Implementing Curricular and Pedagogical Reforms in Chinese Schools: The Case of Collaborating Physics Teachers

by

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ABSTRACT

In 2001, China launched a large-scale educational reform encompassing curricular and pedagogical content in both elementary and secondary levels. Zhengzhou, a city in the Henan province, began to fully implement the reform in senior high schools in 2008. Consequently, the question that is critical to the reform process regarding physics, one of the science education curricula, is: What are physics teachers’ views on collaborative approaches to understanding and implementing the new curricular and pedagogical reforms in Zhengzhou senior high schools? This question was the focus of the research for this thesis. Investigating this question necessarily involved inquiring into the administrators’ perspectives on their role with regard to the teacher development.

Face-to-face interviews were conducted in three senior high schools. Thirteen physics teachers, 2 administrators and 2 students were interviewed. Some classroom observations were made before the interview. Personal reflective journals were written after everyday’s investigation. Field notes and photos were taken to record the research context.

The study indicated that teachers modified their pedagogy as a result of a collaborative process. The power hierarchy between experienced teachers and novice teachers was reduced because of the reform. The College Entrance Examination, students’ feedback, and administrative support were found to be key factors influencing successful teacher collaboration. Administrators provided and explored strategies for teacher development. Moreover, they created a supportive climate for teacher
collaboration through school based incentives for systemic change.
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DEDICATION

This thesis is dedicated to my parents. They are my role models in life and in education.
CHAPTER ONE:

Introduction

On a Wednesday morning, Zhang stepped in her office as usual. Before heading to her class, she went over her lesson plan with other physics teachers and consulted other teachers’ lesson plans. The lesson was about energy conservation and sustainability. After a brief discussion, Zhang decided to apply a new approach in her class, student debate. Although students enjoyed this lesson very much, they sometimes went a bit far from the lesson’s topic. Later in the afternoon, Zhang shared her success and concerns about her new strategy in class with other physics teachers in the weekly meeting and received feedback from the discussion. After the weekly meeting, she attended an evaluation session for a colleague’s open class. The school encouraged young teachers like Zhang to participate a session like this. This is a typical Wednesday for Zhang after the launching of the new curriculum reform. Like Zhang, other grade 10 physics teachers in No.3 Secondary School spent their Wednesday in a similar way. However, teachers from other high schools in Zhengzhou may not experience the school support as much as Zhang did.

The current Chinese curriculum reform carries out systematic changes in Chinese pre-collegiate education (Zhu & Kang, 2002). Two changes were reflected in Zhang’s day: the textbook content is closer to daily life (e.g. issues about sustainability) and the

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1 “Open class” is a class that every teacher in school could audit. Sometimes open class even open to the public. Usually there is an evaluation session afterwards, in which peer teachers and administrators could share their critiques and suggestions.
classroom is student-centered. Similar to Zhang, many teachers tried to incorporate new teaching strategies (e.g. student debate) into creating a student-center classroom and, a step further, coping with the reform trends. Inevitably, teachers were besieged by challenges, concerns, difficulties, and anxieties in the process of adopting the reform (Fullan & Miles, 1992). When teachers encountered challenges and difficulties, many of them sought help from peers (e.g. lesson plan sharing and weekly meeting). Besides, school administrators organized activities and programs to support teacher development and teacher collaboration (e.g. the open class evaluation session).

The study explored how high school physics teachers in Zhengzhou, the capital city of Henan province, use collaboration as a teacher development strategy in the context of the Chinese curriculum reform. Physics teachers’ understanding and experience of teacher collaboration were explored and elements influencing meaningful teacher collaboration were identified. Further, administrators’ role and understanding of teacher collaboration were examined in the context of teacher collaboration as a teacher development strategy.

In this chapter, the background of the study is first described. A depiction of the current Chinese curriculum reform development and its implementation in China and in Henan province were laid out. Three research questions are posed following the background information. The professional significance and a methodology overview are discussed. Limitations of the study are addressed at last.

1.1. **Background**
A brief picture of the current Chinese curriculum reform is portrayed to provide information about the context. The reform timeline and reform purposes are laid out and some reform implementation information in Henan is described.

1.1.1. Timeline of the Reform

The change of social and economic systems called for relative change in K-12 education system (Guan & Meng, 2007). The traditional K-12 education system was creating more and more conflicts with the development of economy, technology, and social structure. Thus, the eighth Chinese curriculum reform in precollegiate education was officially launched in June 2001 when the Ministry of Education issued two documents titled: Outline of Curriculum Reform of Basic Education (trial version) and Curriculum Standards of 18 Compulsory Subjects. In fact, two years earlier in 1999, the Central Committee of the Communist Party of China and the State Council jointly promulgated the Decision on the Deepening of Educational Reform and the Full Promotion of Quality Education which are considered as the propellants of the reform. In 2003, A Blue Print of Ordinary High School New Curriculum was issued, thus heralding the commencement of the reform in high school education. In 2004, the new high school curriculum was piloted in Guangdong, Shandong, Ningxia, and Hainan provinces.
The four provinces spotted in black color in figure 1.1 vary in economic status, ethnic groups, and cultures. Shandong and Ningxia located in North China while Guangdong and Hainan belong to the south China. Ningxia is the only inland province among the four with the Hui people being the predominant ethnic group whose main religion is Islam. The other three are coastal provinces inhabited by predominantly Han people. Ningxia and Hainan are underdeveloped compared to Shandong and Guangdong provinces. The four provinces provide variety and richness in terms of understanding China. In 2007, the high school new curriculum was implemented nation-wide. On April 22nd, 2008, Henan province began to implement the new high school curriculum when the Education Department of Henan Province distributed *A Blue Print of Henan's New*
Ordinary High School Curriculum. In August, most of the senior high schools started to implement the new curriculum.

The current curriculum reform in China is the eighth basic educational curriculum reform since the establishment of the People’s Republic of China in 1949. It involves changes in all subjects in the K-12 school system. The reform includes changes of curriculum goals, structure, and content; teaching and learning approaches; and assessment and administrative structures, which can be “overwhelming for educators at all levels” (Erickson, Kang, Mitchell, & Ryan, 2008, p180).

1.1.2. Aims of the Curriculum Reform

The major problems in the previous high school curriculum included 1) too much emphasis on knowledge and discipline, and 2) exam orientated education.

The previous curriculum described knowledge as absolute and objective. In other words, knowledge was viewed as something out there and had nothing to do with teachers and learners (Zhu & Kang, 2002). With this perception, the only thing students needed to do in school was to receive and store knowledge. Problems with this view of knowledge became apparent whereby teachers and textbooks became the center of the class; and learning meant memorizing and storing. Moreover, the emphasis on disciplines separated knowledge and separated school from students’ everyday life. The classroom world showed definite boundaries between subjects. The knowledge taught in school had particular definition and certainty, which went against the real world, full of complexity and uncertainty (Davis & Sumara, 2006).
The exam-oriented education has a broad influence in China. For most students, College Entrance Examination (CEE) score is the only license to post-secondary education. And for most students whose families live in poverty, majority of whom are in remote areas, the examination is their opportunity to earn a bright future. The importance of and the competition generated by the CEE have shaped Chinese education system to be exam-oriented. The problems with exam-oriented education include 1) promotion of exam-centered learning and neglect of non-examinable subjects though still very important as life subjects such as music, art, and P.E. 2) increased pressure and workload that surpassed students’ capacity, and 3) resulted in learning that was rigid and dull.

Other problems such as the nature of curriculum content, which was out of tune with the contemporary development in science and technology and centralized curriculum management that was inconsistent with local culture or situation, call for a systemic reform (Zhu & Kang, 2002).

In order to reform the exam oriented education to “education for all-around development”, the Ministry of Education set six aims for the curriculum reform:

- Changing the curriculum from focusing knowledge delivery to helping students form a positive learning attitude. Making the process of learning basic knowledge and skills become learning how to learn and forming value.
- Changing the curriculum structure from over emphasis on subject matter, too many subjects, and lacking connections to a more balanced, comprehensive, and elective curriculum structure.
• Erasing the difficult, old, partial, and redundant curriculum content, to enhancing the connections between the curriculum content and students’ life and modern technology development, caring students’ learning interests and experience, selecting content and skills that are necessary for life-long learning.

• Changing from the situation that emphasized memorization of facts and mechanical training; to encouraging students to actively attend learning, and cultivating students’ capacity of collecting and possessing information; nurturing students’ ability to analyze and solve problems, communication and cooperation.

• Changing the assessment system from focusing on discerning and selective function, to making the system facilitate students’ well-being and teachers’ improvement of their teaching practice.

• Changing the over-centralized curriculum administration, to implementing a three-level (nation, local, school) curriculum administration by enhancing the flexibility of the curriculum in order to suit the local, school, and students situations (Zhu & Kang, 2002).

Many research papers, government documents, and administrative guidelines have developed detailed suggestions and generated discussion concerning the six aims.

1.1.3. Curriculum Reform in Henan

From August 2008 to present, the Education Department of Henan Province has issued 14 guidelines and documents concerning the new curriculum in high schools. The guidelines and documents contain suggestions on teacher development programs, laboratory setting and equipment, strategies for assessment of students’ comprehensive
development (including morality, personality but not academic performance), course credit system, textbooks, pedagogical approaches, graduation exam, practice courses, elective courses, and so on. The senior high schools in Henan were mandated to use the new textbooks. In addition, experimental schools and model schools were assigned as leading schools in the reform.

1.2. Research Questions

Many researchers have argued that teachers are the key agent in the reform implementation (Fullan & Miles, 1992; Fullan & Hargreaves, 1996). How teachers, especially physics teachers, in high school adopt and adapt to the current Chinese curriculum reform and how physics teachers in particular learn from collaborative activities (if any) are subject of this study. In addition, administrators’ perspectives are worthwhile to explore because administrators played a leading role in school re-structuring and re-culturing (Fullan & Miles, 1992) which impact teacher learning and teacher collaboration. Three research questions related to high school physics teacher collaboration in the context of curriculum reform were examined in the study:

1). What are physics teachers’ experience and understanding of collaboration as a teacher learning strategy?

2). What are the factors influencing successful collaboration in the context of the reform?

3). What are administrators’ understanding and interpretation of their role with regard to curricular and pedagogical reform in the context of teacher collaboration as
a professional development strategy?

1.3. The Professional Significance

The research will help the physics teachers in the case schools improve the quality of collaborative work by identifying the factors influencing the interactions among peer teachers. Further, it will provide an important case study for policy makers, school administrators and teachers. A local case of how teachers implement the reform through group work may inspire educators and university researchers to design and initiate teacher development programs to facilitate the implementation of the reform. Teachers in other disciplines or other levels of education may gain insights from the descriptions and analysis on physics teachers’ collaborative work.

By examining the literature, the researcher found that few empirical studies inspected the status of teacher collaboration in Chinese curriculum reform. Fewer studies employed qualitative approaches. Thus, the study will provide an empirical case employing qualitative approach in the literature of teacher collaboration in China’s curriculum reforms. In addition, the context of the study will present a special case for the literature body of uncertainties in teaching and teacher education. The Chinese high school system featured the College Entrance Examination, which, in our case, is a major source of uncertainties in teacher development. However, unlike other uncertainties, teachers are too powerless to reduce the uncertainties from the CEE. How teachers deal with the situation are exhibited and discussed in the study. Moreover, the collaboration among physics teachers exhibits some uniqueness that related to the physics subject. The
current Chinese curriculum reform is a large scale reform in a top-down structure. The complexity of the reform could create various issues in teacher collaboration. The study will also provide a valuable case for research on teacher collaboration in large scale reform context.

1.4. Overview of the Methodology

The research employed a qualitative approach. One-on-one interview was the primary strategy to conduct the research. A pilot study was carried out by interviewing two physics teachers from one high school in Zhengzhou. Research questions were reframed and refined in a pilot study as a means to developing and testing interview questions. Five month later, 13 physics teachers including two physics department heads, two administrators, and two students were interviewed. The participants came from three different high schools in Zhengzhou. Meanwhile, two classroom observations were made. Personal reflective journal was written at the end of each day that during the three weeks that I spent in schools. Field notes and photos were taken during the interviews and class observations.

1.5. Limitations

The study was limited by researcher’s time and capability constraints. The study was conducted in three high schools in Zhengzhou. All the three schools are “key school” in Zhengzhou. Students from one school have the top academic achievement while the other
two schools’ students hold an up-middle academic performance. Therefore, the conditions and findings may not be relevant for schools with lower student performance in Zhengzhou in which were not part of this study. Given that Zhengzhou has 26 high schools, the outcomes of this study do not represent the general condition in the city.

The 13 teachers are from three high schools. Nine of them are from No.3 Secondary, two from No.5 Secondary and two from No.7 Secondary. The two administrators are from No.3 Secondary. Considering that there are around 20 physics teachers in each school, the conditions of No.3 Secondary were well represented while the other two schools may not be well represented. Thus, the study discussed few difference between schools. Readers should keep the limitations in mind while interpreting the results.
CHAPTER TWO:

Literature Review

The literature around teacher collaboration in reforms was examined in this chapter. Michael Fullan’s work on teacher collaboration in the reform was first reviewed. Then research on Professional Learning Community was discussed, following by the literature of uncertainties in teacher education. The reason to review uncertainties is that uncertainties have always existed in teaching and in this case were often what collaboration tried to address. Finally, literature of Chinese curriculum reforms was addressed. The literature in Chinese and in English on Chinese curriculum reforms was studied respectively.

2.1. Collaboration and Reform

In this section, Michael Fullan’s work on reform and the collaboration culture was reviewed. His three books: What’s Worth Fighting for in Your School, Change Forces: Probing the Depths of Educational Reform, and Change Forces: The Sequel, were the major literature sources. The problems of, the functions of, and the guidelines for collaboration were discussed.

Fullan (1993) pointed out that change in teaching for more effective learning requires transformation in school culture and such culture is extremely hard to change. Rosenhotlz (1991) described two different kinds of school culture: the culture of individualism and the culture of collaboration. In schools with the culture of individualism, students were often in low achievement and teachers worked alone and
rarely asked for assistance; whereas in schools with collaborative culture, teachers believed that teaching was difficult and a life-long learning profession.

However, forging a collaborative culture is never an easy task. Teaching is a lonely profession and personalities such as “competitiveness, defensiveness about critics, and a tendency to hog resources” (Fullan & Hargreaves, 1996, p5) could exacerbate isolation. Even if teachers do collaborate in schools, they could collaborate to do bad things or do nothing at all. Sometimes collaboration could become a fortress to defeat and eliminate different voices. Sometimes a culture of balkanization may be established in the process of collaboration. Balkanization refers to “teachers associate more closely with some of their colleagues than they do in the school as a whole—a culture made up of separate and sometimes competing groups, jockeying for position and supremacy” (p52).

Although teacher collaboration may entail problems and pitfalls, it was an indispensable element for school improvement. Teacher collaboration could create and maintain a conducive work environment. Student achievement could be improved by reducing the uncertainties in teaching in a collaborative culture. In such culture, teachers could develop collective confidence to respond to change, selecting and adapting those elements that will aid improvement in their own work context (Fullan & Hargreaves, 1996).

In order to achieve a collaborative culture in school, both teachers and administrators’ efforts are required. For teachers, Fullan and Hargreaves (1996) suggested a series of self-reflective strategies such as “locate, listen to and articulate your
inner voice; trust processes as well as people” (p64) as well as some actions: “seek variety and avoid balkanization; push and support principals and other administrators to develop interactive professionalism” (p64). For administrators, they also proposed guidelines for both mind and action such as “understand the culture, value your teachers; promote collaboration; connect with the wider environment” (p84). The collaborative culture will serve to promote school staff moral, political structure, and intellectual (ideas and practice) (Fullan, 1999).

The establishment of a collaborative school culture seems to function best in a bottom-up structure. In order to solve the problems in practice and address teachers’ struggles, teachers collaborate with peers to acquire ideas, gain support, and build confidence. And the collaboration, in a long run, could lead to meaningful reform. The collaboration outcomes reported in the literature were context-orientated and not necessarily wide-spread. How teacher collaboration works in the context of a top-down, large-scale reform needs to be explored. What are the similarities and differences between using collaboration to produce change and to cope with change demands additional research.

2.2. Professional Learning Community

The notion of ‘learning community’ was generated from a sociocultural and situated perspective (Borko, 2004; Levine & Marcus, 2010; Little, 2002; Putnam & Borko, 2000). Many research studies have shown that both pre-service and in-service teacher learning was enhanced by creating a learning community (Coffey, 2010; Graven, 2004). Although
research suggested that teacher collaboration and community learning affected teachers’ work and student achievement, relatively little research sought to look carefully within cases of teacher community to understand whether and how different types of teacher collaboration influenced different types of teacher learning (Levine & Marcus). Little et al. (2003) went a step further, investigating teacher learning community in different situations and for different purposes. However, more research needs to be conducted in exploring the mechanisms of various teacher learning communities.

The notion of people’s cognition and learning process have transferred from stressing on individuals’ psychological behaviour to weighting the learning context and learner’s intention (Putman & Borko, 2000). In other words, studying on individuals’ learning should take the learning situations into account. A situative perspective conceptualizes learning as “changes in participation in socially organized activities, and individuals' use of knowledge as an aspect of their participation in social practices” (Borko, 2004, p4). By using the situative conceptual framework, the understanding of teacher learning has extended to examine the group as a unit in the process of teacher professional development (Little, 2002).

Research on teacher learning communities typically explores features of professional development programs such as the establishment and maintenance of communication, as well as the collaborative interactions that occur when groups of teachers work together to examine and improve their practice (Borko, 2004). Research studies indicated that teacher learning is enhanced by more frequent and transparent
access to colleagues’ practices. In addition, teacher learning communities have helped
teachers make progress on student achievement (Levine & Marcus, 2010). Coffey (2010)
documented the experiences of pre-service educators participating in a service-learning
experience in an urban context. The research indicated that pre-service teacher learning in
a community context could bridge the gap between theory and practice. Sanders (2005)
researched a collaboration project between a US university and 3 Guatemala elementary
schools. The project focused on community based learning and aimed to raise students’
awareness of global citizenship. The results showed that students achieved very
rewarding outcomes and a sustained community was established.

Although many studies have suggested that Professional Learning Community was
an effective way for teacher and student learning, little was known about how different
models of collaboration influence teacher learning differently. Little et al. (2003)
examined several projects in which teachers worked together on student work in the
context of school reform and professional development. The study concluded that teacher
looking at student work together has the potential to enhance teacher learning, to cultivate
a professional community, and to improve student learning. A study explored how
confidence influences mathematics teacher learning in an in-service community (Graven,
2004). This paper illustrated that confidence was a central component of learning that
supported teachers to become professional mathematics educators. A cross cultural
collaborative project was launched by researchers from Australia, Canada, and China
(Erickson et al., 2008; Ryan et al., 2009). The study applied Western perspective and
strategies in Chinese classroom in the context of curriculum reform. The research outcome supported that the Western approach can be successfully applied in Chinese classroom with the consideration of local context.

Both theoretical and empirical studies on Professional Learning Communities suggested that learning was embedded in its setting and situation. Many research reported that Professional Learning Community could generate effective teacher learning. Few research paid attention to teachers’ experience in coping with the reform agenda in a community (Putnam & Borko, 2000); and when teachers work collaboratively, the interactions could either facilitate or constrain teachers’ learning as a group. What factors influence a successful teacher collaboration need to be explored.

2.3. Uncertainty in Teacher Education

Teaching profession is full of uncertainty because 1) teaching lacks of a knowledge base or technical culture. There are limited assessments for teaching method; 2) the nature of teaching centered on human relationships and involves predicting, interpreting and assessing others’ thoughts (Helsing, 2007). Learning to deal with situations of uncertainty, instability, uniqueness and value conflict is a critical part of teacher professional development (Munthe, 2003). Many researchers argued that increased uncertainties are the byproducts of curriculum reform (Friedman, 1997; Frykholm, 2004; Fullan & Miles, 1992; Ponticell, 2003) because reforms render interactions more complex, unpredictable, and difficult to monitor and manage.

Although researchers agreed that the nature of teaching is filled with uncertainties,
they disagreed on the consequences of uncertainties in teaching. According to Helsing (2007), some researchers addressed uncertainties as the causes of teacher negative psychological feeling such as depression, burn out, and guiltiness; while some researchers argued that uncertainties, if well addressed, could become motivators for applying more effective teaching strategies.

Two strategies are provided to deal with uncertainties: external improvement and internal improvement. Setting up the bureaucratic rules, regulations, policies, and procedures of typical schools and changing school culture are ways to prevent uncertainties by improving external environment (Ponticell, 2003). Teacher collaboration and teacher reflective inquiry, which aimed to decrease teachers’ bad feelings about uncertainties, are means to improve internal psychological recognitions (Helsing, 2007).

Teacher collaboration, as a common strategy to reduce uncertainties, was suggested by many researchers (Hargreaves & Tucker, 1991; Munthe, 2003; Snow-Gerono, 2005). Snow-Gerono argued that teacher collaboration could create a climate where uncertainty is viewed as appropriate to experience and address. Meanwhile, teacher collaboration served as a mechanism for the creation of knowledge about instruction. Munthe (2003) suggested that collaboration also provided teachers with means to assess their own performance, using their peers as a source of reliable feedback. Some researchers pointed out that teacher collaboration provided a context in which teachers can experiment at a low risk to themselves and to their students (Zeichner & Liston, 1987).

Friedman (1997) explained the different functions of teachers collaborate within a
cohort with regard to uncertainty: on the one hand a cohort can organize work in a way which is satisfying and provides psychological safety in situations of uncertainty. On the other hand, groups can foster collective psychological defense systems in which people attempt to control threatening realities by denial, rationalization, and external enemies. This kind of social defense, which is often perceived as solidarity of “emotional support,” can prevent teachers from confronting uncertainty and doing real work.

In the case of teacher collaboration in the Chinese curriculum reform, the major source of uncertainties in teacher development was identified and how teachers use collaboration as a strategy to address the uncertainties was discussed. The uniqueness of Chinese situation was examined. The study also addressed the strategies that have been applied to help teachers face uncertainties in the reform. Whether teachers collaboration could create a safety environment for discussing uncertainties or form a social defense system to deny the uncertainties in the context of curriculum reform and under what condition the collaboration help teachers well address uncertainties were examined in the study.

2.4. Chinese Curriculum Reform

Literature body in both English and Chinese was examined on Chinese curriculum reforms. The literature in both languages was discussed in this section respectively. English and Chinese refers to the language was used in research articles and books rather than authors’ cultural origins. There is no intention to make comparison between the “Western perspective” and the “Oriental perspective”.

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2.4.1. Literature in English

2.4.1.1. Theoretical Research

The Chinese Curriculum Reform launched in 2001 is the eighth reform since the establishment of the People’s Republic of China. Limited information was known about the first seven reforms in the literature. Hawkins (2000) examined the decentralization structures in 1985 and 1994 Chinese educational reforms. The focus was on the decentralization in finance, motivations, and curriculum at the pre-collegiate level. The decentralization in the educational system was considered to exacerbate the in-equity and exam-orientated in current pre-collegiate educational system (Dello-lacovo, 2009; Liu & Dunne, 2009), and one of the primary aims of the new curriculum reform were to reduce the influence of the exam-driven education and to encourage all-round develop education. Both Dello-lacovo’s and Liu and Dunne’s research mentioned the influence of the 1985 reform on the current reform. The decentralization structure in education, especially in finance, resulted in schools competition for funds. More than often, funding from companies, parents, and non-government institutions went to schools with the top academic performance, namely the performance in municipal, provincial, and national tests. The situation resulted in an increasingly exam-oriented education. Dello-lacovo (2009) reviewed the development of ‘Quality Education’ (also known as all-round develop education which goes against exam-oriented education) in curriculum reforms since 1985 and pointed out a series of obstacles in the implementation of ‘Quality
Education’ such as teachers’ incompetence in applying western methodology, the development of market economy.

Facing the many problems existing in Chinese education system, the Chinese central government and the Ministry of Education launched a nationwide curriculum reform in precollegiate education (Zhu & Kang, 2002). A large body of theoretical literature introduced the reform, identified challenges and proposed strategies in general. Guan and Meng (2007) systematically discussed the China’s New National Curriculum Reform (CNNCR). It covers the reform “background, origin, essence, goals, features, evolvement, schedule, implementation, the alignment in primary, secondary and middle schools’ curricula and inter-subjects, the outcomes, and challenges” (p579). Zhu (2007) focused on the courses in the new curriculum reform. The paper discussed issues related to re-examining and revising of the academic courses, adding intergraded practice activity courses, diversifying curriculum with local and school-based courses, providing elective courses in the new curriculum. Seven goals of the curriculum reform were addressed by Huang (2004) and six strategies to realize the goals were provided in his article.

2.4.1.2. Empirical Research

However, little was known with regard to the reform implementation in school level and limited empirical research was reported in English. Little researches focused on teacher development and teacher collaboration in Chinese educational reform. Liu and Dunne (2009) conducted a comparative case study in three junior high schools located in the same area in China. The research focused on two aspects, 1 the decentralization and
diversification of power, finance and resource in the new reform, 2 the transformation from test-oriented education to quality-oriented education. The results indicated that the process of decentralization and the development of a competitive educational market have left schools competing for funds. Improving student examination performance remains the priority for schools, local authorities, teachers, parents, and students. The effects of exam-driven education was magnified which contradicted to the national reform policy.

In Halstead and Zhu’s (2009) study, research was conducted in English lessons in a senior high school in Beijing. The study was focused on student autonomy, in particular on three aspects: student learning; class management and school activities; and the students’ personal value systems. Two main obstacles to the development of learner autonomy are identified: the tendency of the teacher to dominate and control the learning process (perhaps in line with traditional Chinese expectations of the teacher) and the overwhelming importance given to the College Entrance Examination. The obstacles were undermining the likelihood of further development of students’ personal autonomy in line with the recent programme of educational reform.

A cross culture research project that involves university scholars, elementary school teachers, and administrators from Australia, Canada, and China was conducted in the context of Chinese basic educational reform (Erickson et al, 2008; Ryan et al, 2009). The project aims to investigate whether Western approaches are suitable and sustainable in Chinese classrooms and for Chinese learners, whether they can be effectively applied
across cultural and geographical boundaries, and to explore the processes and products of teacher researchers operating in networks of professional learning communities. The research was conducted in a number of elementary schools in Beijing and Inner Mongolia. The results demonstrated that the adoption of Western strategies could be effective for teacher development and student learning with the consideration of local context and individual teacher’s needs. The cross culture and school-university-administration collaboration model could lead to meaningful and sustainable curriculum reform.

To sum up, many researchers tend to introduce and describe the Chinese curriculum reform in general as the reform is relatively new and China has its unique political structure and cultural background. Limited empirical research on school level was reported and fewer studies focused on teacher development and teacher learning strategies. Most research on the reform stressed the influence of exams in municipal/provincial/state level. The “exam element” is a unique factor in educational reforms in Henan due to its unreleased guidelines. Research on teacher development highlighted the collaboration across culture and between university scholars and teachers in elementary schools. Little was known with regard to collaboration among teachers and teacher collaboration in secondary schools needs to be explored. Research in this area is required and so was undertaken in this study.

2.4.2. Literature in Chinese on Teacher Development

The mandatory and nation-wide curriculum reform draws most Chinese basic educational researchers’ attentions. A large amount of literature addressed issues in
various aspects including educational leadership, transformations of school culture, teachers’ beliefs, school administration, teacher development, etc (e.g. Li & Ma, 2006; Tang & Ma, 2003; Tang & Ma, 2007; Xiao & Ma, 2009; Xie & Ma, 2007). Similar to the literature in English, empirical research on teacher development, teacher collaboration, and school based research was not prevalent (Cui & Zheng, 2008; Qi et al, 2009; Tang & Ma, 2003). Most studies on teacher development and teacher collaboration tend to pointed out problems, provided strategies, developed theories, reviewed educational theories from Western countries, and analyzed policies (e.g. Li, 2005; Liu, 2007; Wang, 2010; Yu, 2005). This section reviewed theoretical reports on teacher development, school-based research, and teacher collaboration as well as empirical studies on teacher development and teacher collaboration in the context of the new curriculum reform.

2.4.2.1. Theoretical Research on Teacher Development

The reform encompassed a wide range of changes. A large portion of changes required teachers’ adjustments and modifications such as change in pedagogy, change in teacher-student relation, and change in textbook content. Sufficient and timely teacher development became a key to the success of the reform (Zhu & Kang, 2002). Dong and Ma (2007) analyzed the features of the teacher development in the reform and proposed suggestions for future teacher development. According to Dong and Ma, teacher professional development is an evolving process and requires understandings of teacher’s learning needs, which is often overlooked by education department/bureau. Besides the suggestions for government and pre-service teacher training program, Dong and Ma
suggested in-service teachers reflecting on teaching behavior, becoming researchers on their class, and collaborating with colleagues.

2.4.2.2. School-based Teaching Research

In helping teachers become researchers, several researchers have developed a school-based teaching research approach (Li, 2005; Yu, 2005). The school-based teaching research refers to popularizing educational research by involving teachers as researchers; schools and classrooms are the research field and solving problems in teaching is the departure point. By reviewing various studies on teacher development, Li pointed out three internal and five external factors that slowed down the implement of school-based teaching research. Then Li gave three general propositions for improving the school-based teaching research: enhance systemic teacher training program, cooperate with experts from local universities, and stimulate teachers’ motivations.

Yu(2005), as a launcher and organizer of school-based teaching research, described three approaches of school-based teaching research in detail in his paper. The three approaches are 1) school-based teaching research for teaching, 2) for researching, and 3) for learning. School-based teaching research for teaching is that teachers communicate and discuss lessons. The discussion is throughout lesson preparation, lesson teaching, and reflection after the lesson. This approach aims to solve problems in practice and promote theories from daily teaching. The second approach refers to teachers study together on a research project. Compare with the first approach, the school-based teaching research for research approach is more scientific, more formal, and deeper. It is aims to cultivate
teachers’ research ability and deepen their understanding in teaching practice. The third approach, for learning, refers to teachers’ inquiry learning. This approach encourages teachers to inquire questions by reading books, searching online information, working with other people. This approach aims to enrich teachers’ knowledge in both research and in subject matter. The three approaches work together helping teachers adapt to the reform mandates. Teacher collaboration weaves in the three school-based teaching research approaches.

**2.4.2.3. Teacher Collaboration**

With the further implementation of the reform, more and more Chinese researchers recognized that teacher collaboration was an important means to promote changes and teacher advancement. The researchers reviewed the origin of collaboration, defined teacher collaboration, addressed functions of collaboration, identified the problem existing in collaboration, and proposed improving strategies (Li & Ma, 2005; Liu, 2007; Shao & Qin, 2009; Wang, 2010; Wu, 2009).

Cui and Zheng (2008) reviewed the origin of collaboration from philosophy perspective, sociology perspective, and people’s behavior respectively. Collaboration and teacher collaboration were defined by different researchers (Li & Ma, 2005; Wu, 2009). Teacher collaboration involves shared aim; teachers work in group or team, take responsibility and coordinate their actions in order to accomplish the aim. Teacher collaboration could modify teachers’ actions on different students, reduce individual teacher’s workload and increase work efficiencies, enhance teachers’ knowledge
specialties, flourish school culture, and maximize the resource utilizing (Liu, 2007; Shao & Qin, 2009).

In the context of the reform, teacher collaboration is the key to successful reform implementation and teacher development (Wang, 2010). However, problems are pointed out in the current models of teacher collaboration. The problems include that teachers do not have awareness of the purpose and nature of collaboration, school administrations limit teacher collaboration, collaboration lacks time and resource, teachers lack strategies to work with peers, and collaboration strategy is limited (Li & Ma, 2005; Liu, 2007). Li and Ma analyzed the reasons of the existing problems in collaboration; the curriculum content stresses on knowledge, the school culture discourages collaboration, teachers are not given sufficient power, and the imbalanced resource distribution. Recognizing the importance of teacher collaboration for reform implementation, researchers proposed strategies and solutions to improve the current situation. Mutual recognitions are that teacher collaboration requires support of school policies and system; teachers’ voice should be heard in school administration; the teacher collaboration needs to be re-organized and guided; and teachers should actively work with colleagues (Cui & Zheng, 2008; Li & Ma, 2005; Liu, 2007; Wang, 2010).

2.4.2.4. Empirical Research on Teacher Development

The theoretical research thoroughly analyzed many dimensions of teacher collaboration in the context of the new curriculum reform. However, as mentioned before, little empirical research was conducted on teacher development and teacher
collaboration.

The Ministry of Education (MOE) organized follow-up evaluations on reform implementation at pilot districts (Research project team, 2005). The evaluations indicated that teacher professional development was enhanced with the reform implementation. The top-down teacher professional development program structure undermined the quality of teacher development at local level. In other words, the quality of school and district programs is lower than the national and provincial level. School-based research system has become the platform for teacher collaboration. However, teachers and principals have difficulties in applying theories to practice. More specific supports were needed from experts and university scholars. The research methods and data were not disclosed in this report. Given that the research was conducted on the behalf of the MOE and the research subjects (schools, principals, educational department administrators) participated on their own initiatives, the results may be somewhat optimistic than the reality.

Tang and Ma (2003) used questionnaire to evaluate teacher professional development in 10 pilot districts around the country. The results illustrated that teachers’ beliefs were changed but the quality of teacher development program needed to be improved. The investigation was conducted from 2001 to 2004 and thus little was known with regard to the secondary level (the high school reform started from 2003). This study implicated that the collaboration between the universities and precollegiate schools was needed.
Speaking of the collaboration between post-secondary institutions and basic educations, an online platform was established for teacher collaborative lesson preparations in an elementary school with the assistance of university researchers (Qi et al., 2009). A model of knowledge sharing in teacher collaboration was developed through the study. In the study, the researchers categorized teachers’ knowledge as implicit and explicit. The process of collaboration was that individual teachers made their implicit knowledge exposed in the group, acquired the explicit knowledge, and restored as individual implicit knowledge.

As university scholars, Cui and Zheng (2008) launched a three year project aiming to study and improve teacher collaboration as a professional development strategy. In this project, researchers and the high school developed a manual for class observation, laid down guidelines for collaboration, and worked out criteria for teacher researchers. The project successfully improved teacher collaboration and further transferred school administrative structure and the school culture.

As teacher development is one of the reform mandates, they argued that greater attentions should be given to this area by researchers, educational departments, and school administrators. Researchers looked for existing theories, interpreted the theories and proposed implications. However, there are few indications that the theories and suggestions were developed from empirical research. In the limited empirical research on teacher collaboration, teachers’ understanding and experience of collaboration were often neglected. Although many researchers suggested changes in administrative structure and
school culture, school administrators’ voice was rarely heard. In addition, most research focused on elementary school level and the situations in high school need to be explored.

2.5. Summary

From a situated learning perspective, teacher learning was closely related to its context and learners’ own attitude. Many research studies have provided evidence that teachers who actively interacted with the surroundings could produce effective learning and meaningful improvement. Given the nature of teaching profession, teachers are often engaged in a state of isolation and are facing many uncertainties. Seeking help from colleagues was a helpful strategy to reduce uncertainty and build connections with their setting. However, collaboration could also result in balkanization or collective defense to change. Building a conducive collaborative community in school requires effort both from the teachers and administrators.

Teacher collaboration, Professional Learning Community, and uncertainties in teacher education are terms often associate with educational reforms. Many theoretical and empirical studies were conducted on such areas and produced satisfactory outcomes. Meanwhile, the studies also pointed out directions and needs for future research. Therefore, some of the “untouched” features in teacher collaboration, Professional Learning Community, and uncertainties in reform were explored through the research on high school physics teachers’ collaboration in the context of Chinese curriculum reform.

The Chinese curriculum reform provided a unique context for teacher collaboration. The large scale reform is in a top-down structure. Although some autonomy was
endowed to local educational departments and schools, the general reform policies and
guidelines were issued by the Ministry of Education and its affiliated universities. Thus
one key purpose of teacher collaboration was to cope with the reform trends. How
teachers work as a community to stay in line with the reform mandate was one research
focus. The research also explored factors for a successful Professional Learning
Community when coping with reform issues. The uniqueness and commonness of high
school physics teachers’ collaboration were addressed as well. In addition, the College
Entrance Examination was a major source of uncertainties in teaching. What are the
specifics of the uncertainties and how did teacher engage the uncertainties were
discussed.

The study, using an empirical approach, provides a case of teacher collaboration at
the high school level in the context of Chinese curriculum reform. The study employed a
qualitative approach, exploring the mechanism of physics teacher collaboration in the
reform. Meanwhile, administrators’ voices were heard and their understandings and
experience on structure change and teacher collaboration were demonstrated and
discussed.
CHAPTER THREE:

Methodology

This chapter illustrated the methodology of the study. It first introduced the general perspective of the study. As the research context played a critical role in the study, the research context and the participants were described following the general perspective. Then the procedures of data collection were illustrated and the data analysis was overviewed.

3.1. The General Perspective

The study employed qualitative perspective, using case study to explore teacher collaboration in the context of the current Chinese curriculum reform. From Phenomenologists’ view, human are capable to think, understand and learn. Human can abstract from their experience and make sense of their behaviors and the surroundings (Palys & Atchison, 2008). The study focused on understanding of human behaviors - how they understand their interactions with other people and how they learn from collective work. Constructivists’ view, which emphasizes the learning context and the learning process, was also adopted. The context of the study, featuring the Chinese curriculum reform, was taken into significant account.

Further, the study employed an inductive approach, using observations and interviews to explore teacher collaboration, trying to understand each situation on its own terms (Palys & Atchison, 2008). The exploratory interpretive study began with a case study in three high schools in Zhengzhou, trying to understand the collaboration among
physics teachers and allowing theories to emerge. The study also explored how the uniqueness of the reform setting, school culture, and administration structure shaped the collaboration among physics teachers. Meanwhile, teachers’ behaviors were interpreted by considering the specific reform mandate and Chinese cultural traditions such as “respect the aged and love the young” and “respect teacher and revere teachings”.

3.2. The Research Context

The context of the research included the current curriculum reform, the schools and classroom setting, some Chinese and Henan traditions, and interview setting.

3.2.1. The Chinese Curriculum Reform

As addressed in Chapter one, the Chinese curriculum reform encompassed a range of curricular and pedagogical changes. Three aspects of the reform mandates directly related to teachers: the new curriculum content, pedagogical change, and teachers’ role transform.

It is the curriculum function determines the curriculum content and the change of curriculum content means the change of teaching content (Zhu & Kang, 2002). The new curriculum aimed to nurture student growth rather than pass down subject knowledge like the pervious curriculum did. Hence, a more balanced, comprehensive and elective curriculum was generated to replace the traditional, subject-centered curriculum.

Reflecting on practice, the proportion of traditional key subjects such as Chinese, Mathematics, English, were reduce; theories and concepts were cut off whereas the experiment sections were increased; practical activities such as community service and
inquiry based study were added in the curriculum; and the connection between textbook content and daily life was enhanced (Zhu & Kang, 2002).

For physics teaching, the curriculum function became to impart physics knowledge and skills, to introduce physics research methodology, to cultivated student ability in observation, experiment, and analysis, and to recognize the world with physics eyes. Therefore, physics teachers, besides teaching physics knowledge as before, need to immerse student in a physics culture (Song, 2006). The physics textbook content helped such physics culture immersion by adding modern technology application, physics in daily life, physical scientists’ stories, physics research ideology and methodology, and inquiry based study. The newly emerged contents are challenging for both students and teachers because of the unfamiliarity. Teachers need to update their knowledge as well as their attitude to physics.

The reform also calls for teachers’ pedagogical change. As the reform ideology was influenced by constructivism, teachers are transforming from instructors to facilitators (Song, 2006). Meanwhile, the reform requires a shift from traditional teacher-centered classroom to student-centered classroom. The teachers are responsible to create environment and experience in order to facilitate student learning. The student-centered classroom does not mean simply give more time to student and let them learn on their own. Teachers need to interact and communicate with students and develop proper strategies to make the students play the leading role and ensure their learning outcomes (Zhu & Kang, 2002).
For physics teachers, the change in pedagogy includes design inquiry based study, plan more student activities, lead students to discover theories and knowledge, and let student explore physics experiment. All the requirements for pedagogical change featured student learning process, student skill training, and student all-round development (Wang & Shuai, 2008). Knowledge delivery does not dominant teaching functions any more. Teacher pedagogy needs to foster students’ ability to think, to create, to learn and the skills to experiment, to apply physics knowledge.

Last but not least, the reform encourages teachers’ role transformation. The teaching profession has extended its traditional connotation with the emergence of the reform. With the change of curriculum function and curriculum content, teachers have to expand their roles to learners, curriculum designer and researchers. Meanwhile, the student-centered classroom breaks down the power hierarchy between teachers and students.

When the curriculum aims to impart systematic knowledge to students, teachers play a role of knowledge courier: delivering the knowledge to students. Now the curriculum aims to develop all-round student and the curriculum content stresses skill building and ability nurturing. A series of subsequent changes in pedagogy and in curriculum structure then become necessary. As teachers, they first need to adapt the changes themselves then apply the changes in their practice. Hence, the learner becomes their first extended role. However, the role of learner does not limit to learn the curriculum change. As the new curriculum focus on student development, the uncertainties of teaching increased with
more attentions on students’ individuality. With the variety of students and their learning responses, unfamiliarity and uncertainties will emerge very often which require teachers to be a life-long learner.

The role of curriculum designer and researcher is a further step to implement the student-oriented curriculum. In order to develop student individuality, teachers are asked to design specific curriculum to suit to different students. Consequently, designing of curriculum requires knowledge and skills on curriculum theory and on empirical phenomenon. Therefore, the reform requires teachers to become curriculum designers and teacher researchers.

The student-orientated curriculum requires changes not only in teachers’ function but also in their attitude. The student-centered ideology and constructivism approach are reflected by teachers’ behaviors as well as their relations with students. Teachers are not staying in a high status in classroom any more. Instead, they are organizers and facilitators. Their relations with students are mutual respect and interdependent (Song, 2006). The new relations impel teachers to step down from their dignity and build an equal relation with students.

Although every aspects of the curriculum reform are finally reflected by teachers’ action and student achievement, changing in teaching content, pedagogy, and teachers’ role are the three reform mandates directly influence teachers and their practice. In order to study teacher development and teacher collaboration, the reform mandates related to teachers need to be considered.
3.2.2. **School Setting and Classroom Setting**

The study was conducted in three high schools in Zhengzhou: No.3 Secondary School, No.5 Secondary School, and No.7 Secondary School. For the purpose of confidentiality, the schools are assigned pseudonyms. The three schools are all “key schools”. Their student achievement, teaching quality, and funding are in superior positions among the 26 senior high schools in Zhengzhou. All the school facilities are well built: large playground including soccer field, basketball courts, volleyball courts, tennis courts, swimming pools, etc; school libraries with thousands of books; student residence with air conditioner; large cafeteria serving the whole school. The three schools are all boarding schools located in suburban areas of Zhengzhou. Students live on campus from Monday to Saturday and could visit home on Sunday. The three schools were located in urban area before 2003 with relatively small school size. With urbanization and the support of the municipal government, the three schools moved to suburban area and become boarding schools. Students work six days a week from 7:15am to 9:00 pm taking nine classes every work day.

The reasons for selecting the three schools are that the three schools all adopted the new curriculum from 2008, the researcher has connections with the schools and familiar with the three schools and, as Rosenholtz (1991) pointed out, collaborative activities tend to emerge in high achievement schools.

No.3 Secondary School was located at the west suburban area of Zhengzhou. It is on an area of 25 acres. The school has a 60 years history and moved to its new location in
There are around 15 classes in each grade. Each class has about 60 students. Each grade occupies a building and the three buildings are connected through corridors.

**Figure 3.1** Zhengzhou No.3 Secondary School on its 60th birthday (1949-2009)

No.5 Secondary School consists of junior high grades and senior high grades. The junior high campus located in urban area while the senior high grades stayed in suburban area, north of Zhengzhou. No.5 Secondary was established in 1950. The new suburban senior high campus is on an area of 49 acres. There are 14 classes in each grade with around 60 students in each class.
Figure 3.2 No.5 Secondary School, the play ground and the office building

Compared with No.3 and No.5 secondary schools, No.7 Secondary School is very young. It is founded in 1996. But the school grows very fast and become a key school in Zhengzhou in 10 years. Like No.5 Secondary School, the junior high department and senior high department are on different campus. The senior high campus located at the east of Zhengzhou. There are 16 classes in each grade and 60~70 students in each class.
The classroom setting in the three schools is similar. The classroom size is around 15m x 9m with chalkboards in the front and back. Students’ seats are in straight rows and columns. Usually the classroom is filled with students. Little room was left for doing activities. A classroom is usually equipped with a television, a projector, and two air conditioners. In the front chalkboard, every day course schedule is written on one side. Slogans that encourage student learning are written on the front wall.
3.2.3. Some Chinese Tradition and Henan Situation

Some Chinese traditional values and the situation of Henan province could become obstacles to teacher change. Many Chinese ancient classics value respect to teachers and many stories and fables educate children to respect teachers. The respect gradually developed to an absolute obedience to teachers. Hence, teachers hold absolute dignity when interacting with students. Likewise, senior members in a group tend to have a high status and novice members need to respect and obey to them. The respect to teachers and seniors sometimes conflict with the reform mandates. When the classroom is student-centered, teachers have to step down from the high status and help students play the leading role in class. Experienced teachers in a school need to share their dignity and experience with novice teachers in order to better adopt the new curriculum. The reform
mandates challenge teachers and seniors as well as the traditional value. Therefore, how teachers might use collaboration as a strategy to address the many reform challenges was of interest to me.

Henan province has been called the “big College Entrance Exam province” for a long time. The “big CEE province” indicated a high matriculation cut-off line in the CEE. The situation results from the conflicts between the large student population and limited admission quota. Henan has the largest population in China and thus has a large student population. Meanwhile, compare with other provinces, Henan has a small number of high quality universities. Therefore, the competitions in Henan’s CEE are very fierce. The fierce competition amplifies the influence of exam-driven education which is considered as the largest barrier for the reform.

3.2.4. Interview Setting

All the interviews happened in teachers’ office. The office settings in the three schools are similar. Physics teachers in one grade worked in the same office. The office is a large room but each teacher has a separated partition, which gives teachers some privacy while not preventing teachers communication. The interviews were conducted at teachers’ break time, sometimes before the teacher’s class, sometimes after the teacher’s class, and sometimes after the teacher’s work. By the researcher’s request, the interviews happened in teachers’ own partition when only a few teachers were in the office. The confidentiality was ensured and a safe interview environment was created.
3.3. Research Participants

The research participants are 13 physics teachers from No.3, No.5, and No.7 secondary schools, 2 administrators from No.3 Secondary School and 2 students from No.7 Secondary School. The physics teachers are in different genders, teaching experience, and teaching grade. Their teaching experience ranges from 1.5 years to more than 20 years. The researcher categorized the teachers with no more than five years as novice teacher and more than five years’ teaching experience as experienced/veteran teacher. The two administrators are the principal and the dean of teaching affair office, both male. The two students are from a same class grade 11, one male and one female.

The following table presents the interviewees’ information:
Table 3.1 Interviewees’ information (Interviewees’ and schools’ use pseudonyms)

<table>
<thead>
<tr>
<th>School Name</th>
<th>Interviewee</th>
<th>Gender</th>
<th>Grade</th>
<th>Teaching experience</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.7 Secondary School</td>
<td>Zhou</td>
<td>M</td>
<td>11</td>
<td>NA</td>
<td>Student</td>
</tr>
<tr>
<td></td>
<td>Wu</td>
<td>F</td>
<td>11</td>
<td>NA</td>
<td>Student</td>
</tr>
<tr>
<td></td>
<td>Zhao</td>
<td>M</td>
<td>10</td>
<td>More than 20 years</td>
<td>Physics department head &amp; teacher</td>
</tr>
<tr>
<td></td>
<td>Qian</td>
<td>M</td>
<td>11</td>
<td>20 years+</td>
<td>Physics teacher</td>
</tr>
<tr>
<td>No.5 Secondary School</td>
<td>Sun</td>
<td>F</td>
<td>10</td>
<td>5 years</td>
<td>Physics teacher</td>
</tr>
<tr>
<td></td>
<td>Li</td>
<td>F</td>
<td>10</td>
<td>5 years</td>
<td>Physics teacher</td>
</tr>
<tr>
<td></td>
<td>Xu</td>
<td>M</td>
<td>10</td>
<td>10 years</td>
<td>Teaching affair office dean &amp; history teacher</td>
</tr>
<tr>
<td></td>
<td>Kong</td>
<td>M</td>
<td>NA</td>
<td>NA</td>
<td>Principal</td>
</tr>
<tr>
<td></td>
<td>Zheng</td>
<td>M</td>
<td>10</td>
<td>27</td>
<td>Physics department head &amp; teacher</td>
</tr>
<tr>
<td></td>
<td>Lv</td>
<td>M</td>
<td>10</td>
<td>1.5</td>
<td>Physics teacher</td>
</tr>
<tr>
<td></td>
<td>Zhang</td>
<td>F</td>
<td>10</td>
<td>1.5</td>
<td>Physics teacher</td>
</tr>
<tr>
<td></td>
<td>He</td>
<td>F</td>
<td>10</td>
<td>2.5</td>
<td>Physics teacher</td>
</tr>
<tr>
<td></td>
<td>Chen</td>
<td>M</td>
<td>11</td>
<td>17</td>
<td>Physics teacher</td>
</tr>
<tr>
<td></td>
<td>Qin</td>
<td>F</td>
<td>11</td>
<td>4.5</td>
<td>Physics teacher</td>
</tr>
<tr>
<td></td>
<td>Wang</td>
<td>M</td>
<td>11</td>
<td>23</td>
<td>Physics teacher</td>
</tr>
<tr>
<td></td>
<td>Zhu</td>
<td>F</td>
<td>12</td>
<td>5</td>
<td>Physics teacher</td>
</tr>
<tr>
<td></td>
<td>Wei</td>
<td>M</td>
<td>12</td>
<td>22</td>
<td>Physics teacher</td>
</tr>
</tbody>
</table>

3.3.1. Description of the Participants

Zhang, a female teacher in No.3 Secondary, graduated from a normal university
(normal university is where pre-service teachers earn their degree and teacher certificate)
in 2008 and started her teaching in the same year. She teaches two classes’ of physics and is the class advisor of No.16 class. The interview was conducted at 10 pm after she checked the student dormitory. She is young and energetic, passionate about teaching and the reform. She tried different strategies in her class and seemed very proud to tell the researcher about her new approaches and the students’ reactions.

Sun came from the northeast of China and worked in Zhengzhou No.5 Secondary. It is her fifth year teaching. Like most people from northeast China, she is straightforward. Her attitude to the reform seemed negative. She complained about the reform incoherence, administration flaws, and student pre high school education. She seemed passive to the change and believed in the traditional lecture and rote memorizing pedagogy.

Zhao is the physics department head as well as a grade 11 physics teacher. With more than 20 years’ teaching experience, he was respected by other teachers. But Zhao knows his limits and talked about his limits in the interview. He is open-minded and appreciates other teachers’ merits. As the department head, he often participates in conferences and workshops organized at the district level. Thus, sometimes he views the reform beyond school teaching and learning.

Xu is the dean of teaching affair office and a history teacher as well. The dual positions helped him understand the gap between the teachers and the administrators. He worked closely with the principal and the teachers. He seems to be a quiet person who is not good at social. Surprisingly, when talking about the reform and teacher development,
he depicted a full picture of a systemic school reform. He abstracts the issues in the reform as issues in China and he compared the curriculum reform with Chinese economy reform.

3.4. Research Procedures

3.4.1. The Pilot Study

The Chinese curriculum reform was launched in 2001. However, few publications in English were related to this area. After reviewing literature in both English and Chinese, the researcher gained a general picture of the reform. In the spring of 2009, a pilot study was conducted in No.3 Secondary School. Two novice teachers, Lv and Zhang, were interviewed.

The pilot study was driven by the question: “what is going on in school with the reform implementation?” It examined general questions such as teachers’ understanding of the reform, students’ change in the reform, and how the school implements the reform and how teachers respond to the administrations. Then the issues of teacher development and teacher collaboration draw the researcher’s attention.

The pilot study indicated that working collaboratively 1) helped teachers gain in-depth understanding of the new curriculum, 2) assisted teachers to modify their teaching strategies to suit both the school situation and the new curriculum requirements, 3) enhanced the communication within the school community by reducing the hierarchy between novice and experienced teachers, and 4) played a complementary role for the
formal teacher development program.

However, the sample size of the pilot study, which was two novice physics teachers limited the reliability and generalizability of the claims. The veteran teachers and administrators’ perspectives need to be examined. Therefore, the thesis research broadened the scope of the exploratory veteran teachers and administrators’ views on teacher collaboration and professional development.

3.4.2. Getting to Know the Participants

In the winter between 2009 and 2010, the study was carried out in three schools with novice and veteran teachers, administrators, and students. Qualitative researchers believe that understanding people’s perceptions requires getting close to research participants (Miles & Huberman, 1994; Palys & Atchison, 2008). One important reason for choosing the three schools is because the researcher has connections with the schools. The researcher is a former student of No.3 Secondary School. He used to be immersed in the school culture and tradition. The researcher interviewed his former physics teachers and was introduced to other physics teachers. For No.5 and No.7 secondary schools, the researcher was introduced by school teachers/staff to the interviewees. The school teachers/staff were friends of the researchers’ relatives.

The researcher then used both formal and informal introductions to identify himself, stated the purpose of the study, laid out the participants’ right and went through the research procedures with the interviewees. Meanwhile, the confidentiality of the study was clearly described and interviewees’ questions and concerns were addressed. Through
the introduction, the researcher tried to establish trustiness with the participants and to create a safe atmosphere in which interviewees feel comfortable to state their opinions.

3.4.3. Asking Questions

A semi-structured interview question outline was developed before the interview. The order and the way the questions were asked changed based upon how the information emerged as well as contextual factors. Generally, the interviews were led by a few demographic questions enquiring participants’ general information. Then open-ended questions on teacher collaboration and teacher development were examined, following up with successively narrower, more well-defined structured questions. The interview questions were highly contextual in nature. For some teachers, one aspect of collaboration might be discussed for ten minutes while other teachers might use a single word. The questions aimed to explore teachers’ honest ideas on teacher collaboration and teacher development.

3.4.4. Getting to Know the Context

The strategies of knowing the research context include policy document analysis, literature review, personal reflective journal, and photographs. As mentioned before, the context of the study consists of the curriculum reform mandates, school and classroom setting, school administrative structure, and interview settings. By analyzing the reform policy and reform literature, the reform mandates related to the study were laid out. The researcher spent around ten days in each school, getting to know the school setting, classroom setting as well as the administrative structures. School activities, interview
settings, and interesting stories were recorded in the researcher’s personal reflective journal, field notes and pictures.

Class observations and student interviews were made to confirm teachers’ claims in the interviews. Teachers’ actions in class were examined and compared with their words. However, several class observations may not be sufficient to make claims on teachers’ practice. Student interviews were made to collect more information on teachers’ actions and their interpretation of the reform.

3.5. Data Analysis

All the interviews were audio recorded and transcribed. Along with the classroom observation field notes, interview field notes, personal reflective journal, and photographs, the research data were sifted, compared, and contrasted. Meanwhile, unique perspectives and actions were explored. The process aimed to look for themes and patterns that occurred repeatedly. Then the initial themes were tested by more detailed sifting through data sets. The themes were categorized into each research question.

Because of the participants’ distribution in the three schools, few comparisons across schools were made. The situations in the three schools were analyzed as one case. However, comparisons were made within the case. Participants were categorized by their roles such as teachers and administrators, novice teachers and experienced teachers. Their claims were compared and analyzed. The role-ordered analysis aimed to show how people in different roles view the same issue (Miles & Huberman, 1994). Finally, the themes of each research question were presented with detailed analysis in chapter 4.
3.6. Summary

The case study in three high schools in Zhengzhou adopted a qualitative approach, using interview, observation, and policy document analysis to explore the pros and cons of teacher collaboration as a teacher learning strategy in the context of curriculum reform. The inductive study adopted constructivist perspective which emphasizes the context and process of learning. The study explored teacher learning by considering the teachers’ interaction with peers, the reform mandate, Chinese traditional value, local situation, and school administrations.

This chapter depicted the research context and the research participants. Selected individuals were highlighted. Then the procedures of the study were laid out. The chapter ended with a description of the data analysis process and the research findings were analyzed and discussed in the next chapter.
CHAPTER FOUR:

Analysis, Results and Discussion

The study reported in this chapter examined in detail physics teachers’ and administrators’ experience and understanding of teacher collaboration as a teacher learning and professional development strategy. This chapter is organized around the three research questions stated in Chapter One. Question one is addressed by analyzing, interpreting, and discussing data on the teachers’ experience and understanding of the role of teacher collaboration as a professional development strategy; In a similar way question two is addressed by analyzing, interpreting, and discussing data on the factors influencing successful teacher collaboration in the context of implementing the new Chinese curricular and pedagogical reform in physics; lastly, question three is addressed following a structure similar to question one and two by analyzing, interpreting and discussing data on school administrators’ understanding and interpretation of their role with regard to curricular and pedagogical reform in the context of teacher collaboration as a professional development strategy.

The data presented in this chapter includes transcripts of one-on-one interviews with 13 physics teachers and 2 administrators, three class observations, my personal reflective journal, photographs and field notes. As stated in Chapter 3, the teachers including two department heads were from three schools teaching grade 10, grade 11 and grade 12. One class observation was in grade 10 and the other two were in grade 11. Follow-up interviews with the teachers were conducted after each lesson. The observations were
meant to corroborate what was claimed in the interview and classroom practice by the teachers. My reflections in the personal reflective journal were written at the end of each day during the three weeks that I conducted the study. The reflections were about what I observed, heard and thought about regarding the teachers’ participation in curricular and pedagogical reform process. School and classroom settings were photographed. Field notes were taken during the interviews and class observations.

The data analysis process for each question included sifting through and across data sets in search for themes, patterns and any contrasting or unique perspectives or actions. This was aimed at looking for themes that occurred repeatedly. Initial themes were further tested by more detail sifting through the data sets. This resulted in several themes that were compared and contrasted until they appeared stable.

Question one: what are teachers’ experience and understanding of collaboration as a teacher learning strategy?

Although there were several themes that emerged during data analysis aimed at addressing question one. Two key themes that relate to teachers’ experience and understanding of the role of teacher collaboration as a professional development strategy emerged and appeared to encompass many of the other themes:

1. Teacher collaboration as a unique forum for pedagogy and content discussion as well as complementary to government reform training programs;

2. Teacher collaboration as a positive product of government mandated reforms that has reduced the gap between novice and experienced collaborating teachers.
Question two: what are the factors influencing successful collaboration in the context of the reform?

A similar process of data analysis revealed three major factors influencing successful teacher collaborations in the context of implementing the new curricular and pedagogical reform in physics:

1. The uncertainty of the College Entrance Examination as an important factor influencing apparently successful teacher collaboration in the context of the ongoing curricular and pedagogical reforms.
2. Teachers’ desire to improve student performance motivated them into collaboration;
3. Administrative support for teacher collaboration and the mandates of educational reform.

Question three: what are administrators’ understanding and interpretation of their role with regard to curricular and pedagogical reform in the context of teacher collaboration as a professional development strategy?

Analysis of data for this question revealed two key themes regarding the administrators’ understanding and interpretation of their role with regard to curricular and pedagogical reform in the context of teacher collaboration as a professional development strategy:

1. Exploring and providing ways and strategies that support teacher professional development.
2. Creating supportive climate for teacher collaboration through school based incentives.
for systemic change.

The themes presented for each research question above will be illustrated and discussed in the order they appear above. Each of the themes will be illustrated by select and representative excerpts and discussed with reference to the literature reviewed in chapter 2.

4.1. What Are Teachers’ Experience and Understanding of Collaboration as a Teacher Learning Strategy

4.1.1. Teacher Collaboration as Complementary to Government Reform Training Programs As Well As a Unique Forum for Pedagogy and Content Discussion.

4.1.1.1. Government Organized Teacher Development Program

Henan province fully implemented the new high school curriculum from the fall of 2008 when adoption of the new Grade 10 curriculum began. In the summer of 2008, the provincial and municipal departments launched a five year teacher professional development program, aiming to help teachers adopt the new curriculum. It is mandatory for teachers to participate in the program. The educational departments assume that teachers teach from grade 10 to grade 12 in a cycle, hence the five year program ensures every current in-service teacher receive at least one cycle of training from grade 10 to grade 12. (see Table 4.1)
Table 4.1 Teacher development program training cycle

<table>
<thead>
<tr>
<th>Year</th>
<th>If program provided in</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 10</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 11</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 12</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Teachers are organized by disciplines and school district. For example, in 2008, grade 10 physics teachers in Zhongyuan District (one of the five districts in Zhengzhou) attended training programs together. They went to No.3 Secondary School for the program training and all the English teachers in this district went to International Studies Secondary School. The teacher development program addressed three major themes: 1) the differences in content between the new and previous curriculum, 2) the ideology behind the new curriculum, and 3) pedagogical suggestions. The program lasts for 10 days.

Three or four follow-up training sessions are arranged for every discipline during each term. The follow-up sessions are organized based on the development of the reform and teachers’ feedback of their practice in the previous sessions. For the follow-up sessions that I observed, there is no uniformity. Sometimes it was a panel discussion facilitated by reform authorities, textbook editors, university researchers or scholars. Other times it was through online lectures given by reform experts. Typically, during the follow-up training sessions, guidelines and policies that were released from the
government were reported and interpreted including clarification of the new curriculum standard. And at the same time there were attempts made to address problems that the teachers had encountered previously as they continued to implement the reform.

4.1.1.2. The Teacher Development Program’s Role

Among the 13 physics teachers in the schools that took part in my study, 10 participated at least once in the teacher professional development program. Most participants deemed the program somewhat helpful and a small number of teachers gave negative feedback on their training experience.

The teachers gave similar reasons for why the program was not being very helpful. The program weighted more on theories and neglected practice. The content of the program involved justifying and differentiating the new curriculum from the previous ones. It informed the teachers what the new curriculum is about, why they need to adopt it but failed to show them how to interpret and apply it. In other words, teachers knew their destination but did not have maps and vehicles. Therefore, teachers were uncertain about what they were supposed to do in their teaching practice. For example, the reform proposed a shift from traditional teacher-centered classroom to student-centered classroom. Teachers were aware that students should play the leading role in class but they seemed to lack the necessary skills to facilitate student-centered learning by granting the responsibility of learning to the students. In one of the lessons that I watched (grade 11), the teacher, Qian, was lecturing in the first 25 minutes and left the last 15 minutes for students as free time. The lesson was about sensors. In the first 25 minutes, he described
different kind of sensors in daily life, explained the mechanisms, and introduced the concept of “The Curie Temperature”, as well as wrote notes on the chalkboard (see Figure 4.1). In my view, this was a typical teacher-centered classroom. In the last 15 minutes, he gave the time to students to read the textbook, finish the practice exercise, and engage in free discussions without any clear guidance. He sat in front of the classroom and answered questions from individual students.

**Figure 4.1** Qian’s Grade 11 physics lesson

In the follow-up interview, Qian explained his pedagogy for the new curriculum:

R: What did the teacher development program offer you? In what ways was it helpful?

Qian: It tried to change your concept… You cannot lecture through the entire class. It (the
class) should contain student activities, student discussions, student participations, and student experiments. Stuff like that.

R: Did it offer you detailed instruction for how to contain…

Qian: It did not give you mandatory guidelines, just based on the situation, some questions students could inquire for themselves; they could draw conclusions.

It is obvious that Qian considered giving more class time to students as a change from teacher-centered to student-centered. Students could acquire knowledge and skills independently in class. The class reflected his understanding of student-centered classroom. However, he seemed short of methods to facilitate student-centered learning.

Sun and Li, two grade 10 teachers from No.5 Secondary claimed “they’ve learnt nothing from the program” because “it did not tell you what mode to use in teaching the new curriculum”. However, they emphasized that “we were individual cases, the program probably worked for most teachers; it’s just not working for us”.

Some teachers were aware that a 10-day training cannot cover every aspect of the new curriculum. With a lower expectation, it was understandable for them that the program aimed to shift their concepts about curriculum rather than modify their pedagogy. The teachers felt responsible for seeking the pedagogies that suite the reform. Although the program did provide pedagogical references and suggestions, most of them were drawn from pilot provinces, which, in many cases, did not fit well with the situations in individual teacher’s classrooms.
One teacher, Zhang, from No.3 school, said that the program was initially not helpful for her but had potential impact in the long term.

At the beginning of my teaching practice, I felt what I had learned from the program was not very helpful. Because it did not tell you much about actual teaching practice, sometimes the instructor showed you some videos and lesson plans of open classes in pilot provinces. You had an impression, but not very deep. After one year’s teaching, you gradually felt the program was useful. You confronted many obstacles in teaching physics conceptions and experiments when using the traditional teaching method. Especially physics conceptions, it’s abstract and students simply didn’t get it. Then what I have learned from the program emerged, such as using examples in daily life to elicit the conception, allowing students to describe the conception first and comparing to the description in the textbook. And students gained much deeper understandings.

It seems that the training program is to shift the teacher’s conception of about the new curriculum has its long term effect. However, Zhao, an experienced teacher believed that the changing in concept and pedagogy was easier for younger teachers. Experienced teachers were used to the traditional class format and reluctant to change.

Speaking about the follow-up training sessions, most teachers stated that it was good to hear experts’ perspectives and interpretation of the curriculum and textbooks. Their explanation and clarification of the curriculum standard benefited quite a few teachers.
Information on students’ learning habit, psychological state, and the process of adapting to high school life helped the teachers to improve their teaching and student-teacher relations. However, teachers were neither positive nor negative about the authorities and experts’ suggestions on pedagogical and classroom management strategies. As Zhao stated, “they (experts) have their expectations, but they are from their perspectives. You still need to consider your own students’ conditions. For example, students from No.3 Secondary, students from our school and students from No. 8 Secondary, are different for sure. Hence you cannot use the same strategy and achieve the same expectations.”

In general, the teacher professional development program from the educational department plays a role of introducing the new curriculum reform to teachers. It informs teachers, a crucial agent for a successful reform (Fullan & Miles, 1992), the reform background, purpose, origin, essence and how it differs from the previous ones. The program aims to transform the teachers’ conception of curriculum as well as shift their cognition of teaching and learning. Although it required a long time for teachers to assimilate the new structure, some teachers did gain insights from the program and coped with teaching. Due to the limitation of time and the complexity of situations that individual teachers were engaging in, the suggestions on pedagogical changes the teachers received were narrow/shallow and infeasible. The teachers experienced difficulties and confusion in applying contemporary teaching methods suggested in the new curriculum.

4.1.1.3. Teacher Collaboration in Schools
Collaboration refers to a process that ideally leads to convergence of meaning for conversations, concepts, and experiences (Roschelle, 1992). Palincsar and Herrenkohl (2002) suggest two necessary conditions for advancing collaboration: “the thinking is distributed among the members of the group. All members of the group work on the same aspect the problem at the same time, sharing cognitive responsibility for the task at hand; group members are encouraged to share their thinking as they work together” (p26). There are two major forms of physics teacher collaboration in the three high schools in Zhengzhou, teacher weekly meeting and peer discussion.

Physics teacher weekly meetings are held every Wednesday afternoon. It is required by the municipal educational department but the school has the autonomy on deciding the content and format of the meeting. The three schools in this study all apply this strategy in the context of the curriculum reform. The meeting is usually held by teachers within one discipline. The department head organizes and chairs the meetings. Although the procedures for the meetings vary from one school to another, all meetings have a time slot for group discussion, which is the key to promoting collaboration.

In No.7 Secondary School, the weekly meetings consist of two sessions. Each session has a theme. The first session is in the fall term, focusing on interpreting the Full Time Ordinary High School Curriculum Standard (Ministry of Education of the People’s Republic of China [MOE], 2002), whereas the second session is in the spring term, in which every teacher in turn teaches an “open class” (Erickson, et al, 2008) based on his/her understanding of the curriculum standard. The “open class” was followed by a
period of debriefing. The teacher listened to other teachers’ comments and feedback. The teachers themselves split into discussion groups according the grades they taught. The format of the weekly meeting was decided by the school administrators. Other than that, the meeting time is also devoted to discuss issues that are common or repeatedly appear in their everyday teaching.

The format of the weekly meetings in No.5 Secondary School seems a bit loose in structure than the other two schools. Besides the meeting’s routine, which involves summarizing the preceding week’s teaching affairs, checking teaching progress, and making plans for the coming week, most of the time the meeting is dominated by group discussions. Sometimes the discussions are held among one “teaching team” which refers to all teachers in one subject. Sometimes a group could be teachers in one grade. The group size depends on what kind of topic is discussed. The discussion topic is generated from everyday teaching covering a wide range of issues including curriculum design, pedagogy, lesson planning, concept clarification, etc. The meeting normally lasts two class periods (80 minutes).

The weekly meeting format of No.3 Secondary School is structured in two parts. The themes of the first period are around the new curriculum. It could be a group interpretation of the curriculum reform guidelines. It could be a group learning of a reform article. It also could be an in-depth discussion of reform ideology. The first part is usually organized and facilitated by the department head, Zheng. He organizes teachers to learn and discuss the new curriculum. In the second part, physics teachers form
sub-groups by grades. The teaching plans and progress for the next week are decided first. Then, within each group, one or two teachers present a “lesson talk”. Different from the “open class”, “lesson talk” is informal and takes less time. It is not teaching a lesson but talking about how the lesson will be taught. The teacher talks in detail about how he/she will teach the lessons in next week, including how he/she will introduce the concepts, how she/he will explain and interpret the concepts, what kind of teaching method and technology she/he will apply, what examples, graphics, and questions she/he will use to help students understand the concept. There are no students involved in the “lesson talk”. The group members share their comments, thoughts, and even critiques after the “lesson talk”. The second part is also used for addressing the problems that teachers encountered during the previous week of teaching including class management, student-teacher relations, homework marking, student learning attitude, etc. Any teacher can pose questions to the group for discussion.

Peer discussion often happens in room/office in informal ways. Physics teachers in one grade are assigned the same room with mathematics and other science subjects. The office setting in No.3 and No.7 Secondary School is a large room with cubicles for each teacher. No cubicle is in No.5 Secondary School physics teacher’s office. The office setting provides an environment for starting a conversation and sharing ideas. During the interview, I witnessed several peer discussions. For example, in No.5 Secondary, one teacher was marking student tests in the office. She was not sure about a concept in the test. So she checked with the teacher next to her who was also marking the test. They
started to discuss the concept. A third teacher overheard the conversation and joined the discussion because he seemed to know the answer but was not completely sure. They agreed on the answer within a very short time.

**4.1.1.4. Teacher Collaboration’s Role**

The teacher collaboration provided a unique forum for pedagogy and content discussions. When the question: “what do you do when questions/difficulties come up in everyday practice?” All participants mentioned that they sought help from peers/colleagues. Five teachers stated that the weekly meeting was their channel to address issues. Four teachers used the internet to solve their problems. The peer discussion is most teachers’ first choice when facing difficulties in teaching. Only one teacher considered internet as his priority. Among the five teachers who use the weekly meetings as a way to seek help, one teacher thought the weekly meeting is part of the peer discussion; the other four teachers pointed out that they only raise issues in the weekly meeting when the problems/difficulties were common among a number of colleagues.

The most often addressed issues and difficulties were regarding pedagogy and curricular content. The reform guidelines place emphasis on a new teacher-student relation, where the teacher should change from an instructor to a facilitator. A class should become a place for student inquiry. Moreover, the classroom should shift from the traditional teacher-centered environment to student-centered environment. With regard to curriculum, the teacher should become a curriculum researcher. In the process of teaching,
a teacher should become a curriculum builder and curriculum creator (Zhu & Kang, 2002; Zhu, 2008; Song, 2006; Jin, 2003; Wang & Shuai, 2008). The reform mandates challenge a teacher traditional pedagogy and understanding of the curriculum. New standards were set for teachers. However, in order to implement the reform, teachers need to explore new pedagogy and develop their own interpretation of the curricular content. Therefore, the teacher collaboration provides them a forum for adapting to these changes, especially in shaping their pedagogy and interpreting the curricular content.

4.1.1.4.1. Shaping Pedagogy

Pedagogy is a primary topic in teacher collaboration. Zhao and Zheng, the physics department head of No.3 Secondary and the department head of No.7 Secondary shared the view that teacher collaboration is a major resource for teachers’ pedagogical development in the reform.

R: So you mean the collaboration has its vital force.

Zhao: Yes. Teachers have to step down from the dais in class. It is the reform mandate.

Teachers need to shift their beliefs, but how to shift; we lack the detailed guidance from the officials. We have to figure out the concrete actions through group work.

R: Mr. Zheng, as a department head, how do you help teacher better employ the new curriculum?

Zheng: In the weekly meeting, I lead teachers to learn the reform and to discuss the reform.
Teachers gradually change their class mode in such discussions based on the principle that students are the center of the class; inquiry is the key method to meet the requirement.

Besides the department heads, seven teachers pointed out that teacher collaboration aided them to improve their pedagogy. According to the interviewees, teacher collaboration provided an opportunity to establish a type of collective intelligence, which in turn nurtured individual advancement.

R: do you apply the pedagogical suggestions came out from the discussion?

He: Yes. I feel it is helpful

R: how helpful were the suggestions for your teaching practice based on students’ feedback?

He: It was helpful. After all, you are on your own when you do “lesson talk”; sometimes individual’s idea was not necessarily the best. It sparks; it also has defects. But when every teacher could air his/her opinions, all sparks could be collected in this way and I think the lesson will become more wonderful.

R: How helpful was the discussions?

Li: It is very necessary, though some knowledge points you could teach it only rely on your own ability, but the effect may not be satisfactory. You could learn from others’ method. A group of people communicate and discuss the issues. Someone who has gained very satisfactory results could share the story in the group.
Noticing the advantages of collective work, in No.3 Secondary, grade 10 physics teachers systematized a regularized peer discussion. A “group lesson preparation” format was developed during peer discussions. As described by Zhang:

The group lesson preparation is not a routine. After generating the lesson plan, usually days before the class, teachers read each other’s lesson plan. Sometimes I was like ‘aha, his introduction was better, mine was rigid. Students couldn’t be interested in this topic if I did introduction in this way.’ Then we talked about the introduction and gave advices to each other. Sometimes someone didn’t know how to teach a concept. Then the issue was discussed within the group. Sometimes we discussed the proper teaching method for the lesson. For example, before the energy conservation chapter, we discussed the method that should be used in the lesson. We all agreed that this chapter was not suitable for traditional teaching method since energy conservation was more like humanities: no formula, and no calculation. Some teachers suggested using PowerPoint as a teaching tool. I organized my students in two groups, boys and girls, and held a competition: giving examples in daily life about energy conservation. Then one girl raised a question: she read from a book that someone invented a perpetual motion machine and she couldn’t find any flaws in this machine. In the process of seeking for the answer, the whole class discussed why energy conservation law is true and why perpetual motion machine cannot be made. This class was a success because students were so involved in this topic and I videotaped it!
The group lesson preparation systematically transformed the teachers’ pedagogy and spurred collective intelligence. The teachers actively participated in this collaboration as they were often inspired by the group knowledge and wisdom before the class. Their confidence was strengthened and supported by the group. After the class, the teachers shared the results among group members including what worked well and what did not. The group intelligence was improved and further developed in this way. This process was evolutionary as it enhanced teachers’ development of corresponding pedagogy consistent with requirement of the new curriculum and thus contributed to individual teacher growth in professional practice.

4.1.1.4.2. Interpreting the Curricular Content

Another role the teacher collaboration played was to clarify new curricular content. Among the many changes on textbooks, a key one is that of using The Full Time Ordinary High School Physics Curriculum Standard [Curriculum Standard] (MOE, 2002) replaced The Full Time Ordinary High School Physics Teaching Programme [Teaching Programme] (MOE, 2000). Also, both of them were issued by the Ministry of Education. Both of them listed general requirements for the curricular content.

In the former curriculum, there is only one version of textbook. The Teaching Programme, simply put, is an interpretation and guidance of the textbook. It contained requirements of high school physics knowledge and concepts. After years of development and shaping from the tests, the Teaching Programme had detailed interpretation and was
well received among teachers. In turn, tests, exercise books, teacher’s lesson plans were generated based on the Teaching Programme. The Teaching Programme interpretations laid out what should be taught and how deep it should be taught. Teachers followed the instruction and made sure students’ learning outcomes met the Teaching Programme requirement. Tests in all levels also referred to the Teaching Programme. Knowledge outside the Teaching Programme or deeper than the requirement was considered by the teachers to be a flaw of the test developers.

On the other hand, the Curriculum Standard is a standard for publishing textbooks (Zhu & Kang, 2002). Currently, there are four versions of physics textbooks issued by different educational institutes. They are all written based on the Curriculum Standard. In other words, in the new curriculum, textbooks are interpretations of the Curriculum Standard. Meanwhile, teachers could develop their own interpretations. They have the autonomy to decide the content arrangement and to choose the presentational experiment. In addition, the interpretation of the Curriculum Standard was initially done by individual teachers. No common understandings and detailed interpretation were shared. So far, there is no national or provincial level exams that are based on the Curriculum Standard in Henan. Therefore, most teachers were uncertain about the curricular content. Detailed interpretations and instructions of the Curriculum Standard were in high demand. Some teachers even revisited the Teaching Programme, which in turn did not make things better. The table 4.2 is a comparison of The Teaching Programme’s and The Curriculum Standard’s requirements/descriptions on Mechanical Energy.
Table 4.2 The Teaching Programme’s and The Curriculum Standard’s requirement on Mechanical Energy

<table>
<thead>
<tr>
<th>Section title</th>
<th>The Teaching Programme</th>
<th>The Curriculum Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Content &amp; Requirement:</td>
<td>Content Standard:</td>
</tr>
<tr>
<td></td>
<td>Work (B) Power (A) Kinetic energy (A) Kinetic energy law (B) Gravitational potential energy (B) Relations between gravitation work and change of gravitational energy (B) Elastic potential energy (A) Mechanical energy conservation law (B) *Bernoulli equation</td>
<td>1. Use examples to illustrate that work is the measurement of energy change. Understand work and power. Pay attention to the mechanical power in daily life, know its meaning.</td>
</tr>
<tr>
<td></td>
<td>(A level: Low request level. The knowledge content is not suitable in the high school stage, or had already made a more detailed discussion in the junior middle school stage. B level: High request level. *content is the elective content) (MOE, 2000)</td>
<td>2. Inquire the relation between constant force work and change of object’s kinetic energy through experiments. Understand kinetic energy and kinetic energy law. Use kinetic energy law explain phenomenon in daily life.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Understand gravitational potential energy. Know the relation between gravitation work and change of gravitational energy.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Validate mechanical energy conservation law through experiment. Understand mechanical energy conservation law. Use mechanical energy conservation law to analyze problems in daily life.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Know that there are many kinds of energy in nature. Know energy conservation is one of the most fundamental and most well recognized laws.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Recognize the importance of energy</td>
</tr>
</tbody>
</table>
efficiency through energy conservation and the directional feature of energy transform and transfer. Know the relations of energy, human survival, and the development of society. Know the importance of sustainability. (MOE, 2002)

During the interview, the teachers expressed various concerns about curricular content with regard to their own interpretation of the Curriculum Standard. A large proportion of the teachers indicated that the new curriculum was overloaded with content. Given that the new curricular content emphasizes the relation between scientific knowledge and daily life, it covered a larger sphere than the previous curricular content. Moreover, since the Curriculum Standard is a set of requirements of knowledge of concepts (Zhu & Kang, 2002), most teachers still refer to the Teaching Programme in their practice. In other words, the amount of content is excessive while the depth still stays the same.

He: …Compare with the previous curriculum, the content is broader. Some knowledge doesn’t appear in the previous curriculum but shows up in the new one.

R: so you feel the content become more?

He: I feel it become more…

R: How about depth?

He: According to the exercise, it is pretty much the same.
Qin: I feel we don’t have enough class hours for the curricular content. The suggested class hour from the MOE is 2-3 class hours/week, but now we have five classes and still feel the time is insufficient. Then I wonder why 5 classes a week still are not enough. Maybe the MOE does not want students to learn that much and that deep. But from teachers’ perspective, we are afraid that the College Entrance Examination, we don’t know what it is going to be, and the CEE guideline has not been released. So we refer to the Teaching Programme in the old curriculum, just in case.

Such concerns were confirmed by students as expressed by Zhou, a No.7 Secondary School student who also participated in physics Olympiad contest. He observed that many concepts which should be taught at the university level appeared in high school textbooks. This is supposedly aimed at extending students’ views as well as raising their interest in learning. However, such “extracurricular content” became overtime work. He and lots of his peers experienced difficulties and burden learning such concepts. Another student, Wu, complained about their heavy workload,

R: How do you feel about the new curriculum?

Wu: It aims to reduce our workload, but it goes to the opposite direction in implementation.

R: So you feel tired?

Wu: Tired. I’ve never learnt two textbooks in one term before.
Other concerns included the lack of connections between subjects, the imbalance of the workload between grade 10 and grade 11, and that the differentiation of compulsory and elective courses fragmented the knowledge system. Li claimed that the gap between math and physics creates difficulties in teaching and learning and such claim was also observed in class. In Zheng’s class, he tried to explain different methods for solving one problem about Newton’s Second Law. The method required knowledge of transformation of trigonometric functions. The students had not acquired such knowledge in mathematics, which kept Zheng from going in detail about this method.

Most grade 11 teachers reported that the curricular content for grade 11 was too densely scheduled and grade 10 content was relatively loose in terms of student learning burden. Three causes of the imbalance were identified by teachers: 1). the elective physics section was added in grade 11. Students need to learn both compulsory and elective sections, which are covered in two separate books; 2). the graduation exam “consumes” both teachers’ and students’ time and energy. The new graduation exam is held at the end of grade 11 fall term. The new exam covers all the subjects taught in high school. The provincial educational department declared that the results of the new graduation exams will be a reference for admission into post-secondary institutions (The Education Department of Henan Province, 2008). In other words, in the old graduation exams, students could successfully graduate from high school as long as they passed the exams, but now they must do their best in the new exams in order to go to a
post-secondary institute. Therefore, both students and teachers spend a large amount of time in reviewing their work. Some subjects such as History and Geography are completed in grade 10, because of the exam, students have to select them. 3). the College Entrance Examination is expected to raises the minimum for entry to the institutes. Although the guideline for the reformed CEE have not been released, one thing is certain, CEE is still the most important criterion for entry into post-secondary education. Therefore, teachers are not bold enough to fully implement the new curriculum and appear to struggle and hover in-between the old and new curriculum. As Chen stated:

The content seems less than before, but if the CEE did not reform as the textbook did, I think, the content is actually more than before, because we follow the previous curriculum’s requirement and depth. In addition, it (grade 11) is the first grade using the new textbook. We feel if we only follow the new textbook and don’t refer to the old textbook at all, students may suffer losses in the CEE. It is just difficult to well deal with both the new curriculum and the CEE. It is tough, and so confusing.

Apparently, one of the aims of the reform is to reduce students’ workload.

Facing the complex situation and immature curricular content, collaboration became the strategy to address uncertainty. Both individual teachers and their school sought help from group working. Individual teachers shared their interpretation of the Curriculum Standard by developing a common understanding. The department head brought such
interpretation to the meeting of department heads and the interpretation was negotiated in a district meeting. Zhao, as the department head of No.7 Secondary, wished he could convey the teachers’ common voice to decision makers in this way. At the school level, the collaboration reduced the risks of individual misinterpretation and received support from the school. No.7 Secondary organized their weekly meetings to focus on the interpretation of the Curriculum Standard. Individual’s opinions were shaped, developed, and shared in a group and collective intelligence was promoted. In addition, novice teachers stated that their understandings of the content rested in teacher collaboration. Among the six novice teachers whose teaching experience was less than six years, four of them mentioned that most of their difficulties on understanding the curricular content were solved through peer discussion and weekly meetings.

4.1.1.5. The Complementary Role of Teacher Collaboration

4.1.1.5.1. A Special Case of Lv

Although attending the teaching development program was mandatory, Lv started teaching the new curriculum without any government training. His unique experience made him a special case in the study. He was hired by No.3 Secondary in September 2008 and was assigned to teach the grade 10 which is the first grade adopting the new curriculum. Since the government training was offered in summer, Lv was not able to take any training from the educational department. The school did not offer him much pre-service training either. He asserted that his understanding of the new curriculum and teaching skills were mostly promoted through teachers’ group work.
Lv: Frankly, the school organized very little training. However, we teachers often exchange thoughts, learn from each other. Then a common understanding of the new curriculum ideology came out, and we engaged in teaching with this common understanding.

Me: Could you tell me in detail how the communication happened?

Lv: For example, first we prepared our lessons based on individual understanding of the lesson and our students’ attributes. Several teachers got together and shared ideas about the lesson before class. Then we discussed the ideas and modified the ideas. We applied in our teaching. I feel that the modified ideas are suitable to our school’s context and the teaching outcomes are satisfying…

Different from his colleagues, Lv acquired both the new curriculum concepts and pedagogical skills from collaboration. Similar to his colleagues, Lv understood the reform prior to developing appropriate pedagogy. Through the group lesson preparation, Lv could catch up with peers pedagogically. A closer observation on Lv’s understanding of the new curriculum in comparison to his peers will shed lights on how the collaboration complemented government training’s role.

4.1.1.5.2. Comparison of Two Teachers

The teacher development program launched by the provincial educational department can be viewed as formal teacher training whereas the collective lesson preparation and teachers’ group collaboration can be viewed as informal teacher
development. Both the formal and informal teacher professional development shares similar purposes and themes. However, the formal development was a top-down model just like the reform itself. Teachers were organized together and imparted with information about the new curriculum. The information and instructions delivered in the program were from national and provincial educational administrators. The informal development emerged from individual teachers. Teachers spontaneously worked together when faced with problems or confusion. The information and suggestions were from peer teachers. It was a self-organized, bottom-up model. Interaction with students and school administrations were also a form of teacher development and were addressed later in this chapter.

Zhang and Lv, both first year physics teachers in their 20s, teaching grade ten and having just graduated from the university, both immersed in the new curriculum; they were both influenced by No.3 Secondary School’s culture, and hence their similarity in terms of knowledge about the new curriculum. However, Lv was employed 3 months after Zhang and therefore could not participate in the teacher development program. Nevertheless, the two teachers had different understanding of what the curriculum reform meant.

Zhang viewed the reform as shifting from test-oriented education to all-round development education and helping students to be more actively engaged in class. She also saw it as meaning a shift from teacher centered to student centered, revising the textbooks to reflect student centered teaching and learning. Lv viewed the reform as
changing of teachers’ roles and students’ learning strategies. He understood teachers in the new curriculum to be organizers: organize students in class; directors: direct students to the right pathway, and participants: participate in learning with students.

Although, it does not help to indicate which of the teachers’ views is correct, Zhang’s understanding seemed closer to the new curriculum’s ideology and has more potential for success in the new curriculum. The curriculum ideology which was framed by university researchers and reform organizers was directly delivered via the formal teacher development program. Although at first, teachers found the ideology to be inconsistent with their teaching practice (Zhang found the program not helpful initially), after a while their beliefs and teaching behaviors were modified through the peer interaction. Furthermore, Lv’s understanding of the new curriculum was mostly shaped though peer interaction. After one year, his views were different from Zhang’s and seemed peripheral to the new curriculum’s goals.

There are various reasons for the different perceptions of the two teachers. A growing body of literature indicates that science teachers’ attitudes and beliefs are keys to understanding and reforming science education (Cheung & Ng, 2000; Czerniak & Lumpe, 1996; Feldman, 2002; Haney, Czerniak, & Lumpe, 1996; Keys & Bryan, 2001; Prime & Miranda, 2006; Zhang et al., 2003). Meaningful change in action requires transformation in beliefs (Jones & Carter, 2007). The teacher development program functioned as shifting teachers’ beliefs while the teacher collaboration transformed teachers’ action. Lv’s case was a reflection of such claims. The meaningful change in teachers’ action
prequiste the changes in teachers’ beliefs.

I also want to examine the importance of cross level collaboration. Erickson et al (2005) argue that through collaboration between teacher and teacher educators, the learning environment for teachers can be improved. Many researchers (Borko, 2004; York-Barr, & Duke, 2004; Erickson et al, 2008) argue that an effective teacher development approach need involve educators at all levels. In Erickson et al.’s (2008) research, the development of “professional learning communities” (PLC) was claimed as a viable approach to addressing some of the problems emerging from the Chinese context” (p.190). Collaboration across levels seems to be one key attribute of successful teacher development programs. In our case, cross level collaborations were cooperation of the top-down and the bottom-up models for forging teachers’ ideas. Zhang experienced the formal teacher development in which administrations, university researchers, and reform officials participated. They were the launchers and organizers of the reform. Though the teacher development instructor was not necessarily a university researcher or an official, he/she delivered directly the ideas of researchers and officials. The teachers received the information and applied it in their teaching practice. The pattern was top-down: from the national curriculum reform theme to teaching a specific grade 10 physics class. The group work among the physics teachers in the school, however, was bottom-up. Physics teachers encountered problems in classrooms and brought them to the group. The group, working collectively, sought solutions best for the new curriculum context. The solutions were for the specific classrooms but within the
context of the nation-wide reform. The teachers who engaged only in the top-down pattern may hold the canonical beliefs but lack the means to apply it in a specific classroom context whereas those involved only in the bottom-up pattern format may succeed in classroom teaching but are more likely to deviate from the original purpose of the reform. Therefore, collaboration across levels is an effective way of improving teaching practice. Meanwhile, the textbooks, policies, and guidelines were issued under the same ideology. Teachers’ ideas received from the formal development were constantly verified in this way. Their beliefs on the new curriculum were enhanced and consequently affected their teaching practice. Therefore, I believe the cross level collaboration is an effective way to developing teachers’ practice.

4.1.1.6. Government Training and Teacher Collaboration

Although a large proportion of teachers considered teacher development program somewhat helpful in terms of pedagogical instruction and curricular content interpretations, nearly all of the teachers’ understandings of the reform were consistent with official policies and guidelines. To this extent, the teacher development program served its purpose well on informing teachers about the reform. Teachers may not notice the long term benefits. However, when they were overwhelmed by anxiety, difficulties, and uncertainty in the reform (Fullan & Miles, 1992), the information they have gained in the government training were an assurance that they were on the right track. In addition, the teacher development program and the follow-up training contributed to monitoring the implementation process, keeping everyone informed of what is happening, linking
multiple change projects, locating unsolved problems and taking clear action.

The large scale reform and the limited resources constrained the time and content of the government training program. It is unrealistic to concentrate every aspect of a country-wide reform in a ten day program and expect to meet individual needs. Extending the length of the program or increase instructional content would require more resources. Although Louis and Miles (1990) found that at least 30 days a year of external assistance were essential for reform success, considering the various circumstances of schools, it is impossible to provide detailed guidance on pedagogy in a program with teachers from more than ten schools. On the other hand, giving elaborate training on pedagogy and curriculum interpretation may “imprison” a teacher’s creativity and research potential, which is against the reform purposes. The professional development program from the Education Department of Henan Province was successful at introducing the reform to teachers. It provided reform information to teachers but failed to meet the teachers’ teaching needs.

Lv’s case indicated that teacher collaboration could partially complement the government training but cannot replace it. Teacher collaboration could enable individual to discuss with their peers about pedagogy exhibited but played very limited role in transforming the teachers’ beliefs. The collaboration exhibited features such as instant, individual and situation based, feasible, problem based, sustaining, sharing, and evolving. The features helped the teachers to develop classroom-situated pedagogy in the reform and student based curriculum interpretation. The weekly meetings assisted the teachers to
collectively interpret curriculum content. Hence, collaboration among the teachers served to quench their thirst for pedagogy and curriculum understanding. The teacher development program informed teachers and framed their’ beliefs. The local collaboration flourished their pedagogy. Further, teachers’ practice was guided by their beliefs meanwhile the teachers’ beliefs were modified through experience. The relationship between practice or behavior and belief is interrelated (Fullan, 1999).

In addition, the collaboration is the foundation for a bottom-up response to the reform. Teachers’ understanding, experience, and difficulties were collected through collaboration at the school level. Schools’ difficulties, experience and interpretations were shared through stake holder interactions at district level and so on. Together with the follow-up professional development program, the two professional development formats opened up a channel for conversation between the policy makers, university researchers, reform authorities, and in service teachers. Teachers’ voice were heard and responded to in this way. The collaboration between the top-down structure and the bottom-up structure not only helped the reform authorities, university researchers grasp the reform development in schools but also provided direction to teachers. As Fullan (1999) claimed, neither bottom-up nor top-down structure leads to real change. The real change needs as intermediate structure.

Reform mandates were catalytic motives for collaboration among teachers with regard to professional practice. Complemented by the government professional development program, teacher collaboration transformed both teachers’ beliefs and
actions. In the next section, I will take a closer look at the collaboration, scrutinizing the collaboration between novice teachers and experienced teachers.

4.1.2. Teacher Collaboration as a Positive Product of Government Mandated Reforms that has Reduced the Gap between Novice and Experienced Collaborating Teachers

Another interesting point I found regarding the teachers’ collaboration was that the new curriculum played a critical role in reducing the hierarchical divide between experienced and novice, where by the former were willing to share their concerns and problems in teaching with inexperienced (novice) teachers. This is consistent with what a number of studies have highlighted. Mandzuk, Hasinoff, and Seifert (2003) identified the structure of cohort: closure, stability, interdependence, and shared ideology as key to successful collaboration. The physics teachers’ group work in the three schools shared a similar structure. Many researchers (Clarke, et al., 2007) claimed the positive effects of cohort structure in teachers’ development while Shapon-Shevin and Chandler-Olcott argued that “cohorts may exacerbate the influence of an agent who already dominates class discussions” (Mandzuk, Hasinoff, & Seifert, 2001, p170). Fullan and Hargreaves (1996) suggested that the teacher interactions could develop to balkanization. The power differential between the experienced and novice teachers can undermine the neighborhood interactions which refer to the interactions between “ideas, hunches, queries and other manners of representation” (Davis & Simmt, 2003, p.156). This is especially the case in China, where culture and traditions stress power hierarchy.
governed by emphasis on respect and obedience for teachers and elders. Experienced teachers assume a higher status within a teacher community. They are expected to give advice and guidance to novice teachers rather than collaborate with them. When experienced teachers encounter a problem in teaching, they tend to turn to even more experienced teachers and elders for guidance. Novice teachers, on the other hand, are expected to accept experienced teachers’ advice without questioning and challenging. Novice teachers’ opinions often are considered naïve. Thus, a teacher cohort in a school is easily becoming a group dominated by several experienced teachers, and the learning potentials of the collective are damaged in this way.

The participants of the study consisted of 7 novice teachers with no more than 5 years’ teaching experience and 6 veteran teachers whose teaching experience was around 20 years. Most novice teachers felt that they learned more from the veterans than from their novice colleagues. Two novice teachers considered the experienced teachers as their role model. Another two teachers believed that they have learnt from both novice and experienced teachers. Most novice teachers viewed experienced teachers as knowledgeable in pedagogy, skillful in classroom management, and patient in classroom. They were considered as role models for novice teachers. Some novice teachers were touched by veteran teachers’ modest attitude in teaching. According to one teacher’s report, students gained satisfactory learning outcomes in experienced teachers’ classrooms. However, the experienced teachers’ better performance and the gap between experienced and novice teachers’ teaching experience were not a barrier to the
collaboration. The self-organized teacher cohort lasted for nearly two years and was still serving the purpose of improving teaching. Most teachers found the cohort to be very helpful in terms of developing effective pedagogy and producing better learning outcomes. As the interview excerpt shows, Zhang explains why she thought the power difference between experienced and novice teachers did not hinder the collaboration:

As it was the second year, teachers have difficulties...we have pressures in planning lessons.

There are not any references for us, because all of us practice this curriculum at the same time, including the senior teachers. They are experienced in teaching, but their experiences are relative to the old curriculum. Therefore, in front of the new curriculum, we are all blind children. No reference. Even though we use cases in other provinces for reference, we need to find our own path. To this extent, we have to explore by ourselves.

Zhang’s claim was support by some experienced teachers. Wei felt that some novice teachers’ ideas and pedagogies were fresh. He was often inspired by their thoughts about teaching. Chen and Qian considered that each member in the group as having merits and benefited both novice and experienced teachers. I observed Qian’s class. It was about the application of sensors. Qian used the example of photoelectric mouse in the textbook to illustrate a type of light sensor. Then a student asked the mechanism of a laser mouse. Qian hesitated for a while and said “I am not sure”… In the interview after class, Qian admitted that he had insufficient skills in high-tech and current knowledge. He pointed
out that young teachers have abundant current knowledge. Some veteran teachers felt that it was easier for novice teachers to accept the new curriculum ideas and concepts and in turn easier to change their pedagogy. On the other hand, experienced teachers were good at improving students’ performance on tests. They had mastered strategies that help students develop better computation skills, memorize concepts, and were familiar with the physics knowledge.

Lv, a second year physics teacher, thinks that experience gave teachers advantages in successful teacher-student relations while Zhao, a physics teacher with 25 years’ experience, believed otherwise.

Lv: It is difficult in communication with students about their learning. You have to admit that students tend not to trust young teachers. It is a FACT. It is a problem that I have to face. Once students have the feeling of distrust, they start to alienate you and it become harder for you to teach.

Zhao: For old teachers like us, it is hard to change. If you change the way you did for 20 years, you feel uncomfortable, don’t you? The new curriculum suggests an equal relation between teacher and student. Teacher’s class could be interrupt by student at anytime…As an old teacher, I feel hard to accept these; whereas young teachers are easy to get along with students. It is easy for them to change the class mode and education mode. For old teachers, even though they want to change, it is hard to change the differences between student and
teacher. The students cannot relax when they socialize with old teachers and the old teachers don’t know how to deal with this either. After all, they cannot fiddle with us like they did with young teachers. It is a limitation for old folks.

Although both teachers only saw their weaknesses and overlooked their strength in dealing with student relations, this state of affairs created a climate conducive for collaboration. The curriculum requirement—shifting from teacher-centered to student-centered classroom—conflicted with the teachers’ existing beliefs about the classroom and thus wobbled the existing hierarchical structure between the veteran and novice teachers.

The new curriculum created a series of uncertainties within schools and within the teacher cohorts. The uncertainties have broken down the power hierarchy between the veteran teachers and novice teachers. The veteran teachers’ experience was an important resource but not enough to successfully implement the new curriculum. Thus their previous status was challenged within the cohort. This created in them a willingness to allow equal contribution from all the members of the group since they were confronting the same problem. The benefits from the collaboration included enhanced their neighborhood interactions.

On the other hand, novice teachers became bolder in implementing new curriculum. They saw everyone to be making valuable contribution where no one had the experience. The new curriculum offered the novice teachers opportunities to become more successful
than the experienced teachers, hence building confidence. They did not hesitate to offer their opinions before all the community (cohort) members. The fact that they saw their opinions were valued, strengthened their confidence. Thus, the dominant roles of veteran teachers were in a way undermined. It became evident that the democratic space flourished in the cohort format of teacher development.

Implementing the new curriculum in the school has enhanced the robustness of the cohort as a complex learning system in which “neighborhood interactions” resulted in an effective democratic environment in which every member had equal opportunity to present his/her opinion. The case in Zhengzhou secondary schools provided an example of such environment. This is where all community members confront an unfamiliar situation/problem and as a collective seek solutions. The uncertainty of the new situation and all the possible results would minimize the previous power distribution within the community. In this way members who previously enjoyed high status due to experience or social hierarchy disregarded the status leading to stimulation of neighbor interactions. Interestingly, even though veteran teachers were more successful in teaching the new curriculum, they seemed not aware that they had the advantage.

Here I try to argue that the dominant positions in a group are not necessarily based on members’ performance. The dominance is built on how the members perceive their roles and other members’ roles. Given the relationship between teaching performance and Chinese culture, the veteran teachers have the capacity to become dominating in a cohort on this type including a group teachers attempting to understand and interpret a new
curriculum. But in this study, the experienced teachers perceived themselves as inexperienced and did not expect to dominate the cohort discussion and ideas. The novice teachers also did not expect the veteran teachers to dominate discussions in the cohort. Thus, it made it possible to create a democratic environment in which individual or collective beliefs exhibited signs of shifting within the group. The fact that all group members faced the unfamiliar situation (new curriculum) contributed to the shifts in members beliefs.

4.2. What Are the Factors Influencing Successful Collaboration in the Context of the Reform

4.2.1. The Uncertainty of the College Entrance Examination as an Important Factor Influencing Apparently Successful Teacher Collaboration in the Context of the Ongoing Curricular and Pedagogical Reforms

The uncertainty of the College Entrance Examination (CEE) is a major influencing factor for teacher collaboration in the context of the ongoing curricular and pedagogical reform. The reform was launched in 2008 in Henan and thus the first CEE is in 2011. The current grade 12 is still using the old curriculum system. By now, the guidelines for the 2011 CEE have not been released. The uncertainties of the CEE in the new curriculum and the impact of the current CEE encourage teachers to look for help from the collaboration. On the other hand, the features of the CEE became the springhead of teachers’ self-suspicion and thus damaged teachers’ collaboration.
The exam-oriented education has a long history and a broad influence in China. Using nation-wide exam to select competent people is from SUI dynasty, which is about 1500 years old. The test system developed and evolved throughout this time span. Ancient Chinese people view a test as the only way to become noble. Thus, it has great influence on people’s lives. This is also the case in contemporary China. For most students, CEE score is the only license to post-secondary education. And for most students whose families live in poverty, majority of whom are from remote areas, the CEE is their opportunity to earn a bright future. The CEE becomes the solution for conflicts between the limited higher education resources and great demands for higher education. Both students and parents view CEE as the most important test and the turning point in their life. Although many people criticize the CEE as the culprit of both students’ pressure and the test-driven education system, many other people still agree that CEE is a fair selective system and suitable to the Chinese situation. The previous proposed alternatives to the CEE never succeeded nationwide. The importance of and the competitions generated by the CEE have shaped Chinese education system to be exam-oriented.

Schools are evaluated by their performance in the CEE. Zhao and Zheng, physics department heads of No.7 and No.3 Secondary Schools shared similar views that the schools and teachers were judged by the society through CEE performance rather than their efforts in reform. The pressure from the society pushed schools to work out ways of success in the CEE in the context of the reform. To serve this goal, teachers worked
together to develop strategies of implementing the reform as well as success in the CEE.

Zhang mentioned her role model teacher Wang. She described Wang’s class as “successfully cultivating students’ all-round growth and abilities to perform well in tests as well”. The reform guidelines pointed out that the test should refer to the Curriculum Standard (Zhu & Kang, 2002). Schools encourage teachers to interpret the Curriculum Standard. Weekly meetings became a forum for Curriculum Standard discussion.

Therefore, the CEE, along with the new curriculum, created goals and content for collaboration.

However, the unreleased Henan 2011 CEE guidelines make the first CEE under the new curriculum a major springhead of uncertainties in teachers’ teaching. Researchers (Helsing, 2007; Ponticell, 2003) suggested two kinds of strategies that could deal with uncertainties: increase certainties by setting up regulations, rules, and policies and decrease uncertainties by encouraging teacher reflection and collaboration. In our case, the certainty cannot be increased for teachers given the Chinese political structure. The possibilities of releasing the guidelines in a short time are very low. Moreover, the uncertainties in pedagogy and curriculum content cannot be reduced by local collaboration because no one can be certain about prediction. The collaboration, in the study, played roles of amplifying teachers’ demands and soothing teachers’ psychological anxieties.

Teacher collaboration, as an approach to transmit teachers’ voice to administration was stimulated by teachers’ desire to see the CEE reformed consistent with the new
curriculum. Twelve teachers shared the opinion that a successful reform requires corresponding changes in the CEE. The teachers negotiated their suggestions for the CEE in the collaboration and expected to be heard by reform authorities. Zheng proposed to explore multiple ways to select students which would allow students to develop their own interests at high school level. The Education Department of Henan Province also issued documents (The Education Department of Henan Province, 2008) for collecting suggestions on the 2011 CEE. Teachers’ vested interest in seeing the CEE reformed motivated the need for and cemented their collaboration.

Since one of the aims of the reform is to shift from test-driven education to all-round education, the uncertainty of the CEE created anxiety among some teachers and to some extent affected their morale in implementing the reform and collaboration. Some of the teachers, though few, were pessimistic the reform because of the future of CEE. As Sun stated:

As long as the CEE exists, it is test-driven. You cannot test students’ skills and inquiry ability in an exam paper. Students who are only good at dealing with test could success in the CEE. They will go to the same university with those all-round develop students.

Others including Qin and Chen were concerned that the CEE would reverse the reform gains to test-driven teaching and learning, which could render their reform effort worthless.
Zhang: Henan is well-known for fierce competition and pressure in the CEE. If the CEE is still in the old mode, if it does not change, our efforts are all in vein, because no matter what you have done, it is ultimately for the sake of success in exams. Then nothing changed at all. That’s the thing bothered us most. In fact, it is most teachers’ voice that the reform should be reformed from the root rather than from the surface. The new curriculum encourages students to become critical, to develop their individuality, to participate in learning, to learn by themselves, but students who have their own ideas may not be good at working out questions in the textbooks or in the assignment. Teachers also have the dilemma that developing students’ interests and individualities meanwhile promote students test achieving abilities.

A few teachers viewed the collaboration as helpful in terms of implementing the reform because of the uncertainty of the CEE.

Facing the anxieties and uncertainties brought by the CEE, teachers on the one hand, paid attention to policies, looking for indications of the CEE direction; on the other hand, use collaboration to seek psychological safety and to decrease risks of curriculum interpretation and pedagogy exploration.

When I was conducting the research, the first simulative CEE was held for Grade 12 student. Wei told me that after the simulative CEE in physics, No.3 Secondary School cancelled lessons for Heat chapter because the simulative CEE indicated that Heat may
not be tested in the CEE.

For most teachers, collaboration could decrease their chances of misinterpret the curriculum standard. Since no one is certain about the CEE direction, individual interpretation may risk a wrong direction. As teachers, they are in charge of their students’ performance in the CEE. The collaboration could reduce the risk by sharing the personal interpretation and referring to the collective opinion. Many teachers mentioned that they often discuss with other teachers when they interpreted the curriculum or experimented new pedagogy. Frideman (1997) argues that groups can foster collective defense systems by providing emotional support, which can prevent teachers from confronting uncertainty and doing real work.

Fullan and Miles (1992) proposed systemic change for success innovations. Work systemically means

“1) [The] reform must focus on the development and interrelationships of all the main components of the system simultaneously—curriculum, teaching and teacher development, community, student support systems, and so on. 2) reform must focus not just on structure, policy, and regulations but on deeper issues of the culture of the system” (p751).

The systemic reform faces complex problems. The lag in one component could risk the entire system. The teacher collaboration in schools demands not only support from government program but also the restructuring of other parts of the reform such as the
assessment system and the community building. As mentioned before, the CEE has a long history and broad impact in China. The culture of test-driven education has a solid foundation. To restructure and re-culture the education requires extra attention, commitment, participation, and resources.

4.2.2. Teachers’ Desire to Improve Student Performance Motivated Them into Collaboration

Student performance refers to students’ reactions to teaching actions including their class participation, test scores, homework, tutor activities, and their assessment of teachers. Zhao, a department head as well as a weekly meeting leader, stressed that the collaboration was customized to students. This opinion was echoed by two other teachers Qin and Zhang. Zhu stated that weekly meetings often discussed issues related to students such as their homework, learning attitude, living styles, etc. The desire to improve student performance drives teachers’ into collaborating; the positive feedback from the students encourages them to sustain the collaboration; and students’ ideas enrich the collaboration content.

4.2.2.1. Improve Student Performance

As mentioned by Zhao before, he experienced difficulties in transforming his relation with students and thus was willing to learn from novice teachers. Like Zhao, other teachers experience different difficulty with students. Li and Sun had trouble changing student learning approach and applying inquiry-based strategies.
Sun: …the requirements for students become higher. I think what teachers need to do is…student skill and ability…how to develop their skill and ability, and more…lots of problems in there, from the foundations. It is not something that you change in high school and students will follow your changes. From elementary school to junior high school, teachers take control, giving lecture through out the class. Students were used to this mode: bring nothing to the class and write nothing in class, just listen to the lecture. Once in the high school, they are neither active nor willing in class participation. Even if some students are willing to join the class activities, the progress is very slow and the effects cannot meet the expectation. There is a problem that you have to face: if you give the class to students, you probably cannot accomplish your teaching tasks. If you use the old mode, you could smoothly complete your work; but if you give your class to students, they could only complete half of them.

R: So it is the discrepancy between teaching content and teaching mode.

Sun: Not necessarily discrepancy. It needs time to reconcile. It is in the initial stage.

R: It is a major difficulty.

Sun: Yes, for me it is.

R: Any other difficulties?

Sun: Not much. As the requirement for students is raised, the way you prepare the lesson needs to modify. You got to figure out ways that students are willing to acquire the knowledge.

R: What do you do when facing these obstacles?
Sun: I discuss with other teachers.

Li faced similar challenge in teaching. The students were used to the passive memorization (rote) learning and did not process the ability to inquire. This situation motivated her to collaborate with colleagues. Li’s view of collaboration was that the collaboration generated satisfactory results with regard modifying her teaching approach.

4.2.2.2. Teacher Collaboration Was Encouraged by Student Performance

Students’ positive feedback boosted teacher morale and faith in the collaboration. The new curriculum is consistent with students’ cognition process thus students were willing to learn meaningfully. As claimed by Qian, it did well in spurring students’ curiosity and in developing canonical physics knowledge. From Zheng’s perspective, the students became more active in the new curriculum. They are willing to share their original ideas. Zheng has seen the good side of the reform and he offers to keep exploring the inquiry approach and encouraging creativity by working with peer teachers. Some teachers shared the stance that the well-being of students indicated the future well-being of the country. Students’ positive feedback indicated that the new curriculum would bring a bright future for the country. Therefore, teachers are responsible and willing to solve the problems together in the reform and dedicate to the country’s future. Zhang used to attend an open class, teaching grade 11 students the new curriculum content. Grade 11 was still using the previous curriculum. The grade 11 students’ performance was not as good as grade 10. Grade 11 students followed the teachers’ instructions but never had
deeper reflection on what they learned. However, in Zhang’s class, Grade 10 students explored much deeper and broader content than the grade 11 students in the same lesson. The contrast of student performance confirmed Zhang’s confidence in implementing the new curriculum and participation in the teacher collaboration.

4.2.2.3. Teacher Collaboration Was Enriched by Student Ideas

A major function of teacher collaboration is to solve problems that the teachers encountered in their practice. Sometimes the students’ ideas shed light on the effect of teachers’ collaboration. Qin’s interview response is indicative of this.

“…it is common that you engage in unprepared topic, especially in lessons related to modern technology, but the problem has to be solved anyway. Normally, I give student some time and give myself some time. I study the problem, collect information and discuss with other teachers. Days ago a student asked me about hand dryer in the washroom, what kind of sensor the hand dryer applies. It is a question in the exercise book. I did not agree with the answer. So I shared the question with colleagues and conducted online search and finally found that different hand dryers apply different mechanism. Then I explained the different mechanisms of the hand dryers to students. Some of them were so curious that they even want to break the hand dryer and take a look at what’s inside. If they have such feeling, I think that’s a sign for success of the reform”

Qin pointed out that most of the student ideas were related to daily life and needed to be
acknowledged as was determined during teacher peer discussion. When the teachers revealed this new realization to students, the students felt valued and in turn were encouraged by such respect. This is how teacher collaboration was driven by student issues. More ideas were shared in the collaborating group and the dynamic of the group was strengthened.

Fullan and Miles (1992) believed that a serious reform require a large number of people’s participation. With the largest number of people, students’ participation is the key to a successful reform. The three conditions mentioned in this section composed a circle for interactions between teachers and students (Figure 4.2): Teachers engaged difficulties in transforming students. The desire for improving student performance motivated teachers to seek help from colleagues. This is the teacher collaboration was the initiative of teachers themselves. Some strategies are developed through collective intelligence. Teachers apply the strategies in class and receive positive feedback (most likely). The positive feedback gives the teachers confidence and continued collaboration. If students have difficulties in learning, they ask teachers for help. The teachers get inspired by students’ questions and in turn bring the questions to their peer group discussion. The collaboration in turn flourished. The collaboration cherishes students’ perspectives. Finally, the communication between teachers and students results in improvement of student performance consistent with the reform expectation.
4.2.3. The Mandates of Educational Reform and Administrative Support for Teacher Collaboration

4.2.3.1. Reform Mandates

On the one hand, the reform mandate compels teachers to apply the new concepts to implement the new teaching approach. The requirements compel teachers to look for support from peers and thus enhance the collaboration. This started by some teachers realizing the potential benefits of the reform. They took the initiative to implement the reform and contribute to the collaboration.

However, other teachers such as Sun, are an embodiment of teachers who resist or reluctant to embrace the reform. Sun stated that she was uncomfortable with the change in teaching and learning approach. She believed that the traditional approach to
classroom teaching was better than the proposed approaches in the reform initiatives. Nonetheless, she claimed to have modified her teaching approach because there are people who supervise teachers’ class actions. “They judge your class based on the concept of the requirements of the new curriculum. They can walk into your class at any time. So you have to change.”

But, the majority of the teachers interviewed asserted that they support the reform because of the potential benefits. As mentioned before, many teachers are willing to implement the reform because the reform is for students’ well-being. They realized the reform intentions are for the sake of students’ future development rather than for knowledge memorizing. The transformation from subject-based curriculum to student-based curriculum (Zhu & Kang, 2002) was well received by many teachers. Although difficulties, fallbacks, and pitfalls characterized in the reform, the teachers blamed the faults on the implementation process rather than the reform itself. As Zheng claimed, “I think our country’s policies are all good. The problem is with the implementation”. In order to help the students, the teachers need to promote transform their pedagogy first. The reform mandates have challenged both teachers’ knowledge and teaching strategies. Thus, the teachers must meet the reform requirements first and make efforts in stimulating shifts in student learning. Such a process of need for pedagogical transformation can be a positive enhancement for teacher collaboration.

4.2.3.2. Administrative Support

No.5 and No.7 Secondary
The reform encompassed a 3 level administrative structure—national, regional and school level administration. Therefore, teachers from different schools may receive various types of support from the school administrators. In this study, teachers from No.7 and No.5 secondary schools received less support than teachers from No.3 secondary school.

Sun and Li are grade 10 physics teachers from No.5 Secondary. When the issue of teacher and administrator relation was raised, both teachers felt not much to say about administrators. Both of them used one sentence to comment on the relations. Li, “I don’t have much contact with administrators. I contact my fellow teachers and the department head more often”. Sun, “In our school, only two kinds of relations: ‘being supervised’ and ‘providing logistic service’”. There are also other comments on the administrators during the interview. Li and Sun used the word “mess” to describe administrative work with regard to student assessment.

R: Are there any changes in student assessment system? How do you give student their final grades?

Sun: It is 100% of student’s final test score. Wait, (Ask Li) does homework count in the final grades?

Li: Not sure, it is the first year. I don’t know how on earth to assess students.

Sun: It seems that the class participation and homework take a part of the final grades. But it doesn’t say what percentage the final test should occupy.
Li: in fact, I feel…

Sun: Messy. The administrators messed up.

Li: They clearly told us not to give some low-achieved students credits. But finally, they still let them pass. So it is very…very…

R: I want to hear about the “mess up”.

Sun: It is not us who can control. If higher people do not set up rules, principles, and frames, we could only feel mess up. For example, they give us a form to grade student class participation and homework. However, they did not tell us how to count this grade.

Li: Yes. We were not informed.

Zhao’s remark on administrators was somehow cautious. He thinks the success of the reform depends on administrators’ attitude. If they don’t want to change, teachers’ effort in reform was in vein. But he did not mention the attitude of administrators in No.7 Secondary.

**No.3 Secondary**

In contrast to No.5 and No.7 Secondary, teachers from No.3 Secondary gave positive comments about administrative support. The administrators offered various activities for teacher development. The school often organizes public meetings and invites teachers to participate. Teachers discuss the class together. Teachers are also encouraged to audit colleagues’ classes. One day when I was conducting the study in No.3 Secondary, there was an information board at the front gate. It reads that at 5pm,
there was going to be a class evaluation and discussion meeting in the meeting room.

Teachers were invited to attend the meeting, especially welcomed young teachers. One teacher told me the meeting was for assessing a public class. It was organized by the Teaching Affairs Office. In addition, administrators cooperated with experts, educators, university researchers and politicians. Sometimes they attended conferences, training programs about the new curriculum and brought back suggestions and ideas. Sometimes they invited experts and scholars to give speeches at the school and organized teachers to learn from experts’ ideas. The administrators encouraged teachers to communicate with teachers from other schools. The school also subscribed to physics and education journals for updating teachers’ pedagogical and content knowledge. Administrators organized communist party members to work in the community in summer vacation. Teachers tutored students in the community. As Lv commented, the school created a learning environment that encouraged teachers to update not only their knowledge, but also their thinking approach, teaching methods, and so on.

The school organized school wide activities in order to implement the reform. Such activities also enhanced teacher collaboration. “Main body class” and “STS curriculum” were two school wide activities. Qin and He mentioned this new class mode in the interview. “Main body” indicates that students are the main body of the class. It was proposed by the principal. The new class was an exploration and experiment for the new curriculum. It consists of three sections. Section one is the first 16 minutes. Students learn by themselves. They read textbooks. The following 8 minutes are devoted to the
second section—free questioning. Student discuss with peers about the questions they found in the first section. The last 16 minutes is the third section. Teachers solve and comment on unsolved student questions, and stress some key points in the lesson. Now the “main body class” is in the first phase—explore. In early 2010, it will go to the second phase—exchange. Teachers exchange their experience and ideas on the main body class. The third phase is view and emulate. The main body class will be finalized and shared in schools. Both teachers are excited about the “main body class”. They were impressed by students’ performance in the discussion section. He also felt the pressure. “The main body class raised the bar for teachers. It motivated you to learn”.

Besides the textbook content, No.3 Secondary organized STS curriculum themselves. STS courses were offered on every Saturday. Excellent teachers of 6 subjects (Chinese, Mathematics, English, Physics, Chemistry, and Biology) gave lectures on Saturday afternoon. Students who were interested in the STS courses could withdraw their regular Saturday courses and take the STS courses. But they still were required to finish the homework of the regular courses. The STS courses aimed to extend students’ interests in the subject. The format is often speech like. The topics were often beyond textbooks. Students were actively involved in the STS courses according to Zhang’s report:

Sometimes students were so keen on the STS lectures. They sometimes know more than the lecture had covered. There was one time, after the lecture, students were so interested in the topic and they passionately discussed the topic with the teacher. Ask lots of questions. The
teacher cannot handle all the questions so she turned to us. Then, we decided to lengthen the lecture and played a couple of videos about Big Bang and Einstein’s relativity. As I used to take courses of relativity in undergrad, I was able to discuss with students about what I had learnt in the university after the lecture. The lecture, thought it has nothing to do with the test, it helped strengthen students’ interest. Kids were happy with the lecture and actively learnt the knowledge. It’s not like learning for passing an examination, which is tiring. The STS course is an activity aims to broaden students’ view. Students like it and they feel it worth the time.

The three level administrative structure of the reform has endowed more autonomy to schools. Considering the hierarchy tradition in China, the school administrators played a leading role in school level reform. Just as Zhao mentioned, administrators hold the power to reform. If they are reluctant to the reform, teachers’ effort in changing may be unfruitful. The success of a reform requires the involvement of all stakeholders. The differences of the three schools demonstrate the importance of the administrators. Their enthusiasm and commitment benefits both teacher collaboration and reform implementation. One point worth mentioning is that this is not a typical school in the province.

As the new curriculum has been implemented in such a large scale, honestly, the final outcomes depend on how individual school executes the reform. It may be bold, but I think
there is no school in Henan province could carry out the reform as fully as No.3 Secondary School do. I used to do my intern at Huanghai Middle School and teaching lessons at some other middle schools. The traces of test-driven education were very evident. To be frank, it is impossible to remove the traces of test-driven education right now. But I think No.3 Secondary School is great in terms of teaching practice and administration. It provides enough space for students developing their individuality. Nurture their ability of self-directed learning and thinking, which harmonize with the new curriculum. Therefore, I think our school did a very good job. (Zhang)

But why did No.3 Secondary School become a promoter and faithful of the reform? As a former student, I want to provide my explanation.

No.3 Secondary School is one of the key middle schools in China. Students in this school were and still are the most successful in the province in terms of the high school entrance exam performance. The school aims to develop students’ abilities in other areas with few worries about their performance in the CEE. Thus, investing resources on students’ all-around development was already happening in the old curriculum. On the other hand, it is the school’s tradition to care about students’ all-around development. The school soccer and basketball teams were champions in the city and were well supported. Arts, music and P.E. courses were never dropped as other schools did. Singing and debating competitions were held every year. A school culture, which values students’ abilities test taking and other aspects existed. The new curriculum has created a more
supporting environment for the prosperity of the school culture. And the school culture has in turn promoted the development of the new curriculum. As Zhang said in the interview, the success of the reform depends on how schools execute it. How to fully implement the reform at a school level became a challenge for the reform launchers.

In addition, we should caution that individual school’s success in reform may not last long. The short-term successes may be reversed if there is no constant external support. As Fullan and Miles (1992) proposed “Reform fails unless we can demonstrate that pockets of success add up to new structures, procedures, and school cultures that press for continuous improvement” (p749).

4.3. What Are Administrators’ Understanding and Interpretation of Their Role With Regard To Curricular and Pedagogical Reform in the Context of Teacher Collaboration as a Professional Development Strategy

4.3.1. Exploring and Providing Ways and Strategies that Support Teacher Professional Development

Two administrators were interviewed. They are the principal, Wu, and, Xu, the dean of teaching affair office in No.3 Secondary School. Surprisingly, from the administrator’s perspective, there is significant change in Henan’s reform. However, in No.3 Secondary, Xu asserted, teachers and administrators are collaborating in implementing the reform. They gradually recognized the spirit and theme of the reform. They have changed minds but have not expressed the change through action. They are aware of the benefit of the reform but the teachers and administrators lack the ability to implement the change.
Therefore, Xu considered the priority of school teacher development as building teachers’ abilities.

Xu deemed the weekly meetings as ideal forums for professional development. However, the teachers did not use the weekly meetings fully. Therefore, it is up to individual teachers to interpret the new curriculum and corresponding pedagogy. As a transition, No.3 Secondary will create a reform instruction committee in each discipline. The committee members are teachers with experience and expertise in teaching. The committee will work with other teachers to develop curriculum interpretations. Teachers will grow with the help of the committee and finally will develop their own curriculum interpretation and pedagogy. The principal also mentioned that the school stressed interpreting the new curriculum through teacher collaboration, yet the collaboration is not for producing unified understanding and strategy.

4.3.2. Creating Supportive Climate for Teacher Collaboration through School Based Incentives for Systemic Change

Instead of focusing on strategies for teacher development, administrators in No.3 Secondary are implementing a school reform. Teacher development is part of the school reform agenda. In Xu’s opinion, as long as the reform achieves success, teachers will be effective and teacher collaboration will receive support from the whole system.

The theme of the reform is to give time to students and the center of the reform is the “main body class”. The “main body class”, as introduced in last section, consists of three sections, student self-learning, student discussion, and teacher lecturing. In order to
support the main body class, the school will edit learning guidance books, innovate classroom settings, establish self-learning classes, and develop tests.

The learning guidance books (LGB) are designed to direct student self-learning in the first section of the main body class. Along with the curriculum standard and the textbook, the learning guidance book stimulates students’ curiosity in acquiring the knowledge in the textbook and thus meets the curriculum standard. If we use computer game as a metaphor, The LGB is the task provider. It gives students tasks. In order to accomplish the task, students need to learn new skills and purchase new equipment. The textbook is where they could buy armors and learn skills. Teachers are the writer of the LGB. They could reorganize the curriculum content in order to write the LGB. Therefore, teachers must interpret the curriculum standard in detail. They must become teacher-researchers/teacher-scholars.

The classroom setting will be changed to encouraging student discussion. Blackboards will be around the classroom. When students are in discussion, they could write their ideas on the blackboard right away and the idea will be shared easily. The third section of the main body class is for solving problems and promoting the discussion. As student discussion could be very random, there will be no fixed structure for class. Teachers must master the subject knowledge and facilitate student inquiry.

There will be 3-5 self-learning classes every day. The self-learning class is for student 1) digesting the knowledge they have learned and 2) developing their own interests in learning. The self-learning class has three requirements for teachers, 1)
answer student questions, 2) help student establish productive learning habits, and 3) get to know students and help them based on individual situations.

The systematic reform in school set new requirements for teachers, which will motivate teachers to work together and implement the reform. Meanwhile, the administrators have recognized that change is an evolving process. They set steps to help teachers meet the requirement. For example, one of the school reform outcomes is that every teacher writes his/her own LSB. The current requirement is that teachers in one discipline develop a LSB together. The systematic reform will not only urge teacher collaboration, more importantly, it will increase the robustness of the reform. A sustainable reform, I believe, will finally transform teachers to teacher-researchers/scholars.

4.4. Summary

Teacher’s weekly meeting and peer discussion are two major approaches to teacher collaboration. Other approaches include open class, class evaluation activities, and class audition. Teacher collaboration exists for a long time and the curriculum reform endowed new content for collaborating. The collaboration itself presented new features. Teachers seek solutions from collaboration when they come across problems. They gain support when they encounter uncertainties. The collaboration enhanced relations among teachers. Individual’s ideas are promoted to collective intelligence through collaboration. Teachers are able to have dialogue with reform authorities by collaborating. Collaboration created a friendly environment for teacher’s advancement.
Although the collaboration has offered countless support for teachers, the collaboration itself needs support, too. The vagueness of the CEE has motivated and undermined teacher collaboration. Teacher collaboration selflessly dedicated to student’s future wellness and was rewarded by student positive feedback. The reform mandates dictated/influenced collaboration’s direction. Administrator’s action too influenced collaborator’s morale. The collaboration is so strong that it has provided protection for teachers who are in “trouble”, and it is so fragile that a change in its surrounding will lead undermine its successes. The collaboration is only one part of the entire reform. It could make best of its advantage only when every part of the entire system shifts correspondingly.
CHAPTER FIVE:

Conclusion and Implications

The final chapter of the thesis restates the research problem and reviews the major methods used in the study. The key sections of this chapter summarize the results and discuss their implications.

The study looked at physics teacher collaboration as a teacher professional development strategy in the context of Chinese curriculum reform. Three research questions shaped the design and the procedure of the study. The research questions examined teacher’s experience of collaboration, factors impacted on collaboration and school administrator’s role in the collaboration. The three research questions are

- What are physics teachers’ experience and understanding of collaboration as a teacher learning strategy?
- What are the factors influencing successful collaboration in the context of the reform?
- What are administrators’ understanding and interpretation of their role with regard to curricular and pedagogical reform in the context of teacher collaboration as a professional development strategy?

The research was conducted in three senior high schools in Zhengzhou where the new curriculum was adopted from 2008. 13 physics teachers and 2 administrators were involved in the research. Interview method is the primary approach for data collection. Class observation, personal reflective journal, pictures and field notes supplement the
interview by providing context information.

The data were collected and analyzed by looking for themes and patterns in the interview transcriptions. This process resulted in the generation of several themes that related to the three research questions. Two themes that associated with teachers’ understanding and experience of the collaboration were identified:

1. Teacher collaboration is a unique forum for pedagogy and content discussion as well as complementary to government reform training programs;

2. Teacher collaboration as a positive product of government mandated reforms that has reduced the gap between novice and experienced collaborating teachers.

Three factors that influence successful teacher collaboration were spotted:

1. The uncertainty of the College Entrance Examination is a factor for teacher collaboration in the context of the ongoing curricular and pedagogical reforms.

2. Teacher collaboration is motivated by the desire to improve student performance;

3. Administrative support for teacher collaboration and the educational reform mandates.

Another two themes stood out that support the administrators’ understanding and interpretation of their role with regard to curricular and pedagogical reform in the context of teacher collaboration as a professional development strategy:

1. Exploring and providing ways and strategies that support teacher professional development.
2. Creating supportive climate for teacher collaboration through school based systematic change.

From the discussion of the results in chapter 4, conclusion and several implications are noted. The nature and some conditions of teacher collaboration will be summarized and suggestions for practice and professional development, for curriculum planning and implementation, for theory, and for future research will be laid out in the following section.

5.1. Conclusion

Teacher collaboration for purposes of professional development cannot be mandated but it evolves out of necessity. Teacher collaboration cannot be imposed. There must be topics, aims, and content to collaborate about. Li and Ma (2005) considered Chinese teachers as being in a state of “isolated, alone” in their daily practice because in the old curriculum most teachers put their energy only on the small fragment of the whole curriculum. Teachers could achieve success as long as they got familiar with the small fragment which, in most cases, was the textbook. Teachers lacked opportunities and motivation to work with colleagues. With the adoption of the new curriculum, the reform mandates created content and motivations for teacher collaboration. The uncertainties of student learning outcome including performance on CEE exacerbated the need for teacher collaboration. And in turn, teacher collaboration became a necessity in the context of the curriculum reform.

5.1.1. Content for Collaborating
The Chinese curriculum reform encompasses a series of transformations related to in-service teachers and thus produces necessities for collaboration. The changes include, as mentioned in chapter 4, 1) curriculum content related to daily life, 2) Teaching Programme replaced by Curriculum Standard, 3) teachers become curriculum designers 4) shift from teacher-centered to student centered class, and 5) fulfill government training program.

In order to cope with the changes, teachers must develop responsive actions in daily practices. On the one hand, there is no detailed instruction and solutions for teachers to make responsive changes. The vagueness of the reform policies and guidelines create content and necessities for teacher collaboration. On the other hand, teachers need to develop their unique actions for their practice as every teacher is engaged differently with students, classes, school administration, school culture, parents, community etc. The reform endows autonomy to schools and encourages establishing responsive school-level reform but with its own feature. Teachers need to develop strategies that meet both the reform requirements and local demands. Teacher collaboration at school level accelerates the forging of teacher action and thus become a necessity in the context of curriculum reform.

The change in curriculum content spurred teacher collaboration, especially the collaboration between novice and veteran teachers. The new curriculum content was featured as related to daily life and stressing knowledge application. Veteran teachers, as Zhao stated, worked for years in the old curriculum system that underlined subject based
curriculum, knowledge and test scores. They were familiar with physics subject knowledge and mastered skills of promoting student test performance. Such competences could ensure their success in the old curriculum. The latest technology and physics application in life draw little attention of experienced teachers. Novice teachers are more open-minded and familiar with technology applications. The new curriculum content seems friendlier to them. But novice teachers are short of experience and cannot handle the tests. In class, veteran teachers were often challenged by students’ questions related to modern technology while young teachers were plagued by lack of class management skills. Therefore, facing the need to shift in curriculum knowledge as well as for the success in CEE, both veteran and novice teachers have their merits and shortcomings and thus are motivated to collaborate with each other.

With the cancellation of the Teaching Programme, teachers lost their detailed curriculum instructions and interpretations. Meanwhile, the Curriculum Standard does not give specified description of the new curriculum content due to its purpose and function and thus cannot play the Teaching Programme’s role. The need to interpret the new curriculum content then emerged. In order to build up distinct curriculum interpretation with the guidance of the Curriculum Standard, No.7 Secondary organized weekly meeting for group Curriculum Standard interpretation. Administrators in No.3 Secondary encouraged teachers in each discipline to interpret the Curriculum Standard together. In the process of group lesson preparation, grade 10 physics teachers in No.3 Secondary reached a common understanding of the lesson before they discussed teaching
method. The vagueness and importance of the Curriculum Standard provides room and impetus for teacher collaboration. The need to clarify and interpret curriculum content is the motive for teacher collaboration.

Student independence is cherished in the new curriculum. Teachers are supposed to shift focus from passing on knowledge to developing student abilities. The curriculum stresses particularity of student rather than generality of knowledge. In addition to interpreting the Curriculum Standard, teachers need go one step further—creating their own curriculum with the reference to the Curriculum Standard. The physics department heads shared the views that student individuality should be encouraged and different students should be taught differently. The administrators in No.3 Secondary understood that every teacher would become teacher researcher and curriculum designer through the reform, and currently teachers lacked capability to create their own curriculum. The school will organize teachers to write curriculum materials together. A curriculum development committee consisting of outstanding teachers in each subject will assist teachers to design their own curriculum. Teachers have recognized that their abilities cannot fulfill the requirement of curriculum design. They need incentives to learn. Therefore, teacher collaboration occurred because of the demands to shift teacher’s role, competence in curriculum design and available administrative support.

The new curriculum guidelines require a transformation of class mode. The traditional teacher-centered class will be replaced by student-centered class. The new class mode demands teachers not only to abandon the traditional lecture method but also
to build equal relations with students. In the study, a crucial aspect for collaboration was discussing and developing proper pedagogy for a student-centered class. Many teachers were struggling to develop activities that would lead student to learn on their own accord. In the group lesson preparation, teachers shared their pedagogy and gave feedback to each other. In some cases, teachers who had attempted a new strategy and had received positive feedback shared their experience in the group. In the process of building equal relations with students, experienced teachers hesitated to step down from their “dignity of the teaching profession” and to give up the control of class. Novice teachers, on the other hand, found it hard to gain students’ trust and lacked skills to facilitate the class. Both veteran and novice teachers experienced difficulties in building equal relations with students and they perceived the necessity to learn from the other group. Once again, teacher collaboration was stimulated by the new conditions in the curriculum reform and teachers’ awareness of self deficiency.

In the study, teachers claimed that the professional development program from the education department was helpful in terms of informing and changing their concepts on the new curriculum. They also pointed out that the program offered limited instruction in pedagogy and the experts knew little of the context that teachers were involving in. Such a finding seems consistent with Tang and Ma’s (2003) research. Tang and Ma sent out 609 questionnaires in 10 reform pilot districts around China. 20.5% teachers considered the government training (including the national level, provincial level, county level and school level) help them know the background, ideology, and aims of the reform. 40.9%
participants indicated that the training changed their concepts about education. 14.1% teachers recognized the necessity of the reform. Only 21.2% teachers believed that their pedagogies were improved by the training.

The teacher collaboration played a complementary role of the government program. It helped teachers turn ideas and beliefs into action. Besides, teacher collaboration collected teachers’ questions and hardships and transmitted to policy makers, scholars and educators. The spontaneous bottom-up structure magnified teachers’ voice and made communication between policy makers and teachers possible. The government program informed teachers with reform ideology. The desire to develop relative pedagogy initiated teacher collaboration. The follow-up government training, which gave feedback on teachers’ questions and hardships, promoted teacher’s morale in collaboration.

5.1.2. Conditions for Collaboration

The curriculum mandates and teacher professional development program are resource for teacher collaboration. Teachers gained from the initiatives and contents of collaboration. However, it is internal and external conditions that maintain dynamic and health teacher collaboration. In the study, such conditions were identified.

5.1.2.1. Internal Conditions

Teachers in the collaborating cohort were aware that everyone was equal in the group and could benefit from collaboration. The hierarchical structure among teachers used to be a barrier for the interaction of ideas. When it ceases to exist, as everyone is concerned with understanding and interpreting the unfamiliar reformed curriculum,
collaboration becomes active and sustained. The new curriculum “erased” experienced teachers’ awareness of themselves as high status and unchallengeable; meanwhile, young teachers were encouraged to speak out their opinions in the collaboration when they realized that in the reform experienced teachers cannot be called experienced anymore. The power and high status of experienced teachers were built on their familiarity of the old system and proficiency in teaching methods. The reform applied a new system and encouraged new pedagogy and thus undermined the superiority and expertise of the experienced teachers. In the study, most experienced teachers explicitly stated that they could learn from both experienced and novice teachers. Young teachers often provided fresh ideas in pedagogy; they were familiar with new technology and they were and often are easy going with students. Some novice teachers pointed out that experienced teachers were modest and willing to help them. They could appreciate equalness in discussion and often received positive feedback from them. Most teachers felt they could learn from the group rather than from a particular individual. With the recognition of equal relations and the benefits of group work, teacher collaboration was able to flourish.

5.1.2.2. External Conditions

As part of the reform, teacher collaboration cannot succeed and thrive without the support of its environment. In addition to colleagues, teachers work closely with students and administrators in daily practice. Their reactions, thus, influenced the wellness of teacher collaboration.

The desire to improve student performance and the uncertainty of how student
learning outcomes including performance on CCE exacerbated the need for teacher collaboration. Although some teachers complained about the unfairness and resource consuming in the reform, they claimed that they were still supporters of the reform and were continuing to implement the policies because the reform’s aim is genuinely for the well-being of students. Teachers foresaw that the results of a successful reform would benefit student growth. Hence, they were willing to implement the reform and overcome the difficulties in the reform process along with peer teachers.

However, the uncertainty of the CEE makes student performance uncertain in terms of the CEE success. Teachers are not sure how much their effort will contribute to the CEE scores. With the unreleased CEE guideline of Henan province, most teachers were concerned that the CEE will undermine their effort and the reform outcome. On the one hand, teachers were concerned about student well-being and wished to see their all-round development. On the other hand, the CEE is a very important standard for social recognition. As Zhao mentioned, the school was judged by its performance in the CEE. Teachers were under great pressure when dealing with the CEE to find strategies that could both ensure student success in the CEE and develop student abilities and individualities. Individual teachers relied on working as a collective. Many researchers suggested that teacher collaboration is the way to reduce uncertainty (Hargreaves & Tucker, 1991; Munthe, 2003; Snow-Gerono, 2005). In our case, the uncertainty of the CEE was still there but the collaboration alleviated teachers’ anxiety of uncertainty. The risks of individual misinterpretation and mis-capture of the CEE direction were lessened.
by the group work. And the fine line between all-around development education and test-orientated education was negotiated through teacher collaboration.

According to Fullan and Miles (1992), changing is a process full of uncertainty. “Anxiety, difficulties, and uncertainty are intrinsic to all successful change” (p749). Uncertainty is the motivation of learning. The uncertainty in teachers and teaching could result in both negative and positive reactions (Helsing, 2007). In our study, the uncertainty of the CEE and student performance led to teachers’ positive attitude towards collaboration.

Sustained teacher collaboration is motivated by positive student feedback and learning outcomes following their learning experience from “instructional products” of teacher collaboration. The content of teacher collaboration was enriched by student ideas and questions. Compared to an individual teacher, a class of students is closer to the daily life. In addition, the students are endowed with more power in the reform and are encouraged to question teachers. More student ideas were brought into teacher discussion. Student ideas became fodder for flourishment of teacher collaboration. Teacher collaboration was also motivated by the improvement in class engagement, learning morale, and test performance. Teachers claimed that if their new strategies were well accepted by students. They shared positive feedback with their colleagues. When students showed curiosity to learn, teachers became more willing to collaborate with peers in order to maintain the student curiosity in learning. Students’ satisfactory performance in municipal tests vindicated teachers’ success of their new pedagogies, which were the
outcome of teacher collaboration. In turn, when students’ questions and comments were appreciated and valued by teachers, the students got more involved in learning and continued to power teacher collaboration. The reciprocal relation between teacher collaboration and student learning morale evolved with the implementation of the reform.

Besides the cooperation of students, active and sustained teacher collaboration for purposes of professional development requires support from school administration. A comparison of teachers’ comments on administrators in three schools illuminated the administrators’ role in the teacher collaboration. In No.5 Secondary, administrators played the role of urging teachers to implement reform mandates. However, they failed to offer instructions and support for reform implementation. Teachers claimed that they received limited support from the administrators for collaboration. They recognized the relation with administrators as obedience. In addition, because the administrators did not carry out the rules they had made, teachers got confused and were reluctant to execute the reform.

In No.7 Secondary, teacher’s comments on administrators were neutral. Teachers considered that administrators’ attitude and actions were crucial factors influencing teacher behavior including collaboration. Administrators in No.7 Secondary set up themes for teacher’s weekly meeting. The theme was to interpret the new Curriculum Standard, which was a suggestion from the government. The administrators seemed positive about carrying out government guidelines but paid little attention to teacher’s advancement.
The administrators in No.3 Secondary noticed the insufficiency in teacher’s competence to implement the reform. They organized a variety of activities that helped the teachers to manage the reform. More importantly, the school launched a school-level reform how to cope with the new curriculum. Teacher professional development was embedded in the school reform environment and thus received constant support.

The three case schools showed the importance of administrator attitude and behavior to teacher collaboration and the reform. In this reform that revolved around a three-level administrative structure, schools received more autonomy. Considering the top-down administrative structure in school, the power resides in administrators and teachers have limited voice in school decision making. Thus, teacher collaboration is vulnerable to administrative intervention and teacher’s needs are often neglected or misunderstood by the administrators. Vigorous teacher collaboration requires understanding and support from administrators.

5.2. Implications

5.2.1. For Practice and Professional Development

Teacher collaboration is the responsibility of teachers themselves. However, there must be a conducive environment for the teachers to exercise this responsibility. Teachers are often called upon to modify their practice to match shifts in resources, society, educational reform, etc (Butler et al., 2004). In this study, the reform expected teachers to cope with current reform trends, ensure student performance in the CEE, and become teacher-researchers. The demands for change call for teacher professional development.
More collaborative models of professional development were advocated by researchers (Scott & Weeks, 1996). Butler et al. (2004) suggested that teacher collaboration as a professional development strategy requires emphasis on the contributions of both individual and social factors. It is imperative that teachers recognize their shortcomings and the need to learn from peers/group. The collaboration cannot be imposed but can be initiated based on teachers’ needs. The needs could be due to both external and internal factors. An effective teacher development strategy requires examinations of internal and external factors (Akmal & Miller, 2003). The external factors in the study included reform mandates and school policies and activities. The internal factors are the desire to improve student performance and growth. A conducive environment is one in which teachers are aware of their needs that can be addressed through collaboration and that the necessary support and resources are available. Administrators played a key role in creating such environment in the context of the curriculum reform.

Effective collaboration requires clear role definition (Li & Ma, 2005; Palincsar & Herrenkohl, 2002). In the current study, experienced teachers were of the impression that young teachers were familiar with front-line technology and knowledge application; Novice teachers asserted that experienced teachers had advantages in establishing student-teacher relations. Although such impressions motivated collaboration, it is not always the case in practice with certain teachers. For example, if a teacher turns to a person who can provide limited help, the result can be frustrations. Sharing every member’s strong points and clarifying each member’s role within a cohort might
increase the effectiveness of collaboration.

Effective teacher collaboration as a teacher learning strategy calls for reducing the hierarchical structure in school. The mandatory reform undermined the hierarchical structure between novice and veteran teachers. The collaboration was valued when every group member recognized the benefits of working together. However, hierarchical structure still existed between the administrator and teacher and between teacher and student. Teachers identified their relation with administrators as obedience. Few comments in the study indicated that administrator tried to learn and customize school policies from teachers’ needs. Teachers’ voice and requirements were often passively heard by administrators. Likewise, although student ideas contributed to teacher collaboration, the teachers hesitated to examine student opinions on pedagogy and curriculum interpretation. In other words, the teacher reported positive feedback may be a neutral or even negative one from students’ perspectives. Teachers rarely collected student views in terms of professional development. Given the importance of administrators and students in teacher collaboration, I propose that the administrators and teachers, who hold relatively high statues in school, should actively work with teachers and students and learn from their perspectives. In addition, teachers should be empowered in school administration decision making process so that their voice can be heard and their needs can be weighted.

5.2.2. For Reform Implementation

Teacher collaboration, as a teacher learning strategy as well as a communication
approach with authorities, should be encouraged and maintained in a top-down reform context. As reform is a process full of uncertainties, unfamiliarities, and anxiety, individual could be overwhelmed by reform mandates and psychological pressures. Group work could soothe the anxiety by sharing the hard feelings and provide solutions for practice. Individual ideas could be developed to collective intelligence. Collaboration could complement the insufficiency in instruction and develop strategies for local situations. More importantly, teacher collaboration could create a bottom-up structure that cooperates with the top-down reform. The bottom-up structure could connect authorities to local and daily reform implementation, which will benefit both parties.

Interdisciplinary teacher collaboration should be enhanced in the future. Currently, teacher collaboration occurred mostly within one discipline. The weekly meeting are held among physics teachers in one school and the peer discussion happened among physics teachers in one grade. The mismatch between mathematics and physics was mentioned in the study. Physics teachers complained that their students did not have enough math knowledge as they used to have in the old curriculum. This insufficiency dragged physics progress. With the evolvement of the reform, the demands for cross discipline collaboration will be increased. As the reform stressed the shift from subject based curriculum to student based curriculum, more attention will be drawn on student development. In order to know a student, teachers in different subjects could work together and develop a holistic curriculum for the very individual. In addition, teachers will become curriculum designer in the reform. Teachers could decide the order and
progress of the curriculum. The discipline mismatch will increase if teachers do not collaborate across subjects.

The reform needs to be systemic. Since every part of the reform was embedded in its environment, sustained shifts in a single part require relative response from the environment. A systemic reform could not only change every single part but also improve its context. Hence, every aspect of change will receive external support and reform will last and become meaningful. The case of No.3 Secondary showed how teacher collaboration was embedded and supported by a school-level reform. Teacher collaboration was pushed by both inner and external motivations. Meanwhile, the school reform offered content and resource for collaboration. The interdependent relation between teacher collaboration and its context makes systemic reform necessary.

5.2.3. For Theory

There must be something of value for teachers to collaborate about and uncertainty can be a positive catalyst for teacher collaboration. In the study, teacher collaboration was enriched by the reform. The reform mandates provided content for teacher collaboration including the pedagogy, curriculum interpretation, teacher growth, etc. On the one hand, teachers work together to meet the reform requirement. More importantly, their collaboration was driven by the desire to improve student performance, to better student growth and to create a bright future for students. The reform is a process full of uncertainty (Fullan and Miles, 1992). Uncertainty of CEE in the reform was identified as the key factor that makes the success of the reform pending. However, the uncertainty of
CEE was a positive factor that stimulated collaboration. Given the crucial role of CEE, teacher took high risks in “guessing” CEE direction. Collaboration could psychologically reduce the risk or misinterpretation and increase teacher’s confidence in teaching by sharing and modifying “guessing”. In addition, as the CEE will refer to the Curriculum Standard, teacher collaboration was enhanced by collective interpretation of the Curriculum Standard.

5.2.4. For Research

Due to the limitation of time and resource, the study examined a relatively small sample. The results and claims cannot represent the situation in Zhengzhou city or even larger context. Some findings in this study even go opposite with the official investigation from the Ministry of Education. For example, the official study showed that 45.7% students reckoned that teachers sometimes collected student’s views on lesson content and teaching strategy; and 40% of students considered that teachers often collected their thoughts on lesson content and teaching strategy (Research Project Team, 2005). In the current study, most teachers claimed that they did not ask student opinions on pedagogy and curriculum content or they hide such questions in casual conversation with students. Future research could enlarge the sample and examine the overall situation of physics teacher collaboration in Zhengzhou city or in Henan province.

In the year 2011, Henan province will administer the first CEE since the launch of the new curriculum. How the CEE outcomes will influence the reform and thus influence teacher collaboration is worth exploring. Also in 2011, the school-level reform will be
fully implemented in No.3 Secondary. How the school reform will impact teacher collaboration then, and any emergences in teacher collaboration need to be explored.

For the improvement of the collaboration itself, future research could look at how the hierarchical structure was formed and seeking effective ways to remove the hierarchy. Strategies for stimulating the cooperation between administrators and teachers and the cooperation between teacher and student could be developed.
REFERENCES


Opportunities and challenges of China’s inquiry-based education reform in middle and high schools: Perspectives of science teachers and teacher educators.


APPENDICES

APPENDIX I:

Interview Question Outline:

The order and the way the questions were framed changed based on how the information emerged as well as contextual factors.

For teachers:

1. General information of the interviewees.

2. What are the difficulties in teaching the curriculum by far?

3. How do you deal with it? What are the major approaches to solving problems?

4. Do you turn to other teachers or to the group when you have problems in teaching?

5. Are there any kinds of interactions/collaboration/cooperation among teachers in term of implementing the new curriculum?

6. When and how did the interactions start?

7. Could you tell me how it (collaboration) works?

8. Could you tell me your understanding of the new curriculum?

9. Could you tell me your understanding of the collaborative work, such as what is your role in the collaboration, what responsibility should you take?

10. Do you find the collaboration helpful, in what ways, to what extent?

11. To what extent do you find the collaboration helpful in understanding and implementing the new curriculum? could you give me an example?

12. Are you willing to apply the advices from the collaborative work to your teaching?
13. When you seeking help from colleagues, how do you select the people that you want to talk to? What kind of people that you could get the most from?

14. What factors do you think that work well in your collaboration with other teachers?

15. What factors do you think that harm your collaboration with other teachers and should be improved?

16. Do you ask students’ suggestions when you experience problems in teaching?

17. What do you think administrators’ role in implementing the reform and helping teacher adapt to the reform?

18. Did you receive support from the administrators in teaching the new curriculum? if yes, what kind of support and how do the administrators support you?

19. Other comments?
For administrators:

1. What is your understanding of the reform? What do you think the reform want to achieve?

2. What do you think teacher’s role in the new curriculum?

3. Does the school administration offer any support for teachers in implementing the new curriculum? if yes, what are they?

4. Could you tell me your role in helping teachers implement the new curriculum?

5. I heard teachers use collaboration as a strategy to solving problems in the reform, what do you think of teacher collaboration?

6. How do you think the collaboration among teachers will help them better implement the new curriculum, why?

7. Do you participate in their collaboration as an administrator? If yes, how often, and why?

8. Could you tell me your understanding of the teacher collaborative work, what is your role in teachers’ collaboration?

9. What are the factors influencing teachers implementation of the new curriculum?

10. Could you tell me where the collaborative work did well and where should be improved in order to better implement the new curriculum?

11. Other comments?
APPENDIX II:

UBC Ethics Certificate of Approval:

The University of British Columbia
Office of Research Services
Behavioural Research Ethics Board
Suite 102, 6190 Agronomy Road, Vancouver, B.C. V6T 1Z3

CERTIFICATE OF APPROVAL - AMENDMENT & RENEWAL

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<th>UBC BREB NUMBER:</th>
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<tr>
<td>Gaalen L. Erickson</td>
<td>UBC/Education Curriculum and Pedagogy</td>
<td>H07-02028</td>
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INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:

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CO-INVESTIGATOR(S):

David Anderson
Guogeng Fu

SPONSORING AGENCIES:

Social Sciences and Humanities Research Council of Canada (SSHRC) - "Professional learning communities: A multicare study in three countries"

PROJECT TITLE:

Professional Learning Communities: A Multicare Study in Three Countries

CERTIFICATE EXPIRY DATE: August 17, 2011

AMENDMENT(S):

Addition of co-investigator.

RENEWAL AND AMENDMENT APPROVAL DATE:

August 17, 2010

The application for continuing ethical review and the amendment(s) for the above-named project have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.

This study has been approved either by the full Behavioural REB or by an authorized delegated reviewer

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