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Just a Click Away:

Using Computers to Boost Grades in China's Migrant Schools

REAP Brief #115

REAP Rural Education Action Project

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Rural Education
Action Project

Take a look at our other REAP briefs:

REAP Brief #102: Behind Before They Start: The Challenge of Early Childhood Education in Rural China

REAP Brief #103: Chasing the Ultimate Dream: Early Commitment for Financial Aid, Liquidity Constraints and the Choice of Universities of Poor Rural Students in China

REAP Brief #104: Are CompassionateHearts Scholars Compassionate? Smart? Confident?

REAP Brief #105: An Invisible Epidemic: Anemia in Rural China

REAP Brief #106: Malnutrition in China's Rural Boarding Schools: The Case of Primary Schools in Shaanxi Province

REAP Brief #107: Barriers for the Rural Poor on the Road to College: New Evidence from REAP

REAP Brief #108: Development Challenges, Tuition Barriers and High School Education in China

REAP Brief #109: Eye tests, Eyeglasses and Improving Education Performance in Rural China

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REAP Brief #113: Overcoming Undernutrition and Anemia Among Impoverished Rural Primary Students: The Results of VitaMeal

REAP Brief #114: Money for Matriculation: Conditional Cash Transfers to Reduce Junior High Dropouts in Rural China

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Migrant children in China: a large and growing concern

Home: a poor migrant community on the outskirts of Beijing.

Unable to enroll in urban public schools, migrant children face many academic challenges.

Ma Huixia and her husband first settled in Beijing ten years ago, hoping to create a better life for themselves and their daughter, Pingping. Over time, their hopes have grown dimmer. "This room is where I live," says Pingping. "This is our bedroom, living room, kitchen…this is everything." Like many migrant families, Pingping and her family barely scrape by in makeshift, ramshackle communities on the outskirts of the city. Just outside their front door, piles of garbage, discarded plastics, cardboard, and scrap metal lay scattered in the narrow alley. "We know this is not a good learning environment for our daughter," laments Huixia, "but we have no choice. She can't enroll in a public school here, and we can't leave her in our home village because there's no one there to take care of her." For migrant families in Beijing, this plight is common. With their rural registration status, the Ma family has no choice but to send their child to a privately run, for profit migrant school that is technically illegal. Pingping's father earns 2000 yuan (US$320) a month as a construction worker, and Huixia gathers recyclable materials to trade in for about 1200 yuan (US$ 190) per month. The money they earn is only barely enough to cover the cost of living and Pingping's tuition at the migrant school. Despite the school's high costs, Pingping's grades continue to slip—likely due in no small part to the poor teachers and facilities at the shabby migrant school. "If I had the means," says Huixia, "I would get a tutor for my daughter and maybe a computer too. Me? I can barely write my name."

Bare bones facilities and poorly paid staff mean plenty of down time for students at migrant schools.

Over the past three decades, hundreds of millions of rural Chinese have migrated to cities in search of new opportunities created by China's industrialization. However, the rural hukou (registration status) of most migrants has not changed. Regardless of the number of years they stay in the city, these migrants are classified as "rural," and consequently often lack access to basic services—including state-funded education—that regular urban dwellers enjoy. Because migrant children often have difficulty enrolling in urban public schools, unregulated and privately run migrant schools have emerged to offer them educational services. Despite the proliferation of these institutions, they still operate on the margins of the education sector, and are plagued by poor teaching, poor facilities, undeveloped curricula, and high tuition. Migrant children account for the fastest growing segment of the education population and their numbers will only increase as China's twelfth Five Year Plan emphasizes continued urbanization.

What is holding back migrant students like Pingping and what can be done to help them catch up and get ahead? The first obstacle migrant students face is a yawning educational achievement gap that increasingly separates them from their urban public school counterparts. The second is a large and potentially growing "digital divide" that compounds this gap in academic outcomes. While scrutinizing these challenges side by side, REAP recognized the potential of using computer assisted learning to help address both concerns and help China's migrant youth join the fabric of an increasingly modern economy and society.

A big gap in achievement

Due at least in part to the poor educational services available to migrant communities, China's migrant children have been shown to lag behind urban public school students (Fig 1). There are many possible reasons for this poor performance: inferior teaching facilities, underqualified teachers, or the curriculum disruption that occurs when migrant schools—not officially sanctioned by the government—are shut down or relocated. Anecdotal evidence suggests that one particularly serious problem that migrant children face is lack of care outside of the classroom. What happens, for example, to a student who does not understand a lesson? How can he or she catch up?

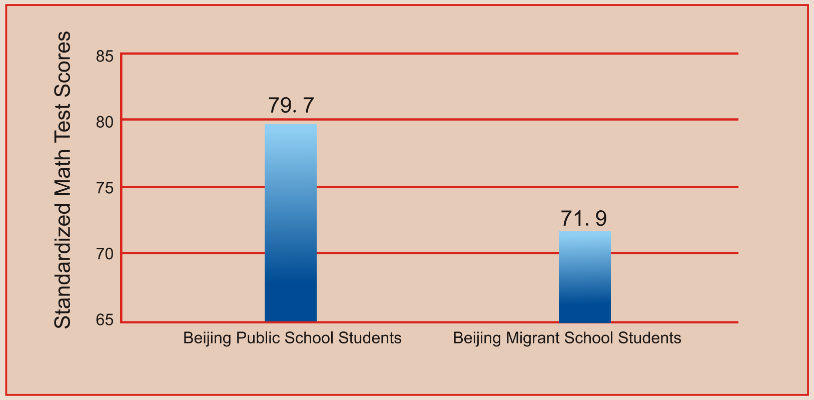

Standardized Math Test Scores
85
80
75
70
65
79. 7
71. 9
Beijing Public School Students
Beijing Migrant School Students

Figure 1. Beijing public school students outperform migrant school students on standardized tests.

Existing in a legal limbo, migrant schools are often forced to shut down unexpectedly, leaving migrant children without a stable schooling environment.

Public school students often have before and after class review sessions in school, access to commercial tutoring services, and interested and well-educated parents to help them with their homework. Migrant students typically do not have any of these options. Due to liability issues and costs, migrant schools almost always open at 8 am—immediately before school—and close at 3:30 pm—immediately after school. Even if schools extended hours, teachers—who are poorly paid and often live far away from school—have little incentive to provide review classes. Commercial tutoring is simply too expensive for migrant families. What is more, migrant parents are often busy working and have little time to devote to helping their children with homework. Even if they were not too busy, the parents of migrant children are typically poorly educated themselves and are in little position to offer help to their children.

Another gap: the digital divide

Computers in migrant schools often flounder in disuse—few of the teachers, let alone students, know how to use them.

One often reads that China has the largest online population in the world. This misleading statistic obscures one of the most obvious symptoms of the education gap between China's migrant and urban students: the digital divide. China's migrant students lack regular access to almost all forms of computing technology. Less than 5 percent of all migrant schools have computing facilities that children can use on a regular basis. What is more, because the families of migrant students often live in poor, suburban villages, only about a third of migrant children have access to a computer in or near their home, and only one in ten has any regular access to the internet (Fig. 2).

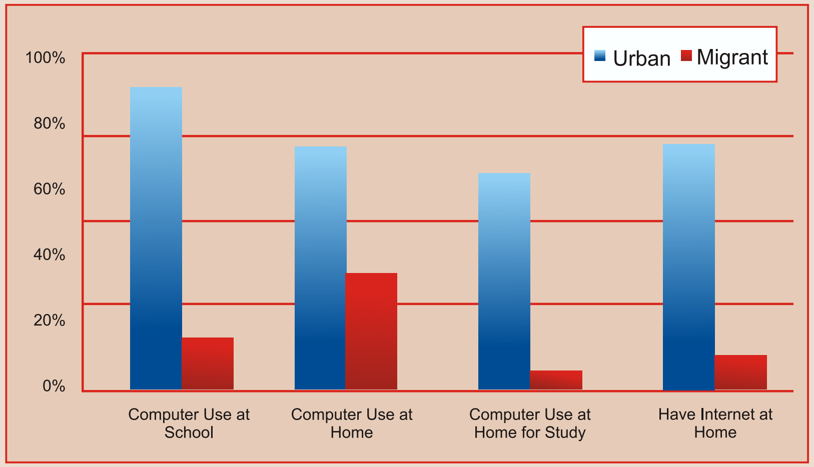


Figure 2. There is a stark contrast between computer and internet use among urban public and migrant school students.

Why is it so hard to find quality computer-based instruction in migrant schools? REAP has identified four main components of this problem. First, hardware is expensive. Migrant school administrators are often after a profit and have little incentive to invest in their school. Second, the software suites that are necessary for computer-based learning are also expensive and hard to come by. Third, even if software were affordable, little of it exists that could help migrant students keep pace with the national curriculum because available software often requires an internet connection or is focused on parochial lessons like basic computer programming. Finally, even if suitable hardware and software were available, there are very few qualified instructors that can teach computer-based content or manage the upkeep of the equipment. Together these factors mean that computers and computer-based learning remain out of reach for migrant students growing up in the digital age.

What are the implications if these gaps are not addressed?

China is currently transforming into a modern, knowledge-based economy. Building a skilled labor force is a vital component of this transition. The enhanced human capital that underpins such a labor force requires the equitable delivery of quality education throughout the country. However, today millions of migrant children are unable to access quality education. For this reason, serious questions remain about whether China's labor force can rise to the challenge of establishing an innovation-oriented economy. A majority of China's rural youth have either migrated or will migrate to cities in order to find work in coming years. When these migrants enter the labor market, what will they do? The days of abundant unskilled labor in China's cities are rapidly drawing to a close. As China moves up the value chain to sustain economic growth, working-age migrants will increasingly require two things if they are to stand a chance competing with urban—indeed, global—peers: proper schooling and a facility with computers and information technology.

Jobs of the past...

...and future.

Computer Assisted Learning (CAL): Part of the Solution?

The need to help migrant children bridge the educational and digital divides holding them behind their peers motivated REAP to ask some simple questions:

1. Why do migrant children perform so poorly in school?
2. What can be done to improve academic performance among migrant children?
3. What can be done to help narrow the digital divide between migrant and urban children?

Noting the success of computer assisted learning initiatives in resource-constrained classrooms in other developing countries, we sought to tailor a similar program to the needs of migrant children. Beginning in September, 2010, we set out to test its capacity to bridge the educational and digital divides that hold migrant students behind their urban peers. Our intervention was based on the premise that well-designed educational games can sustain interest and curiosity in an otherwise unsupportive school environment. We had **three objectives:**

Intellectual objective: Provide clear, quantitative evidence about the linkage between CAL programs and the educational performance of underserved children.

Policy objective: Demonstrate whether computer assisted learning programs lead to better educational outcomes and that such programs, if successful, should be scaled up in areas where poor student performance is chronic.

Educational objectives: Develop a curriculum (and training manual for teaching the curriculum) for a computer assisted learning program for China's disadvantaged youth.

In preparing the intervention we were careful to develop components that addressed each of the factors that we believed were preventing computer-based instruction and learning from reaching migrant children.

- Hardware: 210 new laptops donated by the Quanta Corporation
- Software: A suite of fun, educational games with enough interactive lessons for one semester

- Curriculum: Lessons pegged to the national primary school curriculum in Math
- Protocol: A step-by-step protocol designed to allow any teacher to run the CAL program "out of the box"

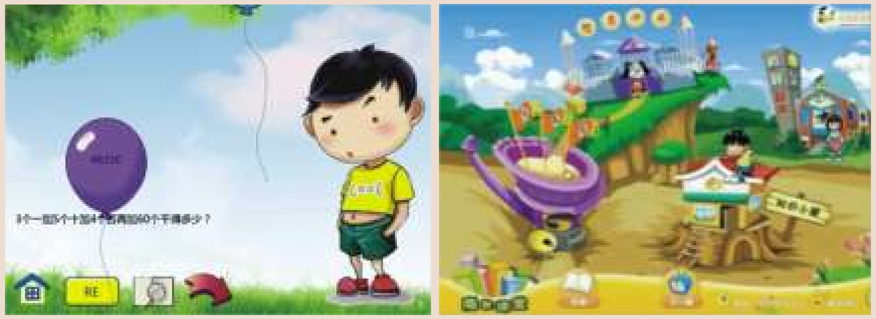
To conduct our intervention we randomly selected 24 migrant schools in the Greater Beijing area. Two classes were randomly chosen at each school—one received the CAL intervention while the other, serving as a control, did not. In order to prepare for the intervention we:

- Trained the teachers in charge of CAL sessions to use the CAL software, maintain a class progress plan, and abide by the rules of the intervention.
- Completed the baseline and evaluation surveys, randomly chose the treatment classes, and arranged student schedules to incorporate two hands-on, teacher supervised CAL sessions per week.
- Established a 24/7 CAL consultation hotline, whereby teachers could report any CAL related technical or management issues and have them resolved in a timely manner.
- Organized volunteers to visit and report on schools once a week in order to:
    - Monitor the progress of the project.
    - Conduct regular maintenance and/or replacements to the laptops and accessories.

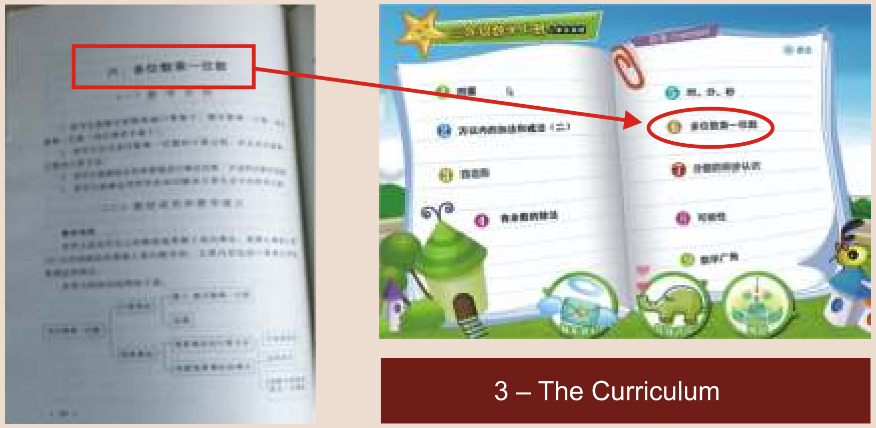
CAL by the numbers:
- 24 migrant schools
- 2587 third graders
- 1118 treatment students
- 1469 control students
- 210 laptop computers
- 10 volunteer monitors
- 2 hands-on sessions per student per week
- 2 game-based math learning software suites

With these preparations complete, we launched the CAL intervention on September 13, 2010.

1 - The Hardware (and installation)



2 - The Software (two game-based educational suites)



3 – The Curriculum

4 - Protocol (training and instruction manual)

…And launch!

The Results

In December, 2010, the REAP team once again headed into the field to conduct an evaluation survey and bring the data in for analysis. After crunching the numbers, we made some astounding findings: the CAL intervention had large, positive and significant impacts in two key areas:

•Academic performance •Self-confidence and self-efficacy

Academic performance

Our results show that CAL has significant beneficial effects on student academic outcomes. Two 40-minute CAL math sessions per week for thirteen weeks increased the student standardized math scores by 0.11 standard deviations (Fig. 3). That is a large effect, comparable to—indeed, often exceeding— the effects of much more costly and complicated interventions such as reducing class sizes and providing extracurricular tutoring. Another useful way to think about the effect is that a 0.1 standard deviation improvement is roughly equivalent to one semester's worth of learning. Thinking about it that way, thirteen weeks of CAL improved test scores as if the intervention students had attended over a semester's worth of school more than the control students. Remarkable!

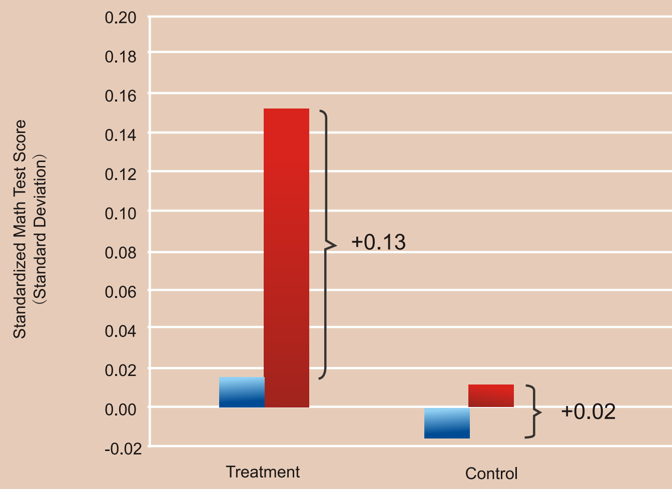


Figure 3. Thirteen weeks of CAL is roughly the equivalent of providing one semester more of schooling, or raising student grades from a C+ to a B.

Heterogeneous effects

Interestingly, when we looked at the intervention's heterogeneous effects (i.e. how CAL affected different types of students differently) we found that the biggest improvements in math scores occurred among the most vulnerable students—the students who performed least well on the baseline test and those with less-educated parents (Fig. 4). These are exactly the students for whom CAL was designed to help most: the ones falling behind.

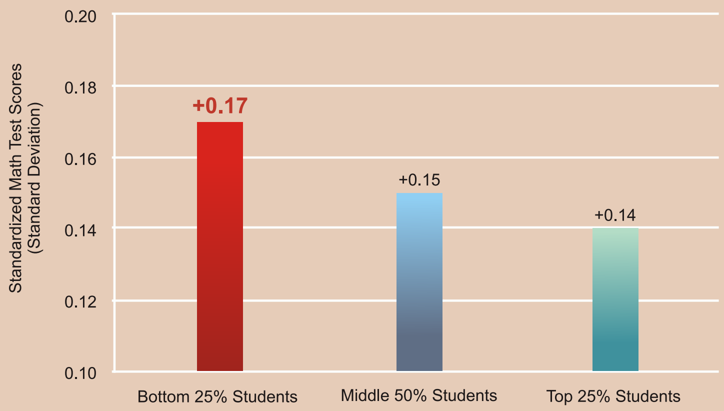


Figure 4. Lowest-performing students showed the most significant improvements in standardized test scores.

Self-confidence and self-efficacy

REAP was also careful to measure non-academic outcomes related to the CAL intervention. Before and after the intervention we measured how students liked school, their self-confidence, and their self-efficacy in math—a characteristic that relates to their perceived ability to learn new math skills. In all three cases we found improvements in these variables for the intervention students when compared to the control (Fig. 5). CAL actually raised these outcomes! There was also a modest spillover effect in which Chinese test scores improved in the intervention group versus the control, reinforcing the finding that CAL can instill a love of learning that can manifest outside the confines of CAL subject matter.

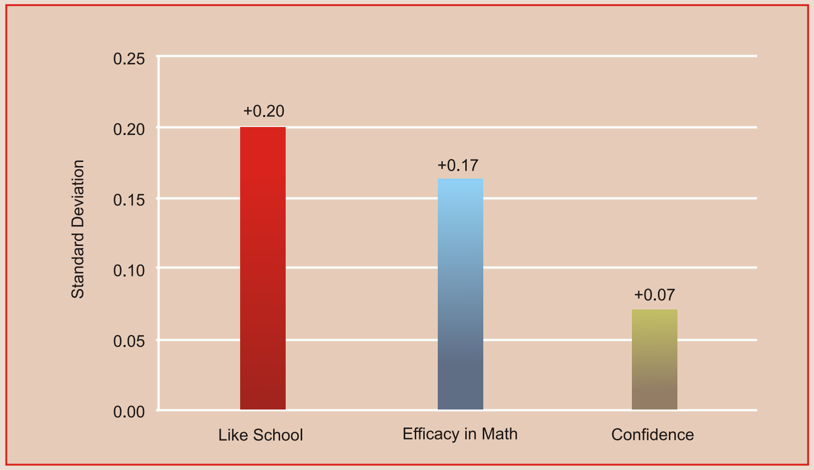


Figure 5. CAL improves three non-cognitive outcomes

Ultimately, China's migrant student educational outcomes will require sustained support at all levels of government. Ideally migrant students should be incorporated into the urban public school system. Such an investment today will pay off in tomorrow's labor market. In the meantime, REAP has shown that a relatively low cost and easily scalable computer assisted learning initiative is an effective means to address the remedial needs of China's disadvantaged migrant youth. Inspired by the success of our CAL projects in migrant schools, REAP is currently evaluating ways to bring CAL to China's most underserved rural public schools. Stay tuned to future REAP Briefs to see how these experiments have played out!

Having demonstrated CAL's effectiveness in raising academic performance in migrant schools, REAP hopes to expand the program to China's rural public schools.

The migrant CAL intervention would not have been possible without the generous support of the Lee Family.

Thank You!

REAP
Rural Education Action Project

For more information about the Rural Education Action Project's work with migrant education, and to learn about our many other projects to address rural education problems, please visit:

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