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**TEACHER TRAINING AND CURRICULUM REFORM IN CHINESE
AGRICULTURAL SCHOOLS**

A Thesis in
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by
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ABSTRACT

The purpose of this study is to examine teachers' current and desired knowledge and skills related to curriculum development and instructional methodology. The study also identifies teacher training and professional development needs as well as the major factors attributed to new curricular implementation.

The population for the study was teachers in 12 agricultural schools that were part of a United Nations pilot project to reform agricultural education in China. A systematic random sampling method was used to select participant teachers from the population. A questionnaire was constructed and used to collect data from selected teachers. The questionnaire included five parts, in which 41 items measured current and desired knowledge/skills regarding curriculum and instruction. Those 41 questions were divided into six categories: planning and management, curriculum and innovative teaching, adopting competency-based education, teaching methods and activities, evaluating and assessing, and educational technology. Thirteen factors related to curriculum reform were presented in the instrument and the respondents were asked to rate the top three. Attitudes and perceptions toward reform policies and strategies as well as training programs were included in two sections in the instrument.

The questionnaire was translated into Chinese and validated both in China and at Penn State University. The researcher traveled to China and conducted the data collection. Three hundred and ninety-eight questionnaires were sent to 12 schools with 350 returned. The response rate was 88%. Data were input and analyzed through SPSS.

The results from the study showed that the average age of the teachers surveyed

was 36 years old, with 14 years of work experience and 13 years of teaching experience. The majority of respondents were male, bachelor degree holders, and were lecturers by professional title. The respondents indicated that they desired professional training at least once per year.

Overall, teachers surveyed supported the reform movement in curriculum and instruction. They didn't think there were sufficient resources and policies in teacher professional development programs and activities. Meanwhile, teachers perceived that teacher training was very important to assist them in implementing curriculum innovations.

The teachers indicated their working conditions related to reforms were unfavorable as they were overloaded by heavy teaching loads, beset with inadequate technical and administrative support, and they encountered obstacles due to insufficient equipment and funding.

In general, teachers desired to have a higher level of knowledge and skills regarding curriculum and instruction as well as the utilization of competency-based education. Among six categories of knowledge/skills in the survey, the results revealed that teachers felt particularly inadequate in three categories. These three categories were educational technology, curriculum development, and innovative teaching. Therefore, appropriate training programs and activities should be conducted to address these weaknesses.

Teachers surveyed indicated that knowledge and skills of teachers, new facilities and equipment, and attitudes of teachers were the top three factors attributed to successful curriculum reform among 13 factors.

Based on the results from this study, a need for teacher training and professional development is evident at these pilot schools. It is strongly recommended that teachers should be given the opportunities and support to attend teacher training and professional development programs, which will increase their current knowledge base and enable them to successfully implement curriculum innovations.

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Chapter I

INTRODUCTION

Background/Statement of the Problem

China is undergoing a large transformation as its economic system is shifting from the centrally planned to a market-driven system since 1978 (State Council, 1999). Agriculture as the basis of Chinese society is facing its greatest challenge to adjust and change its system to meet the needs of the market economy. In particular, agricultural education is playing an important role in preparing people for a new phase of rural development. During the past decade, agricultural schools have started to take actions to reform their existing educational systems and to strengthen their vocational programs (Chen, 2000).

There are about 330 agricultural schools distributed among the provinces, autonomous regions, and municipalities throughout China. The number is not exact because of the evolving nature of the agricultural schools resulting from the nation's transition. Typically, agricultural schools were resident schools that required students to pass standardized admission exams. Schools usually enrolled graduates from junior secondary schools and each program lasts for three or four years. The students normally are 15 to 22 years old. The average enrollment for each school ranged from 1000-3000 students. One-third of agricultural schools were governed at the provincial level, while two-thirds were administered by prefectures. Schools were usually affiliated to agricultural departments with various levels of government bodies. None of the agricultural schools were directly under the control of the Ministry of Agriculture (MOA).

In the past, agricultural schools were academic institutions classified as secondary specialized schools. These schools taught a curriculum that was general in nature but the theory was quasi vocational. If these schools were compared to schools in the US, they would be considered resident community colleges. The mission of these schools was officially described to train intermediate-level specialists who were political and technical experts. Government policy indicated that students were required to master basic theory, to have specialized knowledge, and to develop practical technical skills. Graduates from these schools were graded as “middle-level specialists” (Henze, 1984). Students were usually trained theoretically and narrowly. Most subjects studied in the schools were academic and usually had little relevance to the students’ workplace and reality. Upon leaving school, graduates were often assigned jobs according to a centrally organized plan. Just like graduates from higher education institutions--or at least in theory--every graduate would be assigned to a job position that could be characterized as “white collar.” As government institutions, agricultural schools were protected from scrutiny and from free market tests (Amberson, 2001).

In recent years, significant changes have taken place to reflect the continued reform and the development of the “socialist market economy.” Today, jobs for graduates are no longer guaranteed and the government can only hire approximately 40% of agricultural graduates (Chen, 2000). As a result, it is becoming increasingly difficult for agricultural graduates to find jobs in the public sector. Accordingly, graduates needed to find their employment in the private sector or they need to be self-employed. Students’ education became more purposive and selective, since it now must relate to their training and to employment opportunities in the labor market. Moreover, the feedback to schools

has indicated that agricultural graduates have had difficulty finding jobs that reflects their educational knowledge and skills.

The curricula used and the teaching methods implemented have not always been relevant to the development objectives of individual countries, the needs of farmers, or to the labor market in general (FAO, 1997). As a result of China's economic reform movement, a mismatch of teaching strategies and curricula to meet the needs of the new economic realities has become evident in Chinese agricultural education (Ministry of Education, 1998).

Overtime, there was a realization at all levels that students needed to be taught practically to meet the requirements of the labor force. One of the primary initiatives to meet the changes needed in agricultural schools was to modify the existing courses and to develop new curricula. The essence of this change was to decentralize the curriculum development process and introduce vocational elements into the existing system so it could better serve the local needs of agriculture and rural development.

As the problems and challenges emerged with reform strategies, teachers have been identified key players in this educational endeavor. Traditionally, agricultural teachers are not required to be certified for teaching, therefore most of them lack systematic education in pedagogical knowledge and instructional methodology. This problem has aggravated the situation agricultural schools now face. If this problem is not addressed it will be challenging to move the reform movement forward (Chen, 2000).

Reform Initiatives in Agricultural Schools

In 1995, the Education Department of the Ministry of Agriculture (MOA) developed the general guidelines and goals for the reform of agricultural schools. As reported by Li, director, Education Department, MOA, these were:

According to the requirement of qualitative and quantitative manpower for agricultural industry, rural areas and society, and considering current problems which the agricultural schools have in common, each agricultural school should renew educational ideology, upgrade the pattern of manpower development, place emphasis on systematic adjustment of specialty structure, subject content and instructional methodology in order to produce qualified manpower and create a new and competitive mechanism which can meet the needs of the development of the socialist market economy (Li, 1995, p. 4).

In direct response to the needs of the workforce for the market-oriented economy, general agricultural schools are gradually being transformed to become specialized vocational and technical schools. The focus has shifted away from academic training to a vocation-based teaching scheme. The mission of schools has changed accordingly, and the schools are now officially charged with teaching comprehensive abilities and practical skills that can be applied to regional economic construction, service, technology, management, and the development of rural areas (Chen, 2000). Agricultural schools have been required to direct their educational programs to target agriculture, rural areas, and farmers to emphasize local agricultural productivity.

Decentralized policy initiatives and approaches in curriculum planning, implementing and management are major features of the reform strategies. In the past, administrative and managerial systems in control of curriculum design were hierarchical and centralized. In this old system, principles and general goals for creating the curriculum were set by experts and administrators in ministries, provincial educational departments, and academic institutions, and then passed down to the schools for implementation. Teaching was organized under a countrywide unified syllabus and curriculum. Schools and teachers were often excluded in the curriculum planning process and usually had little initiative to make changes during curriculum implementation. This system made it impossible for schools and teachers to adjust the curriculum structure and content. Also, to some extent, the system hindered social participation in education and discouraged the institutions' interests in serving society (Henze, 1984).

Agricultural schools have had the same three components of curriculum structure (basic, basic specialized, and specialized subject) since the late 1970s. The proportion taught from each group of subjects was relatively fixed, 30-40 percent in basic subjects, 50-60 percent in basic specialized and specialized subjects, and 15-20 percent in elective subjects. Given these percentages, it was apparent that the basic subjects still account for a large amount of instructional time.

In recent years, the ratio of theory and practical information established for vocational subjects has been changed from 7:3 to 5:5 or 4:6. Directives by higher authorities have made it clear that theoretical information should be used to help students master practical skills. Advanced technology and modern practices in

agriculture should also be incorporated into the curricula (Weng, 1998). In addition, teachers are required to allocate 40-60% of instructional time for specialized subjects for practical training. Furthermore, the traditional internship has been strengthened. The duration of the internship has been expanded from one semester to one year. Now the internship has become an important component of practical instruction as well as a way for students to learn about employment opportunities in the marketplace.

In connection with fixed structure and theoretical content in curriculum in the past, the instructional approach was teacher-centered and information-transfer teaching methodology used was lecture. Students had little or no involvement in teaching and learning process. Most classes had about 40 students. Generations of students were socialized to be passive recipients of education. In addition, the value of practical 'hands-on' experiences in agricultural education had been neglected. This approach to education was characterized as growing the crop on the blackboard and raising the pig in the classroom (Shao, 1997).

The major approach of student assessment in the past was through written exams that primarily tested the students' memory. Since the mid 1990, agricultural schools have developed practical tests both for specialized and basic subjects. Today students must show a proficiency of practical skills gained in the course in addition to written exam.

Another significant change is the awarding of certificates. All schools must now adopt a "multiple certificate policy." In this system, students are granted an academic diploma that show they have met the requirement of the programs as well as several certificates that indicate they have mastered the specific competencies set by business, industry, and educational authority.

Major changes in curriculum and teaching methods in Chinese agricultural schools over the past ten years were summarized by Shao and Bruening (2002, p. 72) in

Table 1.

Table 1. Summary of curriculum and teaching method changes in Chinese agricultural schools

Curriculum & Teaching Methods	In the Past (before 1990)	Currently (1990-present)
Planning, Revision and Adjustments	Hierarchical and centralized system: experts, officials and authority dominated process.	Decentralized system: schools, teachers, employers, technicians and expanded stakeholders involved in a participatory process.
Structure	Fixed and ossified: 3 components: basic subjects; specialized basic subjects and specialized subjects.	Flexible, early specialization and modulization (modular teaching approach) developed according to the needs of students, technology advancement & society expectations.
Content and Materials	Theoretical, academic. Textbook only. Ratio of theory/practice: 7/3.	Practical, vocational-based competency-based education. Integrated (comprehensive) materials and media. Ratio of theory/practice: 5:5/4:6.
Teaching Methods and Teaching Aids	70% class teaching (lecture), 30% lab experiment, field practice, and internships.	50-60% class teaching (lecture, discussion, project work), 40-50% lab experiment, field trips, practice and longer internships. Multi media aids used.
Evaluation	Written exams, assignments, and class performance.	Oral, written, practical exams, class performance, assignments, and national standardized skills testing system.

In addition, reform efforts have been strengthened by the information obtained from educational systems outside China. Under the guidelines and support of the Ministry of Education (MOE) and the MOA, several different models such as,

development a curriculum (DACUM), competency-based education (CBE) and the modular teaching approach (MTA) have been tried and integrated into the curriculum development process in agricultural schools since early 1990s.

In 1992, MOE introduced the DACUM system from Canada. The experiences from this initial reform had been considered worthwhile although the innovator schools had difficulty using this system. A key finding was that successful application of DACUM approach needed to be built on adequate resources and qualified teachers (Weng, 1998).

During 1994-1998, the Food and Agricultural Organization of the United Nations (FAO) sponsored a pilot project-*Strengthening Agricultural Education in Northwest China*. The project proposed by MOA was intended to introduce reforms into agricultural schools in northwest China's poverty-stricken regions. Six agricultural schools were involved in a pilot project. The purpose of the project was to reform the educational system from teacher-centered passive-learning system to student-centered active-learning system using a modified curriculum (Diamond, 1999). CBE and MTA were taught at all of the pilot schools to facilitate the transformation (Bruening, 1997).

After all the teaching and practice in project schools and systematic evaluation of the pilot project, the MOA decided to expand the results to other agricultural schools. The ministry believed that CBE and MTA could be useful tools to help develop Chinese agricultural vocational educational system. Eighteen agricultural schools throughout the country were selected as exemplary schools to try CBE and MTA starting the fall semester of 1996. From 1996 to 2000, MOA held workshops annually to discuss all issues regarding the implementation and use of CBE and MTA. The workshops helped

disseminate the results of the project among both exemplary and non-exemplary schools through the participants. The reform practice in non-exemplary schools was guided by MOA officials and policy statements. Typically non-exemplary schools sent their teachers to exemplary schools for training, or exchanged course syllabi, curricular, and teaching materials with exemplary schools.

The project evaluation showed that students that taught using a competency-based approach were progressing faster than students taught by traditional methods, and students learned more subject matter under CBE system. Feedback from students themselves obtained through the survey and the discussion was positive as most of them expressed satisfaction of meaningful learning with CBE. After all, the students have become more employable as knowledge and skills gained are more practical and relevant (Weng, 1998).

Due to the inadequate professional development of teachers as well as policy support caused by changes in administration at MOA, these reform initiatives were unable to be carried on beyond 2000 after the phase down of the demonstration project in the 18 schools. Having assessed the strengths and weaknesses from the first round initiatives, The Ministry of Agriculture has again initiated reform strategies in agricultural schools. The new initiation started in 2002. The second wave of reforms is featuring CBE in much broader and comprehensive aspects. It not only involves the reform strategies of curriculum and instruction, but also other areas such as: adjustment of program patterns, resources reallocation, and school administration and the promotion system. Moreover MOA has attempted to involve all agricultural schools in

the process. To sustain these reform initiatives, teacher training has been identified as a major focus for the second round endeavor (Ministry of Agriculture, 2002).

All the changes that have occurred in the last decade in agricultural schools will require teachers to change their existing curriculum and instructional methods.

Therefore, building the skills of teachers to implement the new curriculum should remain a high priority with today's educational agenda of localities, provinces, and the nation at large if the reform is to be successful.

Purpose of the Study and Research Questions

The purpose of the study was to describe teachers' perceptions toward the teacher training programs as well as the reform of curriculum and instruction in Chinese agricultural schools. Another purpose of this study was to identify the needs that teachers have as they attempt to implement curriculum reform initiatives. The objectives of the study were to:

1. Describe the demographic characteristics of teachers with regard to education, training received and desired, subjects taught, teaching experience, age, gender, educational background and professional titles.
2. Describe teachers' perceptions related to policy, management and resources in teacher training programs.
3. Examine teachers' work conditions and their attitudes toward curriculum reform initiatives within competency-based education.
4. Determine teachers' current knowledge/skill level and desired knowledge/skill level regarding all aspects of curriculum, instruction, and competency-based

education.

5. Determine the factors that contribute to curriculum reform process.

The following four questions guided this study:

1. What do teachers perceive about the overall curriculum reform initiatives, teacher training programs, and competency-based education in Chinese agricultural schools?
2. What current knowledge and skills levels do teachers have regarding curriculum development and instructional methods and what do they desire?
3. What are the most important factors attributed to implementing curriculum innovations?
4. What implications do the findings have for policy makers, school administrators and teachers themselves in facilitating the needed curriculum innovations in agricultural education?

Significance of the Study

In the review of related literature, few studies were found that attempt to determine teachers' perceptions, knowledge and skills regarding curriculum reform, particularly in a Chinese agricultural educators' context. This study was designed to explore the factors that contribute to curriculum reform initiatives and practices during the transition of Chinese agricultural schools. The study is intended to develop a better understanding of the current status of teacher training programs and the areas that need to be addressed in order to implement curriculum reform initiatives. Findings could help formulate policy and result in better practices to provide pre-service and in-service

programs for teachers in agricultural schools. The improved teacher training programs could lead to effective curriculum and instructional practice and benefit the students and society.

The study is important in that it raises questions on what policies could be effectively formulated in order to sustain efforts in curriculum reforms in agricultural schools. If teachers are important in curriculum reform, what are their professional development needs? Ultimately, this study could provide a baseline for implementation of professional development programs in higher education in China.

Limitations of the Study

This study focuses on curriculum reform and teacher training based on the practice of competency-based education in Chinese agricultural schools. The results are important for the schools that have participated in this educational effort during past few years, but may not be relevant to the schools that have not yet initiated reform strategies. Findings may not apply to other types of vocational education. However, the results will provide useful insights into the process of curriculum reforms taking place in all vocational schools in China.

A qualitative research would bring a richer perspective to the study if it could be carried out. Qualitative research involves with direct observation, in-depth interviews, and existing documents examination. It is exploratory and inductive in nature and provides researchers with a triangulation to understand the study topic (Trochim, 2001). Because of time limitation and other logistic reasons, using qualitative methods to farther explore the research questions was not used in this study.

In addition, data were collected in Chinese and translated to English, therefore keeping accuracy and consistence in understanding the instrument and responses could be a problem due to the differences of two languages.

Operational Definition of Terms

Agricultural Schools: Chinese agricultural schools are categorized as intermediate vocational education. They are different from high schools as well as general colleges and universities. Four of 12 schools in this study have been upgraded to higher vocational education in the last two years. Both types of schools offer intermediate and advanced level non-degree diploma in vocational agriculture during recent transition. Students are typically 14 (middle school graduates) to 18 years old (high school graduates) when admitted into school.

Vocational Agriculture Education: refers to all programs and activities offered in agricultural vocational schools and colleges excluding vocational education schools and centers at county level. It is formal and resident education. Majority enrollees are middle and high school graduates and small number of students is farmer or other type of adult learner.

Curriculum Reform: refers to change curriculum development approaches and delivery methods by adopting renewed ideas and models in curriculum and instruction such as CBE, MTA, and student-centered instruction in agricultural vocational schools and colleges.

Competency-Based Education: Competency-based education is an educational system, in which students learn to be experts in performing relevant skills and tasks for

specific occupations. In this system, skills for various occupations are identified, verified, prioritized, and taught using CBE approach, learning-by-doing (Diamond, 1999).

Modular Teaching Approach: refers to how curricula content is divided into certain units or divisions. Breaking up of curricula has always been done by instructors usually based on subject considerations. A module means, an instruction unit conceived to deliver an employable skill. A module has the characteristics of self-containment with defined entry and exit qualifications. Its major contents are: 1). Teaching/learning subject, 2). Teaching/learning objective, 3). Instruction/learning methods, 4). Required equipment, and 5). Assessment method.

Teacher Training Programs: Workshops, seminars and other activities are organized by schools and other institutions are geared to renewing teachers' attitude, upgrading their practical knowledge, skills, problem-solving abilities and repertoire of techniques in the areas of professional practice. They are usually contractual obligations for teachers.

Professional Development Activities: carried out in a variety of formats, settings and learning modes, and intended to maintain, enhance, or expand practitioners' practical knowledge, skills, problem-solving abilities, repertoire of techniques, or other aspects of professional practice (O' Connor, 2000).

Assumptions of the Study

The following assumptions made when conducting the study:

2. The sample is comprised of a sufficient number and diversity of subjects to warrant generalization of results to the population of 12 agricultural schools in China.
3. All respondents are teachers from participant schools and capable of interpreting all questions in the same manner and reporting truthfully and appropriately.
4. Teachers who have not participated in the previous training initiated by Food and Agriculture Organization and The Ministry of Agriculture lack essential knowledge/skills in the new curriculum development and instructional methods, thus they need all training relevant to these topics.

Summary

Selected agricultural schools in China have gradually transformed from non-effective academic institutions to a vocational-based education since the early 1990s. Emerging of vocationalization of educational system has created new opportunities as well as challenges in agricultural schools. To address these challenges the effort has been made to reform existing curricular and change instructional methods. In addition, teachers have been put in frontline of this reform movement as they are identified as the key players if curriculum efforts will be sustained. This study was intended to develop a better understanding of the current status of teacher training programs, teachers' current knowledge and skills regarding curriculum and instruction, and the areas that need to be

addressed so as to implement curriculum reform initiatives. In the following chapter the trends in curriculum development and instructional methodology, the important position that teachers possess in reforming curriculum and instruction, and the role of professional development programs and activities in assisting teachers along the road will be discussed.

Chapter II

REVIEW OF LITERATURE

The purpose of this literature review is to provide a foundation from the literature to support the changes in curriculum and instruction, and at the same time define the role of teachers in this educational endeavor through a critical look at the existing research.

In reviewing literature on changes in education in general, several themes related to this study emerged. The variety of research on different topics indicates increasing effectiveness in educational reform is a difficult and complex issue and many factors affect this change. For this study, the literature review sought to describe features of the trends in curriculum reform in the context of vocational education and the importance of the professional development to the reform process. Literature related to curriculum reform and the teacher's role in the reform process as well as teacher professional development is presented. Both Chinese and international literature is used to frame the research focus and inform findings from studies in Chinese vocational agriculture. In particular, literature in the following three areas were reviewed:

1. curriculum and instruction: curriculum development, teacher-centered versus student-centered instruction, and experiential learning are discussed under this theme;
2. vocational education and competency-based education;
3. and the role of the teacher in educational reform, and the importance of teacher professional development.

Curriculum and Instruction

Curriculum, to many Chinese teachers, is a list of contents of a course plus a textbook. The western idea about curriculum is novel to most Chinese teachers. In most cases, Chinese curriculum does not deal with the issues of objectives, teaching methodology, and learning activities (Shao, 1997).

Most teachers also perceived the job of the teacher is to impart knowledge from teachers to students. The teacher is information provider and the student just needs to observe what teacher explains in the class and what is in the textbook. In addition, curriculum and instruction have been seen as separated two entities, in which the teacher is supposed to teach the curriculum weaved by others (Shao & Bruening, 2002).

Chinese educational ideology has grown out of Confucianism, which gives great attention to the teaching content, and the dominant role of teachers in the process of teaching and learning. As a result, the educational process inevitably became the transmission of information from teacher to student (Shao, 1997). The teacher is supposed to be the repository of knowledge, and the goal is to simply pour this knowledge into the student. Freire (1974) described this approach as the “banking approach,” in which the teacher is seen as possessing all essential information, and students are seen as “empty vessels” needing to be filled. The class experience is usually dominated by teacher talk and students just need to sit down and absorb the information passively.

Hope and Timmel (1999) argued if the modern education is designed to liberate people, helping them to become critical, creative, free, active and responsible members of society rather than domesticating people, as one tames an animal to obey its master’s

will then the information-based and teacher-centered approaches are no longer effective means for this purpose. The knowledge and skills intended to be taught, and the approaches to be used in a curriculum should be able to serve the needs of students, and help them to become innovative and creative members of society. All of this requires renewed ideas about the curriculum, and the appropriate approach for its development and instruction.

Defining curriculum and its development

Curriculum has been considered as an essential element for all schooling. Thus, when we attempt to initiate reforms of the educational system, changes in curriculum have to be the starting point. As Kelly (1982) indicated, changes of the structure of the school system should be followed by attempts to make corresponding modification to the curriculum since the curriculum is the basis of any education system. Without curriculum change, modifications to the structure of the system make little sense and have little point. Therefore, the reform of curriculum is essential to the formation of a new vocational educational system, as the curriculum is viewed as a basic element for overall educational changes.

Various definitions of curriculum have been articulated by different educators and reflect the complexity and dynamics of this educational essence. Skillbeck (1984) referred to “curriculum” as the learning experiences of students, in so far as they are expressed or anticipated in educational goals and objectives, plans and designs for learning and the implementation of these plans and designs within school environment. Stenhouse (1995) defined curriculum is an attempt to communicate the essential principles and features of

an educational proposal in such a form that it is open to critical scrutiny and is capable of effective translation into practice.

Reid (1999) understood curriculum as both practice and institution. By practice, he contended that curriculum practitioners (principally teachers) have to confront the ever-changing circumstance, deal with the situations beyond managing and coping, and pursue ideals of practice. He considered that the practice of teaching is like the practice of medicine, or the practice of law, assuming a relationship of trust and responsibility between practitioner and client. In this sense, he partially answered the question “what is curriculum?” He defined that curriculum is a multitude of encounters between teachers (practitioners) and students (clients) in circumstances of great individuality, where the outcomes are seldom predictable. Curriculum is also, necessarily an institution, he indicated. The operation of schooling system has granted the conception of curriculum both uniqueness and generality such as the notions of “gradedness” and “subjectness.” As he explained, particularity and generality of school authority and society at large often coexist and intertwine out of the multiplicity of contexts. Thousands of idiosyncratic teachers and students under the system have to face and handle the institutional complexity and dynamics while they pursue their ambitions.

By now, one may understand that the curriculum is more than just a piece of writing, which provides guidance for teaching and learning within the school. It is a dynamic and complicated process. Therefore curriculum development should also be a changing and dynamic process as a response to changes of educational purpose, technology, and society.

Like curriculum itself, the concept and the approach of curriculum development has also evolved over times. Taylor (2000) thinks that the term “curriculum development” could be used to describe all the learning, which is planned and guided, by a training or teaching organization, whether it is carried on in groups or individually, inside or outside a classroom, in an institutional setting or in a village or field. Rowntree (1982) indicated that the following four elements need to be thought about when developing a curriculum.

1. the learning which the students achieve,
2. the activities and experiences which bring the learning about,
3. the process of planning and organizing these activities and experiences,
4. the piece of writing which embraces this planning.

Nicholls and Nicholls (1978) noted curriculum development as a planning of learning opportunities intended to bring about certain desired changes in students, and the assessment of extent to which these have taken place. Nicholls and Nicholls also considered the four elements: objective, content, methods, and evaluation as important and closely interrelated in curriculum development. All of these elements should not be treated in isolation, as is illustrated in the following diagram (Figure 1).

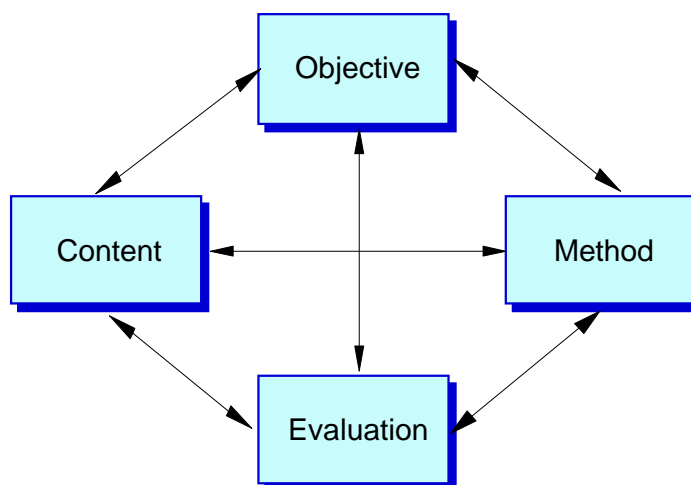


Figure 1: Elements of curriculum (Nicholls & Nicholls, 1978)

There are many different models to consider when developing a curriculum. The emphasis of each approach is different, and largely depends on people's educational philosophy and the way they think about the curriculum. Some see curriculum as the content so they place the emphasis here. Others consider curriculum as a product, which can be achieved through forward planning and objectives are the means by which this end product can be achieved. Kelly (1982) believed that another planning model appears to become increasingly acknowledged in recent years. He argued the curriculum as a process, and the process of learning is considered as the most important element in education rather than the end product.

Among different models, the Objectives Model has been considered a common approach for curriculum development. Regarding the originator of the model approach, Franklin Bobbitt in 1918 stated that: "human life consists in the performance of specific activities, and education which prepares for life is one that prepares definitely and

adequately for these specific activities.” He perceived the specification of these activities as educational objectives (Bobbitt, cited in Stenhouse, 1985, p.52).

Having been developed and reformed in one form or another over many years, major steps involved in the Objectives Model approach, summarized by Taylor (2000, p.8), are as follows:

- Conduct a situation analysis, diagnosing educational and training needs,
- Formulate aims for each level required (i.e. course, subject, unit, lesson, etc.); and allocate time,
- Formulate objectives for each level required (subject, unit, lesson etc.),
- Select the content of the teaching/ training (i.e. what is to be taught),
- Devise teaching/ training methods and learning experiences,
- Organize learning experiences; and allocate time for these,
- Develop assessment instruments.

Curriculum should be regarded as a dynamic instrument rather than a static and fixed structure, and one of the most important roles of the teacher is to make decisions about a whole range of facts (Nicholls & Nicholls, 1978). We all live in a changing society, in which new knowledge is constantly being discovered and old knowledge proved wrong, and where policy changes and changes in educational purpose and structure. Curriculum planning therefore needs to be a continuous, open, and participative process (Taylor, 2000).

Understanding instructional methodology

Curriculum and instruction go hand by hand. Without change of traditional instructional methods the curriculum innovations cannot be successfully diffused (Shao & Bruening, 2002). To examine the teaching and learning practice and map what actually happens in classroom, two instructional patterns: teacher-centered and student-centered approaches to educational delivery. From historical point of view, Cuban (1993).noted that these two traditions of teaching have been anchored in different views of knowledge and the relationship of both teacher and learner to that knowledge. He further described, in teacher-centered instruction, knowledge is often (but not always) “presented” to the learner, who--and the metaphors from different eras and places vary--is a “blank slate,” a “vessel to fill,” or “a duck to stuff.” In student-centered instruction, knowledge is often (but not always) “discovered” by the learner, who is “rich clay in the hands of an artist” or “a garden in need of a masterful gardener.”

The following is another two explanations about teacher-and student-centered instruction from current practitioners. These two terms are defined by Felder and Brent (1996):

Student-centered instruction is a broad approach that includes such techniques as substituting active learning experiences for lectures, holding students responsible for material has not been explicitly discussed in class, assigning open-ended problem and problems requiring critical or creative thinking that cannot be solved by following text examples. In addition, involving students in simulations and role-plays, assigning a variety of unconventional writing exercises,

and using self-paced and/or cooperative (team-based) learning are part of student-centered learning.

Another explanation is from Sener (2000):

Student-centered learning is a learning model, which places the student (learner) in the center of the learning process. It is distinguished from teacher-centered learning or instruction, which is characterized by the transmission of information from a knowledge expert (teacher) to a relatively passive recipient (student/learner) or consumer.

The definitions above reveal essential differences between teacher-centered and student-centered instructional methods. In student-centered instruction, teaching is organized around students' needs, goals, choices, expectations and their background. Effectiveness of instruction is measured according to student performance and learning outcomes. Evaluation is an ongoing activity and it can take many different forms. The teacher seeks out student interests and explores student viewpoints and perspectives in conflicts. Finally, the teacher becomes a guide or facilitator in teaching rather than a sole lecturer.

Experiential learning theory

Experiential learning has gained a considerable rise in all kinds of learning activities and practices in education today. Experiential learning can be described as a process by which the experience of the learner is reflected upon and from emerge new insights or learning (Center for Higher Education Development, 2002). As most educators indicate that the approach to experiential learning utilizes participants' own experience

and their own reflection about that experience, rather than lecture and theory as the means of generating understanding and transferring skills and knowledge. When participants use experiential learning, they are doing something and discover what it is like, how it made them feel, what it meant to them. Therefore experiential learning is particularly effective due to its holistic approach of addressing the cognitive, emotional and the physical aspect of the learner (Pickles, 2003).

The root philosophy of experiential learning, as Pickles (2003) argued, can be traced back to that famous dictum of Confucius around 450 BC. It says: "Tell me, and I will forget. Show me, and I may remember. Involve me, and I will understand." The underline philosophy discloses the importance of involving students in the learning process.

To use this approach appropriately it is necessary to examine all the elements and perspectives involved in this approach.

In 1984, Kolb proposed that experiential learning theory is a holistic integrative perspective on learning that combines experience, perception, cognition, and behavior. Experiential learning is not a new movement in education. There are numerous scholars who have proposed learning models with the characteristics of experiential learning. John Dewey is considered to be the most influential educational theorist of the twentieth century (Kolb, 1984). As early as 1883, Dewey believed that "there is an intimate and necessary relationship between the processes of actual experience and education" (Dewey, cited in Kolb, 1984, pp.19-20). Dewey believed that textbook problems most often were not real problems to students and that school learning should be an experientially active, not passive affair (Dewey, cited in Kolb, 1984). Dewey supported

learning experiences in which learners are directly in touch with the realities being studied, rather than simple reading about, hearing about, or thinking about these realities. When experiential learning techniques are used as contributors to the creation of a learning environment that maximizes learners' skills in learning from their own experience, the full potential for learning can be realized (Kolb & Lewis, 1986).

Some educators think people learn more effectively if they can reflect upon their experiences from time to time. Learning is seen to occur in a cycle, which the learner can enter at any point, mainly involving interaction between experience and generalization. Figure 2 is the Experiential Learning Cycle is developed according to Kolb's Experiential Learning Theory.

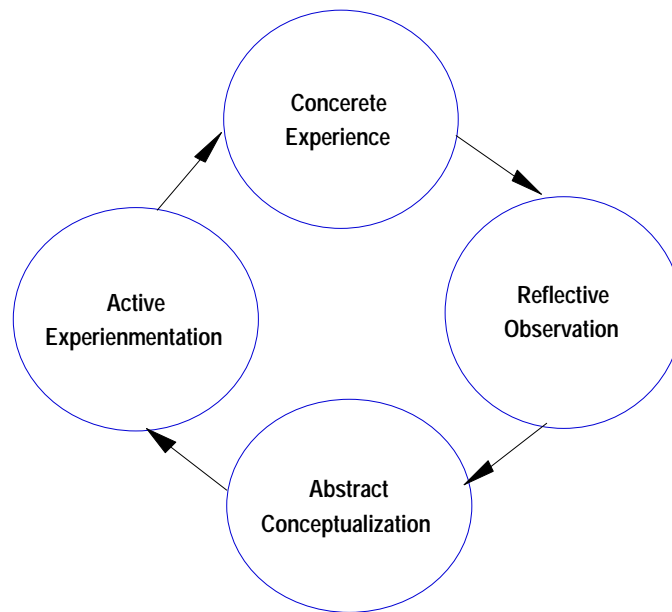


Figure 2: Experiential Learning Cycle (Kolb, 1984)

During the process of learning, individuals are involved in an active exploration of experience, and they selectively reflect on their experience in a critical way. Teachers therefore need to devise appropriate experiences and facilitate reflection while at the same time be able to provide a structure for learners at each stage of the cycle and take them through the appropriate sequence. In this view the transmission of information becomes a more minor element, since the teacher cannot experience, what the learner experiences, nor reflect for the learners themselves (Gibbs, 1988). In this view, we see that the role of the teacher is totally different from that in the traditional training, and teachers become more like guides than information providers.

There are other theories about learning, such as: discovery learning, cooperative learning linear process learning, and problem-solving approach. Most of these theories consider that learning takes place in different stages. Clearly effective learning involves questioning, interacting, thinking, doing, and reflecting, and also linking between the different learning components.

Vocational Education and Competency-Based Education

Toward vocational education

Vocational education is an emerging type of education in China. Its growth is related to the evolving economic transition and it is now starting to gain an important role in China's economic development (Ministry of Education, 1998). Recognizing development trend and examining experiences from other systems is a necessary step to develop Chinese vocational educational system.

The vocational education movement of the last century in the United States grew out of several circumstances including the decline of the apprentice system, the beginning of a free public school system, and the initiation of trade and technical education both home and abroad. However, changes of the legislature have contributed to the lasting system of vocational education we see today. Vocational education has been regulated under the law authorizing federal support for vocational-technical education. In 1917, Smith-Hughes Act was enacted to promote vocational education, provide for cooperation among the states in promoting vocational education, and regulate the expenditure of money appropriated for these purposes (Kapes, 1984).

In Carl D. Perkins Vocational and Applied Technology Education Amendments of 1998, the term Vocational Education has been defined as “organized education programs that offer a sequence of courses that provides individuals with the academic and technical knowledge and skills the individuals need to prepare for further education and for careers (other than careers requiring a baccalaureate, master's, or doctoral degree) in current or emerging employment sectors” (Swortzel, 2003). Such programs, as Brown (2003) explained, shall include competency-based applied learning, which contributes to an individual's academic knowledge, higher order reasoning, and problem-solving skills, work attitudes, general employability skills, and the occupational-specific skills necessary for economic independence as a productive and contributing member of society. Such terms also include applied technology education. This definition ensures that vocational education programs include both academic and occupational skill development. The integration of academics with occupational skills makes vocational education different from job training. Vocational education is part of a

seamless education system in the United States that should prepare students to both pursue further learning and launch successful careers.

Another important approach in vocational education worthy of mentioning is apprenticeship. Apprenticeship is the oldest known type of vocational education in the United States, and has experienced rises and falls in its development. Programs pertaining to apprenticeship have long been a basic method of obtaining occupational competence. Apprenticeship in America today is a government credentialing system for developing and recognizing specific skills, competencies, and accomplishments. Credentialing is handled in a manner similar to that of schools and colleges. An individual's registration in a specific program is documented. The apprentice's performance and progress toward all facets of the target occupation is recorded and matched against the approved training outlines. Apprentices who complete all phases of the prescribed training earn a certificate of completion (Gordon, 1999).

BMEF, a technical and vocational training organization in Germany, indicated in its 2002 annual report that changes in education and training policy have been a major phenomenon in the past decade around the world. In particular vocational education and training policy are being confronted by a series of deep-seated changes, in that industrialized nations are undergoing a fundamental structural transformation. Many nations are transitioning from being national industrial economies to global knowledge-information-and service-based economies. Due to the advance of information and communications technology, modern science and technology is permeating every area of life and work. In the US, the purpose of vocational education has changed from the

preparation for entry-level jobs that require less than a Bachelor's degree to broader preparation that develops the academic, vocational, and technical skills of students in vocational programs over past 15 years (Rahn & Holmes, 1999).

These changes have also called for the modification of curriculum and instructional methodology in vocational education. As Erickson (2001, p.3) noted, "the rapid changes occurring in workplace are affecting the curriculum of vocational school programs by emphasizing problem solving, teamwork, and the use of technology in conjunction with "real-world" simulations and experiences."

In an effort to justify areas for future research in vocational education, Copa and Bentley (1992) indicated that technological change, global interdependence, and changing economic and social conditions and values resulted in the need for the continuous changes in the content of vocational education. How can these changes best be monitored and translated into an effective curriculum for vocational education? Attention needs to be given to strategies for content identification as well as curricular change. In the United States, competency studies and local advisory committees have been used to ensure up-to-date curriculum modification.

Moreover, in another paper, Copa (1992) noticed that the educational reform movement has particular implications for vocational education. These appeared to be related to curriculum, student assessment, program planning, instructional delivery, program evaluation, and teacher preparation. He stressed that teachers must become proficient in using a variety of learning environments and instructional methods that are matched to learning styles and characteristics of individual learners. Vocational

educators must use effective methods in integrating academic content into their programs and also they needed to take the initiative in working with other academic disciplines and help them to make applications of the theory and knowledge of their subject matter content.

Understanding competency-based education

In the past, educational practice has been to teach students increments of prescribed subject matter, the traditional curriculum or discipline-based, in the hope of instilling and retaining knowledge (Yip & Smales, 2003). Apparently, the traditional discipline-based training is not an effective approach in vocational education, which requires students to gain practical skills and experiences that could be used immediately after the completion of the program in their jobs.

Competency-based education system has been tried in vocational education over the past several decades in some industrialized countries. Kerka (2002) indicated, this approach was popular in the United States in the 1970s in the performance-based vocational teacher education movement. However competency approaches were riding in a new wave of popularity in the 1990s with the National Vocational Qualifications (NVQs) system in England and Wales (begun in 1986), New Zealand's National Qualifications Framework, the competency standards endorsed by Australia's National Training Board (NTB), and the Secretary's Commission on Achieving Necessary Skills (SCANS) and the National Skills Standards initiative in the United States.

The British Council (2003) in the United Kingdom identified that a central feature of a system of vocational training and education is the statement of performance standards on which training and qualifications were based. In the United Kingdom, “National Occupation Standards” described what competent people in a particular occupation were expected to be able to do. They covered all the main aspects of an occupation, including current best practice, the ability to adapt to future requirements and the knowledge and understanding, which underpin competent performance.

A competency-based approach in the US was seen by some educators as providing a means for meeting the public’s demand for accountability in accomplishing one of vocational education’s stated goals: providing well-trained, productive workers for industry (Rockler, 1979). Some authors have suggested that CBE assured that students were learning skills needed to become successful and productive workers. A key aspect of determining the level of implementation of CBE involved the process of adoption of change in education (Lehming & Kane, 1981).

Although a variety of definitions for CBE exist, most models of the instructional approach contain the following elements in the United States vocational education. 1). performance-based, 2). responsive to individual needs, 3). provisions for immediate feedback, 4). based upon task analysis, 5). containing measurable objectives, and 6) criterion-referenced assessment (Buttram, Kershner, Rioux & Dusewicz, 1985 cited in Flowers, 1990, p.62).

In theory, CBE better meets individual learning needs. Such a program can be easily tailored to meet students’ strengths and weaknesses with flexibility in determining a student’s needs (Glendenning, 1983; Lee, 1984). In CBE, students have greater control

of the method of learning and the pace at which they learn. Additionally, because evaluation is more individualized, assessment can be more closely linked to what is required, rather than being restricted to easily marked tests (Baron & Wolf, 1996).

Professional Development of Teachers

Recognizing teachers' role in educational reform

Teachers play a great role in education and revitalizing education (Ashmore & Cao, 1997). The attitude and knowledge of teachers are particularly important for overall curriculum reform since their attitude will be crucial in determining the realities of what goes on in the individual classroom. After all, teachers ultimately decide what is taught in the classroom (Kelly, 1986).

It is universally accepted that the teacher is the most important component of education. School improvement efforts and/or educational reforms will only happen when teachers are regarded as a key element of the reform process (Gordon & Yocke, 1999).

In addition, teachers are the final arbiters in the policies they choose to implement and the leaders they choose to follow. Therefore teachers' knowledge and involvement are extremely important in determining what can or cannot be implemented. As Reed (2000) indicated, teachers needed to be intimately involved in the conceptualization and direction of the school reform. This means that a teacher in isolation, a norm in the profession, must give way to a shared decision-making process. Teachers need to share what they know with leaders, policymakers, and other teachers. Teacher knowledge needs to be an integral part of the process.

Smylie (1996) noted that teachers are viewed as both a problem and a solution to successful education reform. Many researchers have further solidified our understanding that teacher quality does indeed lead to improved student achievement. High quality teachers are defined as those teachers who know their discipline, who can engage their students in ways that facilitate knowledge transfer and understanding, who view themselves as continues learners, who have a commitment to school wide effectiveness and improvement (Darling-Harmmond, 2000).

Significant curriculum change is more than just a curricular matter; it extends into most other facets of schooling, including teaching, learning and the culture of the school. Major change demands the attention of community and the full range of school personnel (Reed, 2000).

Coping changes: role of professional development

Change is an aspect of life that all individuals face. Rarely does change from a familiar situation end without resistance and, in some cases, open rebellion. Whenever change is considered, one should ask: are there times when resistance to change might be more common, and even predictable. Bennis, Beene, and Chin (1976, pp. 544-546) identified six instances in which resistance to change could be predicted:

1. if the nature of the change is not made clear to the people who are going to be influenced by the change;
2. when different people will see different meaning in the proposed change;

3. when those influenced are caught in a jam between strong forces pushing them to make the change and strong forces deterring them from making the change;
4. to the degree that the persons influenced by the change have pressure put upon them to make it, and will be decreased to the degree that these same persons are able to have some “say” in the nature or direction of the change;
5. if the change is made on personal grounds rather than impersonal requirements or sanctions; and
6. if the change ignores the already established institutions in the group.

When change is needed, it is important to gain acceptance from those affected as quickly and effectively as possible and to know why a person adopts a change. Pierce (1981) cited age, educational level, and support of administration as being major influencing factors affecting a teacher’s acceptance or rejection of innovative practices. He found that younger teachers, those with higher levels of education, and those whose administration exhibited support for the innovation were more likely to adopt change and innovations (Pierce, 1981).

Hanson (1989) suggested that changes could be enhanced by involving those affected, creating a sense of ownership, and by demonstrating a commitment for change through administrative support.

Fine and Raack (1994) noticed that when analyzing the failure of educational research and best practice to improve classroom instruction and student achievement,

educators often overlooked an obvious reason. Effective professional development must be in place in order for teachers to translate research into classroom practice. Again and again an attempt is made to implement new instructional innovations, the system yet failed to provide teachers with ongoing opportunities to study, reflect upon, and apply the research on teaching and learning.

Moreover, traditionally, school-based curricula were provided to students by teachers, making teachers key to effective implementation. Consequently, teacher training was regarded as essential for the effective implementation in schools of any innovative, teacher-provided curriculum (Klein, 1991). The studies in health programs have showed that in-service training was positively related to more complete implementation and, in some cases, enhanced student outcomes. Multiple studies have demonstrated that when teacher training was overlooked or ineffective, the result is implementation failure. It is concluded from a study conducted by Kealey, Peterson, Gaul and Dinh (2000) in a disease prevention program that teacher training conceptualized as a behavior change process and including explicit teacher motivation components could promote effective implementation of behavior change curricula in public school classroom.

In light of the important relationship between school reform and teacher empowerment, Scribner, Truell, Hager and Srichai (2001) argued that if all students are to learn and perform in ways consistent with being productive citizens (in both economic and civic terms), then all teachers including career and technical education teachers must be empowered to successfully promote school reform to advance increased student learning.

Pasch, Langer, Gardner, Starko and Moody (1995) contended that an empowered teacher has assumed the responsibility to become a designer of instruction and to reflect on teaching practices to improve instruction. Teachers needed to have a feeling of self-efficacy: the knowledge that they are in control of their work environment and that they make a difference with students.

One avenue of advancing teachers was through the improvement of teacher empowerment. Lightfoot (1986) explained empowerment in terms of the opportunities that an individual has for power, autonomy, choice, and responsibility. Extending this concept further by empirically grounding it within education, Short and Rinehart (1992, p.953) constructed six dimensions of this concept: 1). decision making, 2). professional growth, 3). status, 4). self-efficacy, 5). autonomy, and 6). impact. Accordingly teachers must not only have the means to make change, but know that their efforts can make a difference.

Corcoran (1995) summarized the guiding principles for the most promising professional development programs or policies are these that:

- stimulate and support site-based initiatives. Professional development is likely to have greater impact on practice if it is closely linked to school initiatives to improve practice.
- support teacher initiatives as well as school initiatives. These initiatives could promote the professionalization of teaching and may be cost-effective ways to engage more teachers in serious professional development activities.

- are grounded in knowledge about teaching. Good professional development should encompass expectations educators hold for students, child-development theory, curriculum content and design, instructional and assessment strategies for instilling higher-order competencies, school culture and shared decision-making.
- model constructivist teaching. Teachers need opportunities to explore, question and debate in order to integrate new ideas into their repertoires and their classroom practice.
- offer intellectual, social and emotional engagement with ideas, materials and colleagues. If teachers are to teach for deep understanding, they must be intellectually engaged in their disciplines and work regularly with others in their field.
- demonstrate respect for teachers as professionals and as adult learners. Professional development should draw on the expertise of teachers and take differing degrees of teacher experience into account.
- provide for sufficient time and follow-up support for teachers to master new content and strategies and to integrate them into their practice.

After examining research and best practice in professional development, Fine and Raack (1994, p. 2) found the following set of assumptions leading to effective professional development programs:

- Ongoing professional development is required if it is to result in significant change.
- School change is the result of both individual and organizational development.
- The goal of professional development is to support the inquiry into and study of teaching and learning.
- Teachers learn as a result of training, practice, and feedback, as well as individual reflection and group inquiry into their practice.
- Professional development is essential to school development.
- Professional development should be primarily school-focused and embedded in the job.

Professional development programs based on these assumptions are quite different from those founded on traditional assumptions. While national wide workshops still will be appropriate on occasion, most professional development should be school-based. Therefore, in addition to attending workshops and conferences, teachers can be involved in a variety of ongoing, job-embedded learning activities, such as study groups, action research, peer coaching, curriculum development, and case discussions. Through collegial study, dialogue, and joint problem solving, teachers form professional learning communities that have a direct impact on instructional improvement. This approach to professional development contrasts sharply with approaches in which teachers work in isolated, no collegial settings where traditional and outdated assumptions are less likely to be challenged. Such challenges were important because teachers tend to "stick with what they know, despite a lack of student success or engagement" (McLaughlin, 1993, p. 94).

Fine and Raack (1994) indicated when teachers became part of school-based professional learning communities, they were more likely to change their teaching practice by aligning it with research, best practice, and national standards. Collaboration with peers can also be an effective way to solve the problem collectively. As Lieberman and McLaughlin (1992) noted that teachers can work with others who are struggling in similar ways to learn new material and to try out different approaches for reaching students. Many become more enthusiastic about their subject matter.

Time is another factor affecting the reform process. Cuban (1993) indicated that changes in classroom tradition impose a direct, unrelenting obligation upon the teacher to invest far more time and effort than is invested by teacher-centered colleagues. Erickson (2001) noticed that curriculum and instruction were critical points for educational change. This job cannot be done effectively without providing quality time for professional dialogue, training of staff, and curriculum development. Teachers deserve quality time of curriculum frameworks that allow them to raise intellectual and academic standards.

Summary

Curriculum and instruction are important elements to the formation of an educational system. Curriculum is a dynamic instrument, under which, the teachers and the students pursue their goals and ambitions within as well as beyond the school system. Two instructional approaches: teacher-centered verses student-centered have been used to map teaching and learning practice in classroom. Student-centered instruction places students in the center of the learning process whereas teacher-centered learning is characterized by the

transmission of information from a knowledge expert (teacher) to a relatively passive recipient (student).

In the era of educational reform, teachers are being asked to assume new roles and adopt new practices that emphasize teaching for understanding and creativity rather than a routine driven traditional accepted practice. As teachers have been put in the forefront of the educational reforms, teachers training programs and professional development activities have become an essential function in preparing them to implement curriculum and instructional innovations.

Chapter III

RESEARCH METHODOLOGY

This chapter highlights the research methodology and procedures used in the study, which consists of the following sections: purpose and objectives of the study, population and sample, instrument development and testing, methods and procedures, and data analysis.

Purpose and Objectives of the Study

The purpose of the study was to evaluate knowledge and skills needed for teachers to implement curriculum innovations in Chinese agricultural schools. In addition, this study was intended to understand the teachers' perceptions toward their work situation and in-service training for the purpose of curriculum reform. The study also sought to determine the factors that contribute to curriculum reform. The objectives of the study were to:

6. Describe the demographic characteristics of teachers with regard to education, training received and desired, subjects taught, teaching experience, age, gender, educational background, and professional titles.
7. Describe teachers' perceptions related to policy, management and resources in teacher training programs.
8. Examine teachers' current work conditions and their attitudes toward curriculum reform initiatives within competency-based education.
9. Determine teachers' current knowledge/skill level and desired knowledge/skill

level regarding all aspects of curriculum, instruction, and competency-based education.

10. Determine the factors that contribute to curriculum reform process.

Population and Sample

The population for the study included teachers from 12 agricultural schools in China. This group included four vocational colleges as they used to be agricultural schools and these schools still offer the programs at the intermediate level. The total number of agricultural schools before 1998 was 365. After the 4th national educational conference held in December 1998 in China, there was a national policy that called for the merger and upgrade of agricultural schools in terms of the structure and administration. Some agricultural schools became part of the university system. Some joined with other similar types of schools such as forestry schools and others were upgraded as non-degree vocational colleges. Still others merged with colleges such as normal colleges and these schools were renamed. This reform process is ongoing, the exact number of agricultural schools in China is unknown at this time. The estimated number of agricultural schools by the Ministry of Agriculture is 330.

The selection of schools for this study was based on their involvement in curriculum reform during the years 1994-2000. The first group of six participant schools was the United Nations' project schools in northwest region, where a project-*Strengthening Agricultural Education in Northwest China* was launched by the Food and Agriculture Organization of United Nations during 1994-1998. The second group of six participant schools was selected from 18 agricultural schools that implemented CBE and

other reform strategies during 1996-2000 school years. Geographic locations and types of the curricular the schools offered were considered in selection of six participant schools out of 18. In total, 12 agricultural schools were selected to participate in this study. Of which, two were agricultural mechanics and engineering schools, six were agricultural schools, and four were animal husbandry schools. All three types of agricultural schools in China were represented in this study. The following map indicates sampling provinces where the 12 schools were located.



Figure 3: Locations of 12 sampling agricultural schools in the study

The total number of teachers obtained from the 12 participant schools was 1, 299.

A systematic random sampling technique was used to select teachers from each school.

The method for selecting teachers was to select one teacher from every three using a teacher roster in each school, and this yielded a teacher sample size of 398.

Three hundred ninety-eight survey questionnaires were sent off to selected teachers through a contact person in each participant school. There were 350 surveys returned in three weeks. The response rate was 88%. According to sample size estimation formula developed by Krejcie and Morgan (1970), the sampling error was 2.8%.

Instrument Development and Testing

A quantitative research method was employed in this study. The research design was a one-shot case study. The survey instrument was constructed based on an extensive literature review. Both closed- and open-ended questions were developed. The survey questionnaire used for data collection included five parts. 1) Respondents' demographic information, 2) Policy, management and resources regarding curriculum reform, 3) teachers' work situation and perceptions towards reform initiatives, 4) Teachers' current knowledge/skill and desired knowledge/skill regarding curriculum and instruction, and 5) factors that contributed to implementing a new curriculum. A Likert scale was used to measure the respondents' attitudes and perceptions toward curriculum reform in section two and three. The measurement scale was: 1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree, 0=don't know. Teachers' self-reported level of the current and desired knowledge/skills were rated using following scale: 0=none, 1=low, 2=average, 3=high.

The instrument was validated both in the U.S. and in China through a panel of experts to establish content and face validity. The U.S. panel of experts consisted of four faculty members and three graduate students at The Pennsylvania State University. Six

educators and administrators in agricultural education in China also reviewed the instrument. Revisions of the instrument were made based on the comments and suggestions generated in the review process. The research protocol, both English and Chinese versions of instrument, cover letter, and implied consent form were approved by the Office of Research Protections of The Pennsylvania State University (see Appendices).

The reliability was established through a pilot study in China. Twenty-seven teachers in Beijing Agricultural School were responded to the pilot test. Several minor revisions were made to the questionnaire immediately after the pilot test. The reliabilities of the instrument for different sections were calculated using Cronbach's coefficient alpha. Cronbach's coefficient alpha for section two (policy, management and resources regarding curriculum reform) is 0.54. Section three (teachers' perceptions toward work situation and reform initiatives) has an Alpha of 0.66 while the Alpha of Section four (teachers' current knowledge/skills and desired knowledge/skills regarding curriculum and instruction) is 0.89. Several minor changes to the questionnaire were made according to the suggestions collected during the pilot study. Cronbach's coefficient alphas were also computed for the sample and the numbers are 0.67, 0.81 and 0.96 for Section two, three and four respectively.

Methods and Procedures

The questionnaires were translated into Chinese and the translation was verified both by Chinese professors at the Pennsylvania State University and in China. A contact person was identified through school administration to distribute and collect the survey in

each participant school. The population of the teachers was also obtained through this initial contact and this number was used to determine the number of the questionnaires needed to be sent to each participant school. Then, a cover letter explaining the purpose of the study, the procedures regarding participants selection, and the survey questionnaires were mailed to each contact person on June 20th, 2002. At the time schools in China were still in their spring semester. A follow-up phone call to each contact person was made a week after the survey was distributed. The call was completed to further direct the process of participant selection and to provide survey administration. Three hundred and ninety-eight questionnaires were sent to 12 schools with 350 returned. The questionnaires were received during July 5th to 16th, 2002. The response rate was 88%. Usable data were generated from 343 complete surveys.

Data Analysis

Quantitative data collected through the survey were analyzed using Statistical Package for Social Science (SPSS). The following statistics were used to analyze the data:

1. Frequencies and distributions were used to describe respondents' demographic characteristics and educational background variables.
2. Descriptive statistics were used to assess respondents' perceptions toward the policy/ management in curriculum reform, teaching training, and work situation.

3. A paired t-test was employed to examine the differences between respondents' current level of knowledge/skills and desired level of knowledge/skills on 41 items. For the purpose of using the paired t test inferential statistic analysis, the 41 items were grouped into six categories. They were: planning and management (six items), curriculum and innovative teaching (eight items), adopting competency-based education (seven items), teaching methods and activities (nine items), evaluating and assessing (eight items), and educational technology (three items). To examine the practical significance and compare the relative sizes of effects between current and desired knowledge/skills levels among six different categories, Cohen's effect size was computed for the six categories showing statistical significance between current and desired knowledge/skills level. The formula for effect size calculation (Cohen, 1988) is as follows:

$$ES = \frac{M_1 - M_2}{\sqrt{[(\sigma_1^2 + \sigma_2^2) / 2]}}$$

The general guidelines developed by Cohen (1988) were used for interpreting the effect size and judging the practical significance. If Cohen's d was:

<0.20	Very small or little effect
0.20 through 0.49	Small effect size
0.50 through 0.79	Medium or moderate effect size
0.80 and higher	Large effect size

4. Multivariate analysis of variance (MANOVA) was used to identify differences in current knowledge/skills regarding respondents' gender, age, and years of teaching experience. A post hoc follow-up test was performed when significant differences resulted from the MANOVA overall F test.
5. Repeated measures in General Linear Model (GLM) was used to compare the overall knowledge/skills level across the six categories of planning and management, curriculum and innovative teaching, adopting competency-based education, teaching methods and activities, evaluating and assessing, and educational technology.
6. A multiple response table was used to determine the top factors among 13 factors that contribute to implementing curriculum innovations. Both frequencies of case and response for each factor were computed to summarize the data (SPSS Inc. 1998).

Qualitative data obtained from open-ended questions and other sources during the data collection was subjected to content analysis. Content analysis involves searching for meaningful phenomena in the data, assigning them descriptive codes and exploring their relations to arrive at themes, and to describe the data as a meaningful whole. For the purpose of this study, the thematic codes regarding curriculum reform and teacher training were identified to help establish a meaningful structure. The results were integrated into the findings and reporting process.

Summary

This research study was intended to examine teachers' current and desired knowledge/skills regarding curriculum development and instructional methodology, attempting to determine the educational needs of teachers in Chinese agricultural schools. The study design was descriptive and quantitative in nature. A sample of 398 participants was selected from a population of 1, 299 teachers in 12 agricultural schools. Data were collected through a survey questionnaire developed based on literature review. Both descriptive and inferential statistics were used through SPSS to summarize the data and inform the results. The results from the study will be presented in the Chapter 4.

Chapter IV

RESULTS

The purpose of this study was to examine teachers' current and desired level of knowledge and skills regarding curriculum development, instructional methodology, and competency-based education in Chinese agricultural schools. In addition, this study was intended to describe teachers' perceptions toward their work condition and training programs regarding curriculum reform. The study also sought to determine the factors that contribute to successful curriculum reform. This chapter summarizes the results from data analysis. Both descriptive and inferential statistics were used to describe respondents' demographic characteristics, their perceptions toward curriculum reform, and their current and desired knowledge/skills regarding curriculum and instruction. A multiple response table was developed to present the frequencies of 13 factors regarding curriculum reform rated by respondents. The findings are projected in the following sections by each objective in the study.

Demographic Information on Respondents

Objective 1: *Describe the demographic characteristics of teachers with regard to their education, training received and desired, subjects taught, teaching experience, age, gender, educational background, and professional titles.*

The total number of teacher respondents was 350. Three hundred forty-three questionnaires were finalized as usable data while seven incomplete surveys were removed. The majority of the respondents were male (61%) while the female respondents

accounted for 39%. A substantial proportion of the respondents (70%) taught agricultural subjects, 29% taught academic subjects, and 1% taught both vocational and academic subjects.

The respondents' ages ranged from 23 to 60 years old; most (72%) fell between 27 and 40 years old. Their work experience ranged from 1 to 38 years, and a large number of teachers (82%) had worked between 5 to 20 years. Years of respondents' teaching experience were similar to years of their work experience. The majority of the teachers (80%) taught between three to 20 years (see Table 2).

Table 2: Respondents age, work and teaching experience

Items	n	Mean	Minimum	Maximum	SD
Respondents Age	339	36	23	60	7.25
Work Experience (years)	340	14	1	38	8.16
Teaching Experience (years)	340	13	0	38	7.33

A large number of respondents (83%) were bachelor degree holders and only 17% had other educational preparation backgrounds. Eight teachers had Masters degrees, 8% received a college diploma (equal to associate degrees in the US), and 2% were middle level diploma recipients (see Figure 4).

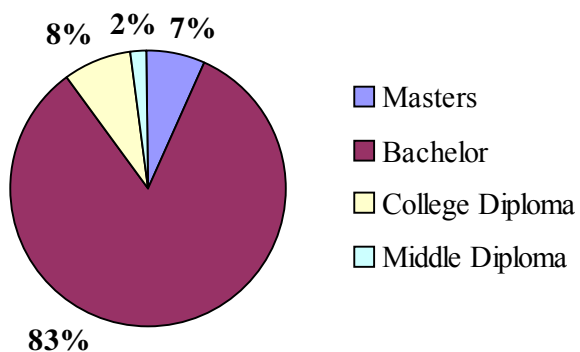


Figure 4: Highest educational background of the respondents

Figure 5 shows the professional titles of teachers. Forty-four percent of the teachers were lecturers, followed by senior lecturers (33%), and 22% were assistant lecturers.

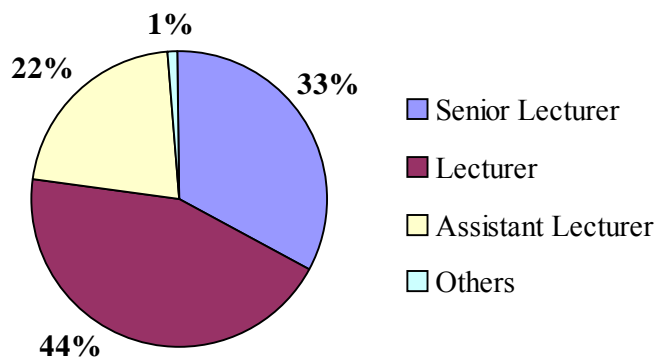


Figure 5: Professional titles of the respondents

Questions regarding in-service training received in the past and needed in the future required respondents to indicate as many categories as applied to each person. The responses were coded either 0 or 1, with 1 indicating a checkmark for the type of training received or needed, and 0 showing training not received in the past or not needed in the future. A multiple response table was computed to present the results (Table 3). Frequencies and percentages were computed for the purpose of this analysis (SPSS Inc., 1998).

Table 3 presents the results of the formal in-service training that respondents received in the last five years regarding teaching methods, competency-based education, use of computers, modular teaching approach, and training in subject matter area. Seventy-nine percent of the respondents indicated they received training in computer technology, 49% indicated they were trained in modular teaching approach, 43% in teaching methods, 38% in competency-based education, and 24% in the subject matter they had taught.

Table 3: Training received in designated areas in last five years

Training areas	Frequencies (n)	Cases (% of valid cases)
Computer technology	233	79.3
Competency-based education	113	38.4
Subject matter area	71	24.1
Teaching methods	126	42.9
Modular teaching approach	144	49.0
Total responses	--	233.7

Note: 49 missing cases, 294 valid cases; percentages do not add to 100 because respondents could select more than one training area.

Table 4 shows the results of in-service training needs expressed by respondents in the preceding five areas. About 65% of the teachers surveyed indicated they needed to receive training in their subject matter area, 62% in computer technology, 55% in competency-based education, 50% in teaching methods, and 23% in the modular teaching approach.

Table 4: Training needed in designated areas in the future

Training areas	Frequencies (n)	Cases (% of valid cases)
Computer technology	202	61.6
Competency-based education	180	54.9
Subject matter area	212	64.6
Teaching methods	165	50.3
Modular teaching approach	76	23.2
Total Responses	--	254.6

Note: 15 missing cases, 328 valid cases; percentages do not add to 100 because respondents could select more than one training area.

Perceptions toward Curriculum Reform

Objective 2: *Describe teachers' perceptions related to policy, management and resources in teacher training programs.*

The examination of the perceptions toward policies, management, and resources in teacher training programs included 14 items in the instrument. Table 5 presents means and standard deviations for all 14 items.

The mean values ranged from 2.49 to 3.56. Data showed that respondents tended to agree with the first 13 items with the mean scores above 2.60. Only one item received a mean score below 2.50.

The item “Teachers need high quality in-service training activities to keep updated in instructional methods” received the highest mean value ($M=3.56$), followed by “The current reforms emphasizing competency-based education is in right direction” with the mean value of 3.50. Eight items received means from 3.03 to 3.44. Four items received mean values falling between 2.49 to 2.96. The respondents tended to disagree with the statement “Current teacher professional development programs conducted at my school are adequate in enabling teachers to implement new curriculum in the classroom” as it was rated the lowest mean ($M=2.49$) among 14 items.

Table 5: Means and standard deviations regarding perceptions toward policies, management, resources in teaching training programs

Item	n	Mean	S.D.
Teachers need high quality in-service training activities to keep updated in instructional methods.	341	3.56	.57
The current reform emphasizing competency-based education is in the right direction.	339	3.50	.54
Agricultural universities need to provide pre-service pedagogical training programs for agricultural teachers.	339	3.44	.66
Teachers need to play a greater role in curricula development.	341	3.40	.57
Teachers need to be better prepared to implement a new curriculum through ongoing training.	338	3.38	.66
In-service teacher training programs need to address problems encountered in new curricular implementation.	336	3.38	.60
Adequate financial support is the key to teacher training programs.	336	3.34	.64
My school rewards those who have tried new methods in their teaching.	310	3.09	.82
My school evaluates teaching reform on a regular basis.	326	3.09	.66
My school has a long-term plan for teacher professional development.	281	3.03	.84
My school provides adequate funds to train teachers to implement a new curriculum.	305	2.96	.90
My school allocates time for teachers to work on developing new curriculum.	284	2.75	.90
Training on competency-based education organized by the Ministry of Agriculture in the past few years was very helpful.	258	2.62	.72
Current teacher professional development programs conducted at my school are adequate in enabling teachers to implement new curriculum in the classroom.	316	2.49	.80

Scale: 1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree, 2.60 \geq agree, 2.60<disagree.

Objective 3: *Examine teachers' work conditions and their attitudes toward curriculum reform initiatives within competency-based education.*

To identify teachers' work conditions and their perceptions toward competency-based education, 21 items were presented in the instrument. Table 6 contains means and standard deviations regarding all 21 items.

The mean values ranged from 2.52 to 3.42. The item "competency-based education is an effective system for each school to adopt" received the highest mean value ($M=3.42$), followed by "I support curriculum reform" with a mean value 3.35. Another seven items received mean values above 3.00, and ranged from 3.00 to 3.24.

The respondents tended to disagree with four reversed coded items: "I am not interested in new teaching methods" ($M=3.15$), "I don't have autonomy in my teaching" ($M=2.88$), "I don't have time to try a new curriculum" ($M=2.81$), and "I don't know how to use competency-based education in my teaching practice" ($M=2.69$).

The respondents tended to slightly disagree with the items "My teaching heavily depends on a textbook" ($M=2.52$) and "I get extra salary for developing new curriculum materials" ($M=2.58$), which were rated as lowest mean score among 21 items.

Table 6: Perceptions toward work conditions and competency-based education

Item	n	Mean	S.D.
Competency-based education is an effective system for each school to adopt.	338	3.42	.61
I support curriculum reform.	339	3.35	.58
I believe training is a very powerful tool to prepare me for innovative teaching.	327	3.24	.64
I can use competency-based education if I am properly taught.	339	3.23	.59
I am not interested in new teaching methods.*	338	3.15	.69
I plan to try some new methods in my teaching next semester.	307	3.14	.56
There are very limited new teaching materials that I can use in my class.	338	3.08	.72
I have too much work at the present time.	334	3.06	.78
I understand the concept of Competency-Based Education.	325	3.00	.53
I usually get instructional support from peers.	330	2.98	.59
I have incorporated new ideas from competency-based education in my teaching.	299	2.98	.70
I feel my school would support me to introduce new ideas.	302	2.96	.69
I know how to develop a new curriculum.	316	2.90	.58
I don't have autonomy in my teaching.*	329	2.88	.76
I am satisfied with my teaching performance.	327	2.81	.61
I don't have time to try a new curriculum.*	330	2.81	.77
I have access to the Internet to obtain new materials for my teaching.	310	2.77	.82
I want to try something new in my teaching but don't feel prepared to do so.	327	2.69	.74
I don't know how to use competency-based education in my teaching practice.*	331	2.69	.75
I get extra salary for developing new curriculum materials.	248	2.58	.82
My teaching heavily depends on a textbook.	340	2.52	.79

Scale: 1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree, 2.60 \geq agree, 2.60 < disagree, * Items reverse coded.

Current and Desired Knowledge/Skills of Teachers

Objective 4: *Determine teachers' current knowledge/skill level and desired knowledge/skill level regarding all aspects of curriculum, instruction, and competency-based education.*

1. Current knowledge/skills of respondents

Table 7 presents the frequencies of responses regarding the respondents' current knowledge/skills in curriculum, planning, competency-based education, and practical issues in teaching.

Curriculum, planning, and competency-based education. The data suggested that the majority of the respondents (50.7%-69.5%) reported their current knowledge/skills level as "average" in the area of curriculum, planning and competency-based education.

More than 30% of the respondents reported they possessed a "high" level of knowledge/skills in the following four areas: writing teaching plans (32.3%), preparing teaching materials (35.5%), developing students' problem-solving skills (33.5%), and offering timely feedback (32.7%).

Five items which received more than 20% of responses as "low" knowledge/skills level were: knowledge of curriculum development models (28.0%), adopting modular teaching approach (24.2%), organizing cooperative learning (21.8%), developing student leadership skills (22.1%), conducting performance-based activities (20.2%), and individualizing teaching (20.9%).

Respondents indicated in the following five areas were “no-none” knowledge and skills by about 10% of the respondents. The items were: writing measurable objectives: 12.2%, individualizing teaching: 11.6%, adopting modular teaching approach: 10.6%, knowledge of curriculum development models: 10.1%, and organizing cooperative learning: 9.6%.

Practical issues in teaching. A substantial number of respondents (32.8% to 63.8%) reported they had an “average” level of knowledge/skills in the area of practical issues in teaching.

About one-fifth of the respondents reported they had “none” knowledge/skills in the following six areas: field trips (21.9%), role play (19.3%), computer-assisted instruction (22.2%), student projects (19.7%), using computers in instruction (28.4%), and using multimedia equipment in teaching (30.1%). Another one-fifth of the respondents reported their current knowledge and skills level in the above six areas were “low”. In addition to the six areas mentioned above, the respondents reported that group projects (22.5%) and debate (22.9%) were also as “low” knowledge/skills areas.

Almost half of the respondents (48.2%) reported they possessed a “high” level of knowledge/skills in lecture, with another half (50.0%) indicating an “average” level. More than 40% of teachers reported that they could manage a classroom (40.3%) and 45.2% possessed the ability to write a test with a “high” level knowledge/skills in these two areas.

Table 7: Frequencies of respondents' current knowledge/skills regarding curriculum, planning, CBE, and practical issues in teaching

Item	n	Current Knowledge/Skills							
		None		Low		Average		High	
		f	%	f	%	f	%	f	%
Writing a syllabus	338	23	6.8	22	6.5	235	69.5	58	17.2
Writing teaching plans	337	1	0.3	5	1.5	222	65.9	109	32.3
Preparing teaching materials	332	7	2.1	28	8.4	179	53.9	118	35.5
Adopting modular teaching approach	339	36	10.6	82	24.2	184	54.3	37	10.9
Conducting experiential learning activities	339	24	7.1	60	17.7	196	57.8	59	17.4
Organizing cooperative learning	335	32	9.6	73	21.8	196	58.5	34	10.1
Knowledge of curriculum development models	336	34	10.1	94	28.0	182	54.2	26	7.7
Developing student leadership skills	339	10	2.9	75	22.1	198	58.4	56	16.5
Developing students' problem-solving skills	340	2	0.6	28	8.2	196	57.6	114	33.5
Writing measurable objectives	336	41	12.2	62	18.5	186	55.4	47	14.0
Based teaching upon tasks analysis	335	24	7.2	62	18.5	194	57.9	55	16.4
Conducting performance-based activities	337	10	3.0	68	20.2	193	57.3	66	19.6
Conducting work-based contextual learning	337	28	8.3	64	19.0	194	57.6	51	15.1
Individualizing teaching	335	39	11.6	70	20.9	170	50.7	56	16.7
Offering timely feedback	336	8	2.4	39	11.6	179	53.3	110	32.7
Using criterion-reference assessment	336	19	5.7	51	15.2	199	59.2	67	19.9

Scale: 0=none, 1=low, 2=average, 3=high.

Table 7: Continued

Item	Current Knowledge/Skills								
	n	None		Low		Average		High	
		f	%	f	%	f	%	f	%
Lecture	328	1	0.3	5	1.5	164	50.0	158	48.2
Discussion	329	8	2.4	44	13.4	210	63.8	67	20.4
Demenstration	331	4	1.2	34	10.3	171	51.7	122	36.9
Case study	327	21	6.4	49	15.0	185	56.6	72	22.0
Group projects	324	41	12.7	73	22.5	187	57.7	23	7.1
Field trip	324	71	21.9	77	23.8	126	38.9	50	15.4
Role playing	326	63	19.3	80	24.5	143	43.9	40	12.3
Problem-solving	330	8	2.4	47	14.2	184	55.8	91	27.6
Debate	323	31	9.6	74	22.9	176	54.5	42	13.0
Oral presentations	326	43	13.2	59	18.1	161	49.4	63	19.3
Computer-assisted instruction	329	73	22.2	93	28.3	128	38.9	35	10.6
Written test	330	2	0.6	9	2.7	186	56.4	133	40.3
Practical test	329	12	3.6	17	5.2	174	52.9	126	38.3
Oral test	327	35	10.7	45	13.8	186	56.9	61	18.7
Student projects	325	64	19.7	65	20.0	164	50.5	32	9.8
Essays	321	20	6.2	32	10.0	173	53.9	96	29.9
Skill test	327	16	4.9	26	8.0	167	51.1	118	36.1
Performance observation	323	13	4.0	43	13.3	186	57.6	81	25.1
Attitude test	328	12	3.7	39	11.9	204	62.2	73	22.3
Conducting student internship	296	13	4.4	35	11.8	152	51.4	96	32.4
Using computers in teaching	334	95	28.4	87	26.0	110	32.9	42	12.6
Using multimedia aids	335	101	30.1	78	23.3	110	32.8	46	13.7
Motivating students to learn	335	1	0.3	27	8.1	196	58.5	111	33.1
Managing a classroom	334	0	0.0	15	4.5	168	50.3	151	45.2
Managing a laboratory	327	27	8.3	30	9.2	173	52.9	97	29.7

Scale: 0=none, 1=low, 2=average, 3=high.

2. Desired knowledge/skills of respondents

Table 8 contains the frequencies of responses regarding the respondents' desired knowledge and skills in curriculum, planning, competency-based education, and practical issues in teaching.

Curriculum, planning, and competency-based education. A large numbers of the respondents (67.3% to 89.6%) reported they desired a “high” knowledge and skills level in the areas of curriculum, planning, and competency-based education. Some of the respondents (9.8 to 28.2 %) desired to have an “average” level of knowledge and skills in the above areas.

In five areas teachers indicated a “high” desired level of knowledge/skills. They were: writing a syllabus 81.9%; writing teaching plans 84.6%; preparing teaching materials 84.6%; developing students' problem-solving skills 89.6%; and offering timely feedback 82.1%.

Only 0.3% to 3.6% of the respondents reported their desired knowledge/skills level as “low”, and zero percent to 2.1% of the teachers surveyed indicated they didn't desire any (none) knowledge and skills in the areas of curriculum, planning, and competency-based education.

Practical issues in teaching. The majority of the respondents (56.4% to 86.4%) reported they desired to have “high” level of knowledge/skills in all practical teaching areas, and 12.5% to 32.9% of the respondents indicated an “average” desired level for all areas.

The following seven areas had more than 80% of the respondents indicating a desired “high” level of knowledge/skills: Lecture 84.0% ; Demenstration 82.5%;

Problem-solving 80.7%; Practical test 85.2%; Skill test 84.1%; Motivating students to learn 86.4%; and Managing a laboratory 80.2%.

A few teachers surveyed (0.3 to 6.4%) indicated a “low” level for desired knowledge and skills about practical issues in teaching. Few of the teachers (0.3% to 4.8%) reported they didn’t need (none) any knowledge and skills regarding practical issues in teaching.

Table 8: Frequencies of respondents' desired knowledge and skills regarding curriculum, planning, CBE, and practical issues in teaching

Item	n	Desired Knowledge/Skills							
		None		Low		Average		High	
		f	%	f	%	f	%	f	%
Writing a syllabus	337	0	0.0	5	1.5	56	16.6	276	81.9
Writing teaching plans	338	2	0.6	3	0.9	47	13.9	286	84.6
Preparing teaching materials	331	1	0.3	3	0.9	47	14.2	280	84.6
Adopting modular teaching approach	339	7	2.1	9	2.7	95	28.0	228	67.3
Conducting experiential learning activities	337	3	0.9	4	1.2	88	26.1	242	71.8
Organizing cooperative learning	333	2	0.6	8	2.4	89	26.7	234	70.3
Knowledge of curriculum development models	333	2	0.6	8	2.4	94	28.2	229	68.8
Developing student leadership skills	337	1	0.3	7	2.1	81	24.0	248	73.6
Developing students' problem-solving skills	337	1	0.3	1	0.3	33	9.8	302	89.6
Writing measurable objectives	336	3	0.9	11	3.3	89	26.5	233	69.3
Based teaching upon task analysis	335	3	0.9	3	0.9	83	24.8	246	73.4
Conducting performance-based activities	337	0	0.0	8	2.4	74	22.0	255	75.7
Conducting work-based contextual learning	337	2	0.6	9	2.7	88	26.1	238	70.6
Individualizing teaching	335	4	1.2	7	2.1	91	27.2	233	69.6
Offering timely feedback	336	1	0.3	3	0.9	56	16.7	276	82.1
Using criterion-reference assessment	336	2	0.6	12	3.6	90	26.8	232	69.0

Scale: 0=none, 1=low, 2=average, 3=high.

Table 8: Continued

Item	Desired Knowledge/Skills									
	n	None		Low		Average		High		
		f	%	f	%	f	%	f	%	
Lecture	331	2	0.6	1	0.3	50	15.1	278	84.0	
Discussion	333	2	0.6	5	1.5	73	21.9	253	76.0	
Demenstration	332	1	0.3	3	0.9	54	16.3	274	82.5	
Case study	330	5	1.5	3	0.9	81	24.5	241	73.0	
Group projects	328	6	1.8	8	2.4	101	30.8	213	64.9	
Field trip	327	12	3.7	9	2.8	92	28.1	214	65.4	
Role playing	328	7	2.1	14	4.3	108	32.9	199	60.7	
Problem-solving	332	1	0.3	3	0.9	60	18.1	268	80.7	
Debate	325	8	2.5	11	3.4	97	29.8	209	64.3	
Oral presentations	328	10	3.0	7	2.1	90	27.4	221	67.4	
Computer-assisted instruction	332	8	2.4	12	3.6	95	28.6	217	65.4	
Written test	333	2	0.6	3	0.9	75	22.5	253	76.0	
Practical test	332	4	1.2	3	0.9	42	12.7	283	85.2	
Oral test	330	6	1.8	11	3.3	99	30.0	214	64.8	
Student projects	327	8	2.4	21	6.4	109	33.3	189	57.8	
Essays	323	5	1.5	7	2.2	95	29.4	216	66.9	
Skill test	328	5	1.5	6	1.8	41	12.5	276	84.1	
Performance observation	325	3	0.9	4	1.2	84	25.8	234	72.0	
Attitude test	331	2	0.6	7	2.1	86	26.0	236	71.3	
Conducting student internship	302	5	1.7	4	1.3	63	20.9	230	76.2	
Using computers	336	16	4.8	16	4.8	74	22.0	230	68.5	
Using multimedia in teaching	336	15	4.5	15	4.5	82	24.4	224	66.7	
Motivating students to learn	337	1	0.3	3	0.9	42	12.5	291	86.4	
Managing a classroom	337	1	0.3	1	0.3	44	13.1	291	56.4	
Managing a laboratory	329	10	3.0	5	1.5	50	15.2	264	80.2	

Scale: 0=none, 1=low, 2=average, 3=high.

3. Differences in current and. desired Knowledge/skills level

To perform inferential statistics analysis, all 41 items were divided into six categories according to the results from factor analysis and the nature of each subscale measured. Table 9 presents these subscales with the items in each category.

Table 9: Items in six categories regarding curriculum, instruction, and CBE

1. Planning and Management	4. Teaching Methods and Activities
Writing a syllabus	Lecture
Writing teaching plans	Discussion
Preparing teaching materials	Demenstration
Conducting student internship programs	Case study
Managing a classroom	Group projects
Managing a laboratory	Field trip
2. Curriculum and Innovative Teaching	Role playing
Motivating students to learn	Debate
Adopting modular teaching approach	Oral presentations
Conducting experiential learning activities	5. Evaluation and Assessment
Organizing cooperative learning	Written test
Knowledge of curriculum development models	Practical test
Developing student leadership skills	Oral test
Developing students' problem-solving skills	Student projects
Problem-solving	Essays
3. Competency-Based Education	Skill test
Writing measurable objectives	Students performance observation
Based teaching upon tasks analysis	Attitude test
Conducting performance-based activities	6. Educational Technology
Conducting work-based contextual learning	Computer-assisted instruction
Individualizing teaching	Using computers in instruction
Offering timely feedback	Using multimedia equipment
Using criterion-reference assessment	

Table 10 contains means, standard deviations, and paired t-test results between teachers' current and desired knowledge/skills in six categories. Paired t-test results revealed current knowledge/skills of respondents were significantly different from desired knowledge/skills. The respondents rated their desired knowledge/skills significantly higher than their current level in all six categories.

Table 10: Mean, standard deviation, and paired t-test regarding teacher current and desired knowledge/skills level

Six categories	Current Knowledge/Skills			Desired Knowledge/Skills		Paired	
	n	M	SD	M	SD	t	p
Planning and management	279	2.18	0.44	2.80	0.31	23.00	<.001
Curriculum & innovative teaching	312	1.91	0.49	2.74	0.34	30.39	<.001
Competency-based education	328	1.88	0.59	2.69	0.41	27.05	<.001
Teaching methods and activities	304	1.85	0.53	2.65	0.44	26.38	<.001
Evaluation and assessment	311	2.04	0.49	2.68	0.42	21.65	<.001
Educational technology	326	1.32	0.91	2.55	0.69	24.65	<.001

Note: The significance level for mean difference is ≤ 0.05 ; Scale: 0=none, 1=low, 2=average, 3=high.

Paired-t test results showed there were statistical significances between current and desired knowledge/skills existing among six categories. But, how important those differences are depends on how large the differences are. The general guidelines for analyzing effect size developed by Cohen (1988) were used to examine the size of significant differences for six categories regarding their current and desired knowledge/skills. The formula used to compute the effect size (ES) for two dependent groups follows:

$$ES = M_1 - M_2 / \sqrt{[(\sigma_1^2 + \sigma_2^2) / 2]}$$

Table 11 presents the effect size for six categories. The results revealed five categories had “small” effect size between current and desired knowledge/skills. Educational technology was the only category which showed “large” effect size between current and desired knowledge/skills according to the general guidelines developed by Cohen (1988).

Table 11: Effect size for six categories

Six categories	n	Current Knowledge/Skills		Desired Knowledge/Skills		Cohen's d Effect Size	
		M	SD	M	SD		
Planning and management	279	2.18	0.44	2.80	0.31	0.24	<i>Small</i>
Curriculum & innovative teaching	312	1.91	0.49	2.74	0.34	0.35	<i>Small</i>
Competency-based education	328	1.88	0.59	2.69	0.41	0.41	<i>Small</i>
Teaching methods and activities	304	1.85	0.53	2.65	0.44	0.39	<i>Small</i>
Evaluation and assessment	311	2.04	0.49	2.68	0.42	0.29	<i>Small</i>
Educational technology	326	1.32	0.91	2.55	0.69	1.06	<i>Large</i>

Scale: 0=none, 1=low, 2=average, 3=high.

Note: Cohen's General Guidelines for Effect Size:

<0.20	Very small or little effect
0.20 through 0.49	Small effect size
0.50 through 0.79	Medium or moderate effect size
0.80 and higher	Large effect size

4. Differences of respondents' current knowledge/skills across six categories

Repeated measures with GLM (General Linear Model) was employed to compare the overall mean differences regarding teachers' current knowledge/skills across six categories of planning and management, curriculum and innovative teaching, competency-based education, teaching methods and activities, evaluation and assessment, and educational technology. The results indicated that there were differences in means across six categories, and these differences were statistically significant. The category of planning and management had the highest mean value ($M=2.17$), followed by evaluation and assessment ($M=2.06$). Three categories: curriculum and innovative teaching, teaching methods and activities, evaluation and assessment received very similar mean values as 1.89, 1.87, and 1.84 respectively, whereas the mean for educational technology was the lowest as 1.38 among six categories (see Table 12).

Table 12: Repeated measures analysis across six categories

Variable	n	Mean	SD	F	Sig.
Planning and management	243	2.17	0.45	75.04	.000
Curriculum and innovative teaching	243	1.89	0.49		.000
Competency-based education	243	1.87	0.61		.000
Teaching methods and activities	243	1.84	0.54		.000
Evaluation and assessment	243	2.06	0.49		.000
Educational technology	243	1.38	0.89		.000

Note: The significance level for mean difference is ≤ 0.05 , Scale: 0=none, 1=low, 2=average, 3=high.

A post hoc follow-up test from the repeated measures was used to examine the differences of means between six categories. Table 13 presents the results regarding all six categories contrasted with each other. The table only contains paired categories, which showed statistical significance, and the categories with no significance were not included in the table.

There were significant differences found between planning and management and the other five categories. The significant differences also existed between curriculum and innovative teaching and evaluation and assessment as well as educational technology, competency-based education verses evaluation and assessment as well as educational technology, teaching methods and activities verses evaluation and assessment as well as educational technology, and evaluation and assessment compared with educational technology. There were no differences found between curriculum and innovative teaching and competency-based education, curriculum and innovative teaching verses teaching methods and activities, and competency-based education verses teaching methods and activities (see Table 13).

Table 13: Pairwise comparison across six categories of current knowledge/skills

	Variable	Mean Difference	Sig.
Planning & management	Curriculum & innovative teaching	0.28	.000
	Competency-based education	0.31	.000
	Teaching methods & activities	0.33	.000
	Evaluation & assessment	0.11	.000
	Educational technology	0.79	.000
Curriculum & innovative teaching	Evaluation & assessment	-0.17	.000
	Educational technology	0.51	.000
Competency-based education	Evaluation & assessment	-0.20	.000
	Educational technology	0.481	.000
Teaching methods & activities	Evaluation & assessment	-0.22	.000
	Educational technology	0.46	.000
Evaluation & assessment	Educational technology	0.68	.000

Note: The significance level for mean difference is ≤ 0.05 .

5. Differences across six categories on gender, age, and teaching experience

Factorial multivariate analysis of variance (MANOVA) was used to examine the differences across six categories of the respondents' current knowledge/skills regarding gender and years of teaching experience. As age and years of teaching experience were highly correlated ($r=0.915$), The variable of years of teaching experience was chosen to conduct MANOVA as it was more logical and meaningful.

Pearson correlation was computed to examine if dependent variables were correlated. Table 14 shows six dependent variables (six categories) are highly correlated. This result allows performing MANOVA that assumes all dependent variables are correlated to each other.

Table 14: Pearson correlations between six categories

Dependent Variable	Planning & management	Curriculum & innovative teaching	Competency-based education	Teaching methods & activities	Evaluation & assessment	Educational technology
Planning & management n	1.000 281	.692** 269	.558** 271	.551** 264	.667** 271	.410** 276
Curriculum & innovative teaching n	.692** 269	1.000 314	.770** 306	.702** 296	.645** 300	.282** 312
Competency-based education n	.558** 271	.770** 306	1.000 329	.671** 299	.609** 304	.327** 316
Teaching methods & activities n	.551** 264	.702** 296	.671** 299	1.000 309	.685** 299	.389** 305
Evaluation & assessment n	.667** 271	.645** 300	.609** 304	.685** 299	1.000 314	.408** 309
Educational technology n	.410** 276	.282** 312	.327** 316	.389** 305	.408** 309	1.000 328

Note: **Correlation is significant at the 0.01 level (2-tailed).

The results from MANOVA analysis (see Table 15) found significant differences among six categories on the years of teaching experience ($p=0.010$, Pillais Trace $F=2.225$) and gender ($p=0.022$, Pillais Trace $F=2.530$). The interaction was not found between gender and years of teaching experience ($p=0.172$, Pillais Trace $F=1.379$).

Table 15: Summary of factorial MANOVA results

Effect		F	Sig.
Gender	Pillai's Trace	2.530	0.022
Years of Teaching	Pillai's Trace	2.225	0.010
Gender \times Years of Teaching	Pillai's Trace	1.379	0.172

Note: The significance level for mean difference is ≤ 0.05 .

A post hoc following-up analysis (Scheffe test) was performed to identify the differences across six categories on years of teaching and gender.

Table 16 summarizes the results from post hoc test between years of teaching experience across six categories. Years of teaching experience was divided into three groups: 1=0 to 10 years, 2=11 to 20 years, and 3 \geq 21 years of teaching experience.

The results indicated there were significant differences between group 1 and 2 ($p=0.001$) regarding planning and management. There was a statistically significant difference between group 1 and 2 ($p=0.004$) regarding curriculum and innovative teaching. There were significant differences found between group 1 and 2 ($p=0.021$) regarding teaching methods and activities. No significant differences were found between the years of teaching experience and evaluation and assessment and educational technology.

Table 16: Multiple comparisons among years of teaching experience

Dependent Variable	Years of Teaching (I)	Years of Teaching (J)	Mean Difference (I-J)	Sig.
Planning and management	1	2	-0.22	0.001
		3	-0.12	0.832
	2	1	0.22	0.001
		3	0.09	1.000
	3	1	0.12	0.832
		2	-0.09	1.000
Curriculum & innovative teaching	1	2	-0.24	0.001
		3	-0.26	0.122
	2	1	0.24	0.001
		3	-0.02	1.000
	3	1	0.26	0.122
		2	0.02	1.000
Competency-based education	1	2	-0.18	0.108
		3	-0.29	0.189
	2	1	0.18	0.108
		3	-0.12	1.000
	3	1	0.29	0.189
		2	0.12	1.000
Teaching methods and activities	1	2	-0.20	0.021
		3	-0.21	0.378
	2	1	0.20	0.021
		3	-0.01	1.000
	3	1	0.21	0.378
		2	0.01	1.000
Evaluation and assessment	1	2	-0.16	0.055
		3	-0.23	0.225
	2	1	0.16	0.055
		3	-0.07	1.000
	3	1	0.23	0.225
		2	0.07	1.000
Educational technology	1	2	0.11	1.000
		3	-0.05	1.000
	2	1	-0.11	1.000
		3	-0.16	1.000
	3	1	0.05	1.000
		2	0.16	1.000

Note: The significance level for mean difference is ≤ 0.05 level; groups: 1=0 to 10 years, 2=11 to 20 years, and 3 ≥ 21 years.

Table 17 presents the comparisons between gender among six categories. Planning and management was the only category that showed a significant difference between male and female respondents. Male respondents had a significant higher knowledge/skills level in planning

and management than females. No significant differences were found in other five categories between male and female teachers.

Table 17: Comparisons between male and female respondents among six categories

Dependent Variable	Male (I)	Female (J)	Mean Difference (I-J)	Sig.
Planning and management	2.264	2.022	0.242	0.003
Curriculum & innovative teaching	1.971	1.828	0.143	0.112
Competency-based education	1.960	1.795	0.165	0.140
Teaching methods and activities	1.920	1.763	0.156	0.116
Evaluation and assessment	2.104	2.059	0.046	0.616
Educational technology	1.470	1.256	0.214	0.202

Note: The significance level for mean difference is ≤ 0.05 level; Scale: 0=none, 1=low, 2=average, 3=high.

Factors Contributed to Curriculum Reform

Objective 5: *Determine the factors that contribute to curriculum reform process.*

To identify the most important factors that contributed to curriculum reform, 13 factors were presented in the instrument. The respondents were asked to choose three factors they perceived as the most important factors that affect the process of curriculum reform. Table 18 and Figure 6 show frequencies of each factor rated by the respondents.

The respondents rated the knowledge and skills of teachers (77.6%), new facilities and equipment (48.7%), and attitudes of teachers (46.9%) as the top three factors attributed to successful curriculum reform.

The following five factors also received relatively high responses from the teachers surveyed. They were: administrative support (23.9%), high quality teaching

materials (21.6%), administrative incentives (21.3%), students' interest in new curriculum (21.6%), and autonomy of making needed decisions (26.5%).

Four factors were identified to be less important by respondents as they didn't receive many responses. They were: flexibility in teaching time assigned (11.1%), technical assistance (8.7%), peer support (2.3%), and community support (2.0%).

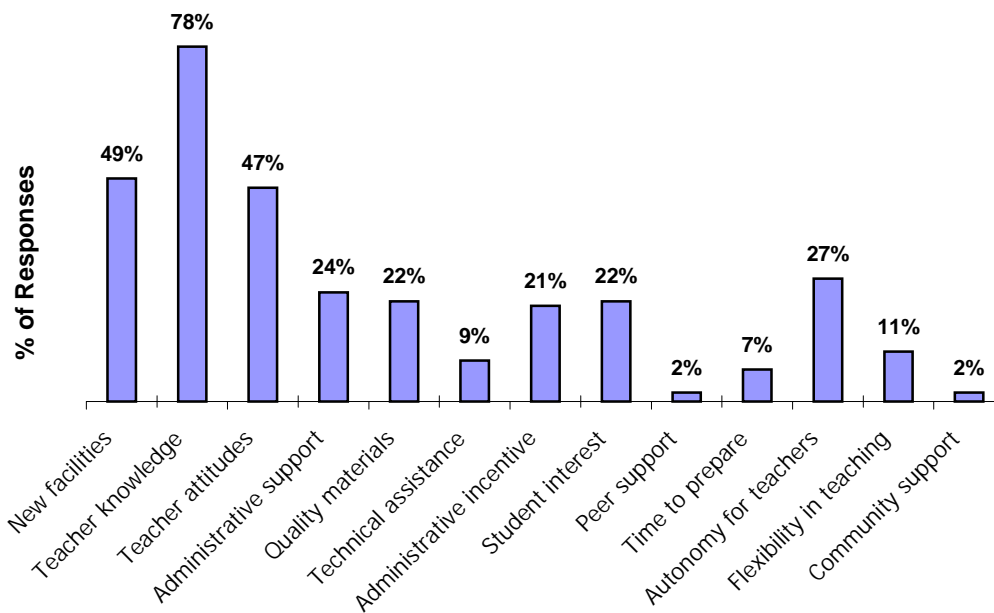


Figure 6: Percent of responses for 13 factors that support curriculum reform

Table18: Frequencies of 13 factors that contributed to curriculum reform

Factors	Frequencies (N)	Cases (%)
Attitudes of teachers	161	46.9
Knowledge and skills of teachers	266	77.6
New facilities and equipment	167	48.7
Administrative support	82	23.9
High quality teaching materials	74	21.6
Technical assistance	30	8.7
Administrative incentive	73	21.3
Students' interest in new curriculum	74	21.6
Peer support	8	2.3
Time to prepare and teach new curriculum	25	7.3
Autonomy of making needed decisions	91	26.5
Flexibility in teaching time assigned	38	11.1
Community support	7	2.0
Total Responses	--	319.5

Note: 0 missing cases, 343 valid cases

Chapter V

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

Agricultural schools in China have been undergoing a huge transition as the system is shifting from non-effective academic institutions to vocational-oriented education brought on by China's economic reforms. Changes of traditional curricular and instructional methods have been recognized as an important strategy to vocationalize the existing agricultural educational system. To sustain this effort, teachers have been identified as an essential force in this reform movement. What kind of attitudes, knowledge, and skills they need to have to deal with this change and how to prepare them to carry out this challenge have become a center issue in dialogues with the people involved. This study was aimed at examining teachers' current and desired knowledge and skills related to curriculum development and instructional methodology, and identifying the areas that need to be addressed in teacher training and professional development programs.

Procedures

The population for the study was teachers in 12 agricultural schools in China that were a part of a pilot project to reform agricultural education in China. A systematic sampling method was used to select participant teachers from the population. A survey questionnaire was constructed and used to collect data from the selected teachers. The questionnaire included five parts, in which 41 items measured current and desired knowledge/skills regarding curriculum and instruction. The questions were divided into

six categories: planning and management, curriculum and innovative teaching, adopting competency-based education, teaching methods and activities, evaluating and assessing, and educational technology. Thirteen factors related to curriculum reform were presented in the instrument and the respondents were asked to rate the top three. Attitudes and perceptions toward reform policies and strategies as well as training programs were included in two sections in the instrument.

The questionnaire was translated into Chinese and validated by professors both in China and at The Pennsylvania State University. The researcher went to China and conducted the data collection during June to July 2002. Data were input and analyzed during 2003.

Summary of the Results and Discussions

The results were summarized according to the research objectives. A discussion follows after a summary of each objective is presented.

Objective 1: *Describe the demographic characteristics of teachers with regard to their education, training received and desired, subjects taught, teaching experience, age, gender, educational background, and professional titles.*

The average teachers surveyed were 36 years old, with a 14 years of work experience and 13 years of teaching experience. The majority of the respondents were male. They were bachelor degree holders. They possessed the title of lecturer. The respondents also desired for professional training at least once in a year.

As the results indicated the teachers surveyed were middle aged with more than ten years teaching experiences and they desired updating their knowledge and skills. They

represent the backbone of the reform movement. These teachers are experienced and capable of making changes. They are technically trained and should know how to work within the system to promote change. Moreover, these teachers appear to be interested in changes as they continue to participate in professional development activities. Therefore, policies should be devised to better use their talent and experience in reforming the agricultural educational system.

Objective 2: *Describe teachers' perceptions related to policy, management and resources in teacher training programs.*

Overall, the respondents thought there were policies, resources, and management processes in school along with the teacher professional development programs and activities. They believed that teachers deserved high quality in-service training activities to keep updated in teaching and needed to play an important role in curriculum development. The respondents thought that the adoption of CBE during past years was the correct approach toward reforms in vocational education. Teachers perceived that current training and professional development opportunities were inadequate in helping them to implement new curriculum initiatives. Teachers also supported the idea that agricultural universities should provide pre-service pedagogy training programs for agricultural teachers.

Results of this study suggest that high quality and timely in-service training and professional development programs are important in sustaining the reform efforts. Therefore, policies, resources, management processes need to be formulated to improve both quality and quantity of teacher training and professional development programs. Many educators indicated (Erickson, 2001; Cuban, 1993; Reed, 2000) that teachers

deserve quality time, professional development opportunities, and involvement of decision-making process to make changes in their teaching practice. An empowered teacher assumes the responsibility to become a designer of instruction and an innovator of teaching practices.

Objective 3: *Examine teachers' current work conditions and their attitudes toward curriculum reform initiatives within competency-based education.*

In general, respondents perceived their working conditions related to reforms were unfavorable. Teachers were overloaded by heavy teaching load, beset with inadequate technical and administrative support, and encountered obstacles due to insufficient equipment and funding. However, teachers expressed their support regarding reform initiatives and felt positive about the prospects of using CBE in agricultural schools.

Despite the inadequacy of resource and technical support, teachers were willing to participate in the reform movement. The problems and difficulties teachers faced in their work didn't seem to discourage them, as they still believed the reform was important. They were ready to try new ideas in their teaching practice if they were properly taught. Moreover, they perceived training was a very powerful tool to assist teachers for innovative teaching.

In fact, the results have challenged a traditional Chinese concept that teachers are not interested in reform and unwilling to devote their time to developing new curriculum and try different teaching methods. From a traditional viewpoint, teachers do not try new ideas in teaching, as they feel either inadequate or even discouraged to do so because of policies or lack of administrative support. These teachers indicated that they would be able to carry out reform initiatives if they were properly taught and supported by

administration and resources.

Administrators should seize this opportunity and move quickly forward to develop professional development opportunities, and at the same time, improve working conditions for teachers. Both administrative and technical support should be put in place for teachers to fulfill their potential to improve students learning through innovative curriculum and instruction. Pierce (1981) revealed that “support of administration” as one of three factors attributed to a teacher’s attitude toward innovative practices. He found those who had administrative support were more likely to adopt changes and innovations in their teaching.

Objective 4: *Determine teachers’ current knowledge/skill level and desired knowledge/skill level regarding all aspects of curriculum, instruction, and competency-based education, etc.*

In general, teachers were interested in upgrading their knowledge and skills related to curriculum, instruction as well as competency-based education. There were differences found between various years of teaching experience of the respondents surveyed. Teachers with fewer years of teaching experience tended to be less knowledgeable than those who had served longer years regarding curriculum and instruction.

Differences were also found between male and female teachers regarding the questions in planning and management. Males tended to report better skills than females. However, all teachers strongly desired more training in educational technology, as they perceived that they had limited expertise and skills in this area. Teachers might also see a great potential of using technology to improve the quality of teaching.

Technology is increasingly used to overcome limitations and obstacles in teaching. Technology offers teachers more tools and flexibilities to achieve educational goals. Teachers or administrators should embrace these new tools in education, and explore how technology can assist teaching and learning. With the rapid advancement and wide use of technology in education, it has the potential to help agricultural schools close the educational gap that exists between urban and rural schools. Therefore, educational technology should be put into teachers' training agenda.

The results showed that teachers felt inadequate in selected pedagogical areas, and thus expected more training, such as, curriculum development and innovative teaching. Therefore, proper training programs and activities should be conducted to address these weaknesses.

Objective 5: *Determine the factors that contribute to curriculum reform process.*

Respondents indicated that knowledge and skills of teachers, new facilities and equipment, and attitudes of teachers as the top three factors attributed to successful curriculum reform among 13 factors. Other two factors followed the top three factors were autonomy for teachers to make needed decisions and administrative support.

Traditionally, teachers in agricultural schools are at the bottom of the hierarchical top-down administration. They have neither included in decision-making process nor given autonomy to try the reform initiatives. Cuban (1993) noticed that the margin of freedom that teachers enjoy in their specific teaching constrained classroom may be small, but it is significant. Of course, that margin can expand or shrink, depending on whether administrators and policymakers see as their task the cultivation or repression of teachers' capacities to lead both inside and outside the classroom. Therefore, adjusting

the administrative structure and reducing organizational constraints can expand teachers' autonomy within the classroom, creating even more opportunities for change.

Klein (1991) cautioned that neither top-down nor bottom-up development of curriculum policies was an appropriate approach. Centralized decision-makers often fail to adequately consult with teachers, and total teacher responsibility demands too much time based upon traditional teacher training and the inherent teaching culture. The development of curriculum must take a middle ground with teachers in the schools and administrators in government agencies in partnership. In other words, too much freedom without necessary supervision and monitoring can also lead to the reform efforts to be fruitless.

The results from the factors rating by respondents again confirmed that the knowledge, skills, and attitudes of teachers, resources availability, administrative support, and teachers' autonomy were critical to the success of the reform. Thus, policies, resources, and professional development activities should be mobilized to tackle these issues.

Recommendations

Based on the results from this study, a need for teacher training and professional development is evident among the schools that were surveyed. It is strongly recommended that teachers be given the opportunities and support to attend professional development programs, which should increase their current knowledge base and enable them to successfully implement curriculum innovations. Specifically the recommendations are suggested in the following paragraphs.

1. Training contents

The results from this study should be utilized to devise effective teacher training and professional development programs. Teachers should be taught how to develop, initiate, and implement curriculum innovation in their teaching practice. To address the effectiveness and accountability of curriculum reform efforts, the teacher must be updated with a curriculum design and delivery process much different from anything they have previously practiced. The new curriculum reform requires rethinking learning theory, planning process, delivery methods, and assessment techniques in the vocational education context. These efforts will enable teachers to better address the development needs of agricultural education during the nation's economic transformation. Therefore, teacher training and professional development activities should address the needs of teachers for new curriculum development and delivery approach to carry out this reform movement.

In addition, more training in CBE that targets various groups of teachers needs to be planned. An in-depth training in CBE for those who have tried the method and an introductory workshop for novice teachers should help teachers make the transformation to stronger vocational programs.

Moreover, training in educational technology should be provided to teachers and assist them to effectively implement curriculum innovations. The use of technology can help reduce the educational gap for rural students.

2. Training methods

Various formats should be employed to empower and train teachers. Workshops, seminars, teacher study groups, class observations, mentoring programs are common practices in Chinese schools that can be used to deliver professional development programs and activities. Especially, the teacher study group, class observation, and mentoring activities should be improved and strengthened. These are most feasible and effective methods in teacher professional development in Chinese schools and they need to be recognized and reinforced. Using those methods, teachers don't need to leave their busy schedule while still having opportunities to update their skills and knowledge through interacting with peers and other sources. While nationwide workshops still are appropriate on some occasions, most professional development should be school-based and offered as a routine practice.

Long-term professional development also needs to be planned, which involves certificate training and graduate education program studies. Those approaches have been practiced in some agricultural schools in recent years and these programs need to be expanded and embedded into teachers professional development plans.

3. Teacher's involvement and autonomy

Teachers need to be consulted and involved in each aspect of the reform efforts and practices. When they are acknowledged and informed they could become more committed to the reform process (Kelly, 1982). There are various means by which teachers could play an active role in the reform process such as through regular communications, meetings, providing them a platform to voice their opinions and

suggestions to strengthen reform initiatives. A democratic management strategy in local schools could stipulate more involvement of teachers and sharing their expertise and support.

Teachers should also be given more autonomy using new instructional methods to strengthen teaching and learning. Teachers should have a feeling they are in control and they are contributing in a meaningful way to the development of students and society. This will develop a sense of ownership and responsibility that is not a part of the philosophy of teachers and administrators in Chinese agricultural schools.

4. Policy support and recognition

Administrative policies and incentives should be in place to support teachers' efforts in implementing reform initiatives. There should be policies and incentives that favor and support those teachers who have made progress to improve teaching and learning in the classroom.

In addition, teacher professional development programs should be integrated into the teachers annual evaluation and promotion plans. Teachers' efforts to improve teaching quality need to be recognized through administrative incentive and professional promotion. In this way, an encouraging atmosphere could be created and eventually the motivation for professional growth could become part of routine activity for all teachers.

5. Long-term efforts in teacher education

The Ministry of Agriculture, educational departments at the provincial level and schools should work together to develop a short-term as well as long-term policies and

plans for teacher professional development programs based on the results from this study. Especially, corresponding government organizations should formulate the policies and mandates to regulate teacher professional development and certification programs. Both pre- and in-service teacher education programs should be developed and mandated. Agricultural universities need to conduct teacher education programs and increase their participation in the reform efforts. Other universities with provision for teacher education programs should be also used to train teachers in agricultural schools.

6. Teacher education model for agricultural teachers in China

A teacher education model is proposed as a result of this study and other similar studies in teacher education. The purpose of developing this model is to incorporate teacher education into a broader context of agricultural education and to promote a systematic formulation of policies and action plans in teacher pre- and in-service education.

Figure 7 is the schematic representation of this model. This model shows that agricultural universities need to take an essential role in providing both pre-and in-service education programs for agricultural teachers through undergraduate programs, graduate programs, and awarding of teacher certificates. Other normal colleges and professional development centers also need to join their efforts to provide training for teachers in agricultural schools. The contents and topics for teacher education programs need to be centered around pedagogy, curriculum and instruction, educational psychology, educational technology, and subject matter areas. Delivery methods for teacher education

programs and professional development activities can be varied. Traditional classroom instruction and student placement are still viable methods while other approaches are available at disposal.

With the development of technology, the programs can be delivered online to reduce the cost and at the same time, provide flexibility in terms of time, space, and learning style of learners. Technologies can support and broaden professional learning communities and help teachers make better use of their time. Through a range of technologies, teachers can access both instructional resources and collegial networks (Fine & Raak, 1994).

In addition, teachers should be required to update their certificate annually through courses, seminars, and workshops that could provide pedagogical updates.

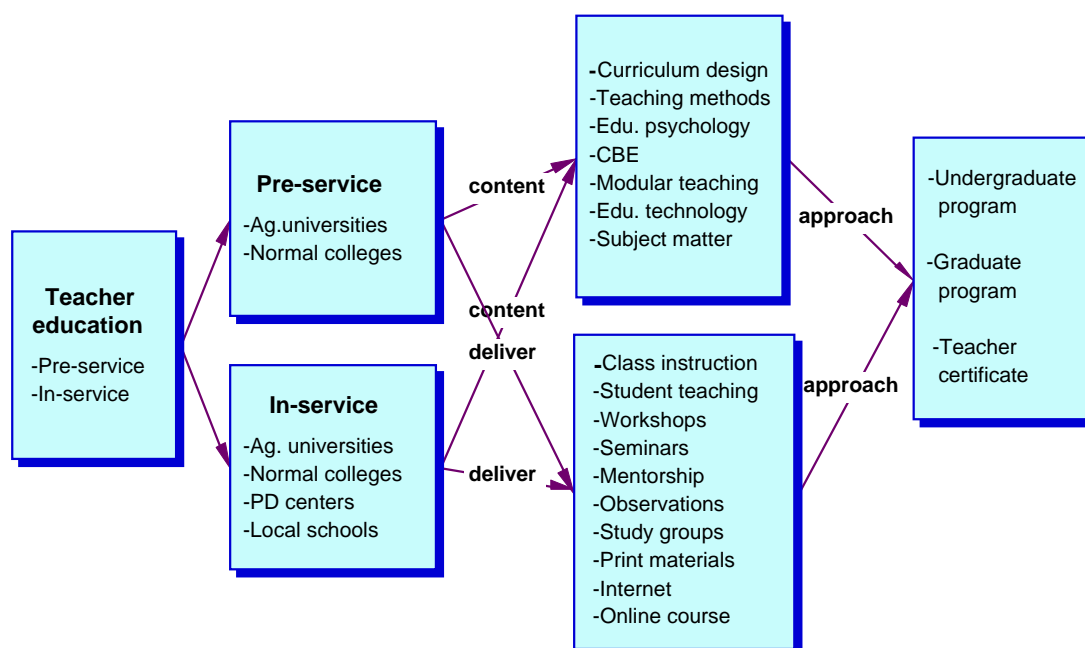


Figure 7: Teacher education model for agricultural teachers in China

Future Research

Future research should focus on two areas: first, policies and procedures in guiding agricultural teacher training and professional development. Generally, agricultural teachers in agricultural schools are graduates from agricultural universities. They are usually trained in their specific discipline without pedagogy training, as they are not required to be certified to teach. Today, there are no coherent policies and practices in teacher pre-service and in-service training at all levels. Therefore, it is very important for government organizations in agriculture and education to launch policies and mechanisms in teacher education and professional development.

Long-term policy frameworks are needed to formalize and improve quality of teacher education. Corcoran (1995) cautioned that policymakers should be aware of the risks of focusing solely on the short-run, immediate needs generated by the implementation of school reforms. Improvement of teaching is a long-term challenge, focusing on the short-term can lead to superficial compliance with new policies and the neglect of long-term investments in teachers' knowledge of subject matter and pedagogy.

Second, the role of higher education in agriculture in providing pre-service and in-service training for vocational agricultural teachers should be explored. Historically, agricultural universities and colleges have not been required to provide pedagogy training for the graduates who have entered into a teaching career. In some universities, they recruit groups of students and place them into a class that prepares them to be future teachers. However, upon graduation, there are often few opportunities for individuals land a teaching position. Most of them have other jobs rather than teaching. Moreover,

the role of teaching in agricultural schools in China is not considered a popular career choice by many graduates.

Teacher education in agriculture needs to be integrated into higher education in China. Until agricultural education is a part of the system of higher education, all reform efforts will be merely a temporary solution. Therefore, strengthening the university's role in teacher education should be seen as a long-term effort to improve teacher education.

Conclusions

This study supports existing literature that teachers play an important role in educational reforms. Teachers desired to incorporate new curriculum ideas into teaching practice to improve student learning. Teachers indicated that CBE was an alternative approach towards the development of Chinese agricultural education system. They also thought that in-service training was important in assisting them to implement reform initiatives. They requested more education and training in curriculum development and instructional methods, educational technology as well as their own subject matter areas. In addition, they believed that teacher attitudes, knowledge, skills, and autonomy, administrative support, and new facilities and equipment were the most important factors affecting the process of curriculum reform. Moreover, they reported that they were passionate and committed to carry out this important and challenging course. If subsequent nationwide studies find similar results, a series of reform efforts should be considered.

Coherent and systematic policies and guidance should be formulated in teacher education and professional development activities. Resources, administrative and

technical supports have to be provided to assist teachers in implementing reform initiatives. Both pre-and in-service training needs to focus on the areas that teachers feel inadequate or never receive formal training in such as pedagogy, curriculum and instruction, educational technology and CBE. To tackle this problem from its root cause, the role of agricultural universities in providing teacher education and certificate training need to be legitimized and mandated. Teacher education and licensure need to be incorporated into the system of higher education in China.

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APPENDIX A
Correspondence

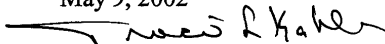
PENNSTATE



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Date: May 9, 2002
From:  Tracie Kahler, Human Subjects Compliance Coordinator
To: Xiaorong Shao
Subject: Proposal for Use of Human Subjects in Research - Exemption (IRB #14444)

Approval Expiration Date: May 9, 2003

“Empowering Teachers to Implement Curriculum Reform Initiatives in Chinese Agricultural Schools”

Your proposal for use of human participants in your research has been reviewed and **approved for a one-year period**. Participants in your research are at minimal risk.

By accepting this decision you agree to notify this office of (1) any additions or changes in procedures for your study that modify the participants’ risks in any way and (2) any events that affect the safety or well-being of participants.

The University appreciates your efforts to conduct research in compliance with the federal regulations that have been established to ensure the protection of human participants.

TLK/mbc

cc: Department Head, Agricultural and Extension Education
Research Dean, College of Agricultural Sciences

COVER LETTER

Date

Dear teacher:

My name is Xiaorong Shao. I used to work in Shaanxi Agricultural School. Now I am doing my doctoral study program at the Pennsylvania State University and I am majoring in agricultural education. The survey questionnaire you have now is designed to collect data for my dissertation research. By conducting this research, I hope to gather the information on teachers' perceptions toward their work conditions and teacher training programs regarding curriculum reform. Teachers' current and desired knowledge/skills regarding curriculum and instruction will be also identified through this survey.

It will take you about 20 minutes to complete this questionnaire if you agree to take part in this study. About 400 other teachers like you from 12 agricultural schools will participate in this study. Your input is very important, as it will be used to formulate the policies in curriculum reform and teacher professional development programs in our agricultural schools. Therefore, I would like you to answer all questions directly and honestly.

Your responses will be kept confidential. Only the researcher will have access to information associated with your identify. Your personal identity such as your names will not be required in this questionnaire. In the event of publication of this study, no any personally identifying information will be disclosed.

Your participation is voluntary. You are free to stop participating in this research at any time, or to decline to answer any specific questions without penalty. Also there is no known risk to participate in this survey. If you have any questions, please feel free to contact me by phone at 910-228-6734 or by email at xzs100@psu.edu.

Your participation in this study and contribution to the improvement of our agricultural education will be greatly appreciated.

Thank you for your cooperation!

Sincerely,

Xiaorong Shao
Ph.D. candidate
Department of Agriculture and Extension Education
The Pennsylvania State University

**INFORMED CONSENT FORM
FOR BEHAVIORAL AND SOCIAL SCIENCE RESEARCH**

The Pennsylvania State University

Title of Project: Teacher Training and Curriculum Reform in Chinese Agricultural Schools

Principal Investigator: Xiaorong Shao, 415 Agricultural Administration Building,
University Park, 16802, (814) 863-7877, xzs100@psu.edu

Other Investigator(s): Thomas H. Bruening, 335 Agricultural Administration Building,
University Park, 16802, (814) 863-7420, thb2@psu.edu

1. Purpose of the Study: The purpose of this research is to identify training needs of teachers in Chinese agricultural schools.
2. Procedures to be followed: Participation in this research will include completion of a 65 questions on a written survey.
3. Discomforts and Risks: There are no risks in participating in this research beyond those experienced in the workplace.
4. Benefits:
 - a. Participant: You might realize the important role you play as a teacher in curriculum reform. You might learn what is the current trend in curriculum reform. You might get an opportunity to participate in a professional development workshop.
 - b. Society: This research might provide a better understanding of current status of teacher training programs and the areas need to be addressed in order to implement curriculum reform initiatives. This information could help formulate policies in teacher training programs regarding curriculum reforms.
5. Duration/Time: It will take about 20 minutes to complete survey questionnaire.
6. Statement of Confidentiality: The survey does not ask for any information that would identify who the responses belong to. Therefore, your responses are recorded anonymously. If this research is published, no information that would identify you will be written since your name is in no way linked to your responses.
7. Right to Ask Questions: You can ask questions about this research. The contact person is Xiaorong Shao. Phone: 910-228-6734, email: xzs100@psu.edu
8. Compensation: There is no any compensation for participating in this research.

9. Voluntary Participation: You do not have to participate in this research. You can stop your participation at any time. You do not have to answer any questions you do not want to answer.

You must be 18 years of age or older to consent to participate in this research study.

Completion and return of the survey implies that you have read the information in this form and consent to participate in the research.

Please keep this form for your records or future reference.

APPENDIX B
Questionnaire

**TEACHING TRAINING AND CURRICULUM REFORM
IN CHINESE AGRICULTURAL SCHOOLS**

Section 1: Respondent Information

1. Work experience _____ years 2. Teaching experience _____ years
3. Professional title _____ 4. Administrative position _____
5. Highest degree and major _____
6. Age _____ 7. Gender _____
8. Subject (s) taught in the school _____, _____, _____.
9. Formal training received in last 5 years (check all that apply)
 - a. Computer technology _____
 - b. Competency-based education _____
 - c. Subject matter area _____
 - d. Teaching methods _____
 - e. Modular teaching approach _____
 - f. None _____

Other type(s) of training received (please specify)

10. The number of training you would like to receive each year (check one only)
 - a. None _____
 - b. Once _____
 - c. Twice _____
 - d. Three times _____
 - e. More than three times _____
11. Identify the topics you would like to consider for your future training (check all that apply)
 - a. Computer technology _____
 - b. Competency-based education _____
 - c. Subject matter area _____
 - d. Teaching methods _____
 - e. Modular teaching approach _____
 - f. Don't need any training _____

Other area(s) you would like to receive training in future (please specify)

Section 2: Policy/Management/Resource Regarding Curriculum Reform

Instructions: Please indicate the degree of your agreement on policy/management/resource regarding curriculum reform in the following areas. Circle the number that most closely reflects your opinion using the scale: 4=Strongly Agree (SA), 3=Agree (A), 2=Disagree (D), 1=Strongly Disagree (SD), 0=Don't Know (DK).

Item	SA 4	A 3	D 2	SD 1	DK 0
1. Current teacher professional development programs conducted at my school are adequate in enabling teachers to implement new curriculum in the classroom.	4	3	2	1	0
2. The current reforms emphasizing competency-based education is in right direction.	4	3	2	1	0
3. Training on competency-based education organized by the Ministry of Agriculture in the past few years was very effective.	4	3	2	1	0
4. My school allocates time for teachers to develop new curriculum.	4	3	2	1	0
5. My school rewards those who have tried new methods in their teaching.	4	3	2	1	0
6. My school provides adequate funds to train teachers to implement a new curriculum.	4	3	2	1	0
7. My school evaluates teaching reform on a regular basis.	4	3	2	1	0
8. My school has a long-term plan for teacher professional development.	4	3	2	1	0
9. In service teacher training programs need to address problems encountered in new curricular implementation.	4	3	2	1	0
10. Teachers need to play a greater role in curricula development.	4	3	2	1	0
11. Teachers need to be better prepared to implement a new curriculum through ongoing training.	4	3	2	1	0
12. Teachers need high quality in-service training activities to keep updated in instructional methods.	4	3	2	1	0
13. Adequate financial support is the key to teacher training programs.	4	3	2	1	0
14. Agricultural universities need to provide pre-service pedagogical training programs for agricultural teachers.	4	3	2	1	0

What other factors do you think may be contributing to curriculum reform?

Section 3: Work Conditions/Perceptions

Instructions: Please indicate the degree of your agreement regarding work situation/perception in the following areas. Circle the number that most closely reflects your opinion using the scale: 4=Strongly Agree (SA), 3=Agree (A), 2=Disagree (D), 1=Strongly Disagree (SD), 0=Don't Know (DK).

Item	SA 4	A 3	D 2	SD 1	DK 0
1. I have too much work at the present time.	4	3	2	1	0
2. I am not interested in new teaching methods.	4	3	2	1	0
3. I don't have time to try a new curriculum.	4	3	2	1	0
4. I don't have autonomy in my teaching.	4	3	2	1	0
5. There are very limited new teaching materials that I can use in my class.	4	3	2	1	0
6. My teaching heavily depends on a textbook.	4	3	2	1	0
7. I think current curricular should be changed.	4	3	2	1	0
8. I have access to the Internet to obtain new materials for my teaching.	4	3	2	1	0
9. I feel my school would support me to introduce new ideas.	4	3	2	1	0
10. I am satisfied with my teaching performance.	4	3	2	1	0
11. I know how to develop a new curriculum.	4	3	2	1	0
12. I usually get instructional support from peers.	4	3	2	1	0
13. I get extra salary for developing new curriculum materials.	4	3	2	1	0
14. I am confident with curriculum reform.	4	3	2	1	0
15. I want to try something new in my teaching but don't feel prepared to do so.	4	3	2	1	0
16. I understand some concepts of competency-based education.	4	3	2	1	0
17. I don't know how to use competency-based education in my teaching practice.	4	3	2	1	0
18. I can use competency-based education if I am properly taught.	4	3	2	1	0
19. I think all agricultural schools should adopt competency-based education.	4	3	2	1	0
20. I believe training is a very powerful tool to prepare me for innovative teaching.	4	3	2	1	0
21. I plan to try some new methods in my teaching next semester.	4	3	2	1	0

What else do you feel is important in your teaching at the present time?

Section 4: Knowledge/Skill Regarding Curriculum and Instruction

Instructions: Please rate your current knowledge/skill regarding curriculum and instruction in the following areas by circling the number from the scale on the left: 0=none, 1=low, 2=average, 3=high. Also indicate on the right column the knowledge and skills level you feel you need to have in order to teach effectively for each item.

A. Curriculum, Planning and Educational issues

Item	Current Knowledge/Skill Level				Desired Knowledge/Skill Level			
	None	Low	Average	High	None	Low	Average	High
	0	1	2	3	0	1	2	3
1. Writing a syllabus	0	1	2	3	0	1	2	3
2. Writing teaching plans	0	1	2	3	0	1	2	3
3. Preparing teaching materials	0	1	2	3	0	1	2	3
4. Adopting modular teaching approach	0	1	2	3	0	1	2	3
5. Conducting experiential learning activities	0	1	2	3	0	1	2	3
6. Organizing cooperative learning	0	1	2	3	0	1	2	3
7. Knowledge of curriculum development models	0	1	2	3	0	1	2	3
8. Developing students' leadership skills	0	1	2	3	0	1	2	3
9. Developing students' problem-solving skills	0	1	2	3	0	1	2	3
10. Adopting competency-based education								
10.1 Writing measurable objectives	0	1	2	3	0	1	2	3
10.2 Based teaching upon tasks analysis	0	1	2	3	0	1	2	3
10.3 Conducting performance-based activities	0	1	2	3	0	1	2	3
10.4 Conducting work-based contextual learning	0	1	2	3	0	1	2	3
10.5 Individualizing teaching	0	1	2	3	0	1	2	3
10.6 Offering timely feedback on students' performance	0	1	2	3	0	1	2	3
10.7 Using criterion-reference assessment	0	1	2	3	0	1	2	3

B. Practical Teaching issues

Item	Current Knowledge/skill level				Desired Knowledge/skill level			
	None	Low	Average	High	None	Low	Average	High
	0	1	2	3	0	1	2	3
1. Teaching methods and activities								
1.1 lecture	0	1	2	3	0	1	2	3
1.2 discussion	0	1	2	3	0	1	2	3
1.3 demenstration	0	1	2	3	0	1	2	3
1.4 case study	0	1	2	3	0	1	2	3
1.5 group projects	0	1	2	3	0	1	2	3
1.6 field trip	0	1	2	3	0	1	2	3
1.7 role playing	0	1	2	3	0	1	2	3
1.8 problem-solving	0	1	2	3	0	1	2	3
1.9 debate	0	1	2	3	0	1	2	3
1.10 oral presentations	0	1	2	3	0	1	2	3
1.11 computer-assisted instruction	0	1	2	3	0	1	2	3
2. Evaluating and assessing								
2.1 written test	0	1	2	3	0	1	2	3
2.2 practical test	0	1	2	3	0	1	2	3
2.3 oral test	0	1	2	3	0	1	2	3
2.4 student projects	0	1	2	3	0	1	2	3
2.5 essays	0	1	2	3	0	1	2	3
2.6 skill test	0	1	2	3	0	1	2	3
2.7 students performance observation	0	1	2	3	0	1	2	3
2.8 attitude test	0	1	2	3	0	1	2	3
3. Planning and conducting student internship programs	0	1	2	3	0	1	2	3
4. Using multimedia equipment in teaching	0	1	2	3	0	1	2	3
5. Using computers in instruction	0	1	2	3	0	1	2	3
6. Motivating students to learn	0	1	2	3	0	1	2	3
7. Managing a classroom	0	1	2	3	0	1	2	3
8. Managing a laboratory	0	1	2	3	0	1	2	3

In your opinion what other knowledge/skill you would like to have for your teaching career?

Section 5: Important Factors in Implementing New Curriculum

Instructions: Choose three statements from the list below that you think are most important to implement a new curriculum. Please put a cross beside the item you select.

1. Attitudes of teachers _____
2. Knowledge and skills of teachers _____
3. New facilities and equipment _____
4. Administrative support _____
5. High quality teaching materials _____
6. Technical assistance _____
7. Administrative incentive _____
8. Students' interest in new curriculum _____
9. Peer support _____
10. Time to prepare and teach new curriculum _____
11. Autonomy for teachers to make needed decisions _____
12. Flexibility in teaching time assigned _____
13. Community support _____

Please provide comments and suggestions related to entire questionnaire

Thank you for taking time to complete this questionnaire!

Xiaorong Shao
 Ph. D. Candidate
 415 Agricultural Administration Building
 Department of Agricultural and Extension Education
 The Pennsylvania State University

Code Number _____

Xiaorong Shao

Education

- 2000-2004 **Ph.D. in Agricultural and Extension Education**
The Pennsylvania State University, USA
- Major: Agricultural Education, Specialty: Curriculum and Instruction
 - Minor: Training/Human Resources in Workforce Education and Development
- 1996-1997 **M.S. in Agricultural Education and Training**
Department of International and Rural Development, University of Reading, UK
- 1979-1983 **B.S. in Soil Science and Agricultural Chemistry**
Northwest Agricultural University, China

Professional Experiences

- 2000-2004 **Graduate Assistant in Agricultural and Extension Education Department**
The Pennsylvania State University, PA, USA
- 1998-2000 **Senior Lecturer and Administrator**
Yangling Vocational and Technical College, China
- 1988-1998 **Lecturer and Administrator**
Shaanxi Agricultural School, China
- 1983-1988 **Assistant Extension Agronomist**
Lintong Agricultural Technology Extension Center, China

Selected Publications

- Shao, X. R. & Bruening, T.H. (2002). Changing the Curriculum and Teaching Methods to Meet the Evolving Needs in Chinese Agricultural Schools. *Journal of Association of International Extension and Education*, 9(3), 69-76
- Bruening, T. H., Scanlon, D., Hodes, C., Shao, X. R. & Zolotov, A. (2002). *Characteristics of Exemplary, Leading and Innovative Career and Technical Education Teacher Preparation Program*. Project Report, pp. 85. Minneapolis, MN: National Research Center for Career and Technical Education, USA
- Shao, X. R. (1999). Features of Foreign Vocational Education Reflected from Teaching Materials (in Chinese). *Journal of Agricultural Vocational Education*, 26(2), 40, 45