary materials for teachers and students.

5.4 OVERVIEW OF THE COMPLETE PROFESSIONAL DEVELOPMENT ARRANGEMENT: FIRST VERSION

The design principles and the experiences during the first try-out resulted in the first complete version of the complete professional development arrangement. Based on the theoretical framework of the training model of Joyce and Showers (1995, 2002), the study of Teclé (2006), and the experience with components of the professional development arrangement during the try-out of the exemplary curriculum materials, the arrangement was divided into two parts: a professional development workshop and follow-up support activities closely related to teachers' classroom practice. The workshop was structured into three main sessions: study of theory, demonstration of intended practice; hands-on practice and feedback. The workshop lasted two half-days.

Professional development workshop

Study of theory

To get a better understanding of IPA, teachers were provided with a description of IPA, its theoretical basis, and requirements of undertaking it. The aim was to

address teachers' concerns such as: What is it? How does it work? How will it affect me? At the beginning of the session, the teachers' prior conceptions about IPA were discussed, followed by a presentation in which the researcher outlined the characteristics of IPA as well as the rationale underpinning it followed. In addition to the presentation, teachers were provided with reading materials referred to IPA teaching.

Demonstration

The demonstration session intended to give teachers an image of what IPA lessons look like in classroom practice. The demonstration was done through video-clips that exemplify IPA lessons. The researcher explained the context of the video clips. The total time of the video clips was about 50 minutes. At the end, the teachers were invited to participate in a plenary discussion to reflect on important aspects of IPA teaching.

Practice and feedback

The exemplary curriculum materials were introduced at the beginning of the practice session. Microteaching was used to provide teachers with the opportunity to practice IPA and get feedback.

School follow-up support activities

The school follow-up consisted of coaching activities, the use of the exemplary curriculum materials, and the creation of a school supportive environment. In the school follow-up activities the support for teachers was extended to the schools after the initial professional development workshop. In this way teachers were helped to move from workshops to classroom practice. The support arrangement can be characterized as follows:

- school-based reflective workshops for all teachers involved in IPA teaching;
- technical coaching. The researcher organized observation sessions where concrete suggestions and tips from observations were shared with an individual teacher in a nonjudgmental manner;
- the researcher made sure that necessary organizational support from the school leadership was acquired.

Tables 5.1 and 5.2 provide an overview of the workshop activities and the school-based follow-up support activities.

Table 5.1 Overview of the workshop sessions and activities

<i>Workshop session</i>	<i>Activities</i>	<i>Duration</i>
Study of theory	<i>Introduction to the workshop</i>	90Mn.
	<i>Completing 'Teacher expectation questionnaire'</i>	
	<ul style="list-style-type: none"> ▪ Collecting background information of participants at the commence of the workshop 	
	<i>Exploring participants' prior conceptions</i>	
	<ul style="list-style-type: none"> ▪ Providing the opportunity for the participants to discuss their ideas of IPA teaching 	
	<i>Theory presentation</i>	
Demonstration	<ul style="list-style-type: none"> ▪ Brief discussion about IPA teaching ▪ Presenting the rationale of IPA teaching and how to implement it 	
	<i>Reading materials</i>	
	<ul style="list-style-type: none"> ▪ Information about what IPA and inquiry learning are, the rationale of them, etc. ▪ Documents of MOE regarding IPA and inquiry learning 	
	<i>Video demonstration</i>	90Mn.
	<ul style="list-style-type: none"> ▪ Video clips which demonstrate the topic introduction, proposal report, research methods, field investigation, and research report presentation of the exemplary lessons from pilot teacher ▪ Plenary discussion and reflection 	
Practice and feedback	<i>Introduction to the exemplary curriculum materials</i>	120Mn.
	<i>Microteaching</i>	
	<ul style="list-style-type: none"> ▪ The teachers walk through the exemplary materials and develop a plan for teaching one lesson from those materials ▪ Feedback and reflection on the microteaching 	
Evaluation of the course	Teachers complete the evaluation questionnaire	15Mn.

Table 5.2 *School follow-up support activities*

<i>School follow-up support</i>	<i>Activities</i>	
School support environment	<ul style="list-style-type: none"> ▪ Handing out the exemplary curriculums materials and relevant documents ▪ Gaining necessary support from the school leadership, such as providing teachers and students with network classrooms, making contact with the interviewees in advance 	
School-based workshops	<ul style="list-style-type: none"> ▪ Introducing teachers with the follow-up scenario of the study; ▪ ; ▪ Preparing for the classroom-based (technical) coaching; ▪ Handing out exemplary examples of inquiry learning lessons and students' products in each stage; ▪ Teachers' reflecting on teaching IPA; ▪ Teachers' observing a short video-taped classroom observation of a fellow teacher, then making comments on it. 	
Technical coaching	<ul style="list-style-type: none"> ▪ Providing feedback to teachers based on classroom observation or video watching ▪ Providing concrete suggestions and tips for next lessons 	30Min/once

This chapter reported the prototyping process of the professional development arrangement. Based on the design principles and the feedback from the try-out, the first complete version of professional development arrangement has been described. The results of the formative evaluation of the first complete version of the professional development arrangement are presented in Chapter 6.

CHAPTER 6

Design and results of the first field test

This chapter presents the design and results of the formative evaluation of the 1st field test of the intervention. Section 6.1 describes the aim and research questions of the study. Sections 6.2 and 6.3 present the expert appraisal and the implementation of the first version of the professional development arrangement. The characteristics of participants, data collections instruments and procedures, and the description of IPA in school A and school B are described in section 6.4-6.6. The results of the 1st field test are reported in section 6.7. Section 6.8 provides a summary of overall conclusions of the formative evaluation and the implications for the instruments and professional development arrangement. Section 6.9 gives an overview of the revision decisions of the professional development arrangement based on the findings.

6.1 AIM AND RESEARCH QUESTIONS OF THE FIRST FIELD STUDY

In this chapter the validity, practicality and effectiveness of the exemplary curriculum materials embedded in professional development arrangement were investigated by expert appraisal and in a small field test. This study used the five levels of evaluating professional development arrangement (Guskey, 2000) as an evaluation framework. According to Guskey (2000), data collection at level 1 (teachers' reactions) focuses on answering questions like 'Did teachers like it? Was their time well spent and will it useful and relevant?' Level 2 (teacher learning) aimed to answer questions about the knowledge, skills, and attitudes participants gained. At level 3 (organizational support) questions such as 'Was the enactment facilitated and supported? Were sufficient resources made available? Were problems addressed quickly and efficiently?' were answered. Level 4 (teachers' use of new knowledge and skills) focused on whether teachers utilized the new knowledge and skills in practice? At level 5 (student learning outcomes) answered questions like: 'What was the impact on students? Did it affect student performance and attitudes?'

The 1st field testing aimed to evaluate the impact on teaching IPA in junior secondary schools. The main research question for this study was as follows:

What is the validity, practicality and effectiveness of the professional development arrangement on helping teachers teach IPA in Chinese junior high school classes?

Based on this question, six sub-questions were formulated to guide the investigation:

Validity

1. What are experts' comments on the professional development arrangement?

Practicality

2. What are the teachers' reactions towards the professional development arrangement? (Level 1)

3. What is the teachers' learning from the professional development arrangement? (Level 2)

4. What is the organizational support for teachers? (Level 3)

5. How do teacher enact IPA in- and outside the classroom? (Level 4)

Effectiveness

6. How do students experience and what do they learn from IPA? (Level 5)

The first question provides information about the validity of the professional development arrangement. Teachers' actual classroom practices (level 4) were seen as the main indicator for the practicality of the professional development arrangement, while students' experiences with IPA and their learning results (level 5) from these activities were considered to be the main indicator for the effectiveness of the professional development experience with IPA. Data on teachers' opinions about professional development arrangement (sub-question 2), teachers' learning from the professional development arrangement (sub-question 3), and organizational support for teachers (sub-question 4) served primarily to help to interpret information on teachers' classroom enactment.

6.2 EXPERT APPRAISAL ON THE 1ST VERSION OF THE PROFESSIONAL DEVELOPMENT ARRANGEMENT

An expert consultation was conducted to improve the validity of the professional development arrangement and to elaborate the components of the professional development arrangement further.

Total five experts were involved in the appraisal. Three experts in the field of curriculum and teacher professional development from South China Normal University, one expert in charge of IPA at the Teaching and Researching Office of Guangdong Province and one expert in charge of IPA at the Teaching and Researching Center of Yuexiu District were involved in the consultation. The five experts were provided with an outline of the professional development arrangement.

Regarding the *theory study*, the experts emphasized that the workshop should not only focus on explaining the rationale of IPA but also provide some examples to help the teachers understand how to enact IPA in teaching practice.

With regard to the *demonstration* session, experts suggested that issues related to running time, subtitle, and settings could affect the potential impact of video-clips. They pointed out that video-clips should be carefully prepared if they are going to serve the purpose of the demonstration. Regarding the video-clips demonstration, the experts suggested that the procedures need to be specified. The video-clips should be carefully chosen and edited according to the goal of professional development. As the IPA can be divided into several stages, i.e. making decisions on topics and writing the research proposal, designing the survey scheme and the questionnaire, field investigation, writing research report etc., the video-clips demonstration should be arranged into several sessions. The discussion questions for each stage should also be designed to facilitate the participants' reflection. The experts suggested to show a specific clip to the teachers preceding each stage.

Concerning the *school follow-up support*, the experts proposed to carry out school-based teaching and researching to solve the problems in IPA teaching practice and to strengthen the communication among the IPA teachers from different subjects.

Some general points that resulted from the expert appraisal were:

- compare the design of the program with other Chinese professional development programs (e.g. Intel Future Teacher Training Program) and learn from its training methods;
- pay attention to the procedural specifications in exemplary materials, especially on the guidance of research methods;
- provide exemplary examples of IPA lessons and the students' products in each stage;
- extend the scope of coaching through peer collaboration activities in each school.

6.3 IMPLEMENTATION OF THE 1ST VERSION OF THE PROFESSIONAL DEVELOPMENT ARRANGEMENT

6.3.1 Study of theory

Before the 1st field test, a workshop for the professional development was organized for the two participating teachers. First, the theories regarding IPA and inquiry learning were introduced. Then the explanations of the usage of exemplary curriculum materials were made to the teachers. And the teachers discussed with researcher how to use curriculum materials more specifically and made preparation for the 1st and 2nd lessons.

6.3.2 Video clips demonstration

The video clips demonstration was planned for the participating teachers before their enactment. As the two teachers were busy and it was difficult to find available time, the video demonstration had to be postponed to the middle of term. In the middle of the term, an activity of the video clips demonstration was carried out for the two teachers.

The video clips were mainly about the choice of the topic, research methods, field investigation, and research report presentation. The whole running time of the video clips was about 50 minutes. The video clips were from the try-out study. After watching the video clips the teachers talked about their impressions. They also reflected on their teaching practice and proposed the improvements for the next stage.

6.3.3 School follow-up support

School follow-up support included 10 coaching activities in each school and the use of the exemplary curriculum materials.

Based on the classroom observation, the researcher exchanged opinions with the participating teachers, discussed the problems which arose during the enactment and attempted to find solutions at the end of each lesson. Then the researcher explained briefly aspects needed attention in preparing the next lesson (activity). The teachers were required to reflect on their teaching so as to improve their enactment of IPA.

6.4 CHARACTERISTICS OF PARTICIPANTS IN THE FIRST FIELD STUDY

Two teachers participated in the professional development workshop and implemented IPA in their respective schools. The participating students (N=54) in school A were in Grade 7 and had just graduated from primary school. The participating students (N=50) in school B were in grade 9. Table 6.1 provides background information of the two participating teachers.

Table 6.1 *Characteristics of participants*

Participants	Gender	Qualification	Years of experience	Teaching load	Teaching grade	Class size
Teacher A	Female	B.Sc.	9	11	7	54
Teacher B	Male	B.L.	13	14	9	50

Note: B.Sc.: Bachelor of Science; B.L.: Bachelor of Literature.

6.5 DATA COLLECTION INSTRUMENTS AND PROCEDURES

The study employed seven types of data collection instruments: classroom observation checklist, interviews with teachers, teacher after class reflection (Weblog), student questionnaire, student interview, and student portfolio. Triangulation of methods was used to enhance the corroboration of findings (Cohen, Manion, & Morrison, 2000; Creswell & Miller, 2000; Patton, 2003). Table 6.2 presents an overview of data collection instruments and related themes.

Table 6.2 *Data collection instruments*

Evaluation level	Data collection instruments						
	CP	RLB	TI	TRB	SQ	SI	SPP
Teachers' reactions			√				
Teachers' learning		√	√	√			
Organizational support			√				
Teachers' use of new knowledge and skills	√	√	√	√		√	
Student learning			√		√	√	√

Note: CP: Classroom observation checklist; RLB: researcher's log book; TI: Teachers Interview; TRB: Teacher Reflection Blog; SQ: Student Questionnaire; SI: Student Interview; SGP: Student Product Portfolio.

Seven instruments were used to collect data for this study and the instruments and data analysis procedures are described in the following sub-sections.

6.5.1 Classroom observation (CP)

A classroom observation was conducted to obtain information about how do teacher enact IPA inside and outside the classroom (sub-question 4). The classroom observations were conducted with help of a classroom observation checklist. The classroom observation checklist consisted of a set of statements about teacher and student activities reflecting the enactment of IPA as intended in the curriculum reform. Van den Akker and Voogt (1994) use the term curriculum profile for such a checklist, which reflects the core of the curriculum innovation as perceived by its designers. The curriculum profile in this study was inspired by curriculum reform initiatives aimed at implementing IPA and also based on on experiences with lesson observations during the tryout and .

The curriculum profile (see Appendix K) covered three main parts of a lesson: start, body, and conclusion. Each part is operationalized into a number of lesson statements that can be distinguished as being acceptable for IPA enactment (so called threshold statements), ideal statements that strengthens the enactment of IPA or unacceptable statements that weaken the enactment of IPA. In the curriculum profile a '+' was assigned when the behavior was observed, a '-' for a behavior not observed, and 'n/a' for a statement that was not applicable to a particular part of a lesson.

The analysis of the curriculum profile data involved counting the number of '+' of individual statements in each part of a lesson. The total was then divided by the total number of applicable statements of each part of a lesson resulting in a practice profile. The practice profiles scores are reported in the form of percentage for judging the extent of implementation of IPA lesson teaching. The maximum attainable or total practice profile score was considered 100%. The acceptable and ideal components were given a different weight—40% of the total score could be obtained by acceptable statements (the so called threshold score and the remaining 60% by ideal minus unacceptable statements).

Classroom observations were conducted by the researcher and a research assistant. Each observer was required to make brief notes on important observations that could not be captured by the instrument. If there were significant inconsistencies between the two observers' observation, they watched the videotapes of the classroom lessons and negotiated the results. During the observation each observer completed the profiles individually by filling the boxes with a plus (+) to indicate observed teacher behaviors and with a minus sign (-) to show behaviors that were not observed. The curriculum profile was completed partly during and following the classroom observation. Based on curriculum observation and replaying the

video-tapes of the classroom activities, the researcher and a research assistant completed the curriculum profiles. Teacher A's class was eight times observed and teacher B's class was nine times observed. The interrater reliability (Cohen's kappa) for teacher A was 0.88 and for teacher B was 0.84.

6.5.2 Teacher interview (TI)

Interviews were conducted with the two teachers individually to collect data on their reactions towards and learning from the professional development arrangement, IPA enactment of teachers, and student learning (sub-question 1, 2, 3, 4, and 5). The interview scheme (see Appendix L) consisted of open-ended items and focused on teacher's general impressions of IPA (preparation and execution in/out class), their opinions about conducting IPA and school support, and their views on student learning from IPA. The interview also paid attention to teacher's perceptions of what they themselves had learned from the new approach, their opinions about the teacher support materials, and the difficulties encountered during classroom implementation (cf. Ottevanger, 2001).

The interviews were audio-taped, brief notes were taken at same time, and transcribed for analysis. The analysis procedure involved assembling the interview data into similar themes (Miles & Huberman, 1994).

6.5.3 Teacher reflection blog (TRB)

The teacher blog was designed to depict data on teachers' learning from the professional development arrangement and IPA enactment of teachers (sub-question 2 & 4). The teacher reflection blog (see Appendix M) based on the instruments used by Ottevanger (2001) and Teclé (2006) was to solicit a teacher's perception of and experience with the curriculum material and the lessons.

Each teacher was asked to write down his or her impression of the lessons, students' behavior, teacher's role, and problems encountered during the lessons, reflections on information provided in the exemplary curriculum material, and supplementary suggestions to improve the material.

The teachers were asked to write the blog immediately after teaching a lesson. The blog required a summary of key points and revision suggestions for each lesson on the revision decisions overview chart. For practical reasons, only one teacher was able to write her reflection blog. The blog was analyzed.

6.5.4 Researcher's log book (RLB)

The researcher's log book was used to collect information on IPA enactment of teachers (sub-question 2 and 4). It was utilized to keep a record of activities and consisted of observation notes associated with the use of the exemplary curriculum materials by teachers during the classroom sessions and the out of school activities with the students. Field notes were kept about the way teachers introduced the activity, how they inspired and helped students to participate in the investigation and the learning progress. In addition, notes were made about the observed general responses of students during the investigation and the difficulties they encountered when students went out of school for investigation. The researcher wrote down the notes immediately after each activity. The activities were video-taped for assisting the researcher in describing the teachers' learning about IPA and about students' learning.

6.5.5 Student questionnaire (SQ)

The student questionnaire was developed to collect information on students' experiences with and opinions of learning IPA (sub-question 5). The questionnaire (see Appendix N) was semi-structured and consisted of three sections. In the first section, students were asked to respond to 14 statements by indicating how strongly they agreed with the statement. Likewise, students were asked to respond to 10 statements by indicating how helpful they found IPA in developing their abilities. Three open-ended items were added. The open-ended items focused on which activities students liked best and least in IPA and for what reason; whether the lessons were different from the former Activities; and what students felt they had learned from the activities and how it could help them in their everyday life.

The student questionnaire was administered at the end of the implementation of IPA at each school. A total of 100 students from the two classes completed the questionnaire. The data analysis involved summarizing the responses of the open-ended and dichotomous items. The closed, rating items were expressed in descriptive statistics (means, standard deviation, percentage).

6.5.6 Student interviews (SI)

Student interviews (see Appendix O) were held to clarify the responses obtained from the questionnaire and validate the observations made during the enactment

of IPA (relate to sub-question 4 & 5). Questions in the interview included the following: Which activity did you like best and why? Were there any differences between these activities and your former IPA? What did you learn from these activities? How about the teacher's role in these activities? What suggestions do you provide for these activities?

The student interviews with a total of 16 statements were held after the end of IPA. A total of 20 students (ten from school A and ten from school B) were involved in the interviews. According to their respective teachers, the students represented three ability groups: good, average, and poor. The researcher made face-to-face interviews with individual students. All the interview conversations were audio-taped and notes were taken at the same time by the researcher. The recorded conversations were transcribed and summarized after the interview. Themes were established to help organizing the data into more meaningful information. Some original quotes from the students were also used to illustrate the findings.

6.5.7 Student product portfolios (SGP)

Student product portfolios were collected to get data on student learning (sub-question 5). Student product portfolios included their research proposal, the design of a questionnaire, data collection, data analysis, students' reflections and a research report.

The assessment of student group portfolios (see Appendix P) included five aspects and 20 items. The five aspects were the research proposal, information collected, investigation scheme, notes of investigation activity, and research proposal.

Student product portfolios were collected during the activity. At the beginning of the activity, teacher provided a big envelope for each group and required them to put their product of each stage into the envelope. Some products were also submitted by email. Students were required to pay attention to improve the quality of their product according to teachers' feedback. At the end of the activity, students submitted their group product portfolio. The researcher and the teacher sat together to review the portfolio of each group, briefly exchanged respective views on the product, and then rated independently. The researcher and the teacher in School A rated for each group respectively.

6.6 DESCRIPTION OF IPA IN SCHOOL A AND SCHOOL B

6.6.1 Grade 7 students in school A

The topic students inquired in school A was “*Foreign Businessmen in Guangzhou*”. Students were curious about the observation that more and more foreign businessmen came to Guangzhou and lived near their school. After the teacher introduction the topic and brain stormed about possible sub-topics, the 51 students were divided into ten groups and had chosen their sub-topics (see Box 6.1):

Box 6.1 *Sub-topics in school A*

1. Survey on foreign businessmen doing business in Guangzhou
2. Foreign businessmen perceptions on the qualities of citizens in Guangzhou
3. Views of merchants in Guangzhou on foreign businessmen
4. Current situation of foreign businessmen doing business in Guangzhou
5. What has attracted foreign businessmen to come to Guangzhou?
6. Links between foreign business with the Guangzhou 2010 Asian Games
7. Perceptions of foreign businessmen on the street sanitary environment in Guangzhou
8. Foreign businessmen and Guangzhou: Trade and business history
9. Residents in the eyes of foreign businessmen in Guangzhou
10. Trade of foreign businessmen in Guangzhou

When each group determined their topic, students began to draft their research proposal. Later the representatives of each group came to the stage to report the research proposal. Teacher and students posed questions and provided suggestions for the proposals. Each group revised their research proposal according to the feedback.

Students searched relevant information online in the electronic reading room and then classified them. The teacher provided guidance for some groups of students for improving their research proposal at same time.

The teacher lectured on research methods and required students to design questionnaire. She commented on the questionnaire drafts for each group one by one. Then students revised their questionnaire and made preparation for investigation.

Teacher A took students out for investigation four times and all the groups had finished their investigation or interview. As the teacher was busy with other work and had not prepared the questionnaire well, the English translations were not printed in the questionnaire. It was therefore not convenient for the students to do the investigation. The teacher and students began to translate the questions into

English immediately and wrote down on the paper, and then they could ask the foreigners questions in English.

At the end of the activity, students gathered together and the teacher drew conclusions. Students were required to write brief reflections on their activity and prepare the statistical analysis. As an example the experiences of Group 1 is described in more detail.

Group 1 from school A consisted of five members. Their topic was "*Survey on the current situation of foreign businessmen engaging in trade in Guangzhou*". Their inquiry backgrounds were more and more foreign businessmen came to China to engage in trade with the reform and opening up policy. Guangzhou is the south gate of China and its foreign export value grew largely recent years. For this reason, the group of the students decided to inquiry the topic. They collected information on foreign trade, designed and revised their questionnaire. About 35 foreign businessmen mainly from Africa and South America were interviewed during their investigation. Students of the group conclude: "*As our teacher provided a lot of support for us, we got along well with the investigation. We overcame the psychological barriers that were afraid of strangers and refusal. It was a great challenge for us. When we sort out data and made slides, it improved our ability to use ICT and analyzing data. The most important thing was that we got a further understanding of foreign businessmen and made suggestions for their puzzles, such as language and residence. In a word, we greatly profited from the activity.*"

After investigation and interview, students started to analyze data and wrote research report. The last session for the students was to prepare the presentation of their research report in the class. The students reported their findings and made recommendations. They also talked about their gains from IPA and reflected their actions and learning. Particularly, three group produced handwriting newspapers to present their results.

6.6.2 Grade 9 students in School B

The topic students inquired in school B was "*The Culture of Couplet Poet in Guangzhou*". Students were interested in the culture of couplet poet in Guangzhou. 49 students were divided into four groups and had chosen their sub-topics (see Box 6.2):

1. History, protection and development of the culture of couplet poet in Guangzhou
2. Links of the culture of couplet poet with people living in Guangzhou
3. Characteristics and functions of the culture of couplet poet in Guangzhou
4. Status of the culture of couplet poet in Guangzhou

Students of each group sat together to discuss their research proposal and survey program. They began to design a questionnaire for their investigation. Teacher B listened to them and gave them guidance occasionally.

As there was not enough time, teacher B only took students out two times and only part of the groups finished their investigation. However, he and the school leader invited a senior expert to give the whole class a lecture on poetic couplet. After the lecture, some students asked questions about poetic couplet in Guangzhou. Compared with students in Class A, students in Class B were not so engaged in the activity. The reasons were the shortage of time and the high pressure of the entrance examinations for senior high school.

Teacher B gave a lecture on data analysis. Students began to analyze their data. Then, they wrote research report and prepared for report presentation. Finally, students of each group prepared the presentation of their research report in the class. Each group reported their findings and recommendations. They also talked about their gains from IPA and reflected their learning.

6.7 RESULTS OF 1ST FIELD TEST

This section describes the results of the 1st field test. The results of the teachers' reactions towards the professional development arrangement are presented in section 6.7.1. Section 6.7.2 describes the teachers' learning from the professional development arrangement. The results of organizational support and teachers' IPA enactment are analyzed in section 6.7.3 and 6.7.4. Student learning experiences and outcomes are documented in section 6.7.5.

6.7.1 Teacher reactions towards the professional development arrangement

Teachers' expectations and reactions

In the interview preceding the workshop the two teachers expressed their expectations about IPA in terms of getting more information, skills and ideas for activities. Specifically they wanted to know how to teach and organize the IPA

lessons, how to enact the IPA, and examples they could see to learn from other teachers. Teachers' reaction about the professional development arrangement was collected in the teacher interview.

Teachers' reactions about the workshop

The two teachers mentioned that they were positive about the professional development workshop. They thought it lived up to their expectations. After the workshop both teachers confirmed that they were planning to use the exemplary curriculum materials in their enactment of IPA. With regard to the video demonstration, which was showed during the school support follow-up instead of during the workshop (see 6.2.2) the two teachers appreciated it highly. They commented that it was the appropriate time to demonstrate the video clips. If it was shown during the workshop they would absolutely follow what the pilot teacher did without their own ideas. Because it was shown in the middle of the term, they could not only get to know what other teachers had done, but also have their own ideas on what they need to do in their class.

School follow-up support

As the two teachers had two times to get together to discuss problems they encountered during the enactment and to find solutions, they thought it was a good opportunity for them to share their experiences and wisdom. They appreciated that the researcher provided coaching and feedback before/after each lesson. They hoped that more opportunities like this should be provided for them to improve their professional development.

Teacher opinions on exemplary curriculum materials

The results from the teacher's blogs and interviews indicated that teachers' overall impressions were positive. The interviewed teachers reported that the exemplary curriculum materials provided enough support for teaching IPA. The reasons they liked the exemplary curriculum materials was that it provided teacher specific guidance which could be followed to carry out the activity. Also, teachers indicated that it was practical. The teachers expressed their desire to adopt the exemplary curriculum material as an example for their future IPA teaching.

6.7.2 Teacher learning from the professional development arrangement

The data of teacher learning from the professional development were collected through the teacher's blog written after each lesson, researcher observation, and

the reflective interview conducted after the lesson observation series. The blog and interview with teachers focused on teacher learning from enactment.

Based on the researcher's observation, teacher A tended to understand the rationale of IPA quickly and adopted inquiry learning in her teaching practice. The students in her class were actively involved in the activity and benefited a lot from the activity. Teacher B spent most of the time on lecture in his first lesson. After class, the researcher exchanged ideas with him and suggested him allocate more time for student group activity. During the second lesson, teacher allocated more time for student activities; but, he just walked to each group and did not guide student activity and provided suggestions for them. After several times of view exchange, the situation changed a little, and paid more attention to guide students.

The responses from the interviews with the teachers revealed that they had learned a lot from the IPA enactment. Teacher A indicated what she learned from the enactment: *"First, the teacher should prepare for students and get to know their level. As the students of this class had just entered junior high school, they needed a period of time to adapt to the study life in middle school. Second, the activity preparation should be meticulous so as to guide students to fulfill the tasks step by step. Third, teacher needed to have the basic information about the topic and have clear objectives so that he/she could guide students in accordance with the objectives. Finally, as I got a lot support from expert and had been coached by professional development workshop, I felt easy to carry out the activity. I gained greatly from coaching students."*

Teacher B briefly mentioned that what he learned from the enactment: to better know the theory of IPA, and how to organize and guide this kind of activity initially.

6.7.3 Organizational support

Information on the organizational support was gathered through the teacher interview.

Regarding the school support, teacher A considered that the principal encouraged her to enact IPA and provided an activity room with access to the Internet. The teacher in charge of the class was very supportive. However, teacher A complained that the network connection was very slow for students to access the Internet in the electronic reading room. The school administration did not contact the museum for students' visit in advance. The teacher felt alone in carrying out IPA and had no opportunities to exchange views and learn from the colleagues.

Teacher B reported that the principal was very supportive of IPA enactment and provided some books on couplet. The school helped him to invite a senior expert of couplet to give a lecture for the students. However, students had no opportunities to search information and process data in the computer room due to the time constraints.

6.7.4 Enactment of IPA

Differences in classroom practice

The degree of the enactment of individual teachers was determined by the classroom observation instrument. The results of teacher A and teacher B are presented respectively in Table 6.3 and Table 6.4. They will subsequently be compared in order to explore differences in classroom practice. For the convenience of comparison, the same session carried out by the two teachers were chosen for the analysis.

The total practice profile score was considered 100% – calculated by weighing 40% for the realization of the thresholds and 60% for ideals statements related to IPA teaching. Table 6.3 presents an overview of the classroom practice profile of teacher A.

Table 6.3 *Practice profile of teacher A*

Activity	Threshold scores				Ideal - unacceptable scores				Total*
	Start	Body	Conclusion	40%	Start	Body	Conclusion	60%	
Topic introduction	80	50	60	25	100	83	0	37	62
Research Proposal	80	100	40	29	100	75	60	47	76
Questionnaire design 1	80	100	100	37	25	58	60	29	66
Questionnaire design 2	100	83	60	32	100	50	0	30	62
Data analysis	80	83	100	35	75	100	40	43	78
Research report presentation	100	67	75	32	100	50	0	30	62
Mean				32				36	68
SD				4.3				7.6	7.4

Legend: * The total = [threshold scores] + [ideal scores – unacceptable scores in %].

As shown in Table 6.3, the mean practice profiles score for teacher A was 68. Teacher A scored largely above the threshold practice score, which was 40%. At the start of each activity, she paid attention to introduce the topic, explained the

objectives and contents of the activity clearly. At the body of each activity, she spent some time to interact with students and provided feedback and suggestions for students. At the conclusion of each activity, she spent some time making conclusions and assignments.

Table 6.4 presents an overview of the practice profile scores of teacher B. The mean practice profile score for teacher B was 48. The teacher B realized an acceptable classroom practice. As for teacher B got the very high SD in the ideal-unacceptable scores, he got 100 ideal score at the start of the topic introduction; however, he got 0 ideal score at the start of research report presentation. Teacher B especially did not realize ideal classroom practice at the conclusion of each activity.

Table 6.4 *Practice profile of teacher B*

Activity	Threshold scores				Ideal - unacceptable scores				
	Start	Body	Conclusion	40%	Start	Body	Conclusion	60%	Total*
Topic introduction	80	50	60	25	100	83	0	37	62
Research Proposal	40	83.3	40	22	50	66.7	20	27	49
Questionnaire design 1	80	83.3	40	27	50	58.3	0	22	49
Questionnaire design 2	80	83.3	60	30	80	66.7	20	33	63
Data analysis	40	50	40	17	25	50	0	15	32
Research report presentation	100	50	75	30	0	25	0	5	35
Mean				25				23	48
SD				5.0				11.8	13.0

Legend: * The total = [threshold scores] + [ideal scores - unacceptable scores in %].

In order to examine the difference in classroom practice of the two teachers, especially following their involvement in the professional development arrangement, the observed practice profiles of the two teachers were compared. Table 6.5 combines the threshold and total scores from the practice profiles of Teacher A and B. The results show that Teacher A enacted IPA at an acceptable level, while teacher B's enactment of IPA did not reflect much of the intentions of the designers.

Table 6.5 *Practice profile scores of the two teachers*

	Teacher A		Teacher B	
	M	SD	M	SD
Threshold scores	31.7	4.27	25.2	5.04
Total scores	67.7	7.42	48.3	13.02

Change over time

For the main part of the curriculum carried out in classroom, the practice profile scores were analyzed per main activity in order to investigate whether changes occurred during the execution of the curriculum. Table 6.6 presents the results of the degree of implementation per main activity. Teacher A obtained a relatively high score during the progress of the curriculum. Teacher B obtained a relatively low score during the implementation. The implementation of topic introduction and questionnaire design (2) were the same for the two teachers, while the degree of implementation of proposal report, questionnaire design (1), data analysis and research report presentation differed. For activity data analysis was very high for teacher A and very low for teacher B. Teacher A did not get the unacceptable scores at the each stage of data analysis, while teacher B performed acceptable behavior at the body of the activity, he spent almost the whole period lecturing. For the average threshold at the conclusion of data analysis, teacher A spent some time discussing activity, summarized the main points of the activity, and made assignments for the activity. However, teacher B ignored these procedures.

Table 6.6 *Degree of implementation per main activity: Maximum threshold score per main activity (absolute and in percentages of the activity maximum score)*

	Max. score	A	B
Topic introduction (TI)	54	34 63%	34 63%
Proposal report (PR)	58	46 79%	31 54%
Questionnaire design (QD1)	58	37 64%	29 50%
Questionnaire design (QD 2)	58	34 59%	36 62%
Data analysis (DA)	58	48 83%	17 29%
Research report presentation (RRP)	47	24 51%	15 32%

Perceived difficulties in IPA enactment

Teacher A reported that because of the large number of students (there were ten groups) she was unable to do as much as she would like to provide specific guidance for each group. She also referred that it was difficult to find suitable interviewees for students.

Teacher B stated that as the students were in grade 9 the activity time was very tight and they could not carry out IPA in-depth. He also mentioned the traffic and safety issues when students went outside of school.

The two teachers expressed their desire of providing more opportunities for them to discuss problems they encountered and find solutions.

Student perceived benefits of teacher support

All the students interviewed responded positively about their teachers' support and guidance. They benefited a lot from it. They specified teacher's assistance in the following aspects: providing the overall flow and specific procedures of the activity; coaching them how to solve problems; guidance in how to design a questionnaire, how to carry out an investigation, and how to write research report; providing a lot of valuable information as well as suggestions for revising the research proposal, questionnaire and research report. Also they thought their teacher could create a comfortable classroom environment for inquiry. Students felt their teachers encourage them to pose questions and provide them feedback.

6.7.5 Impact on students

Perceived impact on student learning: overall practice

Overall, teacher responses indicated that IPA had impact on student learning in the cognitive and affective domains. Teachers mentioned that students' own experiences with IPA helped them link IPA with their life. According to the teachers, students' ability of discovering problems, analyzing and solving problems, and practicing were improved.

In the affective domain, teachers reported that most students appeared to be interested in IPA and enjoyed the activities as well as working in small groups.

Student experiences and learning from IPA: questionnaire response

Data obtained from the student questionnaire provided an inventory of student experiences and opinions about learning IPA lessons. Students' responses of the questionnaire are described. A comparison was made between the results of the two classes, and between boys and girls.

Attitudes to and experience with IPA

Student responses to the closed-ended questionnaire items were analyzed quantitatively in order to get information on how the students reacted to the different items, focusing on the overall experiences of the IPA lesson. Table 6.7 presents the results reactions to IPA from the students in two schools.

Table 6.7 *Students' attitudes to and experience with IPA*

Item	School A (N=51)			School B (N=49)		
	M*	SD	Agree or strongly agree in %	M*	SD	Agree or strongly agree in %
I am interested in the learning of the topic	4.5	0.50	100.0	4.3	0.62	95.9
I like the course of IPA	4.5	0.54	98.0	4.7	0.56	95.9
I am satisfied with the effect of the topic learning	4.4	0.60	94.1	4.4	0.68	93.9
I feel comfortable with group activity in IPA	4.6	0.66	90.2	4.5	0.71	91.8
I gained in many aspects from IPA	4.7	0.46	100.0	4.7	0.46	100.0
I experienced the hardships and pleasure of the activity	4.8	0.49	96.1	4.7	0.62	95.9
The student worksheets are helpful for me to fulfill tasks	4.7	0.55	96.1	4.6	0.61	93.9

Legend: 5= strongly agree; 4= agree; 3= not sure; 2= disagree; 1= strongly disagree.

Overall, the results in table 6.7 clearly demonstrated that students reacted positively to IPA. The very high mean scores (ranging between 4.3 and 4.8) for 7 items in school A and school B suggested that the majority of students had very positive attitudes to and experiences with IPA.

Performance in IPA

The results in Table 6.8 show that over 96% of the students either agreed or strongly agreed that they actively participated in IPA and they fulfilled the tasks they undertook in earnest. About 88% of the students thought that they could finish tasks in time with high quality.

Table 6.8 *Students' performance in IPA*

Item	School A (N=51)			School B (N=49)		
	M*	SD	Agree or strongly agree in %	M*	SD	Agree or strongly agree in %
I actively participate in every activity	4.6	0.57	96.1	4.5	0.82	93.9
I fulfill the tasks I undertake in earnest	4.7	0.55	96.1	4.6	0.54	98.0
I can finish my tasks in time with high quality	4.3	0.72	88.2	4.2	0.58	91.8

Legend: 5= strongly agree; 4= agree; 3= not sure; 2= disagree; 1= strongly disagree.

Self-reported perceptions about one's ability after taking part in IPA

Table 6.9 shows that the students from the two schools, who completed the questionnaire, thought they gained greatly in many aspects from IPA. Nearly 95% of the students indicated that they actively took part in the activities. Besides, more than 97% students thought they fulfilled the tasks they took earnestly. 91% of the students felt comfortable in group activity and 94% of the students considered their ability of cooperating with others had improved.

Table 6.9 *Ability perception after taking part in IPA*

Item	School A (N=51)			School B (N=49)		
	M	SD	Agree or strongly agree in %	M	SD	Agree or strongly agree in %
Pay close attention to the issues in society and life	4.7	0.49	98.0	4.5	0.54	98.0
Handle affairs in a planned way	4.5	0.61	98.0	4.4	0.58	96.0
Pay attention to reflect on the process and outcomes of the learning	4.5	0.64	92.2	4.2	0.60	91.9
Ability for cooperating with others is improved	4.5	0.81	94.1	4.6	0.86	93.9
Ability for communicating with others is improved	4.6	0.78	96.1	4.6	0.60	93.9
Ability for collecting, analyzing and arranging information is improved	4.5	0.58	96.1	4.4	0.76	87.8
Ability in oral and written expression is improved	4.6	0.53	98.0	4.2	0.76	87.8
Ability of exploiting ICT in learning is improved	4.6	0.59	98.0	4.4	0.88	87.8
Ability for applying knowledge comprehensively to solve practical problems is improved	4.7	0.44	100.0	4.4	0.61	93.9
Struggle with difficulties and frustration	4.7	0.59	98.0	4.0	1.25	71.4

Legend: 5= strongly agree; 4= agree; 3= not sure; 2= disagree; 1= strongly disagree.

The observations of the researcher and teachers and the results in Table 6.9 indicate that the majority of the students who had fulfilled their tasks earnestly benefited a lot from the activity. The mean scores ranging between 4.0 and 4.7 were very high. The percentage of students either agreed or strongly agreed in all the items except the last one were over 87.8%. The students thought that they paid more close attention to the issues in the society and life. They felt that many abilities enhanced after participating the activity as the following: applying knowledge comprehensively to solve practical problems, cooperating with classmates, communicating with others, oral and written expression, exploiting information and communication technology in their study, collecting and analyzing information. 71.4% students thought their ability of struggling with difficulties and frustration was promoted.

Aspects of the activity students liked most and least

In addition to the closed-ended items, the student questionnaire had four open questions, for which students were asked to write down two aspects they liked (or disliked) most about the IPA, the differences between the inquiry learning and the former Activities, and the suggestions for the activity. Student opinions here verify most of the findings obtained from the closed-ended items, but also provide supplementary information on their experiences with and feelings about IPA. Table 6.10 presents the aspects students liked and did not like about IPA, sample reasons, and the frequency of response.

Table 6.10 What students liked and did not like about IPA (N=100): an overview

What they liked	Sample reasons why they liked this aspect	Frequency (In N)
Go out for investigation	<ul style="list-style-type: none"> ▪ Enhance the ability to communicate with others, decreasing the sense of prudence with others ▪ Interesting ▪ Develop courage and to be self-confident ▪ Broaden vision ▪ Improve the ability of applying knowledge comprehensively to solve practical problems ▪ Experience the joy and excitement from finishing tasks successfully 	87
Search for information (online)	<ul style="list-style-type: none"> ▪ Increasing knowledge and insights ▪ Novel and interesting ▪ Gain the sense of satisfaction ▪ Enlarge knowledge ▪ Utilize ICT 	24
Use ICT	<ul style="list-style-type: none"> ▪ Enhance the ability to apply ICT ▪ Group members could participate together 	21
Discuss problems with group members	<ul style="list-style-type: none"> ▪ Listen to different opinions and learn from each other ▪ Cooperate with group members ▪ Improve the ability of oral expression ▪ Handle affairs in a planned way 	20
Research report presentation	<ul style="list-style-type: none"> ▪ Apply knowledge comprehensively ▪ Enjoy to share products with classmates 	17
What they did not like	Sample reasons why they did not liked this aspect	
Statistical analysis	<ul style="list-style-type: none"> ▪ Difficult to analyze the data ▪ Don't know how to process and analyze the data ▪ Too complicated and boring 	28
Summarize research report	<ul style="list-style-type: none"> ▪ Not know how to deal with large numbers of materials ▪ Time-consuming, troublesome and boring ▪ low ability of oral and written expression 	20
Prepare research proposal	<ul style="list-style-type: none"> ▪ Difficult to decide the group topic ▪ Disagreement among group members 	18
Questionnaire design	<ul style="list-style-type: none"> ▪ Not designing questions according to the goals ▪ Group member not cooperated well ▪ Not consider problems in many aspects 	11
Group discussion	<ul style="list-style-type: none"> ▪ Disagreement among group members 	10

About 87 responses showed that students from the two schools rated doing the investigation and the interview as the activity they liked most because it was interesting and their ability to communicate with others was enhanced. Students

felt that doing an investigation outside of school enabled them to be self-confident and develop their courage. Furthermore, students stated that it broadened their horizon. In addition, they experienced joy and excitement from finishing tasks successfully and their ability to apply knowledge comprehensively to solve practical problems was improved.

Twenty-four responses from students from the two schools described searching for materials as an aspect they liked most about IPA because it was novel and interesting, increased their knowledge and insights, and helped them to gain the sense of satisfaction. Besides it enlarges the range of their knowledge and their ability to use ICT was improved.

Twenty responses from students stated discussing problems with group members as the activity they liked most because they could listen to different opinions and learn from each other, handle affairs in a planned way, and their ability of cooperating with group members and their oral expression were improved.

Another thing students liked about IPA was using ICT. 21 students indicated that they liked using ICT because the group members could take part in the activity together and their ability to apply ICT was enhanced.

Apart from the positive reactions students had about different aspects of IPA, a few mentioned that they were not happy about certain aspects of the activity. 28 students from the two schools expressed that they did not like statistical analysis because it was difficult and too complicated, they were lack of experience and they had not master the methods to analyze data. Nineteen responses from students from the two schools mentioned that they did not like summarizing the research report because it was time-consuming and boring, and they did not know how to deal with large numbers of data. 10 responses from students stated that they did not like group discussion because there were disagreements among group members.

Differences between IPA and former Activities

The students were asked about the differences between IPA and former Activities in the questionnaire. In school A, students found the forms of activity were more than previous Activities. Twenty two responses of the students indicated that IPA provided the activities of going outside school for investigation, collecting materials, and making presentation for the research report. Eighteen responses considered the activity pay more attention to practical activity.

Although most of the students in school B had participated in IPA before, comparing the activity with those before, 11 students mentioned that the activity was organized well. Six students reported that the school leaders and teachers pay more attention to the activity. Ten students considered that IPA focused on practicing by oneself. Nine students mentioned that students thought the activity time was longer and it was truer than before.

Students' suggestions for IPA

Students in school A hoped that the school would provide more activities like this and invest as much or more time in the investigation outside school. Similarly, 14 students in school B thought more time should be given for the activity and 7 students needed the provision of more practical opportunities. 5 students thought the form of IPA should be more rich and colorful, i.e. to investigate the department concerned, to take more photos of poetic couplet in Guangzhou etc.

Student experiences and learning from IPA: interview results

Students' learning experiences with IPA were also explored through interview. Analysis of the interview data yielded information similar to what was obtained from the open-ended questionnaire items. In some aspects, the opinions about IPA between the students of the two schools were similar. Yet in other aspects there was a great deal of disparity. Students' responses have been gathered together under five categories: student favorite activities and perceived learning with IPA, differences between IPA and former Activities, student perceived benefits of group work, student perceived benefits of teacher support, student suggestions for activity improvement.

Student favorite activities and perceived learning with IPA

Students' overall impressions about IPA were very positive. Students from both schools described it as good, novel, and an interesting way of learning. During the interview, students mentioned making investigation outside school, interviewing experts and looking up materials as their favorite activities. Students felt that these activities provided them with many valuable experiences concerning practice. They indicated that by interviewing the foreign businessmen (school A) they were able to improve the ability of speaking English. Secondly, interviewing strangers improved students' ability of being with other people and they initially got to know society. Students reported that they gained greatly from the activity:

- *We had the opportunity to get in touch with various people in the society. And we could find out their opinions on Guangzhou. In the process, we enhanced our courage.*
- *It was interesting. To interview people was not so difficult than we expected before.*
- *At first I was nervous and afraid of being refused by the foreigners, gradually I did not feel so nervous, and I found some of them were friendly and helpful.*
- *Although it was a painstaking task, I learned to take my courage to communicate with foreigners. It was very important to learn to speak English well.*

Students from school B reported their gains from the activity:

- *I got to know the poetic couplet more deeply, and my ability of collaborate with others was enhanced.*
- *I learned to write report. My abilities of summarizing and communicating with others were promoted.*
- *I had learned how to communicate with strangers, it enriched my social experience.*

Students suggested that more time should be allocated for investigation outside school and reducing the time in classroom so that they could make in-depth investigation and analyze data in detail.

Differences between IPA and former Activities

Talking about differences between IPA and former Activities, students in the two schools thought the main difference was making investigation outside school, which was the real practice activity. Also, students indicated it was more open, and they could obtain results from their activity.

Six students from school B thought the time of the activity was longer than before and its process was more complete, rich and concrete. They felt that they could make a more thorough investigation.

Student perceptions about group work

Most students thought their group members could actively participate in IPA and worked well together. Two students considered their group work was not organized well and few students in the group were not engaged in the group activity.

With regard to the main difficulties they met in the group activity, students in the two schools responded differently. Students from school A considered those were they dared not talking with foreigners (3), designing investigation scheme and questionnaire (3), collecting and sorting out the data (3), and writing research report (1). On the other hand, four students from school B thought the time was not sufficient. Two students conceived that few members in their group were not engaged in the activity.

Student suggestions for activity improvement

Students in the two schools suggested that more activities like this should be held by their school and provide them with more practice opportunities outside school. In addition, students from school B proposed that more time should be given to the activity and let them do a thorough investigation. Some students in grade 9 felt that it would be better to arrange the course in grade 7 or 8 as there was high pressure of entrance exam for the graduation class. Some students felt that more time was needed to be provided for taking an in-depth exploration on the topic, especially for the outside school activity.

Student product portfolios

Student product portfolios included their research proposal, information collection, investigation scheme, notes of investigation activity, research report and students' reflections. For the convenience of analysis, the focus was on students' reflections and research report.

In their research reports, most groups of the students made reasonable conclusions based on their investigation and the materials they gathered. They presented the report in various forms (graphs, pictures, audio, video, text). In the end, they provided feasible and original suggestions about improving the business environment for the foreign businessmen, urban environmental sanitary status, citizen's quality of civilization and English. Most of the students wrote reflections on the activity describing their gains and experience.

Table 6.11 *Portfolio assessment of school A*

Rater group	1	2	3	4	5	6	7	8	9	10
Teacher	85	78	73	83	86	69	90	89	58	45
Researcher	85	76	73	83	86	68	88	89	58	46

As shown in Table 6.11, Group 7, 8, 5, 1, and 4 scored over 83. They performed better than other groups. Group 9 and 10 scored lowest. Those groups produced their portfolio of high quality were interested in and involved in activity, and students from those groups reported more gains from IPA.

The teacher from school B did not assign the groups according to the requirement. He allowed the students to be divided into four groups. Then each of the four groups was divided into two or three subgroups. The portfolio assessment in this class was rated based on the documents of the four groups and the results therefore did not reflect the actual situation of each subgroup (see Table 6.12).

Table 6.12 *Portfolio assessment of school B*

Rater group	1	2	3	4
Teacher	94	89	87	96
Researcher	91	80	77	89

6.8 CONCLUSIONS AND IMPLICATIONS

6.8.1 Conclusions with respect to the results

This chapter presented the design and results of the 1st field test carried out to evaluate the practicality of the professional development arrangement for IPA teaching in Chinese junior high school classes.

In general, the results of the evaluation showed that both teacher and students had positive experiences with IPA. They both liked IPA, were able to enact it in their classes, and found IPA helpful in adopting student-centered approach.

The two teachers were positive about the professional development arrangement. They thought highly of the video demonstration and found the exemplary video-clips helpful for identifying the main features of IPA lessons. In addition, teachers indicated the exemplary curriculum material was helpful in carrying out IPA lessons and it provided support for teaching in a more student-centered manner. The teachers stated that the researcher exchanging views before class and providing timely feedback after class helped them make full preparation for the activity and reflect their teaching practice. Teachers' reflections also indicated that their exposure to IPA enhanced their understanding of the theory of IPA as well as practical skills to guide IPA.

Regarding teachers' learning from the professional development arrangement, teacher A tended to understand the rationale of IPA quickly and adopted inquiry learning in her teaching practice. The students in her class were actively involved in the activity and benefited a lot from the activity. At first, Teacher B used most of the time on lecturing. Several times the researcher exchanged ideas with him, and teacher B allocated more time for student activity and paid attention to guide students.

The principals of the two schools encouraged the teachers enact IPA. Some resources and facilities were provided. However, the level of support was different in each school.

The two teachers have used the knowledge and skills they had acquired in the professional development arrangement in teaching IPA. They adapted the exemplary curriculum materials to their context, Nevertheless, teacher A performed better than teacher B. The large number of students, the safety issues when students go out of school for investigation and interview, and time are the difficulties teachers perceived in IPA enactment.

The results showed that the majority of the students experienced IPA positively. Most students seemed to like IPA because it is novel and interesting and broadens their vision. It made them enjoy the IPA classes and they reported that they learned a lot about the topics they explored. Apart from being novel and interesting, students appreciated the opportunity to do an investigation outside school most as compared to former Activities, which were normally carried out without a field investigation session. Students felt that they were actively involved in the learning process. Apart from helping them develop their courage and increase their self-confidence, students indicated that many abilities such as communicating with others as well as applying knowledge comprehensively to solve practical problems were enhanced after participating in the activity. The analysis also showed that a positive change of students attitude towards IPA teaching.

6.8.2 Implications for the instruments and for the professional development arrangement

Implications for the instruments

In the first field study, total seven instruments were used for collecting data to explore the practicality of the professional development arrangement.

In order to get an in depth understanding in the summative evaluation study and based on the five levels of evaluation (Guskey, 2000), teacher expectation questionnaire and evaluation questionnaire will be added to collect information on teachers' reactions. With regard to school support, a teacher questionnaire, teacher interview, and principal interview will be employed additionally. Regarding teachers' use of knowledge and skills, the level of use interview

(Loucks, Newlove & Hall, 1998) will be applied. Concerning student learning, a parent interview will also be used.

Implications for the professional development arrangement

The results of the first field study showed that teachers were satisfied with the components of the professional development arrangement. The professional development arrangement had a positive impact on teachers and students. Based on the experiences of the first field study and suggestions from the two teachers, revision decisions will be made and the second version of the professional development arrangement will be presented in the next section.

6.9 REVISION DECISIONS AND 2ND VERSION OF THE PROFESSIONAL DEVELOPMENT ARRANGEMENT

6.9.1 Revision decisions

The results of expert appraisal and the 1st field study contributed to the revision and improvement of professional development arrangement. The suggestions for improvement that emerged from the first field study and expert appraisal are reported in Table 6.13.

Table 6.13 Overview of the revision decisions from 1st field study and expert appraisal

Sessions	Suggestions	Revision decisions
Curriculum materials	<ul style="list-style-type: none"> ▪ Provide exemplary examples of the students' products in each stage ▪ Pay attention to the procedural specifications in exemplary materials ▪ Provide examples of how IPA lessons look like in practice ▪ Provide more specific materials on research methods 	<ul style="list-style-type: none"> ▪ Select and provide examples of the students' products on research proposal, questionnaire, and research report. ▪ More procedural specifications provided in exemplary materials. Teachers could deal with materials according to school and student contexts. ▪ Select and provide videos clips of the teachers in try-out and first field test ▪ Provide more specific materials on research methods for students and teachers
Video demonstration	<ul style="list-style-type: none"> ▪ Running time, subtitle, and settings could affect the potential impact of video-clips 	<ul style="list-style-type: none"> ▪ An edited version of the activity provides subtitle, which lasts about 60-80 minutes ▪ For the convenient of video watching, each video clips was given file name and a table of all the selected video clips was listed. The running time of the video clips ranges from 2-10 minutes. ▪ Discussion questions for reflection were designed
Coaching	<ul style="list-style-type: none"> ▪ Extend the scope of coaching through collaboration activities in each school 	<ul style="list-style-type: none"> ▪ More forms of coach: teacher-teacher, teacher-researcher
School-based workshops	<ul style="list-style-type: none"> ▪ Adopt CBAM for evaluation ▪ Provide teachers more opportunities to get together for sharing experiences and wisdom 	<ul style="list-style-type: none"> ▪ Pay attention to teachers' expectation of professional development, their concern at each stage, and their use of level ▪ Organize school-based learning community for teachers to exchange opinions on IPA teaching, discuss problems they encountered and find solutions ▪ Share teaching plan (including slides) with other teachers ▪ Teachers observe short video-taped lessons of a fellow teacher, then make comments on it and reflect on their teaching practice
School support	<ul style="list-style-type: none"> ▪ Garner school administrator support 	<ul style="list-style-type: none"> ▪ Get more support from school leadership, such as, taking efforts to ensure the normal class hours time for IPA

6.9.2 The 2nd version of the professional development arrangement

Based on the comments from participating teachers and expert appraisal, revision decisions had to be made. Table 6.14 summarized the revisions of professional development arrangement.

Table 6.14 *Structure of the professional development arrangement*

<i>Workshop session</i>	Activities
Study of theory	<p>Participants reception and questionnaire completion Participants are required to write the <i>teacher expectation questionnaire</i> at the beginning of the workshop</p> <p>Workshop introduction</p> <ul style="list-style-type: none"> ▪ Exploring the participants prior conceptions of IPA and inquiry learning, and discussing following questions: <ol style="list-style-type: none"> 1. What is your opinion about IPA lessons? 2. What roles do you think the teacher should play in the IPA enactment? 3. What would be your concerns for adopting inquiry learning in IPA? ▪ Introducing the project briefly. ▪ Describing the objectives of workshop <p>Theory exploration</p> <ul style="list-style-type: none"> ▪ Discussing about participants' responses to the questions ▪ Presenting the rationale of IPA teaching and how to enact it <p>Reading materials</p> <ul style="list-style-type: none"> ▪ Information about what IPA and inquiry learning are, the rationale of them, etc. ▪ Documents of MOE regarding the new curriculum reform, IPA and inquiry learning ▪ Exemplary curriculum materials
Demonstration	<p>Video demonstration</p> <ul style="list-style-type: none"> ▪ Video clips which demonstrate the topic introduction, proposal report, research methods, questionnaire design and revise, field investigation, data analysis, report writing, and research report presentation of the exemplary lessons from previous studies ▪ Sharing the examples of how the new practices should be enacted in and out of classroom ▪ Plenary discussion and reflection
Lessons preparation	<p>Introducing the exemplary curriculum materials</p> <ul style="list-style-type: none"> ▪ Teachers walk through the exemplary materials and plan lessons for teaching from those materials with the researcher ▪ Provide time for preparing and designing new lessons to integrate new approaches ▪ Brainstorm to discuss and decide the topics available for the students ▪ Feedback and reflection on the preparation
Workshop evaluation	<p>Evaluation</p> <ul style="list-style-type: none"> ▪ Teachers complete the evaluation questionnaire and the stage of concern questionnaire

Table 6.14 *Structure of the professional development arrangement (Continued)*

School follow-up support (School-based classroom practice)	Activities
School support environment	<p>School support environment</p> <ul style="list-style-type: none"> ▪ Informing school leaders about the scheme of IPA enactment ▪ Coordinating the professional development arrangement with school development planning ▪ Handing out the exemplary curriculums materials ▪ Soliciting necessary support from the school leadership, such as providing teachers and students with network classrooms, making contact with the interviewees in advance ▪ Exchanging views with school leaders regularly based on classroom observations ▪ Develop ongoing meaningful dialogue between staff members in a respectful, mutually supportive environment
Technical coaching	<p>Technical coaching</p> <ul style="list-style-type: none"> ▪ Providing feedback to teachers based on classroom observation or video watching ▪ Providing concrete suggestions and tips for next lessons ▪ Discussing the problems encountered and finding solutions ▪ Providing the excellent exemplary examples of students' products ▪ Providing online resources, audio, video and written materials related to the topics inquired
School-based workshops	<p>School-based workshops</p> <ul style="list-style-type: none"> ▪ Establish a schedule of times and places to meet once or twice a week ▪ Introduce teachers with the follow-up scenario of the study ▪ Complete the stages of concerns questionnaire in the first workshop ▪ Prepare for the classroom-based (technical) coaching ▪ Hand out exemplary examples of IPA lessons and students' products in each stage ▪ Teachers' observing short video-taped lessons of a fellow teacher, then making comments on it ▪ Teachers prepare for lessons together ▪ Share teaching plan (including slides) with other teachers ▪ Teachers' reflection upon their teaching by writing logbook (Blog) ▪ Teachers discuss common problems collectively and learn on topics such as how to reflect on their teaching practice, how to guide student group work, design questionnaire, make survey, and write report etc. ▪ Teachers share ideas and experiences ▪ Teachers' reflection on IPA teaching ▪ Teachers write articles about their own work
School follow-up support evaluation	<p>Evaluation</p> <ul style="list-style-type: none"> ▪ Teachers complete the stage of concern questionnaire, the school support questionnaire, level of use, and school follow-up support evaluation questionnaire ▪ Conducting teacher and principal interview for school support, teacher interview for implementation

CHAPTER 7

Design of the summative evaluation study

This chapter describes the design of the summative evaluation of the intervention. Section 7.1 introduces the chapter briefly. The research question for the summative evaluation study is presented in section 7.2. Section 7.3 describes the levels of evaluation. Section 7.4 presents the participants, data collection instruments and data analysis procedures. The results of the summative evaluation are reported in chapter 8.

7.1 INTRODUCTION

To enable teachers to enact IPA in the classroom a professional development arrangement, comprising a workshop, exemplary curriculum materials, a supportive school environment, and school follow-up support, was developed. Chapter 5 describes the professional development arrangement in detail.

As stated in chapters 4, 5 and 6, the formative evaluation activities were conducted for improving the quality of the professional development arrangement. The summative evaluation was focused on assessing the impact of the arrangement.

7.2 RESEARCH QUESTIONS

In this chapter we describe the design of the summative evaluation, which focused on assessing the effectiveness of the professional development arrangement. The research question for the overall summative evaluation was specified as follows:

What is the impact of the professional development arrangement in supporting teachers to teach IPA in Chinese junior and senior high school classes?

To answer this research question, the summative evaluation study has been guided by the following sub-questions, which were derived from Guskey's (2000) framework for the evaluation of professional development:

1. What are teachers' reactions of the professional development arrangement?
2. What do teachers' learn from the professional development arrangement?
3. What is the nature of organizational support for teachers?
4. How do teachers enact IPA in their classes?
5. What are the students' experiences with and learning outcomes from IPA?

7.3 LEVELS OF EVALUATION

For an in-depth investigation of the impact of the professional development arrangement five levels of evaluation were identified on the basis of Guskey's (2000) framework for evaluating teacher professional development. The five levels of evaluation are described in this section. Indicators for drawing valid inferences on the impact of the professional development arrangement are included.

7.3.1 Teachers' reactions

The 1st level of the professional development evaluates participants' reactions to the professional development arrangement. It is centered on participants' expectation, usefulness of arrangement sessions, and satisfaction with the professional development arrangement. Participants' reaction to the arrangement concentrated on the content, process, and context of the arrangement. Table 7.1 shows the indicators that were used to judge the effectiveness of the professional development arrangement at level 1.

Table 7.1 *Indicators of teacher reaction*

Categories	Indicators
Expectations	<ul style="list-style-type: none"> ▪ The extent to which teachers' expectations have been realized Teachers' satisfaction with the arrangement
Components of the arrangement	<ul style="list-style-type: none"> ▪ Teachers' opinions on the usefulness of the components of the arrangement
Content of the arrangement	<ul style="list-style-type: none"> ▪ Teachers' perceptions about the usefulness of the content offered in the arrangement

7.3.2 Teachers' learning

The purpose of evaluation at level 2 is to explore what teachers thought they acquired from the professional development arrangement in terms of new information and understanding about IPA teaching. In the summative evaluation, teachers' self-reported understanding of IPA and the teaching skills demonstrated in the classroom environment as well as changes in attitudes and beliefs reported in interviews were operationalized in indicators for assessing what they learned (see Table 7.2).

Table 7.2 *Indicators of teacher learning and understanding*

Categories		Indicators
Cognitive learning	Perceived knowledge and understanding	<ul style="list-style-type: none"> ▪ Teachers' formulation of what they learned from the arrangement in their own words. ▪ Teachers' attestation of what they gained in terms of new knowledge and enhanced understanding.
	Demonstrated understanding	<ul style="list-style-type: none"> ▪ Teachers' demonstration of the skills in the classroom environment.
Affective learning	Changes in attitudes and beliefs	<ul style="list-style-type: none"> ▪ Teachers' reported change in attitudes and beliefs.

7.3.3 Nature of organizational support

Evaluation of professional development at level 3 focuses on the organizational environment that affects the implementation of the intended changes. The central question asked at this level was to what extent the district and schools facilitated and recognized the teachers' who participated in the professional development and enacted IPA teaching in their classes. In this study, the following aspects of support as measured by teacher self-reports and principal reports: policies, resources (materials, facilities, time, and physical conditions), school culture and collegial support, school leadership and support, school follow-up support, and district support were considered and operationalized as indicators for assessing organizational support (see Table 7.3).

Table 7.3 *Indicators for organizational support and change*

Categories	Indicators
School policies	<ul style="list-style-type: none"> Principals' explanations of school policies on IPA teaching
School resources	<ul style="list-style-type: none"> Teachers' and principals' opinion on the availability of materials, facilities, times, and physical conditions at the school for IPA teaching after enactment
School culture and collegial support	<ul style="list-style-type: none"> Teachers' perceptions of school culture and collegial support for IPA teaching
School leadership and support	<ul style="list-style-type: none"> Teachers' and principals' perceptions about the role of the principal and school administration in their efforts to enact IPA teaching
School follow-up support	<ul style="list-style-type: none"> Perceptions of teachers about school follow-up support for IPA teaching Principals' opinion on provision of time, recognition of success
District support	<ul style="list-style-type: none"> Principals' perceptions about district administrators' leadership and support

7.3.4 Teachers' enactment of IPA

The evaluation at level 4 concentrates on teachers' application of what they learned in the professional development arrangement in their practice. Two major aspects of enactment were considered. The theoretical underpinnings for these aspects of use are derived from the Concerns Based Adoption Model of change (Hall & Hord, 2001) and from research linking professional development and student learning improvement (Guskey, 2000).

Level of use (LoU)

Hall and Hord (2001) defined eight different levels of use of a new innovation, which addresses the behavioral dimension of change. These levels of use are an important feature of their Concerns-Based Adoption Model. When learning to use a new innovation, teachers move along a spectrum that ranges from three levels of nonuse (*nonuse* level 0, *orientation* level 1, *preparation* level 2) to five levels of use (*mechanical* level 3, *routine* and *refinement* level 4, *integration* level 5, and *renewal* level 6). These levels of use can be determined by specifically identifying teacher behaviors at each level.

Change in teaching practice

Change in teaching practice is a third aspect of determining the enactment of IPA. Instruments used in describing the classroom enactment of participating teachers were classroom observation, teacher interview and student interview. Table 7.4 presents a total of two sets of indicators of use that were formulated for exploring the impact of the professional development at level 4.

Table 7.4 *Indicators of use at level 4*

Categories	Indicators
1. Levels of use	<ul style="list-style-type: none"> ▪ Participating teachers' levels of use of IPA teaching. ▪ Participating teachers use or adapt exemplary materials for planning and executing lessons. ▪ Participating students indicate teachers' use of IPA teaching.
2. Change in teaching practice	<ul style="list-style-type: none"> ▪ Participating teachers structure their lessons in a way that reflects IPA teaching. ▪ Participating teachers function as facilitators of students' learning. ▪ Participating teachers organize activities that promote active student participation. ▪ Analysis of participating teachers' classroom practice profile scores ▪ Participating teachers' perceived change from enactment ▪ Student perception on the role of the participating teachers in IPA.

7.3.5 Student learning outcomes

Evaluation at level 5 attempts to link the professional development arrangement to its impact on students' cognitive, affective and conative learning outcomes. Table 7.5 presents the indicators that were specified to determine students' learning outcomes.

Table 7.5 *Indicators of student learning outcomes*

Categories	Indicators
Cognitive learning outcome	<ul style="list-style-type: none"> ▪ Student portfolios and other collections of students' work ▪ Student reflection
Affective learning outcome	<ul style="list-style-type: none"> ▪ Student experience with IPA lessons ▪ Student attitudes towards IPA lessons
Conative learning outcome	<ul style="list-style-type: none"> ▪ Student reflection and opinions on IPA lessons ▪ Parent opinions on IPA lessons

7.4 METHODS

7.4.1 Participants

School A, B and C were all middle schools which had a junior high school (Grade 7-9) and senior high school (Grade 10-12). School A had about 1,600 students and 90 teachers and about 8 classes in each grade of junior high school and 6 classes in each grade of the senior high school.

School B had about 2,900 students and 162 teachers with 20 classes in junior high school and 32 classes in senior high school. School C had about 1,800 students and 132 teachers with 36 classes. In the study, five teachers from the three schools participated in IPA enactment. Table 7.6 presents the characteristics of the participants.

Table 7.6 Characteristics of participant schools

	School A	School B		School C	
	Teacher A	Teacher B ₁	Teacher B ₂	Teacher C ₁	Teacher C ₂
Age	31	30	29	28	38
Gender	F	M	M	F	F
Qualification	B.Sc.	B.L.	B.L.	B.L.	EdM.
Year of experience	9	6	7	4	17
Teaching load	12	10	10	12	12
Teaching grade	8	10	10	10	10
Class size	49	53	54	50	50

Note: B.Sc.: Bachelor of Science; B.L.: Bachelor of Literature; EdM.: Master of Education.

7.4.2 Data collection instruments and procedures

During the summative evaluation, triangulation of multiple methods was employed to overcome the weakness of each of data source and minimize uncertainty in data interpretation. The entire data collection process was organized in three stages that were conducted at different points in time. Before the implementation of the professional development arrangement baseline data were gathered. During the implementation of the professional development workshop and the school follow-up support data were collected about teachers' reactions, learning, and use of new knowledge and skills. The last stage was carried out at the end of school follow-up support. Table 7.7 provides an overview of the data collection instruments used in the summative evaluation.

Table 7.7 Stages of data collection and corresponding instruments

Evaluation level	Stages of data collection		
	Prior to intervention	During intervention	After intervention
Participants' reactions	▪ ExQ	▪ EQ	▪ SFSQ
Participants' learning		▪ EQ	▪ SFSQ ▪ TIE
Nature of school support			▪ SSQ ▪ PIOS ▪ TISS
Participants' use of new knowledge and skills		▪ CP	▪ SI ▪ TIE ▪ LoUI
Students' learning outcomes			▪ SQ ▪ PI ▪ SFI ▪ SP

Note: ExQ: Expectation Questionnaire (Teachers); EQ: Evaluation Questionnaire (Teachers); CP: Curriculum Profile; SFSQ: School Follow-up Support Questionnaire; SSQ: School Support Questionnaire; TIE: Teacher Interview for Enactment; TISS: Teacher Interview for School Support; PIOS: Principal Interview for Organizational Support; LoUI: Level of Use Interview; SFI: Student Interview; SQ: Student Questionnaire; SP: Student Product; PI: Parent Interview.

The data collection instruments used in the summative evaluation study are described in the following sub-sections. The description includes the characteristics of the instruments, what was measured in relation to levels of evaluation, how the instruments were administered, how many respondents were involved, and the data analysis procedures.

Teacher expectation questionnaire

The data on the characteristics of participants and their expectations for taking part in the professional development arrangement was collected by the teacher expectation questionnaire (see Appendix D). Participants were first asked to provide background information including previous IPA training experiences. Then participants were asked to write down their expectations in two open-ended items. The five participants completed the questionnaire at the start of the professional development workshop. Their responses on the open-ended items for expectations were organized and summarized into similar themes.

Evaluation questionnaire for workshop

The purpose of this questionnaire was to measure participants' satisfactions (level 1) and their learning (level 2) through the professional development workshop. The first part asked the participants to indicate their overall impressions of the workshop, their opinions about the components of the workshop and their perceptions concerning the usefulness and relevance of the learning opportunities in a five-point Likert scale. The second part was focused on the knowledge, skills, and attitudes participants gained after the professional development workshop. It was comprised of five-point Likert-type statements about perceived gains concerning content, process, and context of the professional development workshop. Besides, two open-ended items were related to their future use of the exemplary curriculum materials and participants' suggestions on how to improve the workshop.

The evaluation questionnaire (see Appendix E) was given at the end of the workshop. Descriptive statistics (means & standard deviation) were calculated for the closed items. Teacher responses to the open-ended items were summarized into themes.

Evaluation questionnaire for school follow-up support

This instrument was designed to gather information on teachers' satisfaction (level 1) and the new knowledge, skills, and attitudes (level 2) developed by the teachers during the school follow-up support. The first part of the questionnaire asked participants to indicate their overall impression of the school follow-up

support activities and their perceptions regarding the usefulness of the activities in a five-point Likert scale. The second part of the question was focused on assessing the extent to which participants claimed to have gained knowledge, skills and attitudes intended by the school follow-up support activities. A scale of 1 to 5 was given for each statement item (1= strongly disagree, 5= strongly agree) for the teachers to indicate their response. The open-ended questions focused on what teachers think was the most useful or least useful activity of the school follow-up support activities, any forms or contents that need to be added, what changes had taken place after the teacher professional development arrangement and their enactment, what they learned from school follow-up support.

The questionnaire was developed by the researcher on the basis of the results of the try out study (chapter 4) and improved in 1st field study (chapter 6). The evaluation questionnaire (see Appendix F) for the school follow-up support was administered at the end of enactment of IPA lessons. The five teachers from the three schools completed the questionnaire. Descriptive statistics were used to summarize the quantitative data of the evaluation questionnaire into tables. Participants' responses to the open-ended items have been summarized into manageable parts.

School support questionnaire

School support questionnaire (see Appendix G) is intended to measure the extent of school support for participant teachers in the course of the enactment (level 3). This instrument was adapted from Teclé (2006) and consists of 20 items organized into a five-point Likert scale. These items focus on obtaining the relevant data on the aspects of organizational support, namely resources (8 items), school culture and collegiality (6 items), and school leadership (6 items).

Five participating teachers completed the questionnaire after their enactment of IPA in their respective schools. Quantitative data analysis was used to analyze the data from the school support questionnaire. The analysis included descriptive statistics (means) and the percentage of teachers that agreed/strongly agreed for each closed item.

Teacher interview about school support

This teacher interview (see Appendix H) was employed to obtain teachers' perceptions on various aspects of school support (level 3) (Guskey, 2000). The data collection instrument was used to strengthen the school support questionnaire. There were six items concerning necessary resources and facilities

provided by the school, principal's support for enactment, time for lesson preparation and reflection, and school encouragement on enactment etc. Additional information related to the quantitative data extracted from the school support questionnaire was collected.

The researcher conducted the interview in each school. The interviews were tape recorded and transcribed for analysis. The responses were summarized into three themes related to participants' school resources, collegial and leadership supports.

Principal interview for school and district leadership support

Principal interviews sought to collect information on organizational conditions accompanying the teachers' enactment of IPA. It consisted of 7 open-ended items. The interviews were concentrated on organization policies, principal's leadership and support, district administrator's leadership and support, resources, provision of time, and recognition of success.

The principal interviews (see Appendix I) were carried out by the researcher in each school. Interviews were tape-recorded and brief notes were taken at the same time.

Curriculum profile-lesson observation

Lesson observations were carried out with the help of a curriculum profile (see Appendix K). The curriculum profile was same to the one used in the previous study (chapter 6). The scoring and analysis of the observed lessons with the help of the curriculum profile was similar to the procedure described in chapter 6. For the five teachers a total forty lesson observations were conducted. In addition, a total of fourteen times out of school lesson observations were carried out. All the lessons were videotaped by researcher assistants

Level of use

The level of use (LoU) is a data collection instrument which is intended to supplement the lesson observation, and is focused on establishing the extent of participants' use of IPA teaching. The level of use has been identified as "as a valuable diagnostic tool for planning and facilitating the change process" (Hall & Hord, 1987, p.81). LoU attempts to document the different states of user's behavior of the innovation, and assign the participants at the various levels of use (Loucks, Newlove & Hall, 1998).

LoU (see Appendix J) is a quick self-assessment instrument. It is targeted toward describing behaviors of users as they progress through eight levels of use — from

non-use, to managing, and finally to integrating use of the innovation. The levels of use are: (0) Non-Use, (I) Orientation, (II) Preparation, (III) Mechanical Use, (IVA) Routine, (IVB) Refinement, (V) Integration, and (VI) Renewal. The user selects a single level that best describes his/her level of innovation use. The instrument is time efficient to use as an indicator of an educator's progress along a innovation utilization continuum (Hall & Hord, 2001; Patton, 2002). It consists of two main questions and four follow-up questions aimed at gathering data on IPA lessons. The participants answered the questions. The analysis was with the help of the manual recommended by Loucks et al. (1998). The data analysis process entailed two main steps. The first step involved distinguishing between a nonuser and user of the innovation following a participant response to the first item ('yes'/'no'). The next step involved rating the overall level of Use of a participant on the basis of decisions points outlined in the LoU chart that was suggested by Loucks et al. (1998).

Teacher interview for enactment

The teacher interview for enactment focused on collecting data on the experiences with and opinions of IPA lessons (level 2 & 3). The set of questions used was similar to the one used in the previous study (Chapter 6).

Teacher interviews (see Appendix L) were conducted at the end of the lesson series by the researcher. Interviews were audio-taped and transcribed.

The interviews were audio-taped and later transcribed for analysis. Teacher perceptions were represented by specific quotes under generalized inferred meaning.

Student questionnaire

At the end of the intervention a student questionnaire was administered to gauge students' attitudes to and experience with IPA. The set of questions used was similar to the one used in the previous study (Chapter 6). A factor analysis was conducted on questions (question I) about student attitudes and perceived performance in IPA from which two scales emerged, which were labeled "Attitudes to and experience with IPA" and "Performance in IPA". A set of questions (question II) about students' perception of their abilities as a result of IPAs formed one scale, "Ability perception after taking part in IPA". Table 7.8 shows the reliability (Cronbach's α) of each scale, with the number of items per scale, and exemplary items for each scale. The questionnaire has been conducted at the end of the intervention.

Table 7.8 *Reliability of attitude to and experience with IPA as well as ability perception questionnaire*

Scale	items	α	Exemplary items
Attitudes to and experience with IPA (1+2+6+8+12+13+14)	7	.81	<ul style="list-style-type: none"> ▪ I am interested in the learning of the topic ▪ I feel comfortable with group activity in IPA
Performance in IPA (4+5+7)	3	.74	<ul style="list-style-type: none"> ▪ I actively participate every activity ▪ I fulfill the tasks I undertake in earnest
Ability perception after taking part in IPA (15+16+17+18+19+20+21+22+23+24)	10	.87	<ul style="list-style-type: none"> ▪ Ability for cooperating with others is improved ▪ Ability for communicating with others is improved

Quantitative data analysis was employed to analyze data from the closed items. The analysis involved computing descriptive statistics (means, standard deviation and percentage). The responses of the open-ended items were analyzed qualitatively.

The student questionnaire was administered at end of the enactment of IPA at each school. A total of 197 students from the five classes completed the questionnaire.

Student interview

According to Guskey (2000), in addition to the direct observation to gather information on participants' use of new knowledge and skills, a student interview about their perceptions of their teachers' use of IPA teaching was used to triangulate data. The interview (see Appendix O) was semi-structured and consisted of 22 items designed to solicit data on teachers' use (level 4) and students' experience with learning.

A total of thirty-four participating students were involved in the interview. The interviews were audio-taped and later transcribed for analysis. The interview transcripts were coded in a way that reflects the questions asked and level of evaluation (level 4 & 5). All interviewee responses per item were pooled together and organized into 4 themes: perceptions about IPA, perceptions of teacher's role as facilitator of student learning, group work in which student involved, suggestions for IPA. The excerpts of real quotes were also used.

Student products

Portfolio is a collection of work samples of the group work, including students' brainstorming notes, the research proposal, information collected from the Internet, books, newspapers and journals, a questionnaire or interview scheme,

activity photos, the research report, and students' reflections. Some of the students' diaries and compositions about the IPA in class C1 were also collected. Portfolio assessments are viewed as integral components of formative and summative evaluative processes of IPA outcomes. There are three main purposes of portfolio assessment in IPA. First, it enables teachers and students to monitor the performance and the progress of students' development. The participating teachers, students and the researcher provide the groups with ongoing feedback that would improve their performance and positively influence their attitudes and perspectives toward themselves, toward others, and toward society. Students refine and revise their works according to the teacher's and students' feedback. Portfolio assessment was used as diagnostic tool to examine students' works and formulate recommendations to enhance the quality of the work. Second, the portfolio was used to record the development of groups of students and to demonstrate the learning achievements of the groups over time. It would enable students to better understand their own development. It witnesses the evolution of students' development. These students actually demonstrate movement from deciding sub-topics, writing research proposal (including research methods), designing and revising questionnaire and interview schema, conducting investigation and interview, collecting and analyzing data, writing research report and reflections. Third, teachers assess the effects of IPA on the groups of students. It was used as assessment tool to evaluate the effects of IPA implementation on the groups of students.

The portfolio assessment for the group works in this study was adapted from other research studies (Zhu, 2003; Zhang, 2005). It was used to assess the effects of IPA enactment on students. Five subscales were distinguished and in total 20 items were included. With regard to the research proposal, objectives, contents, methods, steps, and work division were taken into account.

The excerpts of real quotes from student products, such as composition and diary were used.

Parent interview

The parent interview was intended to supplement the student questionnaire and interview. The opinions about their children's learning from IPA and suggestions for the activity were collected. It focused on evaluate students learning (level 5). The interview with parents (see Appendix Q) was carried out 1-2 weeks after the end of activity enactment. Ten parents from School C were interviewed.

CHAPTER 8

Results of the summative evaluation study

This chapter presents the results of the evaluation study on the impact of the professional development arrangement. The aim of the arrangement was to support IPA teachers with the enactment of IPA lessons. Section 8.1 describes teachers' reactions to the professional development arrangement. Section 8.2 presents teachers' learning from the professional development arrangement. The nature and extent of organizational support during IPA enactment is reported in section 8.3. The effects of the professional development arrangement on the classroom practice of each teacher are explored in section 8.4. Section 8.5 presents the impact of the arrangement on students learning. Section 8.6 provides the conclusions of the study.

8.1 TEACHERS' REACTIONS

This section presents participants' reactions to the professional development workshop and the school follow-up support activity. Their reactions were based on participants' general impressions of the workshop, which included their expectations of the workshop and perceptions about the workshop. The participants' general impressions of the school follow-up support activity were also explored.

8.1.1 Teachers' expectations about the workshop

At the commencement of the workshop teachers were asked to indicate how they expect to benefit from a training course that intends to promote IPA teaching. Among the five teachers, teacher C2 had participated in the municipal training on IPA/inquiry learning before the workshop. Teacher A had taken part in the training course provided by the researcher and carried out IPA lessons in 2007 (1st field study). The expectation of the teachers and their responses are summarized in Table 8.1.

Table 8.1 *Expectation of participants regarding the workshop (N=5)*

Expectation	Teacher responses
<i>Skill acquisition</i>	
▪ how to guide students to carry out IPA	A, B1, B2, C1
▪ how to integrate the teaching of IPA with other subjects (i.e. Chinese language, geography)	C1, C2
▪ how to arouse the enthusiasms of students and make them engaged	A, B1
▪ how to evaluate the students' performance during the activity	B1,C1
<i>Information on</i>	
▪ the rationale of IPA and inquiry learning	B2
▪ exemplary cases on how to make choice on topics and time arrangement	A
<i>Activities that help us</i>	
▪ develop knowledge and insight about IPA	B2

The teachers expressed their expectations in terms of getting more skills, information, and activities regarding IPA. Four teachers expected to acquire the skills of guiding students in different stages of IPA. Teacher C1 and C2 wanted to explore how to integrate the teaching of IPA with the subjects they taught. Teacher A hoped to get information on IPA. Teacher A and B1 were interested in how to arouse the enthusiasms of students. Teacher B1 and C1 were interested in how to evaluate students' performance and their products. Teacher B2 desired to develop knowledge and insight about IPA with the help of the workshop.

8.1.2 Teachers' opinions and satisfaction with the workshop

Teachers' overall impression of the workshop

The participants' initial perceptions about their experience with the workshop were assessed in the first part of the evaluation questionnaire. The overall impression of teachers about the professional development workshop was positive. All the five participants indicated that the workshop enhanced their understanding and was useful for their professional development. Four teachers (A, B1, B2 & C2) considered the workshop relevant to their teaching practice. Teacher A, B1, B2 and C1 thought the objectives were met. The participants were asked to indicate if they were going to use the exemplary curriculum materials in their schools. All the teachers responded that they would use the exemplary curriculum materials.

Teachers' opinions regarding the components of the workshop

Furthermore, the participants were asked for their opinions by rating certain statements focused on the sessions of the workshop. All five participants

considered the organization of the workshop as good or excellent. With regard to the usefulness of the course sessions, especially the sessions of video-clips demonstration, curriculum material, discussion on IPA, reading materials, it appeared that all the teachers regarded them good or excellent. The session of video-clips demonstration was rated high. Two teachers (B1 & C1) valued it excellent and three teachers (A, B2, C2) thought it good. The introduction to the exemplary curriculum materials was rated second. These indicate that teachers regarded these sessions useful to them. The microteaching session rated relatively low. One teacher noted that it was not effective that colleagues played as students in the micro teaching because of the differences between the teachers and students in thinking. Two teachers pointed out that the sound effect was not good during the video-clips demonstration which affected their watching although the video-clips were very good examples. Regarding practice with lesson scored relatively low, two teachers thought the time practice was short and they would like to discuss how to prepare for lessons which was more helpful for them (see Table 8.2).

Table 8.2 *Participants value the usefulness of the course sessions (N=5)*

Item	Teacher				
	A	B1	B2	C1	C2
Video clips that demonstrate an exemplary lesson	4	5	4	5	4
Introduction to the exemplary curriculum materials	4	4	4	5	4
Discuss about issues pertaining to IPA	4	4	4	4	4
Reading materials about what IPA is, the rationale underpinning this approach etc.	4	4	4	4	4
Brief introduction to the workshop	4	4	4	4	3
Presentation of "when, what and how" of IPA	3	5	4	4	3
Plenary discussion and reflection on the clips.	4	5	3	4	4
Practice with lesson	3	4	4	4	3
A microteaching with small group of students conducted by fellow teacher.	4	4	3	3	4
Feedback and reflection from the microteaching	3	4	3	3	4
Average	3.7	4.3	3.7	4.0	3.7

Legend: * 1 = very poor, 2 = poor, 3 = just okay, 4 = good, 5 = excellent.

Teachers' perceptions about the content, process, and context of the workshop

According to Guskey (2000), questions related to determining participants' reactions to professional development could be classified into three categories related to the content, process, and context. Participants' reactions to these three categories are reported in Table 8.3.

Table 8.3 *Participants perceptions about the content, process, and context (N=5)*

Item	Teacher				
	A	B1	B2	C1	C2
Content					
My time in the workshop was well spent	4	4	5	4	4
The knowledge and skills explored in the workshop are useful for improving my teaching practices	4	5	4	4	4
Process					
The activities of the workshop are carefully planned and organized	4	5	5	4	4
The teacher guides are immediately useful for my classes	5	5	4	4	4
Sufficient time was provided for the completion of the activities	4	4	5	4	4
Context					
The presenter and organizers were well prepared	5	5	4	4	4
The facilities provided were conducive for learning	3	5	4	4	4
The workshop room was the right size	5	4	4	3	4

Legend: * 1 = strongly agree, 2 = agree, 3 = neutral, 4 = agree, 5 = strongly agree.

As shown in Table 8.3, five teachers regarded that the time was well spent in the workshop. They thought the knowledge and skills explored in the workshop were useful for improving their teaching practices. Teachers considered the teacher guides was immediately useful for their class. They regarded that the knowledge and skills explored in the workshop was useful for improving their teaching practices. Teachers thought the activities of workshops were carefully planned and organized. All the teachers agreed or strongly agreed that the time for completion was sufficient. These indicate that teachers regarded the activity well-organized. All the five teachers reacted positively to aspects of the content and the process of the workshop. As for the context of the workshop, the results indicated teacher satisfaction with workshop organization, facilities, and room.

8.1.3 Teachers' opinions and satisfaction with the school follow-up support activity

Teachers' overall impression of the school follow-up support activity

The teachers' overall impression about the school follow-up support activity was good. At the end of their enactment they attested that the professional development experience was useful for enactment with three teachers (A, C1, C2) strongly agreed and two teachers (B1 & B2) agreed. Teacher A and C1 strongly agreed that their understanding of IPA was enhanced. All the teachers agreed that the school follow-up support activity was useful for their professional development.

Teachers' evaluation on the usefulness of the school follow-up support activity

Furthermore, the teachers were asked how much they value the usefulness of the school follow-up support activity. For this purpose, they were provided with a description of each activity and then asked to rate that particular activity. Table 8.4 shows that the teachers generally rated the activities as good.

Table 8.4 Participants value the usefulness of the school follow-up support activity (N=5)

Item	Teacher				
	A	B1	B2	C1	C2
Researcher provides feedback after classroom observation	5	3	4	4	4
Providing the excellent exemplary examples of students' products (i.e. research proposal, investigation questionnaire, interview scheme, research report, etc.)	5	4	5	5	5
Teacher's reflection on teaching by writing logbook (Blog)	4	3	5	4	4
Teachers' discussing and reflect their own teaching with researcher	5	3	3	4	5
Sharing teaching plan (including slides) with other teachers	4	4	4	4	4
Teachers preparing for lessons together	4	4	5	4	4
Observing a short video-taped classroom lesson of fellow teachers and making comments on it	4	4	3	4	4
Observing a video-taped classroom lesson of oneself and reflecting on it	4	3	5	5	5
Providing online resources, audio, video and written materials related to the topics inquired	5	4	4	5	5
Average	4.4	3.6	4.2	4.3	4.4

Legend: * 1 = very poor, 2 = poor, 3 = just okay, 4 = good, 5 = excellent.

Regarding the usefulness of school follow-up support activity, it appeared that providing the excellent exemplary examples of students' products was viewed as the most effective and most highly valued component of the school follow-up support. Providing online resources, audio, video, and written materials related to topics inquired was rated second. Three teachers (A, C1, C2) rated it as excellent and teacher B1, B2 rated as good. Observing a video-taped classroom lesson of oneself and reflecting on it was rated third. Four teachers rated as excellent or good except teacher B1. The least effective activity was observing a video-taped classroom lesson of fellow teachers and making comments on it. Teacher C1 explained: "Some Chinese were not used to be commented in public. It would be better to exchange views in private."

Furthermore, information about school follow-up support activities was collected by three open-ended items. With regard to the most useful activity in school follow-up support activities, two teachers indicated that exchanging experience among teachers was most useful, because they could learn from each other. One teacher reported that the coaching from the researcher and sharing the exemplary examples were most useful and she benefited a lot from them. All the teachers considered that these school follow-up support activities were necessary for their enactment of IPA. Two teachers suggested that the activities such as experience exchange, field observation, and symposium among teachers and students should be strengthened. One teacher proposed to provide more practical exemplary examples from other schools. And another teacher advised that the support from the community should be considered.

8.1.4 Summary

The teachers indicated that the professional development workshop had met their expectations for learning new information and acquiring skills on how to teach IPA in a more student-centered manner. It appeared that the teachers' overall impression about the workshop was positive. That is, they considered the workshop useful, relevant to their teaching practices, and they felt that their understanding about IPA teaching was enhanced. Moreover, teachers' reactions about the content of the professional development workshop, its delivery, and its context were collected. The results showed that the teachers found the content explored during the workshop useful to their teaching practice. They considered the teacher guide was immediately useful for their class. And they appreciated the organization and structure of the workshop.

Regarding the school follow-up support activities, the teachers thought that the professional development experience was useful for enactment of IPA and indicated that their understanding of IPA was enhanced. Teachers' responses to usefulness of the school follow-up support activities were positive. They highly appreciated providing excellent exemplary examples of students' products and providing online resources, audio, video, and written materials related to topics inquired. However, they rated observing the video-taped classroom lessons of fellow teachers the least effective activity.

8.2 TEACHERS' LEARNING

Two teacher questionnaires were used to measure the extent of teacher learning. The closed items were used for exploring what teachers thought they had obtained after attending the workshop and from the school follow-up activities. In addition to the closed items, the open-ended items were used to collecting teachers' responses to the professional development workshop and the school follow-up activities. The results of teacher learning from the workshop are presented in section 8.2.1. Section 8.2.2 reports the teachers' learning from the school follow-up activities. And section 8.2.3 summaries the teachers' learning from the teacher professional development and the school follow-up support activity.

8.2.1 Teachers' statement of learning from the workshop

For assessing participants' learning, it was pivotal to gather evidence on the knowledge, skills and attitudes that teachers claimed to have gained as a result of their participation in the workshop. For this purpose, participants were asked to indicate to what degree they agreed with statements related to their acquisition of new knowledge, skills and attitudes. Teachers' response regarding to their perceived learning are presented in Table 8.5.

Table 8.5 Overview of the participants' perceived learning from the workshop (N=5)

Item	Teacher				
	A	B1	B2	C1	C2
After participating in this workshop my awareness and understanding about IPA lessons is enlightened	5	5	5	5	4
The video demonstration has helped me identify the important features of IPA lessons	5	5	5	5	4
The practice session has augmented my skills and knowledge of IPA lessons	4	5	4	4	5
The demonstration made me consider trying out IPA lessons	4	5	5	5	4
After attending this workshop I understand that the role of teacher in IPA lessons is crucial	5	4	4	4	5
After studying the exemplary lessons and practicing the design of such lessons, I am convinced that I can manage to put into practice such lessons in my own school	4	5	4	5	5
I will organize my IPA lessons differently because of this workshop	4	5	5	4	4
My opinion about inquiry learning lessons has changed as a result of the workshop	4	4	4	4	4
The presentation about 'what, why and how' of using inquiry learning provided me with much new information	3	5	4	5	4
The microteaching and feedback session helped me get a considerable awareness of my own teaching behavior and knowledge about alternatives	4	4	3	4	4
After attending the microteaching conducted by a colleague I have got the confidence to use IPA lessons with students	4	4	3	4	4
It is difficult to provide an honest opinion on what I will change in future in my way of teaching	3	3	2	2	4
Average	4.1	4.5	4.0	4.3	4.3

Legend: * 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

As shown in Table 8.5, all the five teachers indicated that they acquired more information about IPA and this enlightened their understanding. The teachers appreciated the video-clips demonstration that helped them to identify the important features of IPA lessons and made them consider trying out IPA lessons. Teachers considered they were convinced that they can manage to put into practice such lessons in their own school after studying the exemplary lessons and practicing the design of such lessons. They reported that they would organize their IPA lessons differently because of the professional development arrangement. However, the teachers varied in their opinions about how to change their way of teaching based on their experience in the professional development arrangement.

8.2.2 Teachers' statement of learning from the school follow-up support activity

The teachers were offered the chance to indicate what they learned from the school follow-up support activity (SFSA) with the help of eight closed items and two open-ended items. The teachers' responses to the closed items were presented in Table 8.6. Overall, the teachers reported that the school follow-up support activities had enhanced their awareness and understanding about IPA teaching. Five teachers indicated sharing their teaching plan with other teachers was conducive to sharing information and expertise. In addition, they reported that they conducted IPA lessons as the result of the school follow-up support activities. The mean scores of the learning from the school follow-up support activity were over 4.3 except teacher B2. He rated lower on understanding IPA lessons profoundly and about teacher's guiding role.

Table 8.6 *Overview of the participants' perceived learning from the school follow-up support activity (N=5)*

Item	Teacher				
	A	B1	B2	C1	C2
As a result of SFSA, I understand IPA lessons profoundly	4	4	3	4	5
Feedback from researcher's classroom observation contributes to improving my teaching	4	4	4	4	5
Providing the excellent exemplary examples of student products helps me to guide students	4	4	4	5	5
Writing logbook (Blog) helps me to reflect on my teaching practice	4	5	4	4	4
Teachers discussing collectively contributes to sharing information and expertise	4	4	4	5	5
Sharing teaching plan (including slides) with other teachers is conducive to sharing expertise	5	5	4	4	5
With SFSA and after implementing the IPA lessons, I have a better understanding about the teacher's guiding role in it	5	5	3	4	5
I organized my IPA lessons differently as a result of SFSA	5	5	4	4	5
Average	4.3	4.5	3.8	4.3	4.9

Legend: * 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

In addition, teachers' responses to the open-ended items were analyzed. All the teachers indicated that the school follow-up support activities had enhanced their understanding about IPA teaching. Two teachers noted that getting the information of enactment from other schools broaden their insights. One teacher reported that she learned how to integrate knowledge of different subjects from the school follow-up support activities. With regard to changes taken place as a

result of the school follow-up support activities and enactment of IPA lessons, all teachers responded positively. The teachers indicated that they understood IPA profoundly and planned the IPA in a systematic way. Furthermore, teachers reported that they learned the whole guiding process of IPA and paid more attention to its impact on students. However, one teacher pointed out that as the society focused on high scores in college entrance examination there were still some barriers to the enactment of IPA.

8.2.3 Summary

The teachers proved that the professional development workshop and school follow-up support activities enlightened their awareness and understanding about IPA lessons. They found that the video-clips demonstration helped them to identify the important features of IPA lessons and made them consider trying out IPA lessons. Teachers indicated sharing teaching plan with other teachers was conducive to sharing expertise. Moreover, they reported that they organized IPA lessons differently as the result of the professional development arrangement.

8.3 NATURE OF ORGANIZATIONAL SUPPORT FOR TEACHERS

The extent of school support was measured by a teacher questionnaire, teacher interviews and principal interviews administered at each school. The results are reported as follows.

8.3.1 Teachers' perception about the extent of resource support

A total of six closed items and two open-ended items focused on collecting information about the provision of resources considered necessary for teaching IPA lessons. The analysis of the perceptions of teachers on these aspects of support is presented in Table 8.7. As the overall results show in Table 8.7, School B from teachers B1 and B2, was in good shape in terms of resources ($M = 3.8$), School A (teacher A) and School C (teachers C1 and C2) had slightly fewer resources.

Table 8.7 The extent of resource support for teachers at each school (N = 5)

	Teacher				
	A	B1	B1	C1	C2
The necessary materials are provided to me in a timely manner from the school	3	5	5	2	4
The necessary facilities of the school are made available to me at appropriate times	3	5	5	1	5
The physical conditions of the school (laboratory, supplies, classrooms, etc.) are conducive to my enactment efforts	4	2	2	2	4
We have a quiet place to plan and discuss important issues	3	4	4	4	4
I had sufficient time to prepare for carrying out IPA lessons into my regular classroom routines	3	3	3	2	3
I had ample time to reflect on my student- centered strategies and make appropriate adaptations	3	4	4	4	3
Average	3.2	3.8	3.8	2.5	3.8

Legend 5 = strongly agree; 4 = agree; 3 = not sure; 2 = disagree; 1= strongly disagree.

It appears that for teachers at School B the necessary materials and facilities were provided to them in a timely manner. Teachers at School B and C thought that they had a quiet place to plan and discuss important issues. However, teacher B1, B2 and C1 indicated that the physical conditions of the schools were not very conducive for their enactment efforts. Teacher C1 responded differently compared to teacher C2 to the necessary facilities. The management section did not provide the available computer classroom for teacher's C1 class and she complained about it. She felt very disappointed about it and this impinged on her enthusiasm for the enactment. All the teachers reported that the time for lesson preparation was not sufficient. Their teaching loads were heavy each week.

During the interview the teachers confirmed that multimedia facilities were provided in each classroom in their school. The teachers at School B noted that their school was supportive at providing the necessary materials, facilities and network classrooms in a timely manner. Teachers in School C indicated that some facilities were not provided to them because their school was preparing for the instructional evaluation in senior high school. The teacher in School A reported that the necessary facilities and network classroom were not provided in a timely manner as IPA was not the examination subject. All teachers indicated that they had a lot of work to do in the school and they managed to prepare the lessons, however, they had not enough time to reflect the lessons.

8.3.2 Teachers' perception about the school culture and extent of collegial support

A total of six closed items and three open-ended items were used to assess the school culture and collegial support. The teachers of School B and School C reported that their school was supportive in terms of school culture and collegial support. Compared to the teachers from school B and C, the teacher of School A described her school as less supportive ($M = 2.7$). However, teacher C1 responded differently from teacher C2 in items of school administration and visiting fellow teachers' classroom. Their mean scores about the school culture and collegial support were 3.2 vs. 4.5. In the interview teacher C1 was not satisfied with the collegial support, because when she applied a computer classroom for student to process data she was refused.

Table 8.8 *The nature of collegial support and culture in the schools (N=5)*

	Teacher				
	A	B1	B1	C1	C2
The school encourages experimenting with new strategies aimed at improving student learning outcomes	3	5	5	4	5
Fellow teachers share my enthusiasm for experimenting with new strategies for teaching	2	4	3	4	4
The school administration is open to suggestions for improvement in school practices	3	3	3	3	5
Your effort to improve belittle d by some fellow teachers	4	2	2	2	3
We frequently engage in conversations about ways to improve our teaching approach	2	4	4	4	5
I had the opportunity to visit the classrooms of fellow teachers and observe their teaching or the other way around	2	5	5	2	4
Average	2.7	3.8	3.7	3.2	4.5

Legend: 5 = strongly agree; 4 = agree; 3 = not sure; 2 = disagree; 1 = strongly disagree.

As can be seen in Table 8.8, School B and School C encouraged, according to the teachers, them to experiment with new strategies, and correspondingly, fellow teachers at these two schools were upfront in sharing their enthusiasm. According to teacher A, School A, however, was less conducive to experimenting with new teaching strategies.

Regarding the conversations among fellow teachers, the results show that the teachers in School B and C frequently engaged in conversations about ways to improve their teaching approach. However, the teacher at School A reported that she was rarely ever engaged in conversations about ways to improve her teaching approaches, and the opportunity for classroom observation of fellow teachers was less.

Teachers at School B and C had the opportunities to visit the classroom of peer teachers, while teacher at School A reported that she did not have opportunities to visit one another. Furthermore, although teachers at School C gave lessons at the same time and they could not visit the lessons of each other, they had the opportunities to watch the video-recorded lessons of each other.

Teachers at School B and School C confirmed in the interview that the school administration encouraged them to experiment with new strategies aimed at improving student learning outcomes. Teacher A reported that school administration focused mainly on the student products and did not care about what students learned from IPA.

8.3.3 Teachers' perception about the school leadership

With the help of six closed items and one open-ended item, the nature of leadership at the schools was explored. The perceptions of teachers about the school leadership are reported in Table 8.9.

Table 8.9 *The nature of leadership in the schools (N=5)*

	Teacher				
	A	B1	B1	C1	C2
The principal is an active and enthusiastic leader	3	5	5	3	4
The principal encourages teachers to become involved in school wide decision making	3	4	3	4	3
The school administration encourages teachers to participate in workshops intended for their professional growth	3	5	5	4	4
You are encouraged to plan lessons collaboratively with your fellow department teachers	3	5	5	4	5
The principal recognizes and honors teachers' success with student achievement	3	3	3	3	5
The school administration offers schedules that allow you to collaboratively plan and discuss with fellow teachers	2	5	5	4	4
Average	2.8	4.5	4.3	3.7	4.2

Legend: *5 = strongly agree; 4 = agree; 3 = not sure; 2 = disagree; 1= strongly disagree.

Table 8.9 shows that the principal at School B was viewed as active and enthusiastic leader as far as new innovations were concerned. The teachers at School B and C indicated that the school administration at these two schools encouraged teachers to participate in workshops intended for their professional growth. In addition, they reported that school administration offered schedules

that allow them to collaboratively plan and discuss with fellow teachers and they were encouraged to plan lessons collaboratively with fellow teachers. However, the principal and administration at School A were viewed less supportive. Teacher A indicated that the school administration hardly offer schedules that allow teachers to collaboratively plan and discuss with fellow teachers. With regard to principle' recognition and honoring teachers' success, teacher C1 responded differently from teacher C2. This reflected the different feeling of the two teachers.

During the interviews the teachers at School B indicated that their principal supported their efforts to improve student learning outcomes and had held a meeting to discuss the experiment carefully. Teachers at School C reported their principal had observed their lessons once and encouraged them to do the work better. On the whole, teacher C1 and C2 felt that the principal was supportive to their enactment.

8.3.4 Principals' perception about the school and district support

School A

Concerning the school policy relevant to the IPA enactment, it was required that the teacher in charge of the class should coordinate with the participating teacher so as to ensure the enactment go on smoothly. The school provided a special classroom with computers access to Internet for the participating class.

The district teaching and research center organized an activity and required the teacher to write an article about the IPA enactment to exchange ideas with teachers in other schools.

As for the measures to encourage and support the teachers to enact the IPA experiment, the school arranged the teacher in charge of the class to coordinate with the participating teacher. And the teacher was praised in the school teacher meeting.

The teacher was provided with some time to take part in IPA training. As the course mainly arranged in Grade 10 and only one class in Grade 8 participated in IPA in the school, the participating teacher had no opportunities to prepare for lessons with other teachers and to observe colleagues' classroom teaching.

The director considered that the organizational support played a guiding roles and it standardized the IPA enactment in the school. Praising the teacher in the school meeting promoted the teacher's enthusiasm.

School B

According to the response of the director in charge of teaching and research, school B had a policy of arranging the director to participate in the IPA enactment and helped to solve practical problems teachers encountered in the IPA enactment. The director managed to find time to observe the classroom teaching of the two participant teachers and exchanged ideas with them.

The district teaching and research center invited teachers in this school to share the achievements with the colleagues from other schools.

The necessary resources, facilities and network classrooms were provided for the two classes. The electronic reading room was opened for participating teachers and students. The school provided the teachers some time for participating in the training and seminar of IPA, and fixed time and places for preparing for lessons collectively. The teachers were offered opportunities to visit colleagues and observe their classes.

The school took measures to encourage teachers to carry out IPA, such as issuing certificates for those students participating in the activity, recommending students to participate in the Technology Innovation Match of Guangzhou, and compiling and printing students' research reports for participating teachers and students. The director thought the organizational support for teachers encouraged and supported the IPA enactment.

School C

The policies concerning the IPA enactment in school C were: (a) The school set up a special group for IPA teaching and research, and provided a director in charge of the work. (b) IPA was arranged in the school curriculum program so as to guarantee the teaching period and the teachers of IPA. (c) At the beginning of the new semester, the school provided the new students with a lecture of IPA learning. (d) Providing the recording book of IPA for students and the guiding manual for teachers.

The necessary resources, facilities and network classrooms were provided for the two classes. The vice principal managed to find time to participate in the teachers' preparation for class, to observe the classroom teaching of the teachers and exchange ideas with them.

The district teaching and research center had set up an office for IPA teaching to guide the teachers carry out IPA. The office chose the excellent works of students in the district for appraisal. The IPA teaching and research group in the school also chose excellent works of students and printed a book for sharing in the school.

The participating teachers were provided a room and fixed time so that they could get together to discuss activity preparation and how to solve the problems encountered in IPA enactment. Sometimes the school organized the teachers to observe colleagues' teaching.

The vice principal considered that the organizational support encouraged the teachers to study how to continuously improve their level of guidance and facilitated the students' IPA learning.

8.3.5 Summary

The extent of the school support teachers received was explored along the basis of resources, collegial support, and school leadership. Regarding resources, it was found that the resources in School B were in good shape, and Schools A and C were less resourced. All the teachers indicated that the time for lesson preparation was not sufficient.

Concerning the nature of the school culture and collegial support, School B and School C encouraged teachers to experiment with new strategies, and fellow teachers at these two schools were upfront in sharing their enthusiasm. However, the teacher at School A reported that the school was less conducive to experimenting with new teaching strategies. Furthermore, the teacher was rarely engaged in conversations about ways to improve her teaching approaches, and the opportunity for classroom observation of fellow teacher was less. Similarly, the perceptions about the school leadership of School B and C were in sharp contrast with the perceptions of the teacher in School A. The principal and administration at School A were considered less supportive. Teacher A indicated that the school administration hardly offered schedules that allow teachers to collaboratively plan and discuss with fellow teachers.

Each school took different measures to encourage the IPA enactment of teachers. School B and school C could provide participating teachers fixed time and rooms for preparing lessons, discussing problems and finding solutions.

The district teaching and research center honored the excellent works of students in the district and required teachers to submit articles about the IPA enactment to exchange ideas with teachers in other schools.

8.4 TEACHERS' ENACTMENT OF IPA

Four instruments were employed for exploring teachers' use of the new knowledge and skills to enact IPA lessons. According to Guskey (2000), for addressing the issue of teachers' usage of an innovation, one ought to investigate teachers' evolving concerns, level of use, and change in teaching practice.

The degree of enactment of individual teachers was determined by the curriculum profile-classroom observation instrument. The results of the classroom practice of each participating teachers are presented by weighing 40% for the realization of thresholds and 60% for ideals statements referred to IPA teaching, the total practice profile scores was considered 100%.

The results of the classroom observation, level of use questionnaire, and student interviews for the five teachers are analyzed respectively in following subsequent sections.

8.4.1 Teacher A

Level of use

Teacher A's usage of IPA in/out classroom practice was analyzed based on her response in the level of use questionnaire. She was placed at a routine level of use (LoU IVA) and she affirmed that she had enacted IPA. Teacher A discussed the management of group activities and wanted to get more information from other teachers. In addition, teacher A was able to state what she did with the exemplary materials and reflective meetings that were conducted during school follow-up.

Classroom enactment

As shown in Table 8.10, the mean practice profiles score for teacher A was 67. Teacher A scored largely above the threshold practice score, which was 40%. Her basic skills to enact IPA were good except in research report presentation. She lacked some basic skills at the body of research report presentation and at the conclusion of questionnaire revision 1. Teacher A however applied a number of ideal skills that strengthened her enactment of IPA.

After the enactment, teacher A regretted that she had not spend some time to prepare and carry out IPA lessons well because she was occupied with a lot of other work in the school.

Table 8.10 *Practice profile of teacher A*

Activity	Threshold scores				Ideal - unacceptable scores				
	Start	Body	Conclusion	40%	Start	Body	Conclusion	60%	Total*
Topic introduction	100	33	100	31	100	67	60	45	76
Proposal writing	60	83	100	32	100	92	80	54	87
Proposal report	60	100	100	35	100	92	80	54	89
Research methods	60	67	80	28	50	100	60	42	70
Questionnaire design	80	100	80	35	50	100	20	34	69
Questionnaire revise 1	60	100	20	24	0	83	-60	5	29
Questionnaire revise 2	60	83	100	32	100	83	20	41	73
Data analysis	40	100	60	27	50	83	60	39	65
Research report presentation	66	0	50	15	100	63	-25	28	43
Mean				29				38	67
SD				6.2				15.2	19.6

Legend: * The total = [threshold scores] + [ideal scores - unacceptable scores in %].

The topic teacher A taught was the psychology about love of the students in middle schools. At the start of topic introduction, teacher A introduced topics by introductory questions. She explained the objectives and contents of the activity. At the body of topic introduction, teacher A explained how to conduct the activity with examples. Then she asked students divide into groups to discuss their research proposal. However, she did not move around groups to ask /answer questions, and students did not actively asked teacher's help in group discussion. At the end of topic introduction, teacher A spent some time discussing activity and made conclusion and assignments.

As the time for the enactment was not enough, teacher A did not take students out for investigation and the activity of investigation was not observed. Students had to make use of their spare time for investigation. On the basis of the data analysis of the students, about 1/3 students fulfilled the task seriously.

Box 8.1 *Sub-topics in class A*

1. Attitudes and opinions of parents on students love
2. Survey on situation of sexual health education in families of middle school students
3. Survey on situation of students love in No. 21 middle school
4. Attitudes and opinions of junior high school students on the event of "pornographic photos"
5. Survey on mental status of love of middle school students
6. Impact of parent-child relationship on middle school students' love
7. Investigation on love views of middle school students
8. Attitudes and opinions of middle school teachers on student love

Teacher perceptions

Concerning the usefulness of the exemplary materials, teacher A thought that the exemplary materials were very helpful for her activity preparations. She claimed that she followed the specifications for teaching IPA and believed that she achieved more with these activities than her usual activities. Furthermore, she expressed that she would like to use the exemplary materials in future IPA teaching like this. However, she indicated that time was tight because of one lesson for IPA every week.

When asked about problems she encountered in carrying out IPA, teacher A contended that the major problem was related to time constraints. She claimed the other problem was how to stimulate and maintain the enthusiasm of students, because some students did not realize the value of IPA to them and they thought that IPA conflicted with the learning of other subjects. Teacher A also reported that the multimedia facilities and print materials were not provided timely by her school because of school management. Regarding the teaching methods used and students' involvement, teacher A indicated that she adopted the student-centered approach and tried her best to let students be engaged in the activity. She used teaching methods, such as group discussion and collaboration, questioning, demonstrations, during class. Teacher A reported that she used group competition to arouse the enthusiasm of students. However, some students were reluctant to think, it required a lot of effort from the teacher to guide these students.

When asked the differences between IPA and former (similar) activities, teacher A felt that it was the group activity and the high requirements for the group work.

Regarding perceived learning from the enactment, teacher A said *“The activity should be designed according to students’ ability. Besides, after school the teacher needed to take more efforts on correcting students’ assignment.”*

Student perceptions

All students interviewed showed positive perceptions about teacher’s role in IPA. Students felt that teacher A encouraged them to pose questions and facilitated their thinking because it could live up the classroom atmosphere. They claimed that teacher A answered students’ questions actively and helped them refine their thinking.

Concerning the support of the teacher provided in IPA lessons, students confirmed teacher’s help in following aspects:

- posing questions we had not thought of and triggering us to analyze problems.
- providing relevant materials for us.
- teaching us methods of how to analyze data.
- helping us analyze and revise research proposal, questionnaire and research proposal report.

8.4.2 Teacher B1

Level of use

The teacher B1’s level of use of IPA teaching was explored with the level of use questionnaire. Teacher B1 was placed at level of use IVB (refinement). He declared that he was teaching IPA in a student-centered way, and wanted to make the best of the professional development they received. What’s more, he used IPA teaching for the purpose of changing current practices to improve student outcomes. During enactment, he was engaging students to group work in formulating their plan, searching for relevant information, doing the investigation, writing and presenting the research report, and sharing experience and exchanging ideas.

Classroom enactment

Table 8.12 presents an overview of the practice profile scores of teacher B1. The mean practice profile score for teacher B1 was 51. The teacher B1 realized an acceptable classroom practice. Teacher B1 especially did not realize ideal classroom practice at the start and the conclusion of some activities. He did not demonstrate behavior that strengthened the enactment of IPA.

Table 8.11 Practice profile of teacher B1

Activity	Threshold scores				Ideal - unacceptable scores				Total*
	Start	Body	Conclusion	40%	Start	Body	Conclusion	60%	
Topic introduction	100	100	80	37	50	92	40	36	74
Proposal report	80	100	100	37	0	55	60	23	60
Questionnaire design	60	83	60	27	25	67	20	22	49
Questionnaire revise	100	83	100	38	25	47	20	18	56
Pre-investigation	80	17	40	18	25	75	0	20	38
Data analysis	60	83	60	27	-25	50	0	5	32
Research report presentation	100	50	100	33	0	50	33	17	50
Mean				31				20	51
SD				7.4				9.3	13.7

Legend: * The total = [threshold scores] + [ideal scores - unacceptable scores in %].

The topic teacher B1 taught was traffic problems in Guangzhou.

At the start of topic introduction, teacher B1 clearly explained the objectives and contents of the activity. He interpreted the principles of topic selection and illustrated some examples of sub-topics. However, he did not introduce the activity by introductory questions. Later he asked students wrote down the sub-topics what they would like to inquire into. Then he proposed student divide into groups to discuss topics and related questions according to the requirements of groups. At the end of activity, he assessed the outcomes of group activity and required students to prepare for the presentation of their group research proposal, yet he did not spend time on discussing the activity and summarize the main points of it.

The investigations of class B1 were primarily taken in the vicinity of the school. During the process, some students actively interviewed the passers-by while some students palter with it. One student stretched his mind, and he and another student went to the hospital opposite to their school to interview. Other activities such as traffic police and expert interview were not conducted because of the limited time.

1. Survey on the violation of traffic regulations of pedestrian
2. Survey on the quality of drivers
3. Survey on the length of traffic lights
4. Pedestrian's recognition on road signs
5. Study on road traffic around No. 16 middle school
6. Study on traffic environment of No.2 Zhongshan Road
7. From Dongfeng road to look at problems of the main roads in Guangzhou
8. Rational use of two-way road

Teacher perceptions

When asked about the usefulness of the exemplary materials, teacher B1 claimed they provided focused guidance. He indicated that because the enactment was affected by too many courses, holidays and examinations, the time schedule was relatively tight. Teacher B1 expressed that what he liked in the exemplary materials was that they combined the theory with examples.

Talking about experiences of enacting IPA, teacher B1 thought the aim of IPA lessons was basically attained. When asked about problems he encountered in carrying out IPA, he mentioned stimulating and maintaining the enthusiasm of students. What impressed him most was that although some students' academic performance was average, they demonstrated strong organizational and coordinate skills. Teacher B1 reported that although he tried his best to allow students to participate in, not all the students engaged in the activity. Some students were not enthusiastic about IPA, because they felt that this event will damage their normal learning and they lack of the ability of thinking.

Concerning the differences between the IPA and former (similar) activities, teacher B1 considered the major difference was that they enacted IPA actually.

When asked about what he perceived learning from the IPA enactment, teacher B1 reported *"I learned how to organize such kind of activities. Moreover, I realized that I should allow students to find their own favorite and interested things. The guidance of teachers should be concise and in place."*

Student perceptions

The interviewed students were positive about teacher's role in IPA. They indicated that teacher B1 was good at creating a good classroom atmosphere for

students. One student from class B1 said *“Our teacher was good in making us feel comfortable. The whole activity was full of laughter. And it combined the joy with practice.”* Students indicated that teacher B1 communicated with them during the activity and analyzed their questions objectively.

When asked to comment on the support the teacher provided in IPA lessons, students claimed that teacher B1 provided them suggestions for improvement and pointed out their shortcomings, helped them solve problems. One student reported *“Teacher B1 helped us great. In the process of investigation, he provided helpful suggestions according to the actual situation.”*

8.4.3 Teacher B2

Level of use

Teacher B2 was placed at LoU VI (integration). He declared that he taught IPA in a student centered way and wanted to make the best of the professional development he had received. He used IPA teaching for the purpose of changing current practices to improve student outcomes. What’s more, teacher B2 coordinated his use of student-centered IPA lessons with other colleagues.

Classroom enactment

The topic teacher B2 taught was pleasant livable environment in Guangzhou. At the start of topic introduction, teacher B2 first spent about ten minutes to introduce the importance and principles of topic selection as well as the common problems need to be paid attention to. Later he introduced the topics and gave students about eleven minutes to discuss their sub-topics. Then teacher B2 told students how to make research proposal and discussed the topic selection with groups one by one. At the conclusion of the activity, he pointed out the problems with their research proposals. He also required students to think over the objectives and contents of their sub-topics and fill in their research proposals. Teacher B2 was used to encouraging students thinking and provided necessary support for students. However, at the body of research report presentation, he did not spend time to ask questions or enable students to ask questions after each group report because of the limited time.

Teacher B2 was the only teacher among the five teachers who had taken all the student groups out for investigation. As the destinations were far away from the school, he had to take the subway or bus with students. When they arrived at the destinations, teacher B2 first explained the requirements of activity to students. Then students scattered to do their investigations. Teacher B2 gave students some tips about how to find suitable person who would like to be interviewed and how to talk with the interviewees.

As the time for enactment was not enough, other activities such as expert interview were not conducted.

Box 8.3 *Sub-topics in class B2*

1. Survey on livable environment near No.16 middle school from business perspective
2. Survey on livable environment of Ersha Island
3. Investigation on livable environment of villages in the city: the case of Chebei Village
4. Survey on livable environment of Meihuacun
5. Survey on livable environment of Pantang
6. Survey on livable environment of Xiguan and Zhujiang new town
7. Survey on livable environment of Zhujiang new town
8. Survey on livable environment of Qilou and Eaton Eighteen

As can be seen in Table 8.12, the mean practice score for teacher B2 was 72. Teacher B2 scored largely above the threshold practice score. His ideal behavior minus unacceptable behavior scored 39. This revealed that his basic skills were acceptable and he demonstrated behavior that strengthened the enactment of IPA.

Table 8.12 *Practice profile of teacher B2*

Activity	Threshold scores				Ideal - unacceptable scores				
	Start	Body	Conclusion	40%	Start	Body	Conclusion	60%	Total*
Topic introduction	80	100	100	37	100	92	80	54	92
Proposal report	80	83	100	35	75	100	80	51	86
Questionnaire design	60	100	60	29	25	83	40	30	59
Questionnaire revise	80	83	100	35	75	92	60	45	80
Pre-investigation	80	67	60	28	75	100	60	47	75
Data analysis	80	100	60	32	25	55	40	24	56
Research report presentation	100	50	100	33	0	67	50	23	57
Mean				33				39	72
SD				3.4				13.2	14.9

Legend: * The total = [threshold scores] + [ideal scores - unacceptable scores in %].

Teacher perceptions

When asked about the usefulness of the exemplary materials, teacher B2 considered they provided support for guiding group activity and classroom management. He suggested that 'how to communicate with strangers' and 'report writing' could be added to the materials. He thought it was necessary for him to use the exemplary materials to carry out similar activity, because adopting the materials could make the whole activity more orderly and more efficient.

Talking about experiences of enacting IPA, teacher B2 indicated that what impressed him most was students played their potential in the activity, which was difficult to discover in the traditional day-to-day teaching. When asked about problems they encountered in carrying out IPA, teacher B2 indicated that the period for IPA lessons was not sufficient, especially for the large class size. In addition, he thought some students did not attach importance to this event.

With regard to the differences between the IPA and the former (similar) activities, teacher B2 responded, similar as teacher B1, that the major difference was that they really enacted IPA.

Talking about what he perceived to have learned from the enactment of IPA, teacher B2 mentioned that at present there was a phenomenon that IPA was conducted in a perfunctory way in many schools. Some teachers only arranged tasks to students and required students to submit the results within the specified time. And they paid little attention to the implementation process. When students encountered problems, they could not get guidance from teachers. Students often copied the contents from the Internet. In the end, students did not master the basic methods of studying and solving problems. This time he worked with students to develop research projects and to refine the design of the questionnaire. He accompanied students to go out for investigation and carefully observed every detail of students in the activity, then provided guidance in a timely manner. From the enactment, He realized that teachers should be the most loyal participants of IPA.

Student perceptions

Concerning teacher's role in IPA, all the students interviewed perceived positively and they thought teacher B2 encouraged them to think and helped them to broaden their horizon. Students indicated that their teacher communicated with students during the activity and analyzed their questions objectively.

With regards to the support of teacher provided in IPA lessons, students listed following aspects:

- helping us draw schemas.
- providing some relevant materials for us.
- aiding us how to write investigation report.
- taking us to go out for field observation.
- teaching us procedures, way and skills of doing things.
- pointing out our deficiencies and providing suggestions for improvement.

8.4.4 Teacher C1

Level of use

Teacher C1 was placed at LoU VI (integration) because she asserted that she was coordinating own use of the innovation with colleagues to achieve a collective impact on students. Teacher C1 spent a lot time to prepare the lessons and shared her teaching plan on her own initiatives with other colleagues. The teacher attempted to substantiate her usage by citing where students were involved in group discussion, individual work, and field investigation.

Classroom enactment

Table 8.13 *Practice profile of teacher C1*

Activity	Threshold scores				Ideal - unacceptable scores				
	Start	Body	Conclusion	40%	Start	Body	Conclusion	60%	Total*
Topic introduction	80	67	80	30	100	92	80	54	85
Proposal report	80	100	80	35	75	100	100	55	90
Research methods	100	100	80	37	75	100	80	51	88
Questionnaire design	100	83	100	38	50	100	60	42	80
Interview guide	80	100	80	35	75	83	35	39	73
Data analysis	80	100	80	35	75	100	80	51	86
Report writing	80	100	80	35	75	100	100	55	90
Report revise	100	100	100	40	75	100	80	51	91
Research report presentation	100	83	80	35	100	83	75	52	87
Mean				36				50	85
SD				2.7				5.8	5.7

Legend: * The total = [threshold scores] + [ideal scores - unacceptable scores in %].

As shown in Table 8.13, the mean practice profiles score for teacher C1 was 85. Teacher C1 scored largely above the threshold practice score and her ideal behavior was good. She performed the best among the five teachers. This indicated she demonstrated behavior that satisfied and strengthened the enactment of IPA.

The topic teacher C1 taught was the cultural communication between Black people and Chinese in Yuexiu District. Teacher C1 spent some time to prepare the lessons carefully before the class started.

At the start of each lesson, she spent a few minutes introducing the topic providing background information and explaining the objectives and contents of the activity to students. At the body of each lesson, teacher C1 normally divided the work into small interrelated steps. After her explanation, students began to write what they thought about it, and then exchanged ideas and discussed with group members, soon after they chose representatives to report to the whole class. At the body of research report presentation, she did not pose questions to students because of the time limitation. At the end of each lesson, teacher C1 spent a few minutes discussing the activity and making conclusion, and she also made assignments for the students.

For example, the topic introduction, teacher C1 introduced the lesson with the topic and a brainstorming game. Through playing the game, students' divergent thinking was stimulated. This laid foundation for expanding students' vision of choosing a topic. Then the teacher explained the criteria of choosing a topic and students were required to write up what they thought about topics for their group. During the group discussion, students exchanged opinions with group members and the teacher guided them from time to time. By discovering and thinking questions, students got to know how to select and decide the topics. Based on the observation of this lesson, students were actively involved in the topic chosen and they initially understand how to decide topics according to the criteria.

Teacher C1 took four groups of students out for investigation (totally 2 times). The rest of students had to take use of their spare time to do their investigation. At first students dared not to speak with the passers-by foreigners, particularly in English. Teacher C1 encouraged students speak frankly to the foreigners and gave them tips for the interview. Then students tried and experienced a sense of success and they were more confident in their following interviews.

As the school administration did not approach the staff in the Foreigner management Service Center of Denfeng Community, Yuexiu District well, the interview was not held. This was what the teacher and students were disappointed about.

1. How Black people are involved in Chinese traditional festivals?
2. How to communicate with Black people?
3. Dietetic habits and consumption of Black people
4. Educational situation of Black children in Guangzhou
5. Methods and difficulties that Black people learn mandarin
6. Clothing consumption habits of Black people in Guangzhou
7. Impact of mandarin on Black people in Guangzhou

Teacher perceptions

Concerning the usefulness of the exemplary materials, teacher C1 considered it was useful because it provided examples for her reference and she had got new experiences from the materials. She hoped to be given more materials like this. Teacher C1 suggested that more related videos or audios should be added. She indicated that the period for IPA lessons was not sufficient, especially because of the large class size.

Teacher C1 thought that she had adopted a student-centered approach in the enactment of IPA, such as group discussion, representatives of each group speaking and students from other groups posing questions and providing suggestions. She introduced brainstorming to stimulating students' thinking in the topic selection lesson. Teacher C1 claimed that students were highly engaged in the activity what impressed her most was to go out with students for investigation. She thought she could transfer the teaching methods she had adopted in the activity to other lessons. Teacher C1 admitted that a few students did not like the activity because of heavy learning burden. When asked about problems she encountered in carrying out IPA, teacher C1 indicated that the school did not provide necessary support on multimedia facilities and she was disappointed with it.

Regarding differences between IPA and former (similar) activities, teacher C1 thought its procedures were more specific than before.

When asked about what she perceived to have learned from the enactment of IPA, teacher C1 considered that a successful activity was created by the mutual cooperation of the collectives.

Student perceptions

All students interviewed showed positive perceptions about their teacher's role in IPA. They deemed that teacher C1 was good at creating a good classroom atmosphere. One student reported *"The way of teaching of our teacher made us more actively engaged in the activity and thinking. She opened up space for our thinking and imagination."*

Talking about the teacher's support provided in IPA lessons, students confirmed her help in following aspects:

- encouraging us
- providing valuable suggestions and pointed out direction for us when we argued problems heatedly
- teaching us various methods, such as for investigation and data analysis
- guiding us consider questions from different angles
- helping us revise the research proposal and report

One student claimed *"The teacher's guidance was more thorough and she accompanied us to the activity. The whole process was followed step by step."* Another student indicated *"Teacher C1 enabled us to understand the steps of practice. She guided us to think questions from various angles to develop divergent thinking. What's more, she specified the direction of solving problems for us."*

8.4.5 Teacher C2

Level of use

Teacher C2's IPA teaching was placed at a mechanical level of use (LoU III). The teacher at level of use reported that she was actively involved in reading, planning and improvising materials for IPA teaching. She adapted the innovation to her peculiar classroom context and focused on day-to-day use of the innovation with little time for reflection. Teacher C2 was primarily engaged in a stepwise attempt to master the tasks required to use the innovation, often resulting in superficial use.

Classroom enactment

The topic that teacher C2 taught was on the mini United Nations in Dengfeng residential district. At the beginning of topic introduction, she ordered students to complete the task and the whole classroom atmosphere was a little tense. Teacher C2 presented the ready topics to students she had thought. She did not try to stimulate students to think and students did not think the topics they were interested in and the feasibility of inquiring into the topic. Meanwhile, as the time management was not well, students were not focused on topics they discussed. At the conclusion of topic introduction, proposal report and report writing she did not spend time discussing the activity and summarizing the main points of activity, making assignments for the next activity. However, she pointed out the problems of students and made suggestions for them.

Teacher C2 took four groups of students out for investigation (totally 2 times). The rest of students had to use their spare time to do their investigation. At first some students dared not to speak with the passers-by foreigners, particularly male students. Teacher C2 interviewed a foreigner personally and showed students how to speak to the foreigners. However, the female students performed better than male students.

Box 8.5 *Sub-topics in class C2*

1. The reasons Black people migrate to Guangzhou
2. Why Black people choose Dengfeng community as a place of residence?
3. Beautiful mistake: From language environment to look at the attitude of local people towards foreigners
4. Economic trade relationship between Guangzhou and Africa
5. Impact of settlement of Black people in Dengfeng community on urban management
6. Motivation for Black people to Guangzhou
7. Survey on Islamic style restaurants near No. 17 middle school

It can be seen from the Table 8.14 that the mean practice profile score for teacher C2 was 48. Her threshold score was 20, which was low. As for teacher C2 got the very high SD in the ideal-unacceptable scores, she got 100 score at the start of the research report presentation; however, she got 0 score at the conclusions of proposal report and report writing. Teacher C2 got -50 unacceptable score at the start of report writing and at the conclusion of some activities, especially in proposal report.

Table 8.14 Practice profile of teacher C2

Activity	Threshold scores				Ideal - unacceptable scores				
	Start	Body	Conclusion	40%	Start	Body	Conclusion	60%	Total*
Topic introduction	20	33	80	18	50	50	60	32	50
Proposal report	40	100	0	19	75	67	-75	13	32
Research methods	40	67	20	17	75	67	35	35	52
Questionnaire design	40	50	40	17	50	30	15	19	36
Questionnaire revise	60	67	20	20	50	92	55	39	59
Data analysis	40	67	40	20	50	67	15	26	46
Report writing	20	83	0	14	-25	58	0	7	20
Research report presentation	100	83	75	34	100	83	75	52	86
Mean				20				28	48
SD				6.2				14.7	19.8

Legend: * The total = [threshold scores] + [ideal scores - unacceptable scores in %].

Teacher perceptions

With regard to the usefulness of the exemplary materials, teacher C2 mentioned that she liked the combination of concrete examples with theory, because the theory were the foundations and the examples embodied and visualized the theory. Furthermore they were handy for use. Teacher C2 claimed that she would like to use the exemplary materials in future IPA teaching. Furthermore, she suggested to add more excellent examples in China and abroad, and to provide information about the new development of IPA in China.

Talking about experiences of enacting IPA, teacher C2 thought that most of students were interested in IPA and could participate in the group inquiry. She endeavored to adopt student-centered methods to guide students and she could transfer these methods to other similar activities. When asked about problems they encountered in carrying out IPA, teacher C2 pointed out the interpersonal resources outside school were very important for carrying out IPA. She also talked about some students ignored the value the activity and were not actively engaged though, because they felt that they were burdened with learning and the activity did not improve their test scores.

Concerning the differences between IPA and Activities, teacher C2 claimed that in IPA she had made use of local resources to develop IPA course. And if you find its link with relevant subjects, students would benefit a lot from it for their subject learning.

When asked about what she learned from the enactment of IPA, teacher C2 said *“I was aware of the whole set of links of how to guide students conduct inquiry learning in IPA. I believed that the enactment laid foundation for the future similar learning guidance.”*

Student perceptions

The interviewed students stated that their teacher was good at creating a nice classroom atmosphere for students. One student from class C2 reported *“The way of teaching of our teacher made us more actively engaged in the activity and thinking. She opened up space for our thinking and imagination.”*

When asked about the support of teacher provided in IPA lessons, students confirmed teacher’s help in following aspects:

- guiding us focus on main points and narrow the scope of the study.
- teaching us a lot of methods, such as the way of analysis, survey, and writing,
- giving us some suggestions and improvements on questionnaire design and revise, research proposal and report.
- pointing out the direction and stimulating our thinking.
- teaching us how to write report.

One student reported *“Our teacher helped us to design and revise questionnaire, analyze data and write research report. When we ran into difficulties, she analyzed the existing problems patiently, then enabled us improve our works.”*

8.4.6 Summary

Table 8.15 summarizes the findings of the individual teacher’s enactment of IPA. To be able to interpret the practice profile scores the following criteria were set: The criteria for basic skills (maximum is 40): ≥ 35 is excellent; 30-34 is good; 25-29 is moderate; ≤ 24 is low. The criteria for ideal skills (maximum 60): ≥ 55 is excellent; 45-54 is good; 35-44 is moderate; and ≤ 34 low.

Table 8.15 Summary of the five teachers' enactment

	A	B1	B2	C1	C2
Level of Use	<i>Routine</i>	<i>Refinement</i>	<i>Integration</i>	<i>Integration</i>	<i>Mechanical</i>
Practice profile scores basic skills	Moderate (29)	Good (31)	Good (33)	Excellent (36)	Low (20)
Practice profile scores ideal skills	Moderate (38)	Low (20)	Moderate (39)	Good (50)	Low (28)
Student perceptions	Positive	Positive	Positive	Positive	Positive

As shown in Table 8.15, regarding the level of use teacher B2 and C1 was at the integration level, teacher B1 at the refinement level, teacher A at routine level, and teacher C2 at mechanical level. Concerning the basic skills needed for IPA enactment (as measured through the curriculum profile), teacher C1 was excellent, teacher B1 and B2 were good, teacher A was moderate, and teacher C2 was low. With regard to the ideal skills needed for IPA enactment (as measured through the curriculum profile), teacher C1 were good, teacher A and B2 were moderate, and teacher B1 and C2 were low. Students had positive perceptions of teachers' IPA enactment.

8.5 STUDENT LEARNING OUTCOMES

The results of students' perception from questionnaire and interview are presented in the following subsections.

8.5.1 Students' perception: questionnaire results

Students' experiences and opinions about IPA are analyzed in this subsection. As shown in Table 8.16, students' reactions to specific statements had been organized into three categories: attitudes to and experience with IPA; performance in IPA; ability perception. In general, students from the five classes in three schools were positive about IPA.

Table 8.16 *Students' perceptions of the activity*

	M*(SD)					ANOVA (F)
	Class A N=17	ClassB1 N=42	ClassB2 N=53	ClassC1 N=46	ClassC2 N=39	
Attitudes to and experience with IPA	4.0 (0.75)	4.4 (0.48)	4.5 (0.33)	4.5 (0.46)	4.4 (0.46)	4.099**
Performance in IPA	4.0 (0.72)	4.4 (0.41)	4.5 (0.42)	4.5 (0.46)	4.2 (0.41)	4.645**
Ability perception	4.0 (0.62)	4.4 (0.46)	4.5 (0.35)	4.5 (0.44)	4.4 (0.38)	4.300**

Note: * P<0.001

Attitudes to and experience with IPA

From Table 8.16, it can be seen that means of student in five classes ranged from 4.0 and 4.5 (F=4.009, p=0.001). Tukey's post hoc test reveals that there was a significant difference between students of Class A and all other classes (p ranges from 0.001~0.027) in attitude and experience. On the basis of researcher observation, student questionnaire results, teacher interview, three reasons can be provided for the low score of Class A. It appeared that students from Class A were not interested in the topic they inquired (M=3.6, SD=0.87). The time provided for IPA was not sufficient. As sometimes the IPA classes were interfered by other activities in the school and the teacher had to go out, the time for IPA lessons were decreased. Students were not provided the opportunity to conduct investigation with the help of the teacher, and they had to made use of their after class time by themselves. What's more, as the classroom discipline was not good during the lessons, the teacher had to spend time to deal with classroom discipline. The objectives of each lesson were not fully fulfilled.

Performance in IPA

As shown in Table 8.16 means of student in five classes ranged from 4.0 and 4.5 (F=4.645, p=0.001). Tukey's post hoc test reveals that there was a significant difference between students of Class A and other three classes (B1, B2, C1) (p ranges from 0.001~0.022) in performance in IPA. As the students from Class A were not as positive to IPA as the students from other classes, they scored accordingly lower in performance of IPA. Tukey's post hoc test also reveals that there was a significant difference between students of Class C2 and Class C1 (p=0.036) in performance.

Ability perception after taking part in IPA

As it can be seen in Table 8.16, means of student in five classes ranged from 4.0 and 4.5 ($F=4.300$, $p=0.001$). Tukey's post hoc test reveals that there was a significant difference between students of Class A and all other classes (p ranges from 0.000~0.048) in ability perception. On the basis of researcher observation, teacher interview and student questionnaire results, there were two reasons for the low mean score of Class A in ability perception. First, the three aspects, attitudes to and experience with IPA, students' performance in IPA and ability perception after taking part in IPA, are interrelated. As the students in Class A were not interested in the learning of the topic, then they were not actively engaged in IPA, accordingly they did not perceived their ability had been improved greatly than the students in other four classes. Second, as the IPA classes sometimes occupied by other activities in the school and the teacher had to go out, these lead to serious shortage of IPA class.

Aspects of the activity students liked most (least)

There were four open questions in the student questionnaire. Students were asked to write down two aspects they liked (or disliked) most about IPA, the differences between the IPA lessons and former IPA lessons, and the suggestions for the activity. Student opinions here verify most of the findings obtained from the closed-ended items, but also provide supplementary information on their experiences with and feelings about the IPA. Table 8.17 presents the aspects student liked and did not like about the IPA lesson, sample reasons, and the frequency of response.

Table 8.17 What students liked and did not liked about IPA (N=197)

What they liked	R reasons why they liked this aspect	Frequency (in %)
Going out for investigation	<ul style="list-style-type: none"> ▪ Going into society and acquainting them with local situation, social practice experiences were increased. 	81.7
	<ul style="list-style-type: none"> ▪ Ability to communicate with others was enhanced 	
	<ul style="list-style-type: none"> ▪ Ability of oral expression was improved. 	
	<ul style="list-style-type: none"> ▪ Capacity of bearing setbacks was improved. 	
	<ul style="list-style-type: none"> ▪ Interesting and challenging. 	
Data analysis	<ul style="list-style-type: none"> ▪ Analyzing problems from different angles. 	27.9
	<ul style="list-style-type: none"> ▪ Cooperating with group members. 	
	<ul style="list-style-type: none"> ▪ Utilizing ICT (i.e. Excel). 	
Group discussions	<ul style="list-style-type: none"> ▪ Ability of communication and cooperation were enhanced. 	15.7
	<ul style="list-style-type: none"> ▪ Expressing one's own opinions and exchanging different ideas. 	
	<ul style="list-style-type: none"> ▪ Finding reasonable solutions. 	
Searching for information	<ul style="list-style-type: none"> ▪ Mastering skills of information collection and processing. 	11.7
	<ul style="list-style-type: none"> ▪ Learning a lot of knowledge. 	
	<ul style="list-style-type: none"> ▪ Expanding their horizons 	
	<ul style="list-style-type: none"> ▪ Utilizing ICT. 	
Writing research report	<ul style="list-style-type: none"> ▪ Learning new knowledge. 	10.7
	<ul style="list-style-type: none"> ▪ Having sense of fulfillment 	
	<ul style="list-style-type: none"> ▪ General ability was enhanced, including thinking ability, written ability, analysis ability etc. 	
	<ul style="list-style-type: none"> ▪ Good for reflection. 	
Questionnaire design	<ul style="list-style-type: none"> ▪ Putting forward useful questions. 	6.6
	<ul style="list-style-type: none"> ▪ Good for divergent thinking. 	
What they did not like	Reasons why they did not liked this aspect	
Data analysis	<ul style="list-style-type: none"> ▪ Too much data and heavy workload. 	28.9
	<ul style="list-style-type: none"> ▪ Difficult for analysis 	
	<ul style="list-style-type: none"> ▪ Dull and tedious. 	
Writing research report	<ul style="list-style-type: none"> ▪ Poor writing skills. 	22.4
	<ul style="list-style-type: none"> ▪ Poor ICT skills. 	
	<ul style="list-style-type: none"> ▪ Taking up much time. 	
Going out for investigation	<ul style="list-style-type: none"> ▪ Being vulnerable to be refused by others and felt embarrassed 	18.78
	<ul style="list-style-type: none"> ▪ Not good at communicating with others. 	
Searching for information	<ul style="list-style-type: none"> ▪ Difficult to sort out materials. 	
	<ul style="list-style-type: none"> ▪ Mass of detail. 	
Questionnaire design	<ul style="list-style-type: none"> ▪ Do not know how to design questions. 	15.7
	<ul style="list-style-type: none"> ▪ Need to think from various aspects. 	
	<ul style="list-style-type: none"> ▪ Difficulty in reaching common consensus with group members 	

Over 4/5 (161; 81.7%) of the students liked going out for investigation because it was interesting and challenging. Students indicated that going out for investigation enabled them to go into society and acquaint them with local situation, and their social experiences were increased. Students felt that going out for investigation enhanced their ability of communicating with others and the oral expression. In addition, students stated that their capacity of bearing setbacks was improved.

However, thirty-seven students expressed that they did not like going out for investigation because they were vulnerable to be refused by others and felt embarrassed, and they were not good at communicating with others.

Over 1/4 (55; 27.9%) of students described data analysis as the activity they liked most because they could cooperate with group members and analyze problems from different angles. Students stated that they used ICT such as Excel to deal with data.

Group discussion was one activity students liked about IPA lessons. Thirty-two students (15.7%) indicated that they liked group discussions because they increased communication and cooperation among students and between students and teachers; and allowed them to express their opinions, change ideas and find reasonable solutions.

Students liked to be involved in searching for information. Twenty-three students (11.7%) indicated that they liked searching for information because it helped them learn knowledge, expand horizons, and master the skills of information collection, processing and analysis. Moreover, students explained that they liked searching for information because it helped them use ICT.

Students also felt positively about writing a research report. Twenty-one students (10.7%) stated that they liked writing research report because it was good for reflection and they had the sense of fulfillment. Students felt that it helped them acquire knowledge and improve their general ability such as the abilities of thinking, writing and analysis.

Apart from the positive reactions students had about different aspects of IPA, a few mentioned that they were not happy about certain aspects of IPA. Fifty-seven students (28.9%) felt that data analysis was dull and tedious, because there were too much data to process; and it was difficult for them to analyze.

Forty-four students (22.4%) stated they did not like writing research report because of their poor writing skills and ICT skills, and as a result it took up them much time. Half of the students (22) were from Class 1.

Thirty-one students (15.8%) felt that they did not like questionnaire design because it required them to think questions from various aspects; students did not know how to design questions; and it was difficult to reach common consensus with group members.

Student opinions about IPA

As shown in Table 8.18 six students (35.3%) of class A stated that the activity was interesting, lively and innovative. Three students (17.7%) indicated that they had opportunities to go out for practice and their practical ability was enhanced.

Twenty-five students (26.3%) from class B1 and B2 felt that the activity was in close contact with social life. Twenty-one students (22.1%) mentioned they carried out investigation outside school. Twelve students (12.6%) indicated that teachers and students went about their activity in earnest. Eleven students (11.6%) mentioned that the activity was carried out in a planned and systematic way. In addition, some students thought the forms of activity were novel and its contents were rich. However, three students from class B1 thought the activity time was too long and IPA should not occupy their learning time. This reflected that a few students did not understand the significance of IPA to their learning and they merely care about the courses of examination.

As for the students from school C, one difference they pointed out was same. Ten students (11.8%) mentioned they carried out the activity in a planned and systematic way. For other differences their responses differed greatly. Fourteen students (30.4%) from class C1 indicated that they carried out the activity under the guidance of the teacher and the researcher. Nine students (19.6%) felt that their general abilities were improved. Five students thought it paid attention to practicality.

Students (17, 43.6%) from Class C2 indicated that the activity was in close contact with social life. The second difference students (6, 15.4%) expressed related to both cooperation and division of work in group activity.

Table 8.18 *Student opinions about IPA*

Class	Differences between IPA and former IPA	Frequency (N, %)
A(N=17)	Forms of activity were interesting, lively and innovative.	6(35.3)
	Practical ability was enhanced.	3(17.7)
B1+B2 (N=95)	It was closely linked with the social life.	25(26.3)
	Carrying out filed investigation	21(22.1)
	Teachers and students carried out activity very serious.	12(12.6)
	Carrying out activity in a planned and systematic way	11(11.7)
C1(N=46)	General ability was enhanced.	9(9.5)
	Teacher and researcher supervised them.	14(30.4)
	Abilities were improved, especially general ability	9(19.6)
	Taking investigation outside school	8(17.4)
	Focusing on practicality	5(10.9)
	Carrying out activity in a planned and systematic way	5(10.9)
C2(N=39)	It was in close contact with social life.	17(43.6)
	Both cooperation and division of work were required.	6(15.4)
	Carrying out activity in a planned and systematic way	5(12.8)

Students' suggestions for the activity

As shown in Table 8.19, forty-five students (22.8%) from the three schools thought that they hurried to the activity and the time was not abundant, they hoped more time should be provided for them, especially time for field investigation. Nineteen students considered that some classmates did not actively participate in the activity, and they hoped the group members should engage in the cooperation so as to fulfill their task. Seventeen students (8.6%) considered the activity was good for them and their abilities were improved. They expressed their hopes for the school organizing more activities like this for the students. Eleven students (5.6%) suggested that more exemplary examples should be provided for their reference. Moreover, some students indicated that the forms of activity should be more flexible and interesting. However, three students from class C1 thought that IPA took a lot of time. It would be better to arrange IPA in the summer/winter vacation.

Table 8.19 *Students' suggestions for IPA (N=197)*

Students' suggestions	Frequency (N, %)
More time should be provided for the activity.	45 (22.8)
Cooperation in/among the groups should be strengthened.	19 (9.6)
More activities like this should be organized for students.	17 (8.6)
More exemplary examples should be provided for reference.	11 (5.6)

8.5.2 Students' perception: interview results

Students' learning experiences with IPA were also explored through interview. Analysis of the interview data generated information similar to what was obtained from open-ended questionnaire items. Since students' perceptions did not differ much among the three schools, their responses have been pooled together under five categories: student favorite activities and perceived learning with the inquiry learning, differences between IPA and former IPA, student perceived benefits of group work, student perceived benefits of teacher support, student suggestions for activity improvement.

Student favorite activities and perceived learning with IPA

Students' impressions about IPA were very positive. Students from five classes in three schools described it as novel and interesting.

During the interview, students described going out for investigation as their favorite activity because it was challenging and interesting, and students learned a lot from the activity. The following quotes illustrate students' experiences with IPA.

Box 8.6 *Quotes of students' experiences with IPA*

- *"I learned a lot knowledge extra-curricular knowledge by making outside investigation."*
- *"IPA was an open activity. I realized my insufficiencies in some aspects by the activity and my ability of communication was improved. "*
- *"My favorite activity was going out for investigation. I remembered our group went out of school together, and this was the first time we communicate with foreigners. We were both excited and tense. That experience remained fresh in my memory. "*
- *"What I liked most was to go out to communicate with foreigners and collect data. Because it enabled me to represent myself, communicate with foreigners in English and face difficulties. "*
- *"I liked to go out for investigation with teacher and classmates. Because we could get in touch with variety group of people and it acquainted ourselves with social problems."*
- *"Our abilities in many aspects were tempered, such as organizing ability, communication ability and practice ability."*

When asked further about what students learned and what they benefited most from IPA lessons, students mentioned they learned how to pose questions, how to design questionnaire, how to communicate with others, how to make a survey, how to analyze data, and how to cooperate with classmates. The following four responses illustrate students' feeling about what he/she learned and benefited from IPA.

Box 8.7 *Students' perceived benefits from IPA*

- *"I learned how to design questions and how to think. What I benefited most was I understood that sufficient preparation should be made before doing things, that is to say, doing things need a process of deliberation."*
- *"I learned to make graphs and the methods of investigation and analyzing problems. What I benefited most was I know how to cooperate with classmates, the abilities of oral and written expression were improved."*
- *"I got to know the differences between the research proposal and the research report, and I learned how to write research proposal and research report."*
- *"I mastered the skills of how to make a questionnaire and how to choose the objects of being investigated. I benefited a lot from IPA, such as, how to communicate with strangers."*

When asked their opinions regarding the significance of IPA and its relations with student life, all students interviewed responded positively.

Box 8.8 *Students' opinions regarding relationship of IPA with student life*

- *It enabled me to pay more attention to every bit in our life. And I learned the geographic and humanistic environment in Guangzhou.*
- *The activity was of very important significance. For example, I have lived and studied in Xiaobei area for a long time. The phenomenon that foreigners dwelled in the resident area was a common sight for us. I have never expected that we could obtain information that we normally did not know in our daily life by investigation.*

Differences between IPA and former Activities

When asked the differences between IPA and former Activities, students mentioned a number of differences. They compared IPA with former Activities. The following illustrate their typical responses:

Box 8.9 Summary of responses of students on differences between IPA and former Activities

<p>Comparison IPA with former Activities:</p> <ul style="list-style-type: none">▪ <i>There were more activities in this IPA than former Activities. I had experienced at my first hand this time.</i>▪ <i>There was more practice in the activity and it was of important significance, while we made courseware by copying and pasting in the previous activity.</i>▪ <i>In the past we only knew to take the so-called 'synthesizing' activity depending on network, while this time we carried out real practice and go outside school to make survey and collect data. We benefited a lot from the IPA.</i>▪ <i>This activity was more systematic than before. It followed in order and advanced step by step. Classmates were deeply engaged in the activity. For example, our research report was no longer copied from the network and we went about our activity in earnest.</i>
<p>Relationship with real life:</p> <ul style="list-style-type: none">▪ <i>It required us to focus on the issues in the society and life.</i>▪ <i>We went outside of school, and went directly into society and life.</i>
<p>Role of group work in IPA:</p> <ul style="list-style-type: none">▪ <i>In the previous IPA, there was little time for group members to discuss problems and go out for investigation. Through IPA in this term, we really had the opportunities to practice, every one of us made great efforts and contributed to the group.</i>▪ <i>There was division of work in the group. Group members cooperated with and helped each other. There were high requirements for the group leaders.</i>
<p>Students' abilities improved:</p> <ul style="list-style-type: none">▪ <i>More focusing on language ability, and we could communicate with foreigners.</i>▪ <i>Our abilities were improved and tempered, such as the abilities of oral and written expression, and communication.</i>▪ <i>Our practice ability was greatly enhanced.</i>
<p>Teacher's role in the activity:</p> <ul style="list-style-type: none">▪ <i>The teacher's guidance was more thorough and she accompanied us to the activity. We also got the guidance from expert. The whole process were followed in order and advanced step by step.</i>

Student perceived benefits of group work

IPA teaching advocates the need for students to work in groups. When inquired how they felt about the benefits of group work, the majority of students interviewed indicated that they actively participated in group work such as group discussions, group report, studying out investigation plan, etc. Through group work, students stated that they were able to cooperate with each other and share ideas with classmates, which enabled them to come up with solutions to problems they faced. Although group members sometimes quarreled with each other about their work, they put aside minor differences so as to seek common ground and reach on optimal scheme. However, a few students pointed out that some group members were not actively engaged in the group works.

The main difficulty they met in the group activity, students talked about disagreement among group members. Besides, they could not understand

problems comprehensively because of their knowledge limitations. When disagreement among group members happened, students sought help from the teacher and researcher and discussed possible solutions among group members. With regard to interaction among groups, most of students thought it had positive effect on them. They learned from other's strong points to offset their weakness. The interaction broadened their horizons and students made progress together.

Concerning the quality of the group portfolio, most of students considered they were good and they were satisfied with their product. Some students thought they were just so-so and need to be improved.

Student suggestions

Some students from the three schools thought the time for IPA was not sufficient and suggested that more time should be provided for the activity. Two students from class A proposed that the division of work in a group should be clear and each member should be responsible for his/her work.

All students indicated that they enjoyed IPA and they would like to take part in a similar activity like this. In addition, they hope schools to organize more activities like this for the students.

8.5.3 Students' products

Before the actual enactment, the teachers learned the importance of portfolio assessment in IPA through the teacher professional workshop. They were required to pay attention to collect the portfolios of each student groups over time and they prepared paper or plastic bags for each group to keep their documents. During the enactment, the teachers discussed with students and required each group to assign one student in charge of collecting and keeping the documents of their group. As some of the documents had to be revised several times, students were required to keep all the documents they had written in order to trace their development. Some of the documents were also kept in electronic format and emailed to their teacher so that teachers could easily revise these documents (i.e., research proposal, questionnaire or interview scheme, research report) and provide feedback to student groups.

In addition to the portfolio, some of the students' diaries and compositions about the IPA in class C1 were also collected.

Box 8.10 Quotes from student compositions and diary

<p>The joy of communication: <i>"I thought the communication was a difficult thing especially with foreigners before the investigation. I seldom communicated with strangers because I feared that I am afraid of being refused by others and to lose face. ... At first I felt uneasy and anxious and dared not speak to foreigners. When a classmates and I tried to speak to a foreigner and he completed the first questionnaire, we were very excited. We were encouraged by the success and continued to make investigation. ... After this investigation I found that communication between people was so interesting and it was not a difficult thing. I appreciated the joy of success. What a forgettable and wonderful experience!"</i></p>
<p>Endless pleasure: <i>Some time ago, our group had an opportunity of making investigation outside school with foreigners. ... At first a classmate and I continually said hello to foreigners, but they ignored us and went away hastily. We felt frustrated. At this time, a young foreign lady came across and she nicely accepted our request. To our surprise, she talked with us in Chinese. She wrote down answers on the questionnaire earnestly, and we were very pleased. We had a sense of fulfillment and were more confident. We communicated with foreigners more intimately through our tireless efforts. ... The experience of making investigation on foreigners brought me endless pleasure. The joy is like tasting a piece of sugar wrapped by bitter 'skin', in the end, you'll find it sweet and lingering.</i></p>
<p>Student diary: <i>Although I had done well in written English, my spoken English was poor. At first, I felt nervous and did not how to speak to the foreigners. After a successful first try, I became more confident. ... The English knowledge we learned need to be used in practice, otherwise, it will become rusty."</i></p>

8.5.4 Parents' perception

As students as ultimate beneficiaries of change or innovation, the information gathered from them and their parents was considered useful for gaining insight into the potential impact of the professional development arrangement on teachers.

The parents' opinions about IPA were generally very positive. Their responses show that parents found IPA very useful for their children because the activity was very meaningful, the forms of activity were good, and students were provided with the opportunity to exercise. Table 8.20 shows parents' perceived usefulness of IPA for their children. Some parents indicated their children had accumulated social experience. Some parents felt that their children had acquired more integrated knowledge and social practice knowledge, and understood the foreign culture and customs. More parents claimed that their children's abilities, such as communication, cooperation, independent thinking, social practice, information collection and arrangement were developed through IPA.

Table 8.20 *Parents' perceptions of student benefit from IPA (N=10)*

Benefits	Frequency (N, %)
▪ the ability of social practice was improved and accumulating a great deal of social experiences.	8(80)
▪ the ability of communication was improved.	7(70)
▪ acquiring more integrated knowledge and social practice knowledge.	7(70)
▪ the ability of cooperation and independent thinking were developed.	6(60)
▪ the ability of language was enhanced.	5(50)
▪ understanding the foreign culture and customs.	4(40)
▪ arousing the interest of learning and being helpful for subjects learning.	3(30)

Parents hope schools to arrange more activities like this and the forms of activity could be multiple. They also hope their children to participate the activity more actively, to practice and experience.

8.5.5 Summary

Students from the five teachers were positive about IPA. Most students were actively involved in the activity and they could fulfill their tasks earnestly. Students thought they benefited a lot from IP, such as posing questions, communicating with people, cooperating with classmates, questionnaire design, making survey, data analysis. The aspects of IPA students liked most were going out for investigation, group discussion, data analysis, searching information online. The aspects students liked least were data analysis, writing research report.

The students indicated the differences between IPA and former Activities in following aspects: the forms of activity were interesting, lively and innovative, particularly making investigation outside school; it was closely linked with the social life; carrying out activity in a planned and systematic way; general ability was improved, especially practical abilities. Students suggested that more time should be provided for the activity and they hope to provide more activities like this.

Parents indicated that the knowledge and skills of students were developed through IPA in many aspects, such as integrated knowledge, social practice, cooperation, independent thinking. Furthermore, they desired that schools arrange more activities like this for students.

8.6 CONCLUSIONS

This chapter presented the results of the evaluation of the impact of the professional development arrangement in supporting teachers with the enactment of IPA lessons. The evaluation focused on teachers' reactions to the professional development arrangement, teachers' learning from the professional development arrangement, school support for teachers, teachers' use of the new knowledge and skills in practice, and students' experiences and learning outcomes with IPA lessons. The following conclusions are drawn based on the results gathered at the five levels of evaluation (Guskey, 2000) the study undertook to investigate.

The results revealed that teachers were positive about the professional development arrangement. They thought the professional development arrangement was useful for their enactment and their understanding of IPA were enhanced. Teachers were satisfied with the contents of professional development workshop and follow-up support activities. They appreciated the provision of exemplary curriculum materials, particularly demonstration of video clips, excellent examples of students' products, and resources related to the topics students inquired. However, teachers disliked fellow teachers commented on his/her video-taped classroom lessons face to face.

Regarding the learning from the professional development arrangement, teachers thought it enlightened their awareness and understanding about IPA lessons. The video-clips demonstration assisted them in identifying the important features of IPA lessons and made them consider trying out IPA lessons. Sharing teaching plan including slides was conducive to sharing expertise.

With regard to organizational support, there were differences across the three schools. Both school B and C encouraged teachers to experiment with new strategies. School B provided necessary resources for IPA enactment. School A was considered less supportive in school leadership and collegial support. All teachers indicated the time for lesson preparation were not sufficient. School B and school C could provide participating teachers fixed time and rooms to organize teacher learning communities for sharing expertise. The district teaching and research center honored the excellent works of students in the district and required teachers submit articles about the IPA enactment to exchange ideas with teachers in other schools.

Concerning teacher use of new knowledge and skills, level of use, classroom practice profile scores, teachers' perception, and students' perception on teachers' enactment of IPA has been probed. It showed that teachers adopted student-centered approach with varying quality and degree and five teachers were users (LoU III - LoU VI) of student-centered approach. Student interviews revealed that they were positive about IPA lessons and the teachers' role in IPA.

Impact of the professional development arrangement on students was positive. The analysis of student questionnaire and interview as well as parent interview showed students positive attitudes towards IPA teaching. The majority of the students could actively take part in the activity and their knowledge and skills were improved in aspects such as posing questions, communicating with people, cooperating with classmates, questionnaire design, making survey, data analysis.

CHAPTER 9

Discussion

This study addressed the (iterative) design and evaluation of a teacher professional development arrangement, in which exemplary materials were embedded, to support teachers in the enactment of Integrative Practical Activities in secondary schools in China. Section 9.1 recapitulates the context, research question, and approach applied in this study. The main findings are summarized and discussed in section 9.2. Sections 9.3 and 9.4 reflect on the research methodology and the intervention. In section 9.5 conclusions are drawn and recommendations are made for policy, practice and research.

9.1 RECAPITULATION

Research context and question

The Ministry of Education (MOE) in China launched a new curriculum reform in 2001 in order to meet the challenges of the 21st century. The new curriculum reform advocates quality education to promote the overall development of students. A main challenge in this curriculum reform was to change from the emphasis on knowledge acquirement and recitation towards the development of students' abilities in problem solving and inquiry as well as an innovative spirit and social responsibility. To meet this problem a new course "Integrative Practical Activities" (IPA) was developed for students in Grade 3-12 (age 8-17). IPA is supposed to be more student-centered and inquiry-based.

The main characteristics of IPA are as follows:

- a. *Integration.* The themes of IPA come from the individual and social life of students. The themes selected for IPA must embody the integration of individual, society and nature, as well as the internal integration of science, art and moral.
- b. *Practicality.* Students get first-hand experience by doing, inquiring, serving, experimenting; the emphasis is on activities.

- c. *Openness*. Its objectives and content are open. IPA orients to the living world of students. The content of IPA may vary for different students in different classes, schools and districts.
- d. *Generation*. The generation of IPA is determined by its process-orientation and the development. It stresses that the competencies (which includes attitudes, knowledge and skills) and values of students are developed in the process of the activities.
- e. *Autonomy*. IPA respects the interests and preferences of students, which provides ample space for students to fully develop their autonomy. Students can choose their themes, content, and the modes of learning according to their interests.

The implementation of IPA has encountered several related problems. Because of a lack of comprehensive, systematic and effective in- and pre-service education teachers do not feel qualified to teach IPA. Also, appropriate curriculum resources and materials were not available, which aggravates the implementation problems.

It is within the context of the new curriculum reform that this study has been undertaken. The aim of the study was to design and evaluate a professional development arrangement to support teachers' enactment of IPA. Exemplary curriculum materials were considered an essential part of the professional development arrangement. The main research question of the study was formulated as follows:

What are characteristics of a teacher professional development arrangement in which curriculum materials are embedded, that adequately support teachers in the enactment of IPA?

To answer this research question, the study has been guided by the following sub-questions.

1. What are the characteristics of exemplary curriculum materials that support teachers in the enactment of IPA?
2. How should a teacher professional development arrangement which aims to support teachers in the enactment of IPA be structured?
3. What is the impact of the professional development arrangement on teachers' teaching of IPA?
4. How does teachers' teaching of IPA impact students' learning of IPA?

A design research approach was adopted to answer this question. The study consisted of three main stages: preliminary investigation, prototyping and formative evaluation, and summative evaluation.

Preliminary investigation

The study started with a review of the literature and a front-end analysis. The review of the literature provided the knowledge base for the design of the professional development arrangement in which curriculum materials were embedded. The front-end analysis gained insight into IPA policy and practices and revealed a gap between the intended and the implemented curriculum. As IPA is a new course offered to students in secondary schools, teachers inevitably encountered various difficulties. The main difficulties reported by teachers were: lack of time and energy for the preparation of IPA, lack of curriculum resources, shortage of funds, and insecurity about students' safety. Over half of the teachers had not received any form of training on IPA and did not know how to enact IPA in their teaching practice. Teachers expressed a need for in-service education that paid attention to a student-centered approach to enact IPA in their practice. The literature review and the front-end analysis resulted in design guidelines for the development of the exemplary curriculum materials and the professional development arrangement.

Prototyping and formative evaluation

The next stage primarily focused on the iterative design and formative evaluation of successive prototypes of the exemplary materials and the professional development arrangement.

In total four versions of the exemplary curriculum materials were developed and two versions of the professional development arrangement. In the formative evaluation studies, experts' opinions about, and teachers' and students' experiences with the curriculum materials and the professional development arrangement were solicited. In this way, experts, teachers and students contributed to the validity and practicality of the exemplary curriculum materials and the format and content of the professional development arrangement.

Based on the design principles for the exemplary materials and the results of the context study, the first version of the exemplary materials was developed. The formative evaluation of the first version of the exemplary curriculum resulted in

feedback from experts and users and indicated the validity of the exemplary materials. Concrete suggestions for improving the prototype were provided. The main revisions focused on the objectives, time allocation, and tasks of activity as well as gaining multiparty support for enactment. The second version of the exemplary materials was used with one teacher and 44 students in the try-out. The overall opinion of the teacher and students was positive. The revision decisions generated from this try-out were used to improve the practicality of the exemplary materials. The video clips resulting from the try-out teacher were prepared, as practical examples of IPA lessons. Suggestions for teachers to support their students in revising their research proposal, data collection instruments, and research report were also provided. The third and fourth versions of the prototypes of the exemplary materials were developed to evaluate the impact of the exemplary materials embedded in the professional development arrangement.

Based on the design principles for the professional development arrangement, the context study and the feedback from the try-out of the exemplary curriculum materials, the first version of the professional development arrangement was developed. To improve the validity, practicality and effectiveness of the professional development arrangement, a formative evaluation study was conducted. Two teachers and 100 students were involved. Based on the results of the formative evaluation study suggestions were made to incorporate in the workshop more examples to help teachers understand the enactment of IPA in teaching practice. Examples of the students' products and specific materials on research methods for students and teachers were incorporated in the exemplary curriculum materials. Video clips were carefully chosen and edited. In addition, discussion questions for reflection were designed to be used in the video demonstration session. A school-based professional learning community was suggested as a way to organize school follow-up support, and this suggestion was implemented in the second field study.

Summative evaluation

The impact of the second version of the professional development arrangement (with embedded exemplary curriculum materials) on teachers' teaching and students' learning of IPA was empirically assessed in the second field study. Five teachers from three schools and 250 students participated. The summative evaluation study enabled the researcher to make an overall judgment about the effectiveness of the professional development arrangement. The results of summative evaluation are discussed in the following section.

9.2 DISCUSSION OF THE MAIN FINDINGS

9.2.1 The characteristics of the exemplary curriculum materials

This section discusses the first sub-question: *What are the characteristics of the exemplary curriculum materials that support teachers in the enactment of IPA?*

Exemplary materials are considered an important support tool for teachers attempting to change their practice (Ball & Cohen, 1996; Beyer et al, 2009; Davis & Krajcik, 2005; Ottevanger, 2001; Van den Akker, 1988), particularly at teachers' initial implementation of a new curriculum (Van den Akker, 1988). The exemplary curriculum materials in this study were embedded in a professional development arrangement and aimed to support teachers in the enactment of IPA. The curriculum materials emphasized the structure, essentials and vulnerable aspects of the IPA curriculum (cf. Mafumiko, 2006; Ottevanger, 2001; Van den Akker, 1988) to illustrate the specific features of IPA.

Literature review revealed that video demonstration could be seen as a special form of exemplary materials (Loucks-Horsley et al., 2010; Roes, 1997). And the try-out teacher and three experts suggested providing teachers with vivid examples of IPA lessons. Therefore, video-clips of IPA lessons from the try-out and first field study were prepared and presented for teachers in first and second field study. The results indicate that demonstrating video clips as concrete examples of IPA lessons is an important component of curriculum materials.

The content and format of the materials had a general introduction, explanations for the teacher, exemplary video clips for teachers, and student worksheets. The main characteristics of exemplary curriculum materials supported teachers in the areas of activity preparation, activity procedure, teaching strategies, and learning effects (see Box 9.1).

Box 9.1 A summary of the main characteristics of exemplary curriculum materials

Exemplary curriculum materials for IPA
General description of activity: provide the general overview of the activity and describe what the activity looks like; sequence of each session of IPA; general and specific information on preparation and execution of IPA; indicate learning outcomes expected to be achieved by the students at the end of each activity.
Activity preparation: activity plan and timing; suggestions on specific learning activities and the timing of each activity; provide online resources (background information and other references) required for the activity; provide information about possible problems students may encounter during the activity and how to cope with them.
Activity procedures: provide a list of instructional objectives that clearly specifies the desired outcomes of the activity; provide suggestions on how to determine the topics according to student age level, on how to select available information for students, on how to introduce research methods, and on how to draw conclusions from each activity.
Teacher's role: provide concrete suggestions for the role of the teacher during activity execution; suggestions for grouping: to guide teachers in using groups for group investigation, small group discussions, and group presentation to promote student active participation in the process of learning; provide suggestions on how to support investigations and on how to prepare online resources for supporting student inquiry.
Monitoring and assessing student learning: describe the potential learning effects on students; provide suggestions for the assessment indicators of student products, group performance and individual performance, and on how to use portfolio assessment.
Student worksheets: provide an overview of the purpose of each session of IPA; information on procedures guiding questions for research proposal, investigation schema, and research report; follow-up assignments. The worksheets are also included in the teacher materials.
Exemplary video clips: describe the main features of IPA and what IPA looks like in practice.

The teachers generally were positive about how the exemplary materials supported them with the enactment of IPA in their classes. They were able to use the teacher support material to prepare the activity for the classes. The teachers reported that the exemplary materials provided them with adequate support to teach in a more student-centered way. They used the exemplary materials and adopted student-centered approach in the enactment of IPA. The students reported that IPA was novel and interesting, broadening their vision, and they enjoyed the topics they explored. Students appreciated the opportunity to make investigation outside schools. The majority of students stated that they actively participated in every sectors of the activity and their attitudes towards it were positive. Students indicated that they had enjoyed participating in the activity and benefited a lot from the activity. Apart from their courage developed and self-confidence increased, students indicated that many abilities such as communicating with people and applying knowledge comprehensively to solve practical problems were

enhanced. These results suggest that the curriculum materials are to a great extent valid, practical, and effective for use in secondary schools.

According to the findings of this study, the student worksheets and the exemplary video clips were highly appreciated by the teachers and appeared to work best. Teachers thought the student worksheets were very practical and the exemplary video clips were helpful for identifying the main features of IPA. However, the teachers mentioned that it was not easy for a single teacher to organize IPA because of the large class size.

9.2.2 The structure of teacher professional development arrangement that supported IPA enactment

The second sub-question, *How should a teacher professional development arrangement which aims to support teachers in the enactment of IPA be structured?*, is addressed in this section.

Professional development is key to the implementation of curriculum innovations (Darling-Hammond & Richardson, 2009; Garet et al., 2001; Penuel et al., 2007). The curriculum-linked professional development, which emphasizes to prepare teachers more effectively to enact curricula, tends to be more effective than traditional professional development (Darling-Hammond & Richardson, 2009; Garet et al., 2001; Guskey, 2000; Kubitskey & Fishman, 2006; Loucks-Horsley et al, 2010; Penuel et al., 2007; Putman & Borko, 2000). The effective professional development stressed the features, strategies and components of professional development arrangement (cf. Loucks-Horsley et al., 1998, 2010; Penuel et al., 2007, 2008; Teclé, 2006).

The components of the professional development arrangement are outlined in Box 9.2.

Components of the professional development arrangement
<p>Professional development workshop</p> <ul style="list-style-type: none"> ▪ <i>Theory study:</i> researcher introduced the objectives of workshop, discussed about participants' responses to the questions, and presented the rationale of IPA teaching and how to enact it; provide reading materials on new curriculum reform, IPA, and inquiry learning as well as exemplary materials. ▪ <i>Video demonstration:</i> researcher demonstrated video clips on how the new practices should be enacted in and out of classroom for teachers, and teachers reflected on their practice. ▪ <i>Lessons preparation:</i> researcher introduced the exemplary curriculum materials and teachers walk through the exemplary materials and develop a plan for teaching one lesson from those materials, then brainstorm to discuss and decide the topics available for the students; finally, researcher provides feedback and teachers reflect on their preparation.
<p>Exemplary curriculum materials</p> <p>The exemplary curriculum materials supported teacher learning and practice regarding IPA lessons during the professional development workshop and later in the schools. The main elements of the exemplary curriculum materials are described in the previous section.</p>
<p>School follow-up support</p> <ul style="list-style-type: none"> ▪ <i>School-based workshops:</i> researcher established a schedule of times and places to meet once or twice a week, introduce teachers with the follow-up scenario of the study, complete the stages of concerns questionnaire in the first workshop, hand out exemplary examples of IPA lessons and students' products in each stage; teachers observe short video-taped lessons of a fellow teacher, then making comments on it; prepare for lessons together; share teaching plan (including slides) with other teachers; reflect upon their teaching by writing logbook (Blog); write articles about their own work; discuss common problems collectively and learn on topics such as how to reflect on their teaching practice, how to guide student group work, design questionnaire, make survey, and write report etc. ▪ <i>Technical coaching:</i> The researcher provided feedback to teachers based on classroom observation or video watching, provided concrete suggestions and tips for next lessons, discussed the problems encountered and finding solutions with teachers, provided excellent examples of students' products, and provided online resources, audio, video and written materials related to the topics inquired.
<p>School support environment</p> <p>Establishing a supportive school environment involved garnering as much as possible from the school leadership. The researcher:</p> <ul style="list-style-type: none"> ▪ informed school leaders about the scheme of IPA enactment ▪ coordinated the professional development arrangement with school development planning ▪ handed out the exemplary curriculums materials ▪ exchanged views with school leaders regularly based on classroom observations ▪ developed ongoing meaningful dialogue between staff members in a respectful, mutually supportive environment

A discussion of the teachers' appreciation of the professional development arrangement, and the impact of the arrangement on their learning, their classroom enactment and students' outcomes is presented in the following sections.

9.2.3 Impact of the arrangement on teachers

This section provides information that answers the third sub-question: *What is the impact of the professional development arrangement on teachers' teaching of IPA?*

The five level model of professional development evaluation (Guskey, 2000) was used to assess the effectiveness of the arrangement. The first level of evaluation focuses on teachers' reactions to the professional development arrangement. The second level of evaluation investigates what the teachers' perceive themselves to have learned. The third level assesses the organizational support for the enactment of the innovation. The fourth level concentrates on teachers' use of new knowledge and skills in classroom practice. The last level of evaluation measures how the professional development arrangement affects the learning outcomes of students.

The impact on teachers' reactions and teachers' learning can be summarized as follows:

From the results presented in chapter 8, it can be concluded that teachers appreciated the components of the workshop: content covered and the process they got involved in. It is clear that teachers' reactions to the usefulness of the workshop and follow-up support activity were positive. All the teachers indicated that the workshop enhanced their understanding and was useful for their professional development. They considered that the workshop satisfied their expectation and was relevant to their teaching practice. They felt that their understanding about IPA teaching was enhanced. Concerning the components of the workshop, all the teachers highly appreciated the video-demonstration. They found that the video-clips demonstration helped them to identify the important features of IPA lessons and made them consider trying out IPA lessons. Teachers indicated that sharing teaching plans with other teachers was conducive to sharing expertise. They considered the video-clips demonstration, curriculum material, discussion on IPA, and reading materials as useful. However, the micro teaching did not work well during the workshop. As the enactment of IPA normally lasted about one term, it was not easy to require students to be involved in the microteaching session and it was very difficult for teachers to teach IPA

within forty minutes during the workshop. Instead, the teachers thought it was useful that they and the researcher gathered together to discuss the topics prepared for students and prepare the lesson plans before the enactment. They could experience the process of how to choose appropriate topics and possible problems encountered like students. They appreciated the organization and structure of the workshop.

Teachers liked that they could use the exemplary materials and subsequently contributed to the modification of the exemplary materials. They had opportunity to study the exemplary materials, reflect on their teaching, discuss their opinions with researcher and colleagues, and suggest alteration to the materials that would make the teaching more effective (Guskey's level 1).

The results showed that teachers thought the professional development arrangement enlightened their awareness and understanding about IPA lessons. Their knowledge and insights about IPA were developed.

Regarding the four components of the professional development arrangement, the workshops were relatively easy to implement. However, the school follow-up support activities were difficult to implement. Above all, there were many contextual factors affecting the school follow-up support activities, such as personnel, facility, and time. Teachers reported that they had not enough time to reflect on their teaching because of the heavy workload. During the second field study the researcher developed an online forum for the participating teachers for discussing problems encountered in IPA enactment and finding solutions. However, no one participated and expressed their opinions. Some teachers indicated that they had no time and energy to participate. Also, it was time consuming that the researcher had to watch all the lessons and provide technical feedback to the participating teachers. Moreover, the cultural background needs to be taken into consideration when carrying out school follow-up support activities. For example, some teachers did not like the activity to observe the video-taped classroom lessons fellow teachers and comment on them. It is as one teacher explained: "Some Chinese were not used to be commented in public. It would be better to exchange views in private." (Guskey's level 2)

The establishment of a supportive school environment is also very important for the enactment of IPA in daily practice. However, some teachers thought their schools did not provide them enough time for enacting IPA teaching which affected the

results of enactment. For example, in the second field study, a teacher had a lot of enthusiasm for the IPA enactment. However, the teacher felt frustrated when the administrative staff did not help her students to contact with interviewees in time. From then on, the teacher carried out IPA with less enthusiasm.

The school support for teachers varied across the schools. Two schools encouraged teachers to experiment with new strategies and could provide participating teachers fixed time and rooms to organize teacher learning communities for sharing expertise. One school was considered less supportive in school leadership and collegial support. All teachers indicated that the time for lesson preparation were not sufficient. Teachers' perceptions about the implementation conditions affected their enactment of IPA to some extent. The district teaching and research center honored the excellent works of students in the district and required teachers to submit articles about the IPA enactment to exchange ideas with teachers in other schools (Guskey's level 3).

Results from classroom practice profile scores show that teachers used knowledge and skills in IPA teaching. Four of the five participating teachers performed well in basic skills. The ideal skills of three teachers were satisfactory which strengthened the enactment of IPA. It showed that teachers adopted a student-centered approach with varying quality and degree and all the five teachers were users (from mechanical to integration) of IPA. Teachers acquired skills on guiding students to conduct IPA, making choice on topics and time management, evaluating students' performance during the activities, arousing the enthusiasms of students and engaging them in, and integrating IPA teaching with other subjects. However, teachers also encountered several problems such as lack of enough time for IPA enactment and lack of administrative support.

According to the teacher interview, teachers reported they learned how to organize IPA from their enactment. Teachers realized they should allow students to find their own favorite and interesting things. And the guidance of teachers should be concise and in place. Teachers realized that they had to scaffold the learning process of students (Guskey' level 4).

9.2.4 Impact of teachers' IPA teaching on students' learning

This section provides information that answers the fourth sub-question: *How does teachers' teaching of IPA impact students' learning of IPA?*

The results showed that impact of the teachers' IPA teaching on students (Guskey's level 5) was positive. Students had positive attitudes towards IPA teaching. The majority of students actively took part in the activity and their knowledge and skills were improved in aspects such as posing questions, communicating with people, cooperating with classmates, questionnaire design, making survey, data analysis. Parents also indicated that the knowledge and skills of students were developed through IPA in many aspects, such as integrated knowledge, social practice, cooperation, independent thinking.

Student interviews revealed that they were positive about IPA lessons and the teachers' role in IPA. Students reported that teachers could provide support in aspects, such as, enabling them more actively engaged in the activity and thinking; guiding them focus on main points and narrow the scope of the study; stimulating their thinking; providing suggestions and feedback on design and revision of research proposal and report, and questionnaire; teaching research methods; teaching them how to write report and make presentations.

The students indicated differences between IPA and former activities on several aspects: the forms of the activities were interesting, lively and innovative, particularly doing the investigation outside school; it was closely linked with social life; carrying out the activities in a planned and systematic way. Students reported that their general ability was improved, especially their practical abilities. Students suggested that more time should be provided for the activity and they hoped that schools provide more similar activities.

Parent interviews show that they had positive attitudes towards IPA and recognized their children benefited a lot from the activity. Parents suggested school to provide more similar activities for students.

9.3 REFLECTIONS ON THE RESEARCH METHODOLOGY

This study adopted a design research approach in order to realize a valid, practical, and effective professional development arrangement (the intervention), and to generate theoretical underpinnings for such an intervention (cf. Kelly, 2006; Van den Akker, 1999). The research approach provided opportunities for a better understanding of the complex local implementation conditions and the

difficulties teachers might experience in the implementation process, which were important for the future improvement of the intervention. This section presents some reflections on: research methodology, focusing on design research and the research–practice gap; design research in the context of China; the contribution of the study to the knowledge base; and the researcher’s role.

9.3.1 Design research and the research–practice gap

The design and the development of the professional development arrangement dynamically evolved, based on the state-of-the-art knowledge used in the professional development arrangement, as well as on the comments, suggestions, and needs from experts and teachers. Theoretical analyses have been made in teacher learning and teacher professional development from the perspective of curriculum enactment as well as the potential of exemplary curriculum materials in the professional development arrangement. These theoretical analyses provided insight into the design of the professional development arrangement.

The teacher professional development arrangement bridged research and practice in both university and school contexts, and is an example on how research and practice can come closer together. This study has engaged researchers and teachers at university, school, and district levels to iteratively design, develop, and evaluate an innovative professional development arrangement to improve IPA teaching and learning in secondary classrooms. The researcher played a major role in designing and developing the professional development arrangement and curriculum materials centered on teaching and learning in authentic contexts. The researcher also provided a description of teachers’ research and practice experiences as participants in the professional development arrangement.

The middle school teachers were involved in applying what they had learned into authentic practice and providing comments and suggestions on improving the professional development arrangement and exemplary curriculum materials. Teachers presented their own rich and elaborated descriptions of their experiences in the enactment of IPA. Collaboratively, teachers joined the researcher in analyzing their experiences and formulating recommendations for improving the intervention. The insights emerged from the study can be useful to others.

9.3.2 Design research in the context of China

In recent years, design research has aroused the interest of Chinese researchers. Although the Chinese version of “*Enhancing the worth of instructional technology research through ‘design experiments’ and other development research strategies*” (by

Reeves, 2000) was published in a book titled “Methods and strategies of educational technology” (Miao & Zhao, 2003), it did not arouse attention of Chinese researchers. In 2006, Plomp made a speech regarding educational design research in the fifth international forum on educational technology in Wuhan (Plomp, 2006). Liang and Yu (2006) introduced the process and characteristics of design-based research. Zhang (2007) introduced the characteristics, design principles, and procedures of design research as well as a series of studies that adopted design research in the University of Twente. In 2007, the Educational Design Research Seminar was held in Shanghai. Plomp, van den Akker, Nieveen, Kelly, and Bannan-Ritland introduced design research from various perspectives and coached the participants how to conduct design research (see the proceedings, edited by Plomp & Nieveen, 2009). From then on, design research has attracted the interest of Chinese researchers. More and more articles introducing design research have appeared and studies that adopted design research have emerged. The major reason for Chinese scholars to be interested in design research is: the potential of design research to improve educational policies and practices, underlying was also the need of changing the paradigm for educational research. In the past, Chinese researchers are used to conducting educational research from a theoretical and philosophical perspective. Practitioners often complained that researchers are indifferent to actual problems and talk about strategies on paper that appeared often useless for practitioners.

Although some authors (Chen & Jia, 2008; Cheng & Wang, 2010; Liu, 2010; Liu, Yang & Kan, 2009) claim they adopt design research in their studies, problems can be found by reviewing these studies: research questions are not clear, there is a lack of a relevant knowledge base, an insufficient literature review, an inappropriate intervention scheme, no iterations at all or too few iterations, and triangulation of research methods are not employed.

This study that adopted design research can provide an example as how to conduct design research in the context of China. Its exploration can enhance the influence of design research in the field of educational research in China.

9.3.3 Contribution to the knowledge base

One main goal of design research is to produce new knowledge by research (Bauer & Fisher, 2007; Plomp, 2009; Reeves, 2006; Van den Akker, 1999, 2006, 2009). Knowledge created through design research is derived from a systematic process, initially grounded in existing knowledge and evolved further through empirical testing (Sandoval, 2004).

The knowledge generated by the study is the design guidelines for the professional development arrangement and the exemplary curriculum materials in the context of China. In this regard this study can be considered a validation of the findings of similar studies carried out in the Netherlands (e.g. Roes, 1997; van den Berg, 1996) and Africa (e.g. Teclé, 2006). The following sources were used to inform the development of interventions: literature, data gathered during the study, and the practical knowledge of participants (teachers and students). For example, according to experts' suggestion video-clips of IPA lessons were prepared and presented for teachers in the first and second field study. Both participating teachers in the first field study reported that the video-clips demonstration held in mid-term was the appropriate time for them. If it was shown at the beginning they would absolutely follow what the pilot teacher did without their own ideas. As it was shown in the middle of the term, they could not only get to know what other teachers had done, but also have their own ideas on what they need to do in their class. Therefore, choosing the appropriate time of video-clips demonstration for teacher professional development needs to be taken into account.

9.3.4 The role of the researcher

One of the benefits of the design research approach was that it stimulated the researcher to learn and perform a number of (new) roles. In the development of exemplary curriculum materials and the teacher professional development arrangement, the researcher performed as designer, implementer, and evaluator; as observer and facilitator (help teachers to guide and encourage students) in the classroom observation; as trainer and facilitator in the workshop and follow-up support. These roles were essential for developing and evaluating the intervention (the professional development arrangement in which exemplary materials are embedded). The researcher was afforded the opportunity to gain deeper insights into the strengths and weakness of the intervention. And the researcher obtained a great deal of knowledge and many new skills from those roles and understood the implementation further. However, playing multiple roles created problems in the research process and might have influenced the quality of findings. For example, the researcher performed the multiple roles of the designer-facilitator-evaluator of the curriculum materials. In order to prevent response bias and interpretation bias, much attention has been paid to triangulation of research methods (observation, questionnaire, interview, and products), data sources, evaluators and theory (McKenney, Nieveen & van den Akker, 2006). These measures have contributed to the reliability and validity of the findings.

9.4 REFLECTION ON THE INTERVENTION

9.4.1 Teacher and exemplary curriculum materials

Teachers as learners of curriculum materials, their learning experiences and processes need to be taken into consideration in the enactment of curriculum innovation. Fullan (2007) emphasized that the implementation of educational change involves “change in practice”. Curriculum innovations are multidimensional: the use of new materials, the use of novel teaching approaches, and the change of beliefs. The results of this study illustrate the inter-relationship among the three dimensions. For example, in the first and second field study, using the exemplary materials resulted in two of the teachers implementing IPA only at a superficial level. The teachers’ beliefs about the new curriculum reform and IPA hindered them from showing the desired behavior. By the face-to-face communication with the researcher, the teachers changed their behaviors to some extent. It is not easy for teachers to change their beliefs. It is a process which needs to integrate the theory study with practice and reflection through systematic and sustainable change.

Teachers as target users of the exemplary curriculum materials need to be involved in its design and development. Teacher involvement in the development of the materials has proven to be favorable to both the teachers themselves and materials (cf. Ottevanger, 2001). In this study teachers’ needs and suggestions were taken into consideration in the design and improvement of the exemplary materials. The information on teachers’ use and perception of as well as problems with the exemplary curriculum materials collected by interviewing teachers and observing teachers in their lessons were used to improve the exemplary curriculum materials.

From the perspective of the curriculum enactment, teachers are not faithful users of the curriculum materials. Teachers rarely enact curriculum materials precisely as written. Ben-Peretz (1990) underlined that the distinction between the curriculum proposed in the materials and the curriculum enacted by the teacher. Contemporary perspectives on the teacher-curriculum relationship have recognized the important role teachers play in curriculum material use. Curriculum enactment highlights the curriculum autonomy of teachers. Teachers can make adaptations and own decisions, redesign the curriculum materials or create the new materials according to their specific context. In this study, teachers

and students developed and enacted their own curriculum in their context with the exemplary curriculum materials serving as guide. They have the choice to determine techniques for and content of IPA. Teachers are involved in not only contributing to the improvements of the exemplary curriculum materials but also in redesigning their own practice.

9.4.2 Professional development and curriculum enactment

It is clear that the exemplary curriculum materials can facilitate the teachers' learning process when dealing with a curriculum innovation. However, the exemplary curriculum materials could not fulfill all the functions of the learning process.

Previous studies in China to support teachers through professional development in IPA enactment primarily adopted approaches such as action research and narrative study. They mostly adopted the model of training. The training formats included expert lectures, demonstrations, lesson study and discussions, workshops, seminars. These studies seldom provided school follow-up support activities for professional development.

Professional development and curriculum enactment have bi-directional influences. Studies (Garet, et al., 2007; Penuel, et al., 2001; Teclé, 2006) reveal that effective professional development has positive impact on curriculum enactment. In turn, curriculum enactment facilitates professional learning.

Professional development is widely believed to be required for supporting implementation (Spillane & Thompson, 1997), and some studies have shown how professional development can influence teachers' knowledge and practice (Garet, et al., 2001; Supovitz & Turner, 2000). Teachers learned new content and pedagogy through the professional development arrangement. The impact of their learning could be seen in changes in their classroom practices and the effects on students' learning.

Teacher involvement in curriculum design and enactment could strengthen feelings of ownership with the innovation and contribute to teacher professional development. (Ben-Peretz, 1990; Clandinin & Connelly, 1992; De Vries & Pieters, 2007). By adopting curriculum materials and enacting IPA teaching, participating teachers felt confident and their suggestions provided information for improving the professional development arrangement.

9.5 CONCLUSIONS AND RECOMMENDATIONS

9.5.1 Conclusions

This study aimed at the design and evaluation of a teacher professional development arrangement in which exemplary curriculum materials are embedded for supporting teachers in the enactment of IPA within the context of the new curriculum reform. The following conclusions can be drawn from the findings of this study.

One contribution of this study to the knowledge base is through design principles for exemplary curriculum materials and professional development arrangement. The design principles of exemplary curriculum materials are to be consistent with national curriculum reform policies, involve students actively in inquiry learning through activities, provide opportunities for collaboration and formative assessment, content and pedagogical support, and video clips demonstration. This study has confirmed findings from previous research about the effectiveness of the exemplary curriculum materials as a tool for facilitating teacher learning about innovative curricula (cf. Mafumiko, 2006; Motswiri, 2004; Van den Akker, 1988; Voogt, 1993). The exemplary curriculum materials offered concrete lessons for use by teachers to provide them practical experience. The exemplary curriculum materials also allowed teachers to redesign the materials or create their own lesson materials according their context.

The design principles for the professional development arrangement intended to provide active learning opportunities for teachers and a long time span for practice. The design guidelines indicate that from the perspective of curriculum enactment professional development arrangement is effective when it consists of a combination of exemplary curriculum materials, workshop, school follow-up support and organizational support. The role of curriculum materials as a component with teacher professional development arrangement has reconfirmed previous positive findings (cf. Ottevanger, 2001; Roes, 1997; Teclé, 2006; van den Berg, 1996). The study has shown that a professional development arrangement with four main components has the potential to support teachers learn and enact IPA teaching in practice. When the professional development workshop, exemplary curriculum materials, follow-up support, and organizational support are systematically integrated and extended over time, they more likely impact on teacher learning and practice. The professional development arrangement can lead to the improvement in participating teachers' learning and classroom practice.

In this study the enactment perspective on curriculum implementation is applied for teachers' enactment of IPA. The enactment perspective emphasizes that teachers and learners jointly create the IPA curriculum, as is considered essential in the rationale of IPA. This approach fits in current thinking about the role of teachers in making the curriculum (e.g. Clandinin & Connelly, 1992; Craig & Ross, 2008). The exemplary curriculum materials served as a procedural guide and provided examples on how what IPA can look like in practice. However, because teachers and students jointly have to decide about the topics for IPA, the teachers could not simply use or adapt the exemplary curriculum materials. Teachers and students therefore developed and enacted their own curriculum in their specific context with the exemplary curriculum materials. Teachers involved in IPA enactment not only contributed to the further development of the exemplary curriculum materials but also redesigned their own practice. The researcher working collaboratively with a group of teachers engaged in their classroom practice could listen to the teachers' voice and facilitate the process of curriculum enactment.

The major contribution of this study to practice is the design and implementation of a professional development arrangement which is viable and effective for supporting teachers enacting IPA within the context of the new curriculum reform. An element of curriculum materials was to integrate video-clips demonstration into professional development as a pedagogical tool in teacher education. The video demonstration showed the teachers what the IPA lessons look like in practice and was helpful for identifying the main features of IPA. This seems a productive strategy for facilitating teachers' learning and the materials themselves. The student worksheets were also very practical for teachers' enactment of IPA. The contextual factors, such as time and cultural background need to be considered when implementing school follow-up support activities. Instead of microteaching, teachers and the researcher gathered together to discuss the topics prepared for students before the enactment and prepare the lesson plans before each lesson was more useful for IPA training. Teachers could experience the process of how to choose appropriate topics and the possible problems encountered like students. The endeavors of researcher and teachers positively impact the students' learning and help students find their experiences that are personally and socially meaningful.

Overall, it can be concluded that a professional development arrangement consisting of professional development workshop, exemplary curriculum materials, follow-up support, and organizational support contributed to the enactment of a more student-centered IPA lessons of the teachers in secondary schools in China.

9.5.2 Recommendations

The following recommendations are made based on the findings.

Recommendations for policy and practice

Based on the findings, the following recommendations for policy and practice are put forward:

- The in-service training on IPA should provide not only training sessions or workshops but also follow-up support with a certain time span, in order to enable teachers apply knowledge and skills to practice and reflect on the results.
- Provide courses on IPA for the pre-service teachers in normal colleges and universities so that they are prepared to be qualified for the future IPA teaching. Based on the experience of this study, the content of such courses could include rationale of IPA and the curriculum reform, research methods in IPA, and teaching methods of IPA. The structure of the courses could involve theory study, lesson preparation, video demonstration, and teaching practice for IPA.
- When to launch a new curriculum reform, it is appropriate to adopt design research as a methodological approach. The reform efforts would profit from more evolutionary approaches, with integrated research activities to feed the process (Van den Akker, 1999).

Recommendations for professional development practitioners

For practitioners who are involved in professional development activities, the following recommendations are applicable:

- Providing workshops alone lacks the opportunity to practice what teachers learned. The workshop combined with the exemplary curriculum materials, school-based practice, and follow-up support could help teachers learn in practice and improve student learning.
- The exemplary curriculum materials embedded in teacher professional development arrangement could facilitate teacher learning and classroom enactment. It is necessary to provide teachers opportunities to be involved in developing or redesigning lesson materials according to their context in order to facilitate the enactment of curriculum innovations.
- Video-demonstration would be a useful tool for teachers to get the image of how IPA looks like in practice. It would be better to combine the video demonstration with other strategies, such as curriculum enactment or case discussions.
- Organizing learning communities for teachers would provide teachers the opportunities to exchange experience and lesson plans, discuss problems encountered and find solutions, share expertise, and reflect on their practice.

- Garner as much as support from district and school leaders in order to provide teachers opportunities to apply acquired knowledge and skills into their practice.
- The university researchers should collaborate with teachers in primary and secondary schools to establish a new working relationship in order to improve the professional development of teachers. This will be conducive to link theory with practice and co-create usable knowledge.

Recommendations for future research

This study revealed that the impact of the professional development arrangement on teachers' classroom practice and student learning outcomes.

Further research is necessary to develop an in-depth understanding of IPA on students' learning. In this regard further research of portfolio assessment reflecting student assessment of IPA is warranted. It would be also worth investigating further how to promote group work in the enactment of IPA.

Future research might examine the long-term effect on the attitude, behavior, and skills of the participating teachers. It would be also worthwhile to explore the effect of exemplary videos on teacher learning and the influence of ICT on the teacher learning community. Finally, future research could investigate to what extent the arrangement described in the study is also applicable to the teacher professional development in other subjects in China.

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ENGLISH SUMMARY

Supporting Teachers to Enact Integrative Practical Activities in China

INTRODUCTION

The knowledge-based economy and information society raise new demands on the quality of citizens in skills, abilities, attitudes and habits. The development of the so called '21st century skills' are considered critical for the success of students in society. From 1990's, many countries initiated curriculum reforms to meet the challenge of the 21st century. These reforms emphasize to foster students' problem solving and inquiry skills and the development of personality and creativity. To this end, several Asian countries have advocated the provision of integrative learning activities for students in primary and secondary education.

The Ministry of Education (MOE) of the People's Republic of China launched a new curriculum reform in 2001 in order to meet the challenges of the 21st century. The new curriculum reform advocates quality education to promote the overall development of students. A main challenge in this curriculum reform was to change from the emphasis on knowledge acquirement and recitation towards the development of students' abilities in problem solving and inquiry as well as a positive attitude towards innovation and social responsibility. To meet this problem a new course "Integrative Practical Activities" (IPA) was developed for students in Grade 3-12 (age 8-17). IPA is supposed to be more student-centered and inquiry-based. The main characteristics of IPA are:

- a. *Integration.* The themes of IPA come from the individual and social life of students. The themes selected for IPA must embody the integration of individual, society and nature, as well as the internal integration of science, art and moral.

- b. *Practicality*. Students get first-hand experience by doing, inquiring, serving, experimenting; the emphasis is on activities.
- c. *Openness*. Its objectives and content are open. IPA orients to the living world of students. The content of IPA may vary for different students in different classes, schools and districts.
- d. *Generation*. The generation of IPA is determined by its process-orientation. It stresses that competencies (which includes attitudes, knowledge and skills) and values of students are developed in the process of the activities.
- e. *Autonomy*. IPA respects the interests and preferences of students, which provides ample space for students to fully develop their autonomy. Students can choose their themes, content, and the modes of learning according to their interests.

The implementation of IPA has encountered several related problems. Because of a lack of comprehensive, systematic and effective in- and pre-service education, teachers do not feel qualified to teach IPA. Also, appropriate curriculum resources and materials were not available, which aggravates the implementation problems. This study is undertaken in the context of the implementation of IPA.

AIM AND RESEARCH QUESTIONS

This study aims at designing and evaluating a professional development arrangement to support teachers' enactment of IPA. Exemplary curriculum materials were considered an essential part of the professional development arrangement. The following research question and sub-questions formed the basis of the research:

What are characteristics of a teacher professional development arrangement, in which curriculum materials are embedded that adequately support teachers in the enactment of IPA?

Sub-questions:

1. What are the characteristics of exemplary curriculum materials that support teachers in the enactment of IPA?
2. How should a teacher professional development arrangement (that includes such materials) be structured?
3. What is the impact of the professional development arrangement on teachers' teaching of IPA?
4. How does teachers' teaching of IPA impact students' learning of IPA?

RESEARCH APPROACH AND DESIGN

A design research approach was adopted to answer the research question. This approach was chosen because of its problem-orientation, utility-orientation and theory-orientation. It aims at reducing the uncertainties in designing and developing educational interventions in dynamic situations and at generating concrete recommendations for quality improvement. Emphasizing the usability of its findings, design research appears to be a promising and appropriate approach in China.

The design of the study comprised of three stages. During the *preliminary stage*, a literature review was performed on IPA and integrative learning, teacher learning and curriculum enactment, exemplary curriculum materials and professional development. Also, a front-end analysis on the situation of IPA implementation in secondary schools was undertaken to gain insights in the gap between IPA policy (curriculum intentions) and practices (curriculum implementation). Teachers expressed a need for in-service education that paid attention to a student-centered approach to enact IPA in their practice. The outcomes of literature review and the front-end analysis as well as expert consultations on the implementation of IPA were used as the basis for the design and development of exemplary curriculum materials and a professional development arrangement.

The *prototyping stage* primarily focused on the iterative design and formative evaluation of successive prototypes of the exemplary materials and the professional development arrangement. The design of the exemplary curriculum materials was guided by the following design guidelines:

- be consistent with national curriculum reform policies;
- include procedural specifications;
- use exemplary video clips.

The design of the professional development arrangement intended to provide active learning opportunities for teachers and a long time span to practice. The design guidelines consisted of:

- integrate exemplary curriculum materials in the professional development arrangement, to develop an operational understanding of IPA;
- introduce the rationale of IPA during a workshop at the start of the professional development arrangement;
- provide coaching to create a professional learning community and organizational support as school follow-up support.

- in total four versions of the exemplary curriculum materials were developed and two versions of the professional development arrangement. In the formative evaluations, experts' opinions about, and teachers' and students' experiences with the curriculum materials and the professional development arrangement were solicited. In this way, experts, teachers and students contributed to the validity and practicality of the exemplary curriculum materials and the content and structure of the professional development arrangement.

The *summative evaluation* focused on the impact of the final version of the professional development arrangement on classroom practice and student outcomes. Five teachers from three schools and 250 students participated. Data were collected through classroom observation, questionnaires for teacher and students, interviews with teachers, principals, students and parents and an analysis of students' products. The main results of the evaluation are summarized in the next section.

RESULTS

The teachers' reactions to the professional development arrangement were positive. They were satisfied with the content of the professional development workshop and follow-up support activities. Teachers highly appreciated the exemplary video clips and the student worksheets. Teachers thought the exemplary video clips were helpful for identifying the main features of IPA and the student worksheets were very practical.

Concerning the organizational support, there were differences across the three schools. The results indicated that the organizational support is an important factor of facilitating teachers to enact IPA teaching.

Classroom observations and teacher interviews as well as student interviews showed that teachers were able to translate the new knowledge and skills into their classroom context. The teachers adopted a student-centered approach with varying quality and degree. Although the performances of some teachers were not yet perfect, the indication was that they were moving towards a more student-centered approach. Students were positive about IPA lessons and the

teacher's role in IPA teaching. They indicated that their teachers were good at creating a nice classroom atmosphere for students. Students confirmed that teachers offered them support in aspects such as providing suggestions for improvement of the research proposal and report, stimulating students' thinking, in teaching research methods, and providing relevant materials. Lack of enough time for IPA enactment and lack of administration support were the type of problems the teachers encountered.

Student learning experiences and outcomes were judged based on students' products, students' opinions and perceptions as well as parents' perceptions on IPA learning. The outcomes indicated that students and their parents were positive about IPA teaching. The majority of students could actively take part in IPA and their knowledge and skills improved in aspects such as posing questions, communicating with people, cooperating with classmates, questionnaire design, conducting a survey, data analysis. Parents also indicated that the knowledge and skills of students were developed through IPA in many aspects, such as integrated knowledge, social practice, cooperation, and independent thinking.

CONCLUSIONS

This study has confirmed findings from previous research about the effectiveness of the exemplary curriculum materials as a tool for facilitating teacher learning about innovative curricula (cf. Mafumiko, 2006; Motswiri, 2004; Van den Akker, 1988; Voogt, 1993). The role of curriculum materials as a component in a teacher professional development arrangement has reconfirmed previous positive findings (cf. Ottevanger, 2001; Roes, 1997; Teclé, 2006; van den Berg, 1996). In addition this study showed that exemplary video clips and student worksheets in particular were essential for IPA enactment by teachers. The video-clips demonstration as a component of the exemplary curriculum materials contributed to the IPA enactment of teachers. It enabled teachers to identify the main features of IPA, to reflect on their learning and practice, and to exchange opinions in order to make their teaching more effective.

The intervention was successful because teachers and students were encouraged – as is part and parcel of the rationale for IPA – to develop and enact their own IPA curriculum in their specific context. To do this, teachers transformed the core

ideas of the exemplary curriculum materials for their own practice to fit their local practice. Teachers involved in IPA enactment not only contributed to the improvements of the exemplary curriculum materials but also designed their own practice.

The findings of the study indicate that a professional development arrangement consisting of professional development workshop, exemplary curriculum materials, follow-up support, and organizational support contributed to the enactment of student-centered IPA lessons of the teachers in secondary schools. When the four elements of the arrangement are systematically integrated and a the duration of the professional development is closely aligned with teacher and student enactment of IPA, it is more likely that the intended outcomes of IPA for teachers and students are realized.

It is recommended that the outcomes and research approach of this study are used to develop effective teacher professional development arrangements to support other curriculum innovations in China.

NEDERLANDSE SAMENVATTING

Het ondersteunen van docenten bij het uitvoeren van integratieve praktische activiteiten in China

INTRODUCTIE

De kenniseconomie en de informatiesamenleving stellen nieuwe eisen aan de kwaliteiten van burgers wat betreft vaardigheden en attitudes. De ontwikkeling van zogenoemde '21st century skills' kan als cruciaal worden beschouwd voor het welslagen van leerlingen in de samenleving. Sinds de jaren '90 hebben vele landen curriculumhervormingen doorgevoerd om aan de uitdagingen van de 21^{ste} eeuw tegemoet te kunnen komen. Bij deze hervormingen wordt de nadruk gelegd op het bevorderen van probleemoplossings- en onderzoeksvaardigheden en op de ontwikkeling van de persoonlijkheid en creativiteit van leerlingen. Om dit streven te kunnen realiseren, hebben verschillende Aziatische landen gepleit voor het aanbieden van integratieve leeractiviteiten voor leerlingen in het primaire en secundaire onderwijs.

Het ministerie van onderwijs van de Volksrepubliek China heeft in 2001 een nieuwe curriculumhervorming gelanceerd om aan de uitdagingen van de 21^{ste} eeuw tegemoet te kunnen komen. De nieuwe curriculumhervorming pleit voor kwaliteitsonderwijs om de algemene ontwikkeling van leerlingen te bevorderen. Een grote uitdaging in deze curriculumhervorming was het teweegbrengen van een accentverandering van het verwerven van (feitelijke) kennis naar ontwikkeling van probleemoplossings- en onderzoeksvaardigheden van leerlingen, alsmede het verkrijgen van een positieve attitude ten opzichte van innovatie en sociale verantwoordelijkheid. Daartoe is onder meer een nieuwe cursus "Integratieve Praktische Activiteiten" (IPA) ontwikkeld voor leerlingen van leerjaar 3-12 (leeftijd 8-17). IPA wordt verondersteld meer leerlinggericht te zijn, en meer gebaseerd op onderzoek. De voornaamste kenmerken van IPA zijn:

- a. *Integratie*. De thema's van IPA zijn ontleend aan het individuele en sociale leven van leerlingen. De geselecteerde thema's voor IPA moeten de integratie van het individu, de samenleving en natuur, alsmede de interne integratie van wetenschap, kunst en moraal uitdrukken.
- b. *Functionaliteit*. Leerlingen doen ervaringen op uit de eerste hand door dingen te doen, te onderzoeken, te bedienen, en te experimenteren; de nadruk ligt op activiteiten.
- c. *Openheid*. De doelen en inhoud van IPA zijn helder en open. IPA richt zich op de actuele wereld van leerlingen. De inhoud van IPA kan variëren voor verschillende leerlingen in verschillende klassen, scholen en districten.
- d. *Generatie*. Het genereren van de onderwerpen voor en de aanpak van IPA wordt bepaald vanuit een procesoriëntatie. Het benadrukt dat competenties (waaronder kennis, vaardigheden en attitudes) en waarden van leerlingen worden ontwikkeld via het proces van de activiteiten.
- e. *Autonomie*. IPA respecteert de interesses en voorkeuren van de leerlingen, waardoor hen veel ruimte wordt geboden om hun autonomie te kunnen ontwikkelen. Leerlingen kunnen de thema's, de inhoud, en vorm van leren zelf kiezen, overeenkomstig hun interesses.

De implementatie van IPA is op meerdere onderling samenhangende problemen gestuit. Vanwege een gebrek aan een omvattende, systematische en effectieve opleiding en nascholing, voelden leraren zich niet gekwalificeerd om IPA te onderwijzen. Ook waren er geen passende curriculumbronnen en -materialen beschikbaar, waardoor de implementatieproblemen werden verergerd. Dit onderzoek is opgezet in de context van de implementatie van IPA.

DOEL EN ONDERZOEKSVRAGEN

Deze studie heeft als doel het ontwerpen en evalueren van een scholingsarrangement om de invoering van IPA door docenten te ondersteunen. Exemplarische curriculummaterialen worden gezien als een essentieel deel van het scholingsarrangement. De volgende onderzoeksvraag en sub-vragen vormden de basis van het onderzoek:

Wat zijn kenmerken van een scholingsarrangement (waarin curriculummaterialen zijn geïntegreerd) voor docenten die de uitvoering van IPA adequaat ondersteunen?

Sub-vragen:

1. Wat zijn de kenmerken van exemplarische curriculummaterialen die docenten ondersteunen bij de invoering van IPA?
2. Hoe zou een scholingsarrangement voor docenten (dat dergelijke materialen bevat) gestructureerd moeten zijn?
3. Wat is de impact van het scholingsarrangement op het onderwijzen van IPA door docenten?
4. Welke invloed heeft het lesgeven in IPA door docenten op het aanleren van IPA door leerlingen?

ONDERZOEKSBENADERINGEN -ONTWERP

Er is ontwerponderzoek uitgevoerd om de onderzoeksvraag te beantwoorden. Deze aanpak werd gekozen vanwege de oriëntatie op praktijkproblemen, de gebruiksrelevantie en de bijdrage aan de kennisbasis. Ontwerponderzoek heeft als doel het verminderen van de onzekerheden bij het ontwerpen en ontwikkelen van onderwijsinterventies in dynamische situaties en het genereren van concrete aanbevelingen voor het verbeteren van de kwaliteit. Door de nadruk te leggen op de bruikbaarheid van de bevindingen, lijkt ontwerponderzoek een veelbelovende en passende aanpak te zijn voor onderwijsonderzoek in China.

Het onderzoek bestond uit drie stadia. Tijdens het *voorbereidende stadium* werd een literatuurstudie uitgevoerd over IPA en integratief leren, docentleren en curriculumimplementatie, de functie en kenmerken van exemplarische curriculummaterialen en professionele ontwikkeling. Tevens werd er een analyse uitgevoerd naar de situatie van IPA implementatie in secundaire scholen, om inzicht te krijgen in de kloof tussen beleid met betrekking tot IPA (het beoogde curriculum) en de praktijk (het geïmplementeerde curriculum). Docenten meldden een behoefte aan scholing, waarin aandacht werd besteed aan de leerlinggestuurde aanpak om IPA te implementeren in hun praktijk. De uitkomsten, van de literatuurstudie en de implementatie-analyse en tevens van overleg met een expert over de implementatie van IPA, werden gebruikt als de basis voor het ontwerp en de ontwikkeling van exemplarische curriculummaterialen en een scholingsarrangement.

Het *stadium van prototyping* richtte zich primair op het iteratieve ontwerp en de formatieve evaluatie van successievelijke prototypes van de exemplarisch materialen en het scholingsarrangement. Het ontwerp van de curriculummaterialen werd geleid door de volgende ontwerprichtlijnen:

- het is consistent met nationaal curriculum hervormingsbeleid;
- het bevat procedurele specificaties;
- het bevat voorbeeldmatige videoclips.

Het ontwerp van het scholingsarrangement was zo ingericht dat docenten actief werden betrokken bij hun leerproces, en gedurende langere tijd konden oefenen met IPA. De ontwerprichtlijnen bestonden uit:

- het integreren van exemplarische curriculummaterialen in het scholingsarrangement, om een operationeel begrip van IPA te ontwikkelen;
- het introduceren van de grondgedachte achter IPA tijdens een workshop aan het begin van het scholingsarrangement;
- het aanbieden van coaching om een professionele leergemeenschap te creëren en van organisatorische ondersteuning als follow-up ondersteuning op de school.

In totaal werden er vier versies van de curriculummaterialen ontwikkeld en twee versies van het scholingsarrangement. In de formatieve evaluaties werd gevraagd naar de meningen van experts en naar de ervaringen van de docenten en leerlingen met de curriculummaterialen en het scholingsarrangement. Op deze manier droegen experts, docenten en leerlingen bij aan de validiteit en bruikbaarheid van de materialen en aan de inhoud en structuur van het scholingsarrangement.

De *summatieve evaluatie* was gericht op het in kaart brengen van de impact van de uiteindelijke versie van het scholingsarrangement op de lespraktijk en de resultaten van de leerlingen. Vijf docenten van drie scholen en 250 leerlingen namen hieraan deel. De data werden verzameld door middel van observaties, vragenlijsten voor docenten en leerlingen, interviews met docenten, schoolleiders, leerlingen en ouders en een analyse van producten van de leerlingen. De voornaamste resultaten van de evaluatie worden samengevat in het volgende deel.

RESULTATEN

De reacties van de docenten op het scholingsarrangement waren positief. Ze waren tevreden over de inhoud van de workshop en de follow-up ondersteuning op de school. De docenten stelden de videoclips en de worksheets voor de leerlingen zeer op prijs; de clips werden nuttig geacht voor het identificeren van de voornaamste kenmerken van IPA en de worksheets voor de leerlingen werden als zeer praktisch ervaren

De meningen over de organisatorische ondersteuning verschilden over de drie scholen. De resultaten gaven aan dat de organisatorische ondersteuning een belangrijke factor is in het faciliteren van docenten bij het implementeren van IPA.

De observaties in de klassen en de interviews met docenten alsmede de interviews met leerlingen gaven aan dat docenten in staat waren om de nieuwe kennis en vaardigheden naar de context van het klaslokaal te vertalen. De kwaliteit van de leerlinggerichte aanpak verschilde tussen de vijf docenten. Hoewel de implementatie bij sommige docenten nog niet perfect was, waren er aanwijzingen dat ook zij een beweging richting een leerlinggerichte aanpak hadden ingezet. De leerlingen stonden positief tegenover de IPA-lessen en de rol van de docent bij het aanleren van IPA. Zij gaven aan dat hun docenten goed waren in het creëren van een prettige sfeer in de klas voor de leerlingen. Leerlingen bevestigden dat de docenten hen ondersteuning boden door het leveren van suggesties voor verbetering van het onderzoeksvoorstel en de rapportage, in het stimuleren van het nadenken door de leerlingen, in het aanleren van onderzoeksmethoden, en het leveren van relevante materialen. Een gebrek aan tijd voor het implementeren van IPA en een gebrek aan administratieve ondersteuning waren het type problemen waar de docenten tegenop liepen.

De beoordeling van de leerervaringen en resultaten van de leerlingen werden gebaseerd op de producten van de leerlingen, de meningen en percepties van de leerlingen en ook de percepties van de ouders over het lesgeven in IPA. De uitkomsten gaven aan dat leerlingen en hun ouders positief stonden ten opzichte van het lesgeven in IPA. De meerderheid van de leerlingen kon actief deelnemen aan IPA en hun kennis en vaardigheden verbeterden in aspecten als het stellen van vragen, de communicatie met mensen, het samenwerken met klasgenoten,

het ontwerpen van vragenlijsten, het uitvoeren van een survey, en de analyse van de data. Ouders gaven ook aan dat de kennis en vaardigheden van leerlingen zich door IPA in vele aspecten hadden ontwikkeld, zoals geïntegreerde kennis, sociale interactie, samenwerking, en onafhankelijk denken.

CONCLUSIES

Dit onderzoek heeft de bevindingen van eerder onderzoek naar de effectiviteit van exemplarische curriculummaterialen als gereedschap voor het faciliteren van het leren over innovatieve curricula door docenten (cf. Mafumiko, 2006; Motswiri, 2004; Van den Akker, 1988; Voogt, 1993) bevestigd. De rol van curriculummaterialen als een component in een scholingsarrangement voor docenten heeft de eerdere positieve bevindingen herbevestigd (cf. Ottevanger, 2001; Roes, 1997; Teclé, 2006; van den Berg, 1996). Daarnaast heeft dit onderzoek aangetoond dat vooral de voorbeeld videoclips en worksheets voor de leerlingen essentieel waren voor het implementeren van IPA door docenten. De videoclip demonstraties, als een component van de exemplarische curriculummaterialen, droegen bij aan de IPA implementatie van docenten. Het stelde docenten in staat om de voornaamste kenmerken van IPA te identificeren, om te reflecteren op hun leren en oefenen, en om meningen uit te wisselen om hun doceren effectiever te maken.

De interventie was succesvol omdat docenten en leerlingen werden aangemoedigd – als de voornaamste gedachte achter de IPA – om hun eigen IPA curriculum in hun specifieke context te ontwikkelen en uit te voeren. Om dit te kunnen doen transformeerden de docenten de kernideeën achter de exemplarische curriculummaterialen naar hun eigen praktijk om ze in te kunnen passen in hun lokale aanpak en context. Docenten die betrokken waren bij de uitvoering van IPA droegen niet alleen bij aan de verbetering van de exemplarische curriculummaterialen maar ze ontwierpen ook hun eigen praktijk.

De bevindingen van dit onderzoek geven aan dat een scholingsarrangement bestaande uit een workshop, voorbeeldcurriculummaterialen, follow-up ondersteuning, en organisatorische ondersteuning, bijdroegen aan de implementatie van leerlinggerichte IPA lessen van de docenten in het voortgezet onderwijs. Wanneer de vier elementen van het arrangement systematisch worden

geïntegreerd en de tijdsduur van de professionele ontwikkeling nauw verbonden is met implementatie van IPA door docenten en leerlingen, is het waarschijnlijk dat de gewenste uitkomsten van IPA worden gerealiseerd.

Het verdient aanbeveling om de uitkomsten en onderzoeksbenadering van dit onderzoek te gebruiken om effectieve scholingsarrangementen voor docenten te ontwikkelen ter ondersteuning van ook andere curriculuminnovaties in China.

《支持教师实施综合实践活动课程的设计研究》

中文摘要

张倩苇

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引言

知识经济和信息社会对公民在技能、能力、态度和习惯等素质上提出了新的要求。21世纪技能的发展对学生在当今社会的成功至关重要。从20世纪90年代开始，许多国家发起了课程改革以迎接21世纪的挑战。这些改革强调培育学生问题解决和探究的能力，发展学生的人格和创造力。为达此目标，一些亚洲国家倡导为中小学学生提供综合学习活动。

为迎接21世纪的挑战，中华人民共和国教育部在2001年启动了新一轮的课程改革。新课改提倡素质教育以培育全面发展的学生。这次课程改革的的一个重要改变就是从强调知识获取转向学生在问题解决和探究的能力以及创新精神和社会责任感的发展。为应对这一挑战，提出为3-12年级(8-17岁)的学生开设“综合实践活动”(IPA)。综合实践活动强调以学生为中心和以探究为基础。综合实践活动的基本特征是：

- A. **整体性**。综合实践活动的主题来自学生的个人和社会生活。主题的选择应体现个人、社会、自然的整合，体现科学、艺术、道德的内在整合。
- B. **实践性**。学生通过做、考察、服务、实验获得亲身体验，强调以活动为主要形式。
- C. **开放性**。活动的目标和内容是开放的。综合实践活动面向学生的生活世界，其内容会因不同地区、学校、班级的不同学生而不同。
- D. **生成性**。综合实践活动的生成性是由其过程取向所决定的。它强调学生的能力(包括态度、知识和技能)和价值观在活动的过程中得到发展。
- E. **自主性**。综合实践活动强调尊重学生的兴趣和爱好，这为学生自主性的充分发挥开辟了空间。学生可根据他们的兴趣选择学习的主题、内容和方式。

综合实践活动的实施遇到一些问题。由于缺乏全面、系统和有效的在职和职前教育，教师不能胜任综合实践活动教学。而且，缺乏合适的课程资源和材料也加重了实施的问题。本研究是在这一背景下开展综合实践活动课程实施的。

研究目的与问题

本研究旨在设计和评价支持教师实施综合实践活动的专业发展方案。课程材料作为专业发展方案的一个必需部分。下列研究问题和分问题构成研究的基础。

一个恰当的支持教师实施综合实践活动的专业发展方案（课程材料嵌入其中）的特征是什么？

分问题如下：

1. 支持教师实施综合实践活动的课程材料的特征是什么？
2. 一个教师专业发展方案（包括课程材料）是怎样构成的？
3. 教师专业发展方案对教师开展综合实践活动教学的影响是什么？
4. 教师的综合实践活动教学是怎样影响学生学习综合实践活动的？

研究方法与设计

为回答研究问题采用了设计研究法。选择设计研究法是因为其问题导向、效用导向和理论导向。设计研究法旨在降低在一个动态情境中设计和开发教育干预的不确定性，为干预质量的改进生成具体的建议。由于强调其研究结果的可用性，设计研究法显现出是一种有前景的和适用的方法。

本研究的设计包含三个阶段。在**预备阶段**，开展了综合实践活动与综合学习、教师与学生的学习、示范性课程材料与教师专业发展方面的文献综述。对中学实施综合实践活动现状的前端分析揭示了综合实践活动的政策（课程意图）与实践（课程实施）之间的差距。教师表达了对在实践中强调以学生为中心的方法实施综合实践活动的在职教育的需要。文献综述、前端分析以及专家咨询的结果为设计和开发示范性课程材料和教师专业发展方案打下了基础。

原型开发阶段主要关注连续的示范性课程材料和教师专业发展方案的原型的迭代设计和形成性评价。示范校课程材料设计的指导方针是：

- 与国家课程改革的政策保持一致；
- 包含程序性规范；
- 使用示范性视频片段。

教师专业发展方案设计的指导方针意在为教师提供积极的学习活动机会和持续较长时间的实践。设计的指导方针包括：

- 将课程材料整合进教师专业发展方案以发展教师对综合实践活动的操作性理解；
- 在教师专业发展之初举办引入综合实践活动理念的工作坊；
- 提供辅导来创设专业学习共同体以及组织支持作为学校的后续支持活动。

总共开发了四个版本的示范校课程材料和两个版本的教师专业发展方案。在形成性评价中，获取了专家、教师和学生对课程材料和教师专业发展方案的观点、体验。他们以这样的方式对示范性课程材料的有效性和实用性以及教师专业发展方案的内容和结构做出了贡献。

总结性评价关注将课程材料嵌入教师专业发展方案的最终版对课堂教学实践和学生在学习结果的影响。来自三所学校的 5 位老师和 250 位学生参加了实地试验。通过对课堂观察、教师和学生问卷、学生作品以及对教师、校长、学生和家長访谈的分析进行数据收集。总结性评价的主要结果在下部分总结。

结果

教师对专业发展方案的反应是积极的。他们对教师专业发展工作坊和后续支持活动的内容满意。教师们高度评价起作用最大的示范性视频片段和学生工作表。他们认为示范性视频片段帮助他们确认综合实践活动的主要特征，而学生工作表非常实用。

关于组织支持，三所学校间有差异。结果表明，组织支持是促进教师开展综合实践活动教学的一个重要因素。

课堂观察、教师访谈以及学生访谈表明，教师能把新知识和技能转变到他们的课堂境脉中。他们以不同的质量和程度采用以学生为中心的方法，而且五位教师都是使用者。学生访谈表明他们对综合实践活动课以及教师在综合实践活动教学中的作用持肯定态度。他们认为，教师们善于为学生创设良好的课堂氛围。学生们确认教师

提供的支持包括提出改进意见、激发学生思考、传授研究方法、提供相关的资料等方面。尽管有的教师的表现不是那么理想，但有迹象表明他们正走向更以学生为中心的方法。缺乏足够的时间实施综合实践活动，以及缺少行政支持是教师们遇到的一些问题。

学生学习的经验和结果是根据学生对综合实践活动学习的观点和感知以及家长的感知来判断的。结果表明，学生和家长肯定了综合实践活动教学。大多数学生能积极参加综合实践活动，他们的知识和技能在提出问题、与人交流、与同学合作、设计问卷开展调查、数据分析等方面得到提高。家长也表示，学生们在综合知识、社会实践、合作、独立思考等方面得到发展。

结论

本研究确认了以往关于示范性课程材料作为促进教师实施革新性课程工具的有效性的研究（参见：Mafumiko, 2006; Motswiri, 2004; Van den Akker, 1988; Voogt, 1993）。课程材料作为教师专业发展方案一个成分的作用再次证实以往的研究发现（参见：Ottevanger, 2001; Roes, 1997; Teclé, 2006; van den Berg, 1996）。而且，本研究表明特别是示范性视频片段和学生工作表对教师实施综合实践活动是必需的。示范性视频片段的展示作为示范性课程材料有助于教师实施综合实践活动课程。它帮助教师确认综合实践活动的主要特征、反思他们的学习和实践、交换意见以使教学更有效。

干预是成功的，由于鼓励师生——作为综合实践活动理念的一部分——在他们特定的境脉中开发和实施他们的综合实践活动课程。为此，教师将示范性课程材料中的核心理念转换到他们的实践中以适合他们当地的实践。教师参与综合实践活动的实施贡献不仅在于对示范性课程材料的改进，还重新设计他们自身的实践。

研究结果表明，教师专业发展方案由专业发展工作坊、示范性课程材料、后续支持以及组织支持有助于中学教师实施以学生为中心的综合实践活动课。当方案中的四个要素系统地整合起来，持续较长时间的教师专业发展与师生的实施结合，它们更有可能实现综合实践活动对教师和学生的预期结果。

本研究的研究结果和采用的研究方法对于中国开发支持其他课程革新的教师专业发展方案学科的更有效的教师专业发展研究有参考价值。

APPENDICES

Appendix A

Questionnaire on the Present Situation of IPA Implementation in Secondary Schools

Please tick“√”in or fill in the horizontal line.

1. The school you work: _____ . And the class(es) you teach: _____ .

- in junior high school
- in senior high school
- in junior and senior high school

2. Gender

- male female

3. Your age

- under 30 31-40 41-50 50-60 over 60

Professional title

- second-grade teacher first- grade teacher high-grade teacher

4. Years of teaching

- below 5 5-10 11-20 21-30 over 30

5. Have you ever took part in the implementation of other courses related to IPA, such as inquiry learning, extracurricular activities?

- No Yes

6. How long have you engaged in the teaching of IPA?

- 0-1 year 1-2 years 2-3 years over 3 years

7. Which subject did you engage in before the teaching of IPA?

- Chinese Language Mathematics Physics Chemistry Biology Politics
- History Geography Information Technology others (please fill in):

8. Have you ever received the new curriculum reform training on IPA?

- No
- Yes. Which level of training have you received?
 - national provincial city district school

9. Does the school you work have following requirements?

- campus network multimedia classroom(s) computer room(s) library laboratory(s)
- activity room for students others (please fill in): _____

10. The domains of IPA (main contents) are (multiple choices):

- Activities Information Technology Labour and technology Inquiry learning
 Community service and social practice Military training

11. How important are each of the following goals in implement IPA in your school?

Tick one answer for each goal

	not important	important	very important
1) To develop the practical abilities and innovative spirits of students	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2) To cultivate students' abilities to apply knowledge comprehensively	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) To enhance the close relation between student life and social reality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4) To develop the social responsibility of students	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5) To develop the students' awareness and abilities of IT application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) To transform the way of learning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. How many times does your school offer IPA for the students in one term?

- once a week once two weeks once a month once several months no

13. Any other methods have you adopted in the process of teaching except the lecture?

- discussion, argument hands-on read related books field observation and investigation
 collect online materials others (please fill in): _____

14. What are the main approaches when you collect materials for preparing for lessons?

- textbook & reference book communicate with colleagues online resources materials provided by students
 others (please fill in): _____

15. Are you involved in developing curricular materials in your teaching work?

- No
 Yes. (more than one answer is possible.)
 curricular documents at school level
 exemplary lessons
 multimedia courseware or online courseware
 others (please fill in): _____

16. What are the main difficulties you have met in the implementation of IPA? (more than one answer is possible)

- Too high demands on teachers
 It is difficult to operate IPA in practice
 Lack of time and energy
 Lack of teaching facilities
 Lack of appropriate curriculum resources
 The safety of students during off-campus activities

- Students are inadaptable to it
- No support from school leaders
- Short of funds
- Others (please fill in): _____

17. Please list the topics in your teaching of IPA.

18. Can you provide an example of one of the most satisfying of a learning activity in your teaching?

The example should be one that you feel gives students the most useful, effective, and advanced learning experiences.

- No, I cannot provide such an example, proceed to the end.
- Yes, see below

Please describe your example by answering the following questions (use a maximum of 20 words for each answer):

1. Give a brief description of the activity

2. What information technology is involved?

3. What student activities are involved?

4. What changes, if any, took place for teachers?

5. What did students gain from it?

6. Any other comments on this activity

Thank you very much for your cooperation!

Appendix B

Exemplary curriculum materials for integrative practical activities

PART ONE: Explanation to the Teacher

1. Introduction

The activity materials are designed for the topic for *Foreigners Living in Yuexiu District and Our City Life*. It is meant for the Chinese integrative practical activities for secondary school (Grade 10) in Yuexiu District. The topic consists of the following sub-topics:

- The reasons that foreigners come to Guangzhou and their living characteristics (Why foreigners choose to come to Guangzhou to do business and live? What characteristics are foreigners live in Guangzhou? How foreigners communicate with citizens of Guangzhou? How foreigners get to know Chinese culture?);
- The opinions of foreigners on Guangzhou (Whether the business environment in Guangzhou is good or not? Whether the living environment in Guangzhou is good or not? How the foreigners perceive the quality of citizens of Guangzhou? What suggestions the foreigners provide for the Guangzhou Municipal Government?);
- Foreigners and city life (The situation on public order management in the foreigners cluster areas; What changes did the foreigners bring about for the resident areas? What changes happened when the shopkeepers and shop assistants do business with the foreigners? How the citizens of Guangzhou view the foreigners? Proposals to create conducive business and living environment for the foreigners in Guangzhou);
- From foreigners come to Guangzhou to do business and live to see the development of Chinese society and economy.

2. Teacher Support Materials

These materials consist of two parts: the explanation to the teacher (Part 1), teacher support materials with student worksheets (Part 2).

- Part 1 (the one you are reading now) describes the place of “*Foreigners Living in Yuexiu District and Our City Life*” in the integrative practical activities curriculum and the audience; sequence and content of activities, general issues in activity preparation and execution.
- Part 2 consists of teacher support materials and student worksheets both of which have been prepared to respectively support and help teachers and students in teaching and learning the topic of *Foreigners Living in Yuexiu District and Our City Life*. The student worksheets have been prepared to guide students in performing integrative practical activities by inquiry learning.

3. Sequence and content of activities

Activity	Activity content	Time and periods
1	Topic introduction, grouping and dividing the work, making arrangement of the project	80 minutes/ two 40-minute periods
2	Collecting and analyzing relevant information about the topic	40 minutes
3	Preparing investigation/interview scheme	80 minutes
4	Field survey/investigation/interview, collecting data	400 minutes/ five 40-minute periods
5	Data processing and analyzing, preparing report	80 minutes/ two 40-minute periods
6	Reporting and presenting the results	80 minutes/ two 40-minute periods

(IPA starts from the first week of March, 2008 and ends in July. It needs about 20 periods and one more period needs to be prepared except examination week.)

4. Preparation and execution of activities

General issues

Most of how-to-do suggestions have been given in each activity; however, the following issues have to be considered seriously for a successful integrative practical activities.

- Use brainstorm, let students discuss what topics they are interested and write down on the sheet. Analyze the results of the sheets and decide the topic of IPA.
- Adopt various methods to arouse the interest of students' inquiry, invite parents of students, social personage to participate their process of discussion and inquiry so as to facilitate students' participation.
- Think about and list down the problems that you expect students might encounter in the process of activities and how you will proceed helping them. For example, difficulties related to design the scheme of investigation/interview. If students lack the required skill, such as the questions will be asked, demonstrate this before starting with an activity.
- Use the exemplary curriculum materials with flexibility according to practical situation.

How to organize your practical work

- Grouping of students: Make as many groups as your space allow. An ideal situation would be 3-5 students per group. Each group decides their subtopic. Set groups according to proposed arrangement, and observe the gender balance. Maintain same groups unless there is a good reason to reshuffle. Specify roles each member needs to play to carry out the activities. Ask each group to have the chairperson and the secretary to coordinate group tasks (e.g. who will collect relevant information, preparing investigation/interview scheme, carry out field survey/ investigation/ interview, and present group results)
- Monitoring progress of activities: when in classroom, walk around to monitor student work. Check how students are making arrangement of the project, collecting relevant information, making investigation/interview schema, preparing report.

PART TWO: Teacher Support Materials

1. Objectives of the activity

Realize the reasons and features of foreign businessmen come to Guangzhou, and their impact on and changes of Guangzhou social life and economy from the perspective of foreign businessmen and the development of Guangzhou; provide suggestions for the social and economic development of Guangzhou.

It is expected that at the completion of the activity students should be able to:

- Have certain ability to collect, process and organize relevant information through the use of the Internet as well as libraries and museums to find books, newspapers, etc. and carrying out social surveys.
- Understand the history, characteristics and causes of foreign businessmen to Guangzhou, understand the changes brought about by foreign businessmen to Guangzhou, improve the ability of identifying problems, analyzing problems, and problem-solving, obtain personal experience of research and exploration through field observations, interviews and questionnaires, etc.
- Grasp initially the general research methods of social issues, have certain ability of collaboration, communication and innovation, and enjoy the pleasure of inquiry learning through surveys, interviews and other activities.
- Realize the importance of strengthening communication with foreigners, pay attention to the basic etiquette of foreign exchanges, and establish a correct values of the treatment of the foreign cultures.
- Understand the changes brought about by the Guangzhou reform and opening up, resulting in the pride in Guangzhou and the motherland; provide proposals to the social development of Guangzhou, establish the notion of social harmonious development through surveys, discussions and other activities.

2. Resources materials and further reading

References:

- Guo, Yuanxiang (2001). *The course of integrative practical activities: Design and implementation*. Beijing: Capital Normal University Press.
- Kang, Jian (Ed.). (2003). *Experts' comment on the cases of integrative practical activities (Volume Senior high school)*. Shengyang: Liaohai Publisher.
- Liao, Xianliang (Ed.). (2003). *Cases of integrative practical activities (Grade 7-12)*. Wuhan: Wuhan University Press.
- Liu, Daorong (Ed.). (2003). *Classroom teaching cases of the new course integrative practical activities*. Guangzhou: Higher Education Press of Guangdong.
- Ministry of Education. (2001). *Experiment programme of curriculum for compulsory education (try-out)*. Beijing: Ministry of Education.
- Ministry of Education. (2001). *Curriculum programme for integrative practical activities (try-out)*. Beijing: Ministry of Education.
- Zhu, Lifeng (2003). *How to conduct inquiry learning*. Guangzhou: Guangdong Higher Education Press.

Websites:

Web of integrative practical activities

<http://jxjy.com.cn:88/index.asp>

Science education

<http://data.sedu.org.cn/doteacher/>

Special topics on integrative practical activities

<http://www.zhsj.net/>

Basic education of CCNU

<http://www.hdedu.org/>

Integrative practical activities

<http://www.pep.com.cn/zhsjhd/>

Web of new thinking – – integrative practical activities

<http://ipac.cersp.com/Index.html>

3. Preparation

- Use brainstorm, let students discuss what topics they are interested and write down on the sheet. Analyze the results of the discussion and decide the topic of inquiry learning for this term.
- Prepare background information of the topic and sub-topics for the students

4. Safety

Attentions for student go out to survey:

- Students should be required to inform teachers and parents when they get out of school for survey.
- Students should be accompanied by classmates/parents/teacher for survey, avoid going out alone.

5. Activity plan and Timing (min)

Time	Student activities	Teacher role
40	Group and divide the work, make arrangement of the project	Monitor group activities and provide guide
40	Report the arrangement of each group	Evaluate groups' arrangement provide suggestions
40	Collect and analyze relevant information	Visit groups and provide support or guide
80	Prepare investigation/interview scheme	Visit groups and provide support or guide
400	Field survey/investigation/interview, collect data	Visit groups and provide support or guide
80	Process and analyze data, prepare report	Visit groups and provide support or guide
80	Groups report and present the results of topic inquiry	Evaluate groups' work and provide suggestions

6. Group work

Set framework for small group activities, for example, the number and roles of members (preferably 3~5 students per group), arrangement of activities, duration of activity, selecting topics, searching relevant resources, field survey/investigation/interview, collecting and analyzing data, writing report and present the results.

7. Start of activity

Introduce the topic and sub-topics to the students briefly. Give information to students on the purpose of the activity. Guide them through the activities of discussion and grouping.

8. Execution of activity (student worksheets are included in this part)

The whole process is divided into 6 main activities. In each phase, students are required to fulfill different tasks. You can require students to communicate what they have done, learn their progress and provide suggestions, in order to regulate the activities effectively. Then arrange the tasks for the next stage.

8.1 Group and divide the work; make arrangement of the project and write down.

Teacher provides suggestions for grouping and how to carry out collaborative learning. Each group draw up a program of activities, make the division of labor within the group, then discuss and determine the research proposal.

Research proposal

Topic	Adviser	
Chairperson:		
Members:		
Background (Why you choose this topic? What are the reasons?):		
Objectives and significance (for student, parent, school, community or government) of the topic:		
Contents of inquiry (What aspects are you going to inquiry?):		
Research methods and devices (method , i.e., literature collection, questionnaire, investigation, field observation, interview etc.; means, i.e., access to Internet, go to library, experiment, take pictures/ video recording, tape recording etc.):		
Division of tasks:		
Implementation procedures:		
Time period (week number)	Main task	Persons in charge of
Expected artifacts (including paper, web-page, slides):		
Adviser's evaluation:		

Activity evaluation: You may evaluate research proposals from the validity, clarity of objectives, completeness of research content, feasibility of research conditions and procedures, appropriateness of research methods, and the rationality of task division. Provide suggestions for modifications.

8.2 Collect relevant information

Each group collects literature related to the group topic by accessing to Internet, looking up dictionary, listening to the radio, watching TV etc. All these are to make preparation for the subsequent works.

List of literature collected

Topic			Group number	
Purpose				
Approaches				
Number	Title of literature	Source of literature (website, name of book and journals, and publish time)		
1				
2				
3				
4				
5				
6				
What problems you encounter in the process of collecting and process the information:				
Adviser's evaluation:				

Activity evaluation: you may evaluate the information collected from the correctness, comprehension and practicability.

8.3 Prepare investigation/interview scheme

Each group determines the place and target groups of investigation/interview; prepare the questions shall be asked. Teacher may help students to contact with the personage they are going to interview in advance.

Teacher can play the segments of the videos to show how to make a survey and interview.

Scheme of survey/interview

Topic		Group number																																	
Content of survey/interview:																																			
Objectives of survey /interview:																																			
Target groups of survey /interview:																																			
<p>Introduction: Hello, we are students from XX secondary school. We want to know your opinions about XX. May we take up your time to ask you a few questions? Thank you very much for your cooperation!</p> <p>Personal information:</p> <p>Gender: Age group:</p> <p>Educational level: Occupations:</p> <p>Items of survey/interview:</p> <p>Closed questions:</p> <p>1.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">A.</td> <td style="width: 25%;">B.</td> <td style="width: 25%;">C.</td> <td style="width: 25%;">D.</td> </tr> </table> <p>2.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">A.</td> <td style="width: 25%;">B.</td> <td style="width: 25%;">C.</td> <td style="width: 25%;">D.</td> </tr> </table> <p>3.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">A.</td> <td style="width: 25%;">B.</td> <td style="width: 25%;">C.</td> <td style="width: 25%;">D.</td> </tr> </table> <p>4.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">A.</td> <td style="width: 25%;">B.</td> <td style="width: 25%;">C.</td> <td style="width: 25%;">D.</td> </tr> </table> <p>5.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">A.</td> <td style="width: 25%;">B.</td> <td style="width: 25%;">C.</td> <td style="width: 25%;">D.</td> </tr> </table> <p>6.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">A.</td> <td style="width: 25%;">B.</td> <td style="width: 25%;">C.</td> <td style="width: 25%;">D.</td> </tr> </table> <p>7.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">A.</td> <td style="width: 25%;">B.</td> <td style="width: 25%;">C.</td> <td style="width: 25%;">D.</td> </tr> </table> <p>8.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">A.</td> <td style="width: 25%;">B.</td> <td style="width: 25%;">C.</td> <td style="width: 25%;">D.</td> </tr> </table> <p>Open-ended questions:</p> <p>9.</p> <p>10.</p>				A.	B.	C.	D.	A.	B.	C.	D.	A.	B.	C.	D.	A.	B.	C.	D.	A.	B.	C.	D.	A.	B.	C.	D.	A.	B.	C.	D.	A.	B.	C.	D.
A.	B.	C.	D.																																
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A.	B.	C.	D.																																
A.	B.	C.	D.																																
Adviser's evaluation and suggestions:																																			

Activity evaluation: you may evaluate the investigation scheme from the feasibility, pertinent of drafted questions.

8.4 Record group activity log

Teacher needs help students to contact with the personage /expert they are going to interview in advance.

Before each activity, the teachers should account to students with the precautions for going out surveys.

Each group's activities, especially going out interviews, surveys, field observation should have the activity log, so that teachers and students can understand the progress of activities.

Activity log

Topic				Group number	
Time		Place		Recorder	
Members of activity:					
Objectives:					
Forms (group discussion, expert interview, survey, field observation etc.):					
Process:					
Results (What conclusions, any problem solved, whether the intended objectives and plans completed):					
Difficulties encountered:					
Experience of activity:					
Adviser's evaluation and suggestions:					

Activity evaluation: Teachers may evaluate from the authenticity of activity records, integrity, timeliness and whether or not to achieve the desired objectives, and suggest modifications in a timely manner.

8.5 Process the data collected and write report

Each group deals with the data collected and the form a research report. Teachers to provide guidance on statistical analysis of data and research report writing.

Statistical analysis table

Topic												Group number					
Group members														Time			
Number of questionnaire issued				Number of valid questionnaire				Rate of valid questionnaire									
Gender				Ages group													
Male		Female		20 below		21-30		31-40		41-50		51-60		Over 60			
N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Educational level								Occupation									
Primary		Secondary		College		Undergraduate		Graduate									
N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Items		Content						Statistics (N & %)									
1								A		B		C		D			
2								N	%	N	%	N	%	N	%		
3																	
4																	
5																	
6																	
7																	
8																	
Open-ended question 1: Number and percentage of each answer Analysis:																	
Open-ended question 2: Number and percentage of each answer Analysis:																	
Activity experience:																	
Adviser's evaluation:																	

8.6 Report and present the results to the whole class

Each group appoints their representatives to report and present their results in the classroom. They may upload their reports to the website.

Research report

1. Written material			
Title		Time of finish	
Group members:			
Authors of report:			
Achievement:			
Suggestions:			
Appendices (including research proposal, activities record, interview schedule etc.):			
2. Materials (Pictures, models, photographs, audio and video data etc.)			
Name	Producer	Content	

Activity evaluation:

Teacher evaluate the research report from following aspects: completion of research process and content, original data are authentic and detailed, cooperation and division of labor, conclusion are clear and reasonable, suggestions are feasible and innovative, multiple forms of expression, students experience are rich and reliable.

List of IPA report form of each group (For teacher)

Group	Chairperson	Title of research	Report form
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			

9. Conclusion of activity

You may require each group to report their progress and reflect their performance in each period and provide suggestions. Make assignment for the next period.

10. End of activity

Require students reflect and evaluate their performance in the activity. You can finish the activity by making conclusions for the activity and evaluate the performance of the students. Provide suggestions for further activity.

11. Evaluation of activity

The two tables below used for evaluating the performance of students and groups. The first one is for student self-evaluation, and the second one is for group evaluation. It should be noted that the evaluation run through the whole process of the activity, it is not only carried out at the end of the activity.

11.1 Self-evaluation

Table of self-evaluation

Name	Class		Grade			Evaluation of group members
Elements	Good	Better	Need to try hard			
Attitude to participate is active and earnest						
Have interest in inquiring topic						
Use various methods to collect information						
Information collected are complete						
Cooperate with group members; exchange and share information with other group						
Find ways to solve problems						
Have one's own opinion in the artifacts						
Use multi-form to represent learning results						
Fulfill task very well and punctually						
What impressed me deeply in the activity:						
What I have learned in the activity:						
Parent's suggestion:						
Advisor's evaluation:			Grade			

11.2 Group-evaluation

Table of group-evaluation

Group number		Topic	
Indicator	Elements of evaluation	Self-evaluation	Evaluation by other groups
Research proposal	Significance and feasibility of the topic chosen		
	Proposal (content, work divided, schedule and presentation)		
Process	Veracity, correctness and comprehensiveness of information collected		
	Feasibility of scheme for investigation and interview		
	Full and betimes of activity log		
	Authenticity of activity log		
	Cooperation in the group		
	Degree Of expected objectives realized		
Report	Production (credibility and reliability of production, full and accurate of content, and multi-forms of presentation)		
	Effective oral and written demonstration		
	Innovation and social effect		
	Gain and experience		
Adviser' evaluation:			

12. Resources materials for teachers and students

References:

Jian, Kang (ed.) (2003). *Experts' comment on the Cases of integrative practical activities (Volume Senior high school)*. Shengyang: Liaohai Publisher.

Xianliang, Liao (ed.) (2003). *Cases of integrative practical activities (Grade 7-12)* Wuhan: University of Wuhan.

Videos:

1. Horizon Survey: Foreigners looking on China (1) Why learn Chinese
2. Horizon Survey: Foreigners looking on China (2) Imagination and reality
3. Horizon Survey: Foreigners looking on China (3) How many cultural differences
4. Horizon Survey: Foreigners looking on China (4) The Chinese colleagues in the eyes of the foreign employees
5. Horizon Survey: Foreigners looking on China (5) Are you satisfy with your life in China?

Websites:

1. Make money in China: African businessman in Guangzhou feel just like a fish in water
http://www.ycwb.com/xkb/2007-02/06/content_1377119.htm
2. The crime of foreigners in China increase
http://gzdaily.dayoo.com/html/2007-06/25/content_29901993.htm
3. Full record of black “tribe” in Guangzhou (Picture)
http://gzdaily.dayoo.com/html/2007-12/13/node_59.htm Guangzhou Daily 2007-12-13B6
4. Foreigners spend holiday in Guangzhou
http://gzdaily.dayoo.com/html/2008-02/12/content_122626.htm
Guangzhou Daily 2008-02-12 A4
5. Uncover the “mini United Nations” of Dengfeng
http://gzdaily.dayoo.com/html/2008-03/04/content_131698.htm
Guangzhou Daily 2008-03-04 A20

Note: Above are recommended references and websites, students should be looking for more related information.

Appendix C
Interview list for expert appraisal (first prototype)

Date: _____

Name: _____

Position: _____

- Integrative Practical Activities teacher
- Curriculum and Instructional specialist
- Instructional design specialist
- Others: _____

1. Do you agree with the definition of curriculum materials?

Curriculum materials are print and/or non-print materials used to support teachers in the implementation of curriculum and to facilitate the learning process. They include textbooks, teacher's guide, reference materials etc.

2. Do you agree with the objectives of the activity? If not, what objectives should be added/removed?

1. Collect, process and evaluate relevant information by making use of Internet, newspapers, journals and carrying out social investigation; on the basis of these activities, form one's own ideas.

2. Learn the phenomena of pollution in tourism district and the causes by field survey, investigation, interview, and the application information technology so as to gain personal experience of inquiry.

3. Cooperate with others and share the productions by group work.

4. Apply acquired knowledge to solve practical problems, gain personal experience of inquiry and enjoy the pleasure of inquiry learning.

5. Experience the scientific attitude and methods.

3. Do you have any suggestions for improving the student worksheets?

4. Do you agree with the activity contents of each period? If not, what content should be added/removed?

5. Do you think the time planning of the activities is ok? If not, what should be changed?

6. Do you think the tables of evaluation reasonable? If not, what content should be added/ removed?

7. Do you think the content is helpful for teacher to execute integrative practice activity (Acronym: IPA)? If not, why?

8. Do you think that the prototype fits learners and the teachers?

9. Do you think what modifications should be made?

10. Others:

Appendix D
Teacher expectation questionnaire

Dear Teachers:

You are going to participate in the workshop that is intended to promote student centered approach by focusing on integrative practice activity. By means of this questionnaire I would like to have some of your background information, insight into your expectations with regard to the workshop, and your opinion on and experiences with IPA. The information that you provide will be used to generate suggestions for improvement of the IPA in-service training program.

General information

Your school:	Your age:	Gender:	(M/F)
Class taught:	Subject(s):	Teaching load per week:	
Position:	Qualification:	Major of study:	
Years of teaching:	Years of teaching IPA:		

1. Have you ever participated in workshop(s) related to integrative practice activity/inquiry learning? If yes, would you please write down what the focus of that workshop had been?

2. What do you expect to benefit from a workshop that focuses on IPA teaching for promoting student centered approach?

Thank you very much for completing the questionnaire

Appendix E
Evaluation questionnaire

Name: _____ School: _____ Date completed: _____

Participants' reactions

1. What is your overall impression about the Integrative Practice Activity workshop?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
According to my expectations					
Useful for my professional growth					
Relevant to my teaching practice					
Enhanced my understanding					
The objectives are met					

2. What is your opinion for the following aspects of the following aspects of the workshop?

	Very poor	Poor	Just Okay	Good	Excellent
Group discussion pertaining to IPA lessons/student centered lessons					
Presentation of the "what, when and how" of IPA teaching					
Video demonstration					
Practice session (designing lessons and microteaching)					
Curriculum materials used					
Organization					

Remarks

3. How do you value the usefulness of the following course sessions?

	Very poor	Poor	Just okay	Good	Excellent
Session one: Theory exploration					
<ul style="list-style-type: none"> ▪ Brief introduction to the workshop ▪ The opportunity to discuss about issues pertaining to student centered approach in science education. ▪ Presentation of “when, what and how” of IPA teaching ▪ Reading materials about what student-centered education is, the rationale underpinning this approach etc. 	1	2	3	4	5
Session two: Video demonstration and discussion					
<ul style="list-style-type: none"> ▪ Video clips that demonstrate an exemplary lesson and a routine IPA lesson ▪ Plenary discussion and reflection on the clips. 	1	2	3	4	5
Session three: Practice session					
<ul style="list-style-type: none"> ▪ Introduction to the exemplary curriculum materials ▪ Practice with lesson 	1	2	3	4	5
Session four: micro-teaching and feedback					
<ul style="list-style-type: none"> ▪ A microteaching with small group of students conducted by fellow teacher. ▪ Feedback and reflection from the microteaching 	1	2	3	4	5

Remarks

4. What were the most effective sessions of this workshop?

5. What were the least effective sessions of this workshop?

6. Indicate for the following statements to what degree you agree with them or not.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
My time in the workshop was well spent	1	2	3	4	5
The knowledge and skills explored in the workshop are useful for improving my teaching practices	1	2	3	4	5
The activities of the workshop are carefully planned and organized	1	2	3	4	5
The teacher guides are immediately useful for my classes	1	2	3	4	5
Sufficient time was provided for the completion of the activities	1	2	3	4	5
The presenter and organizers were well prepared	1	2	3	4	5
The facilities provided were conducive for learning	1	2	3	4	5

Remarks

Participants learning from IPA training workshop

7. Please indicate for the following statements to what degree you agree with them.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
After participating in this workshop my awareness and understanding about IPA lessons is enlightened	1	2	3	4	5
The video demonstration has helped me identify the important features of IPA lessons	1	2	3	4	5
The practice session has augmented my skills and knowledge of IPA lessons	1	2	3	4	5
The demonstration made me consider trying out IPA lessons	1	2	3	4	5
After attending this workshop I understand that the role of teacher in IPA lessons is crucial	1	2	3	4	5
After studying the exemplary lessons and practicing the design of such lessons, I am convinced that I can manage to put into practice such lessons in my own school	1	2	3	4	5
I will organize my IPA lessons differently because of this workshop	1	2	3	4	5
My opinion about inquiry learning lessons has changed as a result of the workshop	1	2	3	4	5
The presentation about 'what, why and how' of using inquiry learning provided me with much new information	1	2	3	4	5
The microteaching and feedback session helped me get a considerable awareness of my own teaching behavior and knowledge about alternatives					
After attending the microteaching conducted by a colleague I have got the confidence to use IPA lessons with students	1	2	3	4	5
It was difficult to provide an honest opinion on what I will change in future in my way of teaching	1	2	3	4	5

Remarks

8. Do you think you are going to adopt or redesign the exemplary curriculum materials?

9. What do you think you have learned from the IPA training workshop?

Appendix F
School follow-up support questionnaire

Dear teachers,

The purpose of this questionnaire is to determine what you think about the school follow-up support activities (SFSA) provided during your IPA implementation. Your feedback will provide us valuable information for improving the teacher professional development arrangement in IPA.

General information:

Name: _____ School: _____ Date completed: _____

1. What is your overall impression about SFSA ?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
According to my expectations	1	2	3	4	5
Useful for my implementation of inquiry learning	1	2	3	4	5
Enhanced my understanding of inquiry learning	1	2	3	4	5

2. How do you value the usefulness of the following activities?

	Very poor	Poor	Just okay	Good	Excellent
Researcher provides feedback after classroom observation	1	2	3	4	5
Providing the excellent exemplary examples of students' products (i.e. research proposal, investigation questionnaire, interview scheme, research report, etc.)	1	2	3	4	5
Teacher's reflection on teaching by writing logbook (Blog)	1	2	3	4	5
Teachers' discussing and reflect their own teaching with researcher	1	2	3	4	5
Sharing teaching plan (including Slides) with other teachers	1	2	3	4	5
Teachers preparing for lessons together	1	2	3	4	5
Observing a short video-taped classroom lesson of fellow teachers and making comments on it	1	2	3	4	5
Observing a video-taped classroom lesson of oneself and reflecting on it	1	2	3	4	5
Providing online resources, audio, video and written materials related to the topics inquired	1	2	3	4	5

3. Please indicate for the following statements to what degree you agree with them.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
As a result of SFSA, I understand IPA lessons profoundly	1	2	3	4	5
Feedback from researcher's classroom observation contributes to improving my teaching	1	2	3	4	5
Providing the excellent exemplary examples of student products helps me to guide students	1	2	3	4	5
Writing logbook (Blog) helps me to reflect on my teaching practice	1	2	3	4	5
Teachers discussing collectively contributes to sharing information and expertise	1	2	3	4	5
Sharing teaching plan (including Slides) with other teachers is conducive to sharing expertise	1	2	3	4	5
With SFSA and after implementing IPA lessons, I have a better understanding about the teacher's guiding role in it	1	2	3	4	5
I organized my IPA lessons differently as a result of SFSA	1	2	3	4	5

4. Which was the most useful activity in SFSA? And why?

5. Which was the least useful activity in SFSA? And why?

6. Any forms or contents of activity should be added in SFSA?

7. Do you think any changes have been taken place as a result of SFSA and your implementation of IPA? What are they?

8. What do you think you have learned from SFSA?

9. Do you have any comments or suggestions for SFSA?

Thank you very much for completing this form!

Appendix G
School support questionnaire

Dear teachers:

This questionnaire is focused on the extent of support provided to you by the school during implementation. It attempts to measure the degree to which school's supports facilitation, accommodation and recognition of those participants involved in IPA program.

Instruction:

Please indicate the extent to which you agree or disagree with the following items.

	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
The necessary materials are provided to me in a timely manner from the school					
The necessary facilities of the school are made available to me at appropriate times					
The physical conditions of the school (laboratory, supplies, classrooms, etc) are conducive to my enactment efforts					
We have a quiet place to plan and discuss important issues					
I had sufficient time to prepare for carrying out IPA lessons into my regular classroom routines					
I had ample time to reflect on my student-centered strategies and make appropriate adaptations					
The school encourages experimenting with new strategies aimed at improving student learning outcomes					
Fellow teachers share my enthusiasm for experimenting with new strategies for teaching					
The school administration is open to suggestions for improvement in school practices					
Your effort to improve belittled by some fellow teachers					
We frequently engage in conversations about ways to improve our teaching approach					
I had the opportunity to visit the classrooms of fellow teachers and observe their teaching or the other way around					
The principal is an active and enthusiastic learner					
The principal encourages teachers to become involved in school wide decision making					
The school administration encourages teachers to participate in workshops intended for their professional growth					
You are encouraged to plan lessons					

collaboratively with your fellow department teachers					
The principal recognizes and honors teachers' success with student achievement					
The school administration offers schedules that allow you to collaboratively plan and discuss with fellow teachers					

Thank you very much for completing this questionnaire !

Appendix H

Teacher interview for school support

Name: _____ **School:** _____

1. Was the school administration supportive in providing you the necessary resources, say materials, supplies etc that is needed for your lessons? On timely manner?
2. Did you get enough time to prepare on your lessons and also reflect on them?
3. Does the school encourage you implementing with new strategies aimed at improving student learning outcomes?
4. Does the school administration have schedules that allow you to collaboratively plan and discuss with fellow teachers?
5. Did the school organize opportunities where you could observe fellow teachers teaching or the vice versa?
6. How could you describe your principal's supports in your efforts to improve students' learning outcomes?

Thank you very much for accepting my interview!

Appendix I

Principal interview for school and district support

Dear principal (director),

During February to July, 2008, the program carried out in Grade 10 (8) of your school had been gotten the support from you and the concerned departments in the school. The intent of this interview is to gain insight into your opinion on and support to the program. Your feedback would provide valuable information for my improving the teacher professional development arrangement in IPA (inquiry learning).

Thank you very much for accepting my interview!

1. Did the school make policies relevant to organize and support teachers to implement IPA? If yes, please specify them.
2. Did the school administration provide necessary resources, facilities and network classrooms for the participating teachers? On timely manner?
3. Did you manage to find time to observe the classroom teaching of the participating teachers? Did you exchange ideas with them?
4. Did district teaching and research office take part in your activity? Did they share results with other school staff?
5. Did you take any measures to encourage and support the teachers to implement IPA? If yes, please specify them. Were teachers recognized and honored for their successes with students? Did you share results of the implementation with the teachers?
6. Did the school provide the participating teachers enough time for participating in the training and seminar of IPA (inquiry learning)? Did the school provide the participating teachers fixed time and places for collegial preparing for lessons? Did the school offer opportunities for the participating teachers to visit colleagues and observe their classes?
7. How do you think the roles of organizational support provided by you and the school administration play in the IPA (inquiry learning) program carried out by the teachers?

Thank you very much for accepting my interview again!

Appendix J
Levels of use questionnaire

Description of the Level of Use

Level	Characteristic	Teacher behavior	
0	Nonuse	Takes no action with respect to the innovation	NONUSERS
1	Orientation	Seeks information about the innovation	
2	Preparation	Prepares to use the innovation	
3	Mechanical	Is poorly coordinated, making changes to better organize use of the innovation	USERS
4	Routine (4A)	Has established a pattern of use and is making few, if any, changes	
	Refinement(4B)	Assess impact and makes change to increase it	
5	Integration	Makes deliberate efforts to coordinate with others in using the innovation	
6	Renewal	Seeks more effective alternatives to the established use of the innovation	

Brief background

It is to be recalled that you are one of the participants of the teacher professional development program that was aimed at promoting student-centered approach in IPA education. The program has been focused particularly on training teachers on how to teach IPA lessons. You have attended the training workshop(s) (that included presentation of theory, video demonstration, practice and feedback), and you also got support with exemplary curriculum materials and school follow-up support. The following questions are intended to gauge the effect of the teacher professional development program on those teachers who participated in this program.

A. Levels of Use that define nonusers

i. Are you using IPA lessons?

If No for (i), follow up questions

a) Are you looking for information about student IPA lessons?

- Yes
- No

b) Did you intend to use IPA lessons sometime in the coming term in your classes?

- Yes
- No

B. Levels of Use that define Users

If yes for (i), follow up questions

- a) What kinds of activities are you engaging students or what are you doing regarding your implementation of IPA lessons?

- ii. Are you coordinating your implementation of IPA lessons with other teachers, including others in different departments?

Yes for (ii), follow up question for (ii)

- (a) Are you planning or exploring to make major modifications or replace IPA lessons that are promoted through teacher professional development program?

Thank you for completing the questionnaire!

Appendix K

Curriculum profile-classroom observation instrument (final version)

School: _____ Class: _____

Teacher's name: _____ Lesson Topic: _____

Observer's name: _____ Date: _____

Observation guide: Please mark (+) in column 'A' to indicate that the activity was observed, (-) in column 'B' to indicate that the activity was not observed at all.

Curriculum Statement Items	A (+)	B (-)	Score
Acceptable elements and ideal elements (mark ' * ')			
Start of lesson			
1. Teacher introduces a topic with background information.			
2. Teacher clearly explicates the objectives of the activity.			
3. Teacher explains the contents of the activity.			
4. Teacher requires students to discuss the topic they are interested in.			
5. Teacher explains how to group according to topic.			
6. * Teacher checks homework			
7. * Teacher discusses or answers homework questions, in class or in groups			
8. * Teacher introduces activity by introductory questions			
9. * Teacher makes presentation by aids of projector, blackboard etc.			
Body of lesson/ activity			
1. Teacher organizes students' discussion in groups			
2. Teacher moves around groups to ask /answer questions			
3. Teacher makes activities more meaningful to students' daily life			
4. Students actively ask teacher' help in group discussion			
5. Students in a group cooperate and discuss with each other			
6. Stdents write up the research topic and members' role /activity notes in group			
7. * Teacher has activity materials ready and organized			
8. * Teacher creates a favorable learning environment			
9. * Teacher responds positively to students' questions/answers			
10. * Teacher stimulates less motivated groups			
11. * Teacher handles discipline problems			
12. * Teacher effectively handles timing difficulties			
13. * Teacher encourages students to ask questions and think deeply			
14. * Teacher guides students to discuss			
15. * Teacher requires students clearly explicate the questions they are going to study			
16. * Teacher discusses research proposal /investigation scheme /research report with students			

17. * Teacher encourages students listen attentively to other's speech.			
18. * Teacher provides intellectual and emotional support for students.			
Conclusion of lesson			
1. Teacher spent some time discussing activity at the end of activity/lesson			
2. Teacher assesses the outcomes of group activity			
3. Teacher summarizes the main points of the activity/lesson			
4. Teacher make assignments /homework before the end of activities			
5. Teacher present requirements for the next activity /lesson			
6. * Teacher asks groups for specific information			
7. * Teacher asks each group to report their results to the class			
8. * Teacher guides students to draw conclusions from the activities			
9. * Teacher makes assignments by the aids of projector/blackboard			
10. * Teacher guides students to reflect their learning process			
Unacceptable elements			
Start of lesson			
1. Teacher skips the introduction			
2. Teacher doesn't give students enough time to think			
Body of lesson/ activity			
1. A learning environment where students are subdued			
2. Teacher spent almost the whole period lecturing			
3. Students are not given enough time to complete the activities			
4. Teacher make no effort to engaging students in activities			
5. All students of a group are not equally involved in the activity			
Conclusion of lesson			
1. Teacher skips conclusion of the activity			
2. Teacher does not spend enough time drawing conclusion			
3. Teacher ignores questions of students			
4. Teacher explains homework not clearly			

General observations:

1. Number of student in class: _____
2. Number of small groups: _____
3. Average number of members in a group: _____
4. Was time allocated to different activities? Yes No
5. Type of question asked:

Low level	High level
-----------	------------

Give examples of the questions asked.

6. How does Teacher respond to questions?? Negatively Positively
Give examples of the questions asked and their responses.

7. Classroom layout. i.e. desks arranged in rows, fixed benches arranged to allow group work, flexible seating arrangement of tables or desks etc.

8. Provide summary of learners' response to the learning activities.

Appendix L

Teacher interview

A. General information

School:

Subject(s):

Qualification:

Years of teaching:

Working experience:

Teaching load:

Position:

Years of teaching IPA:

B. General impression and appreciation

1. Please describe your general impression on the teacher materials?
 - a. Are the materials useful?
 - b. Does the development go smoothly?
 - c. Is the time arrangement practical?
 - d. Have the students learned a lot?
 - e. I have obtained many new experiences
2. What did you like about the exemplary materials, and why?
3. What did you dislike about the exemplary materials, and why?
4. What things would you like to have added to the materials? Which contents should be included in the curriculum materials were ignored?
5. What things would you like to have taken out of the materials?
6. Can you carry out topic activity like this without teacher guide? Would you like to use the curriculum materials for teaching IPA in future?
7. Do you have any comments or suggestions on the exemplary materials?
8. Do the materials provide support for the activity organization, guiding group activity and classroom management?
9. Have you spent more or less time on preparing the integrative practice activity than the former integrative practical activities? Is the preparation time acceptable? Can it be shortened? If yes, how to shorten?
10. Do you think the activity objectives are realized? If no, which are not realized? And why?
11. Have you encountered any difficulties in fulfill the activity objectives?

12. What was your most striking experience while engaging in the activity?
13. What was your greatest disappointment while engaging in the activity?
14. Have you attempted to make the students involved in the activities? How about their involvement? Are the methods you adopted effective or non-effective? And why?
15. Do you think the students like the activity? Why or why not?
16. Did the students encounter any special difficulties when they conducted IPA?
17. Do you think the activity succeed in student-centered?
18. Do you think you can transfer the teaching methods to other topics?
19. What did you learn from the implementation of IPA?
20. Do you think whether the activity preparation workshops once or twice a week are helpful for your implementation? If yes, in which aspects? Do you think where the activity preparation workshops need to be improved? Are there any good forms for supporting teachers' implementation of IPA?
21. Are there any differences between the integrative practical activities in this term and your former activities?

Appendix M
Teacher reflection

Lesson: _____ Title: _____ Total time: _____

A. General impression

1. What was your general impression about the lesson?

- a. useful a bit useful useless
 b. ran smoothly ran quite smoothly were some problems
 c. time allocation realistic time allocation less realistic time allocation not realistic
 d. student learned a lot student learned a bit student learned nothing
 e. I gained a lot of new experiences I gained few new experiences I gained no new experiences

B. Preparing the lesson

2. What was your total preparation time for this lesson:
 less than 15/ 15 / 30/ 45 / 60 / 90 / more than 90 – minutes.

3. Which of the activities did you carry out for the preparation of the lesson and how long did each take? (it is possible that you did this during school time or in your spare time. Take both into account).

Activity	Time
Reading relevant pages on the background information	Minutes
Collecting materials	Minutes
Preparing materials for the lesson (for example Slides, pictures, student sheet, videos etc.)	Minutes
Thinking about classroom management	Minutes
Deciding about formation of groups	Minutes
Contacting for visit out, interview	Minutes
Others, (please specify)	Minutes

4. Tick one or more of the following if you agree with them:

- The preparation was complicated
 The preparation was more complicated than my usual lessons
 The teacher guide helped me a lot with the preparation of my lesson
 Not all required materials needed for this lesson were mentioned in the teacher guide, namely (*list the ones left out*)

_____ Not all required materials needed for this lesson were easily to find, these were

_____ Instead of (*name of the material*) _____ I used
 (*name of material*) _____

Remark: _____

5. Tick one or more of the following if you agree with them:

- I would have given a completely different lesson without the teacher guide
- I have achieved more with the learners during this lesson than I do during my usual lessons
- I have achieved more with the students during this lesson than I would have without the use of the teacher guide
- I followed the teacher guide closely during the lesson
- I used the teacher guide as a general guide during my lesson
- I did not follow the teacher guide at all during my lesson

Remark:

6. Is the background information sufficient for the lesson?

- Yes No

If no, what information would you like to be added/changed

7. After reading the teacher guide, did you have clear idea how this lesson would look like?

- Yes No

If yes, was the lesson you taught different from the idea you had developed from the teacher guide before the lesson?

- Yes No

If yes, describe the difference,

8. Are there sections in the teacher guide, which were less useful?

- Yes No

If yes, which sections and why?

9. Which sections of the teacher guide did you find very useful and why?

10. Does the teacher guide provide enough and clear information for this lesson?

- Yes No

If no, what kind of information did you miss or would you like to have changed?

11. (Tick one or more of the options below) What was your role and the students' role during the lesson?

Teacher's role

- Assessor of students
- Lecturer
- Instructor
- Other, (please specify) _____
- Active participant
- Explainer
- Guider of students which difficulties

Students' role

- Active learner
- Passive learner
- Discusser
- Listener
- Group worker
- Individual worker
- Self-reliant student
- Other, (please specify) _____

12. Did anything take you by surprise during this lesson (e.g. particular problem)?

- Yes No

If yes, what was it and how did you manage it?

13. Do you feel the aims of this lesson were achieved?

- Yes No

If no, indicate which aims were not met and why not?

C. Students' participation

14. How would you describe the behavior of the students during this lesson?

- a. Active A bit active A bit passive Passive
- b. Undependent A bit undependent A bit dependent Dependent
- c. Interested A bit interested A bit uninterested uninterested

15. How would you describe the learning outcome for the students of activity "Foreign merchant in Guangzhou". I think the students who did the activity in this lesson learned

16. What changes in the set-up of this lesson could increase the participation, motivation and learning outcome of students?

D. Personal reflection

Please try to write down below your inner feelings and impressions about this whole lesson, as you would share the experience with a good friend, who is not necessarily a biology teacher. You could think of aspects like moments you felt well, forced, unhappy, disappointed or comfortable teaching. Please do not hesitate to give your opinion, be it positive or negative.

Appendix N
Student questionnaire

Dear students:

We would like to know your opinions on the inquiry learning in IPA you took part in this term. Do not discuss with other classmates when you fill in the questionnaire. What we need is your personal opinion. Your answer will help us to improve the IPA teaching in the future.

Thank you very much for your cooperation!

Personal information:

Name: _____ School: _____ Grade/Class _____ Age: _____ Gender: _____

I . Attitudes to and experiences of the activity (Please indicate the extent of your agreement with the following statements)

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. I am interested in the learning of the topic					
2. I like IPA lesson					
3. IPA is the lesson I like least					
4. I actively participate every activity					
5. I fulfill the tasks I undertake in earnest					
6. I am satisfied with the effect of the topic learning					
7. I can finish my tasks in time with high quality					
8. I feel comfortable with group activity in IPA					
9. I showed my talents that have not been exploited in the classroom situation					
10. IPA facilitate me like to study subjects I didn't like before					
11. I feel my knowledge isn't enough after participating IPA					
12. I gained in many aspects from IPA					
13. I experienced the hardships and pleasure of the activity					
14. The student worksheets are helpful for me to fulfill tasks					

II. Aspects increased after taking part in the activity (Please indicate the extent of your agreement with the following statements)

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
15. Pay close attention to the issues in society and life					
16. Handle affairs in a planned way					
17. Pay attention to reflect on the process and outcomes of the learning					
18. Ability for cooperating with others is improved					
19. Ability for communicating with others is improved					
20. Ability for collecting, analyzing and arranging information is improved					
21. Ability in oral and written expression is improved					
22. Ability of exploiting ICT in learning is improved					
23. Ability for applying knowledge comprehensively to solve practical problems is improved					
24. Struggle with difficulties and frustration					
25. Others (Please fill in):					

III. Open-ended Questions

1. Please list two activities you liked about the activity you did:

a.

Reason:

b.

Reason:

2. Please list two activities you disliked about the activity you did:

a.

Reason:

b.

Reason:

3. How was the IPA different from your former Activities?

4. Would you like to continue the topics similar to this in the future IPA? If yes, what is your next topic? If not, which aspects are you interested in?

5. Please write any other comments or suggestions for the activity.

Appendix O
Student interview schedule

General question:

What's your name?

Questions focused on the activity:

1. Of the activities you did in the integrative practical activities this term, which was your favorite and why?

2. Is there any difference between the integrative practical activities in this term and the former activities?

3. If you could have more of anything in this activity, what would that be?

4. If you could have less of anything in the activity, what would that be?

5. Do you think you actively participated in the group activities (proposal writing, information collection, studying out survey plan, investigation or interview, data process and analysis, research report writing, report presentation)? What were you involved in most? What involved least?

6. Did you discuss, collaborate and share with your group members?

7. How did your group members work together with the topic?

8. What were the main difficulties you and your group encounter in the activities?

9. Did the group members disagree with each other during the activity? If yes, how did you resolve it?

10. Did the interaction between the groups have impact on the progress of your own group? If yes, in which aspects?

11. Do you think whether the division tasks of the group at the beginning were different from the division tasks during the implementation? If yes, what are the differences?

12. How do you think the quality of your group portfolios (including research proposal, information collected, survey plan, record of investigation or interview, data process and analysis, research report)? Please illustrate their advantages? How do you improve them?
13. Do you think who contributed more to the research report writing, the group members or the lead? Did the research report represent the whole process of your group?
14. Is the activity meaningful to you? If yes, please give an example?
15. Can you think of anything new that you learned from the integrative practical activities?
16. Was the teacher good at creating comfortable classroom atmosphere for students?
17. Do you think the teacher provide you help in the activity? If yes, please specify how he/she provided? If no, why not?
18. do you think the IPA teacher encourage you to pose questions?
19. Did the teacher communicate with students and answer the questions during the activity?
20. What do you think are the regrets or unsolved problems in the activity?
21. Would you like to participate in similar activities like this?
22. Do you have any comments or suggestions which you think might be useful?

Appendix P
Portfolio Assessment

Rater:

Date:

Item	Content	Rater			
		Group 1	Group 2	Group	Group N
Research proposal	1. Objectives are explicit				
	2. Contents are concrete and integrated.				
	3. Methods are appropriate.				
	4. Research procedures are feasible.				
	5. Work division of group members is reasonable.				
Information collection	6. Information collected is rich and exact.				
	7. Information collected is representative.				
	8. Obtain information by means of books, newspapers, journals, Internet etc.				
	9. Classify information collected.				
Investigation scheme	10. Scheme is detailed.				
	11. Questions drafted are pertinent.				
	12. Making use of information collected before.				
Notes of investigation activity	13. Activity notes are true, complete and timely.				
	14. Expected objectives are realized.				
	15. Process and analyze data.				
Research report	16. Contents are credible.				
	17. Using a variety of forms of presentation (graph, picture, audio, video etc.)				
	18. Conclusions are reasonable.				
	19. Provide feasible and original suggestions.				
	20. Each member writes reflections on the activity, gains and experience.				
Sum					

Grades : 5 – very good, 4 – good, 3 – medium, 2 – poor, 1 – very poor

Appendix Q
Parent interview

1. What do you think your child learned from the integrative practical activities? In which aspects?
2. What are your suggestions for the integrative practical activities?