Technical Assistance Consultant’s Report

Project Number: TA3958
December 2006

PRC: Improving Basic Education in Underdeveloped Areas through ICT

(Financed by the Technical Assistance Special Fund)

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Asian Development Bank
PREFACE

In 2002, following discussions between Vice Premier of the People's Republic of China (PRC) Li Lanqing and Asian Development Bank (ADB) President Tadao Chino, ADB and the PRC Ministry of Education (MOE) began discussions on possible technical assistance (TA) to assess the potential of and propose new approaches for harnessing information and communication technology (ICT) to contribute to national efforts to address key education challenges. Following approval of TA 3958-PRC: Improving Basic Education in Underdeveloped Areas through ICT and signature of a TA Letter of Agreement on 29 January 2003, ADB and MOE (the TA's executing agency) jointly launched TA activities in early 2003. The TA's twin thrusts were to (i) undertake a broad assessment of and identify promising innovations and strategies for the application of distance education and ICT in education, with a particular focus on supporting access to quality universal compulsory education among disadvantaged populations including minorities, women, and remote communities; and (ii) support a very modest and targeted pilot test of promising approaches and technologies with a tight pro-equity focus.

This Focused Synopsis document—which complements a full text version of the TA final report and technical annexes—distills key findings from the TA's desk research and the focused pilot test conducted in Xiangxi Tujia-Miao Autonomous Prefecture (in particular, Fenghuang County) of Hunan Province. The document focuses on assessing key issues and constraints that currently obstruct the effective and efficient utilization of ICT to promote broader education objectives, particularly in poorer rural areas, as well as proposing a set of the recommendations for consideration by MOE and other relevant agencies at central and provincial levels.

The report was drafted by TA consultants (in alphabetical order) Dr. Susan Crichton, Mr. Hu Wenbin, Dr. Meng Hongwei, and Dr. Wang Qiong, along with ADB Social Sector Economist and project officer, Dr. Chris Spohr. In addition to citations listed herein, it also incorporates analytical inputs by Dr. Philip Hui, Professor Ji Ping, and Dr. Bernadette Robinson. The team wishes to note its sincere appreciation for guidance and support from the MOE Division of International Organizations (MOE-DIO), as well as contributions by other MOE departments and key project partners including bureaus of education in Xiangxi Prefecture and Fenghuang County, Jishou University (in particular, the Teacher Training College), and principals and teachers of the pilot test's target schools. This work also benefited from discussions with the Ministry of Finance, experience sharing with the National Center for Education Technology, and collaboration with the Canadian International Development Agency and dialogue with other members of the international community.

The conclusions drawn herein are based on consultant research as well as a small-scale pilot test supported under Asian Development Bank (ADB) technical assistance TA 3985-PRC: Improving Basic Education in Underdeveloped Areas through ICT. Due to the limited scale of the project, time period, and very small geographic coverage of the TA's pilot test, this report recognizes limitations in the scope and systematic rigor of evidence collection and analysis. Reflecting this, one of the report's key recommendations is the conduct of a larger-scale, cross-cutting study. To the extent that many conclusions and findings in this report are drawn from observations in the specific context of the pilot test locality, it inevitably can make only cautious inferences about the full picture of a vast nation like the People’s Republic of China. While recognizing such limitations, it is hoped that this research report compiled by the TA’s education

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1 Content herein reflects the views of the author and not necessarily those of the Ministry of Education of the People's Republic of China or the Asian Development Bank, its Board of Directors, or the countries they represent.
experts can provide a useful resource for education authorities in tapping the potential of ICT to improve education in poorer rural areas of the PRC.

This policy-targeted Focused Synopsis (which extracts key content from the full final report) references a set of technical annexes; tools are generally available in Chinese only (see Annex Table following this synopsis).
1. Background

The People’s Republic of China (PRC) has the largest basic education system in the world with a student population of more than 200 million. Basic education is organized on a 6-3-3 model (6 years primary, 3 years junior middle and 3 years senior high school). Primary and junior middle schooling (grades 1-9) is regarded as compulsory education. The PRC’s achievements in universalizing primary education have been widely recorded. Ministry of Education (MOE) figures show that net enrolment rates at the primary level were 98.95% in 2004. Currently, counties comprising more than 95% of the PRC’s population have essentially universalized access to nine-year compulsory education.

1.1 Meeting the Challenge of Universalizing Access to Compulsory Education

The achievements at the national level, in terms of enrolment rates, may themselves be somewhat sanguine, and they certainly mask considerable provincial, county and township variations, especially in poorer western regions, as would be expected. The PRC government has fully recognized this undesirable situation and is committed to universalizing compulsory nine-year education nationally by 2010 by giving more and more support to the traditionally poorer, western areas. Each of the 12 provinces, autonomous regions, and province-level municipalities (henceforth, simply termed “provinces”) in the west has a plan to achieve this. A number of national policies and plans provide the specific framework of support that is designed to accelerate the achievement of the target, and quite a few national programs are targeted at poor western provinces with the intention of meeting the goals established in national policy. For example, the central government has implemented Compulsory Education Project (Phase I & II), Rural Boarding School Project targeted primarily at poor western provinces. These programs all fall under the umbrella of the National Breakthrough Plan of the “Two Basics” (basically universalize nine-year compulsory education and basically erase illiteracy) in Western Areas.

In the past few years, the PRC has accelerated efforts to address the cost of education as a major cause of dropout/non-enrollment among children of poor families in particular. This has included an increased role and responsibility by the central government in providing funds for basic education. Starting in 2001, the Government introduced a new program of “two exemptions and one subsidy” (TEOS), initially targeting students from poor families in rural areas of the Western Region who were to be exempted from paying any tuition or miscellaneous fees, exempted from textbook charges, and (for those living in boarding schools) entitled to a stipend or subsidy to support basic living costs. In December 2005, the State Council announced2 that starting on 1 January 2006, a new fund guarantee mechanism (FGM) for compulsory education would be introduced to eliminate miscellaneous fees for all rural compulsory students in the Western Region, to be extended to rural areas nationwide in 2007. This dramatic reform is highly consistent with international recommendations3, and is expected to significantly lessen the financial burden on poor rural families previously imposed by children’s education costs.

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In addition to extending and augmenting the TEOS, the FGM reform also represents a fundamental change regarding non-salary recurrent costs (**gongyong jingfei**) available to rural schools, which are expected to both increase and be transparently recorded as a distinct budget line for the first time. Following earlier reforms to unify and control schools’ collection of fees from families, the latter will essentially be replaced by government budgetary payments to the schools themselves. Therefore, schools will need to develop their own budgets reflecting their individual development needs. While schools will also continue to receive support for “hardware” (e.g., equipment and facilities), this is almost the first time for many rural schools to have some funds for teacher development and other expenditures and activities. It is essential that leadership, from all levels, ensure that increased funding for non-salary recurrent costs under the new mechanism in practice translates into addressing such needs rather than being redirected to hardware items.

### 1.2 Ensuring Quality Education for All Children

At the same time, there are variations in the quality of educational opportunities across the country. While provincial enrollment figures suggest that inland areas may be narrowing the gap in education “quantity” (i.e., numbers of children in school) vis-à-vis coastal areas, other evidence suggests gaps in the **quality** of education are actually continuing to widen. This also appears to be true of gaps between poorer rural areas and urban centers within given regions or provinces.

Partly in view of such challenges, since 2000, MOE has embarked on a radical program, introducing a New National Curriculum (NNC) to improve the quality of basic education in the PRC. The targets of the NNC are prescribed in the Outline of the Curriculum Reform of the Basic Education issued by MOE in 2002. One of the main targets is to transform the old curriculum from teacher directed, knowledge-delivery oriented instruction to student-centered learning designed to increase students’ capacity to problem solve. The key components of NNC are innovative practice with a move to student centered-instruction, inquiry, collaborative learning, and self-study\(^4\). This shift requires a far-reaching change in the approach of teachers to teaching and learning. The success of NNC depends very much on the teachers’ ability to teach in a child-centered way that changes their role from lecturer / dispenser of information to facilitator of knowledge construction. This implies a major transition, as teachers typically teach in the manner in which they were taught and few, if any, have experienced student-centered instruction as learners. The problem is particularly challenging for teachers in rural areas - especially in western provinces and poorer, more remote areas in central and even eastern regions, as they tend to have much lower qualification standards than colleagues in more developed areas.

ICT has been chosen as one of the strategies to assist the western areas to universalize and improve basic education. From Sept. 2000 to Sept. 2003, MOE piloted an ICT focused project titled “Western Rural Schools Distance Education Project” (WRSDEP) with the financial support from the Li Ka Shing Foundation. The project very pragmatically aimed at using limited ICT hardware (in terms of investment per school) to help teachers in rural schools to improve teaching quality through access to resources, teaching materials, and information. It distributed ICT hardware to the remote rural schools and provided basic training to selected teachers on ICT use, focusing on skills in downloading information from an IP satellite system\(^5\), maintaining

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\(^4\) The Outline of Curriculum Reform of Basic Education, MOE, 2001

\(^5\) The IP satellite system provides 1-way broadcast of digital content that is downloaded on computers in schools. Software allows the schools to check a schedule, download relevant content downloads, and manage the content.
the system, and storing the content. The National Center for Educational Technology (NCET) acts as a resource center to develop and disseminate relevant teaching materials and documents. Under the WRSDEP, subject- and grade-specific teaching materials (e.g., sample lesson plans and videos of classroom teaching) have been produced and sent to rural schools via the IP satellite.

To further these efforts, MOE launched a much larger project titled “Rural School Modern Distance Education Program” (RSMDEP, sometimes also referred to as the “National Distance Education for Poverty Reduction Project”), intended to span the period 2003 - 2007. The main purpose of the project is to “… build a nation wide distance education network to improve the teaching quality, and also provide support to the rural economic and social development”.

With a total investment of more than RMB10 billion, the project covers all the provinces but focuses on middle and west poor provinces. The central government provides half of project funds while local governments need to provide the other half as counterpart funds. According to the design of the project, hardware will be distributed in three model configurations:

- teaching points will have a set of video facilities with a DVD player and some VCD/DVDs;
- township center schools will be equipped with a computer and satellite receiver to download the materials from the MOE resource center; and
- junior middle schools will be equipped with a multimedia computer classroom with direct internet access.

1.3 Government Commitment and Foundations for Educational Improvement

In short, MOE and relevant Government ministries have accelerated efforts to advance priority objectives for enhancing access, quality, and efficiency of compulsory education. This positive direction and strong leadership are also reflected in the PRC’s development vision set out in the Eleventh Five-year Plan for Economic and Social Development (FYP) for 2006-2010, which (among others) puts a priority on advancing rural compulsory education and on expanding the contribution of ICT to the 11th FYP’s central thrust of building a socialist new rurality.

With such foundations and leadership in place, the task becomes ensuring that such directions are operationalized. Research and pilot testing under Asian Development Bank (ADB) technical assistance TA 3958-PRC: Improving Basic Education in Underdeveloped Areas through ICT (executed and guided by MOE), as well as other national and international evidence, suggest that many countries’ education systems face similar sets of key issues, which must be addressed in order to fully capitalize on the potential of ICT to advance national education objectives. The PRC is no exception.

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6 http://www.moe.gov.cn/edoas/website18/info7671.htm
7 In particular, Section 7.1 of FYP Chapter 2 (which focuses on the key imperative of building a socialist new rurality) calls for “developing distance education for rural primary and middle schools”, as a keystone of nurturing a modernized rural population.
8 The TA was approved in 2002 following high-level dialogue between Vice Premier Li Lanqing and ADB President Tadao Chino in 2002 seeking ADB support in this area. See also Spohr (2002).
2. Key Issues

ICT has great potential to improve basic education, particularly in poor and rural areas. However, findings from analysis and the pilot test under TA 3958 and broader research indicate that there are important obstacles that inhibit the full potential of large-scale investments in ICT in poor rural areas of the PRC (and many other developing and industrialized countries) due to issues centered on:

1. Mindset/vision guiding integration of ICT into education;
2. Clear and comprehensive strategies on “ICT for education”; and
3. Challenges in operationizing existing vision and strategy.

These three issues will be elaborated on below and form the structure for presenting the recommendations in Section 3.

2.1 Mindset/Vision Guiding ICT Investments

The PRC has made impressive progress in providing ICT hardware (herein defined to include commercially procured software) to rural schools, as well as teacher training and developing quality learning resources. However, at least in some localities, it appears that introduction of ICT reflects a mindset/vision focused on technology acquisition (i.e., hardware and software) rather than what is defined below as “soft components”. Getting the hardware to teachers does not ensure that they are capable of using it effectively or linking it to the transformations in pedagogy required to implement the NNC.

2.1.1 International Perspectives

A recent UNESCO study reviewed the state of ICT education in Asia and classified countries into three categories according to their development levels:

1. Beginning countries with some pilot ICT projects;
2. Countries not fully integrating ICT within education; and
3. Countries already integrating ICT into the education system.

An increasing number of countries are entering the middle category: for example, the PRC has a national ICT policy and a master plan with various strategies but has not yet reached full integration, particularly if “integration” is conceptualized as much broader than “ICT in the classroom”. For example, in recognition that teachers represent the “frontline” of efforts to transform education systems toward student-centered, active learning (a key thrust in the PRC’s NNC, for example), ICT-related efforts should give greater focus to the use of ICT not as a final objective, but as a tool to improve teaching methods.

For purposes herein, it is useful to distinguish three mindsets surrounding the introduction of ICT into basic education:

1. **ICT education** (focused on students learning how to program or use software applications);
2. **ICT in education** (focused on teachers incorporating ICT into teaching in the classroom, e.g., multimedia classrooms, power point to support lectures, use of computers for testing

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9 ICTs, Education and Developing Countries, a Decade On: What Don’t We Know, and What Should We Do About It? The Information for Development Program. Retrieved July 28, 2006 from http://www.infodev.org/content/general/detail/2075
10http://www.unescobkk.org/index.php?id=1368
or tracking student records, etc.);

3. ICT for education (which may include the above, but starts more firmly from the philosophy that ICT is a tool to support education, typically requiring ICT to be strategically combined into broader approaches, e.g., ICT-based support to improve teaching even if the hardware never actually enters the classroom - what can the teacher do after he/she walks away from the computer.

The lattermost recognizes that ICT has the potential to enable innovation by providing new tools (within broader approaches) to transform education to better promote the learning of students (Seeley-Brown, 2000; Scardamalia & Bereiter, 1994). In developing countries (especially in rural areas), it is often most realistic that ICT for education strategies first focus on teachers in order to realize ICT’s potential to improve student learning. These strategies include (but are not limited to) how ICT can assist teachers to access / develop resources to support their teaching.

With this backdrop, the next subsection looks at experiences in the PRC, focusing on the underlying ideology or mindset.

2.1.2 Progress and Underlying Mindsets in the PRC

In less than five years, the PRC has established a national wide network of distance education to cover most of schools, especially in rural areas. Nationally, the student-to-computer ratio decreased from roughly 125 in 2000 to 30 in 2005: as highlighted in the 11th FYP, the RSMDEP alone has already equipped almost all schools in the Western Region. This is clearly an important accomplishment, and represents a foundation for future efforts.

At the same time, it should be recognized that such quantitative indicators provide only a partial picture, which focuses on hardware/technology inputs rather than progress toward linking hardware acquisition with advancement of concrete education objectives. In practice, we have observed in the project’s pilot test area, investments in ICT have been strongly hardware-oriented, while local educational leaders have relatively limited systematic thinking on the importance of investment in soft components, such as:

- capacity building;
- generation of locally relevant content;
- peer networks communication among teachers, principals, and administrators across schools/institutions; and
- monitoring and evaluation (M&E) to feedback into program improvements.

International experiences (ISTE, 2002; Moursund & Bielefeldt, 1999) have shown that “hardware-driven” or “hardware infusion” approaches are inevitably unsuccessful, since it is human capacity and effective support systems (i.e., the soft components) that are essential to the efficacy and efficiency of any ICT hardware. Cuban (2001) states educational technology is often “oversold and underused,” suggesting that without directly allocating funds for soft components, costly ICT investments inevitably fail to deliver on ICT’s potential and rarely assist teachers to achieve concrete education objectives and/or act as a springboard to support broader innovation (see Annex SR5).

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11 In the PRC, this realization was reflected in the launch of the MOE-Li Ka-Shing Foundation Modern Distance Education Training Program for Middle and Primary Schools in the Western Region.
Despite directions set in national education strategies/directives, it appears that the dominant mindset/vision at many tiers of the PRC system is that the introduction of ICT hardware in schools will automatically solve education problems, such as inequality with schooling access and poor teaching quality, etc. This is evident in the fact that there is a lack of concrete mechanisms for evaluating investments in ICT in terms of the educational objectives that such investments were intended to deliver (e.g. improved teaching based on student-centered approaches, as set down in the NNC and stressed in objective statements for the WRSDEP and its successor the RSMDEP). At the moment, planning and monitoring of ICT programs in the PRC (and in many countries) to a considerable degree focuses on quantitative inputs, such as how many computers purchased, how many teachers trained, how many sets of other equipments such as camera and printers were delivered, etc. There are very few indicators developed to check outcomes of such investments, such as reduced drop-out rates and increased enrollments, improved student learning outcomes (e.g., subject mastery, flexible skills, and creative, higher-order thinking), community access, etc.

2.2 Strategies to Link ICT to Priority Education Sector Objectives

As noted above, it appears that the linkage between investments in ICT and broader education objectives—e.g., adoption of student-centered education under the NNC, and the RSMDEP's stated objective of improving the teaching quality and providing support to the rural economic and social development—should be further strengthened. At minimum, the mindset/vision implied by such objectives is not being adequately transmitted to operational-level actors or translated into action. Linked to this gap in mindsets/vision is a lack of clear strategies to ensure that soft components (capacity building, development of relevant digital content, development of supportive networks, and M&E) develop in parallel with the hardware availability. With strategies principally focused on hardware acquisition, schools and local education sectors have not been able to capitalize on the true potential of ICT for education to support national objectives.

2.2.1 Weak Strategic Linkages to Efforts to Adopt the NNC

The NNC is strongly characterized with a focus on changing the pedagogy from traditional lecturing to student-centered approaches. However, because of the mindset of prioritizing hardware over soft components, there is a risk that that ICT will continued to be used as a new blackboard and chalk for transmitting subject content through lecture, using essentially unchanged “teacher-centered” pedagogy. There is no strong evidence to suggest that the teachers, especially those in rural schools, are using ICT effectively in classroom subject teaching or that they have fully embraced the principles of NNC. It is essential to note that is this not because teachers are reluctant to change, but rather they do not have the skills or the support to change their practice. At the same time, teachers are under huge pressure to prepare their students for various exams, since their very success, as well as the students, is tied directly to test results. It appears that local educational leaders have not developed strategies to support teachers as they make the transition to new teaching approaches.

Currently, besides the mandatory requirement from MOE on the ICT capacity training (see Section 2.2.2 below), there is no mechanism as part of performance review to create positive incentives or rewards for teachers for upgrading their understanding and capacity with ICT as a tool to improve their classroom teaching practice (e.g., by tapping ICT's potential as a window to an array of self-learning materials, communication and experience sharing with peers across
schools, and finding interesting informational resources for insertion into student-centered lesson plans). The current teacher observation / evaluation process focuses primarily on the transmission of content and student examination results and does not appear to place a big value on the tentative steps teachers are taking toward adopting NNC approaches. At same time, teacher performance review has not been reformed with more value on teachers’ practice with ICT use in classroom teaching, and there is no direct motivation for teachers to take the risks/extra works to pursue the approach of ICT-integrated teaching.

2.2.2 Gaps in Approaches to Capacity Building for Teachers

Experience from many countries shows that the most difficult challenge integrating ICT with education reform initiates is teacher preparation (de Moura Castro, 2001; Moursund, & Bielefeldt, 1999). MOE is right to attach great importance to teacher training for ICT integration. The Department of Teacher Education of MOE has developed a very ambitious program to upgrade the teachers’ ICT capacity. However, we identified three main issues with this approach as operationalized at the local level, as observed in the pilot test area: (a) not enough attention is being paid to pre-service training, (b) teachers lack skills to use ICT to assist them in planning lessons and developing resources (including using traditional or “non-ICT” materials available locally) for use in their classrooms; and (c) in-service training is focused on passing a skills-based ICT exam and gaining a certificate rather than acquiring practical skills for the classroom.

The success of ICT for education depends very much on changing the practice of the teacher education institutions to include issues concerning the link between student-centered instruction, ICT integration, and the NNC. The linkage between the teacher education institutions and the rural schools is weak, and there is a need for significant change with the curriculum of the teacher education institutions in response to the new needs from the ICT factors. Currently, new teachers need to be re-trained in ICT for education as soon as they take the posts as teachers. While some new teachers possess varying degrees of computer literacy, they may not understand how to use ICT as a complementary element use it to support broader improvements in pedagogy (i.e., ICT for education).

MOE has taken important steps toward improving teachers’ ICT-related competencies hand in hand with their mastery of new pedagogies under the NNC. In recognition of the fact that “Generally speaking, the majority of teachers in the PRC still cannot meet the demands of national efforts to promote educational informatization, the NNC reforms for basic education, and implementation of quality education”, and that this to a certain degree has become an important “bottle neck” inhibiting the effectiveness of ICT investments, in 2005, MOE formally released the Standards for School Teacher ICT Capacity (Draft Version). The Standards stipulate that every in-service teacher should complete 50 hours of training and receive a certificate of ICT capacity. More importantly, guidelines set in the Standards center on equipping the primary and secondary school teachers with “New Concept, New Technology and New Curriculum”. This emphasizes transformation from traditional, teacher-centered pedagogical methodology to student-centered instruction, in response to the NNC, as well as broader integration of ICT into education processes and innovation. However, development of the Standards is only the first step: recommendations to take this work forward are given in Section 3.2.2.

13 http://www.moe.gov.cn/edoas/website18/info13495.htm
International studies found that it takes repetitive training and years practical experiences for teacher to be able to integrate ICT within broader education processes and strategies for improving teaching and learning; traditional “one-shot” trainings opportunities are insufficient and ineffective to build the applied skills and competencies required to support changed practice. In the United States (see Annex SR3), for example, it was determined that five phases of skill acquisition (spread over a period of period of several years) were required to assist teachers as they move from an entry level understanding of ICT as a tool to improve teaching through to full integration in education processes—in contrast to the US strategy, which explicitly embeds experiential learning, capacity building in the PRC is too often viewed as one-shot and uni-modal (i.e., lecture-based training).

2.3 Constraints to Operationalizing ICT to Support Education

At a third level, international experience shows that the effective and efficient use of hardware depends on sound operational arrangements, most urgently perhaps regarding financial arrangements and school management.

2.3.1 Gaps in Supportive Mechanisms for Financing and Budgeting

Beside the misalignment of mindsets (vis-à-vis nationally stated objectives) resulting in weak leadership and lack of clear strategies observed in the project county to address key gaps (e.g., teacher capacity to use ICT effectively in shifting to student-centered teaching), another key constraint to the efficacy and efficiency of ICT utilization in rural schools is that these schools usually do not have enough non-personnel funds to ensure the reliable operation of the ICT facilities. This has very negative impacts both on the teachers training and maintenance and use of the ICT facilities.

The newly revised Compulsory Education Law, passed by the National People’s Congress in March 2006 outlines financial arrangements for teacher training under which funding responsibilities are to be shared by central and local governments. The central government has allocated funds for training, but some local governments do not allocate enough money as required, perhaps especially in poorer rural areas. An important unintended side-effect, however, is that due to the poor revenue capacity, the local governments cannot afford to train all teachers, with teachers often de facto required to share the costs. To some extent, teachers may have to pay (since they could be disqualified if they do not earn a certificate), but this may have adverse impact on teachers’ motivation and the coverage and efficacy of the training.

Installation of ICT facilities generally increases schools’ operating costs in terms of electricity, space, furniture, etc. Rural schools have particularly limited budgets to cover these new costs, which has significantly restrained schools’ willingness and capacity with the maintenance and utilization of the facilities. Schools had previously been charging fees to students to cover these costs, and up to recently, the government tolerated such a practice due to shortage of finance revenue. However, with the PRC’s introduction of the new FGM for compulsory education, the central government will take on more financial responsibilities while eliminating schools’ collection of all such miscellaneous charges. While this is a very beneficial shift overall, to the extent that central and local governments (which in poor areas often face shortages of funds) cannot quickly mobilize and allocate resources, there could be a danger that the schools may just let the costly ICT facilities go unused simply to cut costs. Such cases represent a clear waste of scarce education resources invested in initial ICT procurement.
2.3.2 School Evaluation Issues in Operationalizing New Directions for ICT to Support Education

Other key challenges to operationalization at the school-level are closely linked to the management practice and behavior of head teachers in rural areas. As with teachers, head teachers are heavily influenced by school evaluation approaches. School management is usually reviewed and evaluated according to what schools have rather than how they use what they have. Consequently, head teachers are very concerned about keeping everything in pristine condition (even unused) rather than encouraging teachers and students to use the facilities according to teaching and learning needs. This results in a tendency to secure equipment and restrict its use. If managed properly, ICT equipment can be located in a central place so teachers can use it freely, but unfortunately, head teachers of many rural schools lack understanding and/or the capacity to manage full and efficient utilization of limited but potentially powerful ICT facilities and resources. This has limited the impact of well-intentioned programs such as the WRSDEP.

In sum, effective and efficient utilization of ICT to improve education in underdeveloped areas of the PRC faces key and interlinked challenges at three levels: mindset, strategy, and operation. The following section presents the responding recommendations at these levels by same order.
3. Core Recommendations

In view of the issues identified in Section 2, we think that although RSMDEP has made significant progress, a number of critical issues need to be addressed in some rural areas. Otherwise investments in ICT in education in these areas may fail to deliver on their stated education-side objectives. Based on analysis under TA 3958 and a broad array of evidence in-country and international lessons learned, and mapping into each of the three broad areas identified above, this final section proposes a series of recommendations for consideration as priorities for urgent action and for longer term directions. Many of these focus on the role of rural teachers, which appears justified given that they in many ways represent the most critical (and challenging) “frontline” in national efforts to improve basic education in the PRC.

3.1 Empower Leaders for the Change of Mindset/Vision

Internationally, it is recognized that strong leadership\(^\text{15}\) is required to champion innovative uses of ICT for education and that this requires training and ongoing support to leaders at all levels. The PRC thus needs to accelerate recent progress in developing strong leadership that understands the link between technology proficiency and improved and reformed teaching practice. This type of leadership helps to build school/community partnerships and encourages innovation (which inevitably requires teachers to experiment and take some “risks”) and collaboration.

Leadership from all levels (national through local school) is recognized as being key to effective integration and implementation of professional development training into practice. International experience indicates that leaders not only need to model good technology use, but they also have to understand current curriculum standards and effective staff development strategies (see Annex SR 6 & 7 for background information). Without strong leadership there was a danger that schools will struggle to develop realistic expectations for changed practice and not be able to motivate teachers to take appropriate risks. Further, strong leadership at all levels is critical for sustaining the momentum from the initial professional development activities and helping teachers to gain ownership and confidence in their abilities to incorporate the strategies into their everyday work. A few specific things could be done to help the development of the leadership:

- Provide training programs for all education officials at various levels in the vision and practice of ICT for education (see T1A,B for training materials; SR1 for background);
- Provide regular training for head teachers on the management of ICT for education at school level, and encourage their active participation in teacher professional development activities so they have a similar understanding of the link between ICT and curriculum reform\(^\text{16}\).
- Revise the evaluation of schools to focus on full and effective ICT utilization (with allowance for wear and tear), rather than rewarding schools for ICT equipment that is in pristine condition due to disuse.
- Assist head teachers in the development of local budgets (see below) to support expenditures for soft components.

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\(^\text{15}\) Yee (1999) studied Canadian, New Zealand, and USA schools, noting principals are critical for creating competency expectations for teachers as well as being role models for effective ICT use. As well, ISTE provides ICT competencies for education leaders (http://cnets.iste.org/administrator)

\(^\text{16}\) See Annex CS2 for information concerning content available from two projects in Gansu province related to ICT and NNC.
3.2 Develop Effective Strategies for Soft Components as the Foundation for ICT for Education

ICT itself is flexible. It can assist or hinder activities, depending on its selection and use (Cuban, 2001). Inappropriately chosen ICT may not only increase the already very heavy workload but also distract the investment in other more cost-effective areas. The experiences from some countries showed the negative impact of emphasis on ICT to the achievement of universal basic education\(^\text{17}\). Clear and effective strategies are thus key to addressing the gaps noted in Section 2.2.

Four priority recommendations are offered to address the strategic issues identified under this TA. The first proposes a systematic review and study (which should be empowered by a high-level mandate) of policy, strategies, and programs (perhaps focused at the provincial through county levels, their operationalization, and emphasizing their contribution to stated national education objectives. Subject to refinements by that systematic review, three other recommendations focus on (i) a second phase of the RSMDEP; (ii) review of approaches to content development; and (iii) enhancing teacher pre-service training to include issues related to student-centered instruction, ICT integration, and the NNC.

3.2.1 Undertake a systematic study of ICT to support education

Based on the project team’s observations and analysis, we recommend MOE and relevant ministries should organize a cross-disciplinary panel of researchers—spanning relevant departments of MOE (e.g., basic education department, teachers education department, etc) and additional experts on various aspects of rural education and ICT for education—to implement a systematic study of the implementation of ICT-related strategies and programs to date in basic education, while also reviewing national level vision and policy\(^\text{18}\). The investigation should prioritize schools in poorer rural areas, for whom ICT has the greatest potential benefit (e.g., by breaking teachers’ barriers to information, peer communication, and support from local education offices and institutions) but which currently face the greatest obstacles in practice (e.g., due to existing human and financial resources, etc). The study should:

- focus on past ICT investments in the Western Region and the implications of ongoing and proposed ICT interventions for capital and recurrent costs, sustainability, quality, and equity (e.g., resource concentration in key schools, potential “crowding out” of support for conventional education inputs, etc.);
- assess what mode or combination of modes of ICT-supported approach is appropriate for schools in areas at different levels of development\(^\text{19}\);
- work to identify integrated packages of soft components needed to ensure effective and efficient use of available hardware;
- explore international experiences with ICT for education and distill relevant lessons/models for the PRC; and
- set clear guidelines (e.g., funding ratios) for investment in hardware and soft components for any future education programs or projects involving ICT.


\(^{18}\) ISTE, UNESCO, COL all provide excellent examples of systematic studies (www.iste.org; www.unesco.org/education; http://www.col.org/colweb/site/pid/1)

\(^{19}\) UNESCO (2000) notes “to be effective, especially in developing countries, ICTs should be combined with more traditional technologies such as books and radios”.
The panel might also assess broader issues for reform that impact upon or have relevance for any ICT interventions, for example the:

- disconnect perceived by teachers between the examination system and the NNC;
- need to increase and strengthen NNC training, especially for rural, ethnic minority teachers\(^{20}\); and
- need to negotiate a subsidized rate for Internet access for all schools\(^{21}\).

It is hoped that findings from this TA can serve as an input to this review, but it is important that this involve key government (and as appropriate non-government) actors to reassess and refine recommendations herein, and that this review feed directly into national policy dialogue.

### 3.2.2 Institute a second phase of the RSMDEP

In parallel with this study, RSMDEP and subsequent programs should pay more attention to teachers in rural Western Region schools. A second-phase RSMDEP should:

- principally focus on strengthening soft components, with clear strategies planned to address the needs of different types of schools. In particular, high priority should be given to supporting a shift towards ICT for education in more remote schools, for reasons noted;
- improve both training content and methodology of in-service training on using ICT to support the NNC, with more flexibility to meet varied individual needs. RSMDEP very appropriately has 3 models of ICT facilities and the teachers training of ICT should reflect the different requirements of the models instead of taking “one-size-fit-all” policy. Particularly in view of the Government’s bold new directions\(^{22}\) for rural development, assessment of national and international experience under TA 3958 suggests that special priority should be given to the model targeted at more remote schools, with a strong focus on teachers’ use of very limited ICT equipment\(^{23}\), perhaps principally in non-teaching hours as a self-improvement tool and a window to information;
- ensure that training activities are highly participatory\(^{24}\) — i.e., hands-on learning that models the teaching practices they are encouraging and allow teachers to be learners first and practice the new skills before they are called upon to teach them. As improving teaching is a process, programs should include follow-up training and be supported by broader capacity building elements (e.g., locally relevant content for self-study);
- develop tools to encourage communication among teachers, head teachers, and local education offices and institutes (see also Section 3.2.3); and
- integrate recommendations on the other soft components outlined below, including mechanisms for M&E noted in Section 3.3.2.

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\(^{20}\) Innovative projects, such as the one between the 2\(^{nd}\) largest school board in Canada (Calgary) and the University of Calgary, have piloted the positive link between the completion of professional development activities and graduate course credit.

\(^{21}\) For example, in 1999 Tanzania has established an eThink tank for the purpose of formulating ICT access strategies [www.opt-init.org/framework/pages/appendix3Case7.html](http://www.opt-init.org/framework/pages/appendix3Case7.html). Three provinces in Canada have networks in place to subsidize costs and standards for schools, local government, and hospitals. As well, Annex CS1 shares a community based approach for Internet access from rural Australia.

\(^{22}\) In particular, this includes the new drive to build a socialist new rurality, as well as the new focus on human capacity under Government efforts at development-focused poverty alleviation from the village upwards.

\(^{23}\) Institutions such as the University of Ghana are currently developing strategies to maximize the potential of limited ICT hardware for the greatest impact recognizing 1 computer per instructor and/or student will not be possible in the near future.

\(^{24}\) See Annex T1A,B; 3.2.5 for examples of participatory training materials.
Related to the above, as noted in Section 2.2.2, MOE’s development of *Standards for School Teacher ICT Capacity (Draft Version)* represents important progress, but this is only the first step. In view of disparities across geographical regions and between rural and urban areas, it is recommended that a separate set of standards should be developed in the near future that is tailored to addressing the capacity gaps and broader contexts facing rural teachers, many of whom may otherwise fail to meet requirements identified in the *Standards*. Such additional guidelines could be appended to the existing draft *Standards*. Furthermore, it is recommended to in parallel formulate the following as soon as possible: (i) a monitoring and evaluation system to track the implementation and efficacy of the augmented *Standards* in different contexts, based on which the *Standards* could be timely further refined; and (ii) an action plan to ensure the augmented *Standards* are operationalized effectively, particularly in poorer rural areas.

### 3.2.3 Review of Content Development Approaches

A shift is needed to rapidly enhance teachers’ and schools’ access to timely, relevant content that supports the principles of NNC and that are flexible enough to be used as resources for teachers in their lessons is very essential for the integration of ICT into educational change, whether or not ICT hardware actually enters the classroom.

Given its mandate and technical capacity, NCET should lead this charge. This will require some retooling within NCET and similar institutions, prioritizing alignment with the pedagogical requirements underpinning the philosophy of NNC. New ways and mechanisms should be explored to expand the availability of the contents both in term of quantity and quality:

- Materials should be designed using the core principles of instructional design and therefore, clearly focused on broader education system objectives: i.e., they should be developed for teachers/principals in different types of schools based on a detailed and systematic assessment (that can be designed by the multidisciplinary panel of experts) of obstacles to effective implementation of the NNC and other efforts to improve the learning environment for all children in those types of schools.

- While some teacher support materials may continue to focus on teaching using multimedia and/or other ICT facilities, a substantial portion of these materials should focus on better teaching in classrooms without any ICT (e.g., how to more creatively use locally available resources, small group activities, etc.), which will be particularly essential in schools in poorer, more remote areas. Materials should be designed in such a way that they can be used and/or modified by teachers depending on student needs and school contexts.

- In addition to transforming from creation of content centered on “ICT in education” toward ICT-based materials that support broader education objectives (i.e., “ICT for education”), such institutions should also shift from a role of solely creating content to one that additionally compiles and distills “local best practice” or “grassroots innovations” from among materials developed by teachers themselves. Access to such peer-developed resources will help to ensure relevance to actual conditions in schools (see Annex SR11 for an approach to content development).

- To support this, new mechanisms and incentives (see Annex T3 for example of FLC as a tool for collecting teacher developed resources) to encourage and collect grassroots innovations: this may include competitions, linkages to promotion, and other reward

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25 CIDA, in partnership with NCET, has developed an instructional design manual and guided study that will be available Fall 2006 via the IP satellite.

26 Annex T1C provides examples of teacher developed lessons from TA 3958-PRC.
Incentive mechanisms to encourage the teachers develop and use the modules. Annex T3 describes a promising tool pilot tested under the TA: the Fenghuang Learning Community (FLC). 27

3.2.4 Enhance Pre-service Teacher Training to Strengthen Mastery of the NNC, SCI, and ICT Integration to Support These

The reform of the curriculum of the teacher education institutions will have a profound impact on the progress of ICT for education in the PRC. If teacher education institutions are lagging in understanding “ICT for education”, it is impossible to expect that their outputs—new generation of teachers—will be able to integrate ICT with broader education processes 28. Specifically:

• Curricula need to be updated with the view of enable new generations of teachers with full capacity to capitalize on ICT as a tool and a window to resources to support student-centered instruction in their subject area (see Annex SR5).
• The ideology and contents of teacher education need to be retooled toward the concept of ICT for education.
• Teacher education universities should play more active role in providing follow-up support to schools, in close cooperation with both in-service training institutions and content developers like NCET.

3.3 Building-up Supportive Operational Conditions with Focus on Financial Arrangement and Change of School Performance Evaluation

Finally, it is critical to simultaneously address operational-level obstacles identified in Section 2.3, which center on issues related to financing and M&E. These should also be embedded into new strategies discussed in Section 3.2.

3.3.1 Develop and Disseminate Guidelines to Address Finance-side issues

As part of the development of new school financial management regulations associated with the FGM, specific guidelines should be formulated and disseminated to ensure school budgets allocate appropriate funds for ICT activities, such as maintenance and operation of ICT facilities, teacher training, etc. MOE should develop these guidelines based on consultation with the Ministry of Finance and a sample of schools and bureaus of education and finance in poorer rural counties. This dialogue can also draw on international models. 29

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27 Canada’s Telus 2 Learn program has been compiling teacher innovations for several years. Key features in its systematic design include (i) careful categorization of content, ranging from “ready-to-use” lesson plans to tips for specific activities/projects; (ii) screening of good quality teacher submissions; and (iii) selection of excellent contributors as lecturers at special events (both a recognition and a form of capacity building).

28 Initiatives from UNESCO’s NExGeneration of teachers’ project and the COL’s Pan African Strategy offer positive examples that link ICT and teacher training.

29 A 2004 review of successful schools in New Zealand (http://www.nzcer.org.nz/pdfs/13385.pdf) showed While many such schools take a rather conservative view to investments in ICT (e.g., placing it as a lower priority than budgeting for teacher professional development), even these schools generally take recurrent costs of ICT owned into careful consideration in school budgeting, to ensure that equipment is fully utilized. A policy note for Turkey outlines diverse country experiences, including issues of budgeting (see http://siteresources.worldbank.org/INTGLDEVLEARN/Resources/policy_note2.pdf). Ongoing ADB cooperation with the Government of Uzbekistan on ICT for education is also exploring issues of school budgeting for ICT.
To support dissemination of these guidelines and ensure effective operationalization, capacity building for head teachers and local education officials should be developed and mobilized.\textsuperscript{30}

### 3.3.2 Establish and Implement Sound Monitoring and Evaluation Mechanisms

To overcome operational-side issues linked to M&E (identified in Section 2.3.2), it is key to establish sound mechanisms for M&E to both (i) provide timely feedback on progress and problems with the development of ICT for education; and (ii) to set in place the right incentives for teachers and schools to innovate. At a broader level, evaluation indicators for school and teacher performance should be reformed from “test score decides” to a more comprehensive concept of education quality that has the development of \textbf{all} students as its core (as clearly mandated in the NNC). In parallel, and more specifically focused on ICT for education:

- Various indicators should be identified to review the outputs/outcomes of different interventions in ICT-supported education programs and to reinforce the mindset that ICT is not itself an end goal but is a tool to advancing priority education sector objectives (see Annex T4A, B).
- Procedures for evaluation of schools should be revised to create incentives for head teachers to support full use of ICT facilities rather than trying to keep them in pristine condition: consistent with output-based evaluation, school assessment should focus on how well schools use limited ICT\textsuperscript{31} (and related resources) to promote teachers’ professional development and improve schooling access and quality (see Annex SR2 for link between curriculum and hardware).
- Classroom observation and documentation strategies should be developed to support teacher innovations and encourage the transition from traditional to NNC-based practice. In particular, teacher evaluations should track and support the evaluation of teaching practice over time, and provide some allowance for temporary “failures”, as part of teacher efforts to adopt modern, student-centered pedagogies. Annexes T4A-B provide building blocks for such an approach, as piloted under the TA.\textsuperscript{32}

\textsuperscript{30} Materials from the Intel-South Africa SchoolNet program give a useful resource for capacity building on school-based budgeting and school administration (http://ace.schoolnet.org.za/docs/course_mod_detail.htm#1B).

\textsuperscript{31} Even limited ICT facilities still can play very helpful role in improving the classroom teaching. For example, it is very common that small, rural schools may have only one computer. If the computer is managed in a way to enable the teachers to search for information and resources in their subject teaching, ICT can play a role in helping improving classroom teaching without moving the computer in classroom—in some ways, this is at the core of the WRSDEP, as well as the ADB-supported ICT for Innovating Rural Education in Mongolia Project, working in extremely remote rural areas of Mongolia (see Annex CS3 for summary on the project).

\textsuperscript{32} Annex CS4 provides information concerning digital documentation, linking it to the Italian approach of Reggio Emilia.
4. Conclusion: Taking the Agenda Forward

The PRC is making great efforts to ensure equitable and quality education for all children (starting from poor rural areas), with the aim of harmonious development of the society as a whole. ICT’s potential to serve as a powerful tool for this purpose hinges on having vision and strategies that align with international best practice, as well as being context relevant and sensitive to gender and minority issues within the PRC, fully understood, and implemented at all levels.

The recommendations listed above focus principally on empowering change at the level of teachers and schools, as the critical frontline for modernizing education (as measured by outcomes rather than inputs). They collectively form an inter-related package, and include suggestions for short-term changes that will provide foundational building blocks for longer-term changes. In consideration of international experiences and the state of development in PRC, these recommendations are not only critical but also viewed by the team to be viable.

In view of the resource and time limitations of the TA and (in particular) the need for high-level national leadership and commitment, this report provides tentative suggestions for pushing forward this agenda, including the need for a systematic cross-sectoral review backstopped by a clear mandate to influence change. It is hoped that the analysis and recommendations presented herein can make positive contributions for such continued policy dialogue on effective and efficient use of ICT as a tool in broader efforts to improve basic education in underdeveloped areas and the PRC as a whole.
List of Supporting Annexes

This Focused Synopsis is accompanied by annexes including:
- **Case Studies** (coded by “CS”) illustrating key issues (available in English and Chinese);
- **Tools** (T) intended as resources (for direct use or modification) to support development of “soft components in the context of PRC basic education (Chinese only);
- **Supplementary References** (SR), which may support further research (English only).

A second monograph includes Case Studies (CS annexes), overviews of T and SR annexes, and the Bibliography, while the remaining annexes are provided on CD-ROM.

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