

Learning and Teaching Beyond Boundaries – Educational Change Through Technologies

Ranjeet Nath, Institute of International Education, India

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Introduction

The UN Millennium Development Goals underscore the importance of applying the benefits of information and communication technologies (ICT) with institutions in developing countries and disadvantaged communities. This abstract highlights the role of technology as an educational change agent among the students and educators. Schools have focused on improving student's achievements, have rigorous academic standards, assessments and accountability measures however a profound gap still remains between the knowledge and skills students learn in school, and the knowledge and skills they need in a 21st century workforce. Very rapidly, technology is becoming a core differentiator in attracting students and communities and continues to be the key source of growth in international education.

Verizon Innovative Learning Program has believed that technology can be a vehicle to improve teaching learning and has been bringing educational change through technologies in India and The Philippines. With the focus on increasing efficiency of teachers and students in use of education technology to increase access to Science, Technology, Engineering and Math (STEM) education among girls from underprivileged societies, students are exposed to technology, and additional enrichment interventions throughout the academic year at their secondary school level to ignite and sustain passion for Science and Math. In a country like India where only 3% females occupy positions in technology sector, where 16% are at mid management and a huge 81% percent are at junior rung, will such interventions change the figures in future? Based on the data gathered, the paper will highlight what kind of technological intervention will change the composition of IT sector in next decade.

The Need

Around the world, the participation of women in the fields of science, technology, engineering, and math (STEM) has been historically low. Despite the incredible progress made in women's representation in education and the workplace, there is still much room for improvement in the science and technology arenas. The disproportionately low representation of women and girls in STEM fields has significant implications for women's financial security, economic growth opportunities, and global innovation.¹ It is vital to reduce the gender gap in the STEM fields.

The argument for encouraging girls' interest and participation in STEM subjects is strongly supported by research studies indicating that proficiency in mathematics is a strong predictor of positive outcomes for young adults. A Survey of Adult Skills conducted by the Organization for Economic Co-operation and Development (OECD), for example, showed that foundation skills in mathematics have a major impact on individuals' life chances. The survey also demonstrated a link between poor mathematics skills and limited access to better-paying and more-rewarding jobs; at the aggregate level, inequality in the distribution of mathematics skills across populations is closely related to how wealth is shared within nations.²

¹ <http://www.aauw.org/what-we-do/stem-education/?gclid=CISj24eU6sACFQeTjgodCYwAag>

² <http://www.oecd.org/pisa/keyfindings/pisa-2012-results-overview.pdf>

The secondary school period is a critical time for young women to gain life skills that prepare them for higher education and career success. However, promising young female students in poorer communities rarely consider careers in STEM fields due to fears of the level of difficulty in understanding complex concepts in STEM. Additionally, teachers often lack the resources and training to motivate students to get involved in STEM fields.

The pilot phase of Verizon Innovative Learning Program—initiated in India in October 2013—was a small step toward addressing a bigger challenge. The program is running successfully in targeted schools, and IIE has effectively engaged teachers and students in teaching and learning science and math. Effective strategies have included:

- Need Assessment and Rapport Building: The Program Team makes frequent site visits and conducts frequent consultations with government officials and school authorities in order to continuously learn about stakeholder needs and to generate buy-in—key to fostering sustainability.
- Teacher Involvement: Teachers play a vital role in the program; they are VILP’s torch bearers and the main points of contact within the target schools. Beginning the program with teacher training helped build confidence and trust among the teachers. Their enthusiasm has helped maintain their investment and encourages innovation.
- Introduction of Education Technology: Teachers are using creative learning techniques in the classroom, mixing digital content with thinking maps and more traditional methods of teaching, creating a more interactive learning environment. Receiving the education technology from the principals also motivated the teachers further and increased their participation in the program.
- Involvement of Verizon Local Employees: The program successfully engaged 25 female Verizon employees working in Chennai and Hyderabad to mentor selected girls participating in the program. The mentors, who have diverse professional backgrounds at Verizon, are helping these girls to develop leadership competencies that will allow them to achieve a brighter future. Mentors help their mentees to identify short- and long-term academic and professional goals and draw upon their knowledge and experience to support mentees in reaching those goals. This relationship also helps to develop industry-institution partnerships that will continue even after the program expands to other schools.

Building on the successful Verizon Innovative Learning Program in India pilot and leveraging our lessons learned, we proposed to extend the program in **Philippines** and in **India** to support and encourage girls in secondary education to develop and pursue interests in the STEM fields. The program provided opportunities for girls in selected poor communities in Manila, Philippines, and Chennai, Hyderabad and Bangalore in India, to learn new career skills and undergo training in STEM. New technologies were integrated into the classroom and supplemented with extra-curricular mentoring by Verizon employees so that students are motivated and build capacity to pursue post-secondary education (academic or vocational training) programs that will lead to careers in the high-tech and science sectors. The program will fulfill IIE’s mission of increasing access to education globally and will leverage our proven global experience developing the leadership skills of women and girls.

The Case for Philippines:

Young students in Philippines face a number of challenges in gaining motivation and engagement in STEM subjects. Encouraging and engaging students in STEM at the secondary level is critical to nurturing the next generation of scientists, doctors and engineers who can contribute to the country's productivity, growth and future role in globalization; girls in particular are deprived of potential careers because of their limited access to high-quality STEM education. As a result, high percentages of women are unable to participate in these key growth sectors, depriving them of employment and livelihoods and impeding economic growth in these industries and regions. Many experts agree that educating girls and women is critical to economic development in Philippines.³ One study cited that Philippines' GDP could grow by nearly .2 percent each year with an increased investment in female education.⁴

The Case for India:

The program will provide opportunities for girls in selected poor communities in the aforementioned three cities in India to learn new career skills and undergo training in STEM. New technologies will be integrated into the classroom and supplemented with extra-curricular mentoring by Verizon employees so that students are motivated and equipped to pursue post-secondary education (academic or vocational training) opportunities that will lead to careers in the high-tech and science sectors. The program will fulfill IIE's mission of increasing access to education and will leverage our established experience developing the leadership skills of women and girls.

Approach

Research shows that it is not uncommon for young girls to be discouraged from pursuing math and science. In many countries, there is an unconscious perception that science and math are typically "male" fields, while humanities and arts are primarily "female" fields. These stereotypes further inhibit girls from cultivating an interest in math and science from a young age, while boys continue to have more significant access to educational support in STEM fields (e.g., tutoring, participation in science fairs, etc.) Teachers must work to encourage young girls to pursue opportunities in STEM by offering more hands-on workshops for girls to learn about science and technology. Schools must also consider bringing female engineers to talk to students about their professions and to reach out to young girls in particular. For this reason, our proposed approach will engage local Verizon employees in the program, building on our strong success doing so in India.

A. Program Aim

VILP aims to **address gender inequity in STEM by providing extra support to female students** by building their skills and confidence to successfully pursue STEM fields. Since teachers and principals are key to the success of students, the program will also **enable teachers to provide cutting edge education** through the use of innovative technology, benefiting the selected girls and their classmates.

³ <http://www.businessweek.com/articles/2013-03-07/the-economic-benefits-of-educating-women>

⁴ <http://www.businessweek.com/articles/2013-03-07/the-economic-benefits-of-educating-women>

Our integrated **approach** will improve secondary school outcomes for girls and increase access to STEM training for girls. Our approach incorporates the following best practices:

- **Combine technical training with enrichment support** focused on life skills, career development and entrepreneurship training.
- Integrate training in **education technology** for science and math education.
- **Build community ownership and buy-in** and take into account the local cultural and social elements that have contributed to barriers for girls to pursue secondary education in STEM subjects. The role of local Verizon employees has been integral to the program's early success.
- **Invest in teacher training** for effective and sustainable intervention at the school level.
- **Respond flexibly to changing circumstances, utilizing ongoing assessment tools and quality control**, so that insights from monitoring and evaluation across the intervention sites are fed back into the program to improve outcomes.

B. Targeted Audience

In India our primary target will be 300 girls (100 in each city) studying in grade eight in five schools each in Bengaluru, Chennai and Hyderabad (15 schools total). Our secondary target will be 30 high school teachers in selected schools and the parents of selected girls and In Manila, 100 girls, 5 schools and 10 school teachers.

Other female and male classmates in target schools will benefit from the integration of education technologies and teacher training in effective classroom pedagogies that are key elements of the program model.

C. Geography

The program will be implemented in the Verizon focus states of India – Telangana, Tamil Nadu and Karnataka and Manila, Philippines. The beneficiary high schools will be selected from the cities of Hyderabad, Chennai and Bengaluru in India and from Manila, Philippines.

Goal: The overarching goal of the program will be to increase girls' participation in the economic development of each state by preparing them to succeed in the science and math subjects in 12th grade and pursue post-secondary education in STEM fields.

Objectives: To pursue this goal, we will seek to achieve the following process and product objectives during VILP Global:

(i) Individual Level:

Girl students at the secondary class level: IIE will support the development of learning environments conducive to teaching and learning, using creative learning techniques to engage female students in STEM subjects. IIE will set up coaching classes during after school hours and summer/winter vacations for selected students. Program-supported tutoring sessions also will be available for the students. These will include leadership and life skills training components to inspire confidence and provide tools to help girls succeed both in preparing for exams and entrance tests and also in envisioning and succeeding in finding appropriate career paths. The participating students will undergo hands-on experiential training to build communication skills, self-awareness and leadership potential.

One of the unique opportunities that selected students will receive is mentoring support from Verizon volunteers. Verizon volunteers will act as a catalyst to create interest in science and math subjects among students as well as to guide students in understanding career paths in the engineering and technology sectors. Students will also have an opportunity to visit the in-country Verizon facilities so they can learn about the various roles in the high-tech work force. Throughout the pilot phase of VILP, volunteers have been meeting with selected female students in a group every other weekend and engaging in interactive conversation around various issues of concern for the girls in the classroom and beyond.

Each program component will incorporate technology, including classroom pedagogy and use of distance learning and collaborative tools to encourage sharing and cross-learning among students in the different intervention sites.

(ii) School Level:

Science & math teachers and heads of institutions: IIE will organize trainings on educational technology for secondary school math and science teachers from selected schools. Our objective is to train the teachers to integrate technology into the classroom in order to teach subjects effectively, stimulate young girls' interest in STEM and in pursuing post-secondary education in STEM subjects, and provide information about various STEM career opportunities. Teachers will participate in workshops, seminars and site visits to the Verizon facilities as well as program networking events. Targeted outcomes include the following:

- Teachers are exposed to creative learning techniques that support interactive learning environments and facilitate presenting the STEM syllabi in meaningful ways. Teachers will use education technology tools that will be provided to schools. We propose to continue working with the HCL enabled Myeducation software that uses animation, videos, and virtual labs for effective teaching and learning.
- Teachers and principals are better informed about various career opportunities for their students.
- Teachers and principals are inspired to motivate their students, especially girls, to aim high and apply for further training in universities.
- Teachers and STEM professionals from the industrial sectors (including Verizon volunteers) develop partnerships, facilitate visits to industrial settings and invite STEM professionals to visit classrooms and make presentations or hold workshops.

(iii) Family Level:

Encourage parents and family members: Regular opportunities will be offered to parents to attend workshops that open their minds to the career opportunities available to women in STEM fields and to help them become advocates for their girls in pursuing post-secondary education in STEM fields. Trained facilitators and high achieving female role models from various industries will interact with parents and teachers to help them visualize a different future for the girls, including the value of post-secondary education, various scholarships, government schemes and career opportunities. These sessions will also include an opportunity for parents and teachers to interact face-to-face and discuss the students' progress and future options.

Monitoring & Evaluation: In the pilot phase, IIE developed a framework and design for the ongoing monitoring and evaluation of the program which we propose to continue to use in VILP Global. Using a baseline pilot report and end-of-academic-year end line survey, the program will have data to support the achievement of outcomes. We propose to use the same framework and tools to evaluate program outcomes in all three cities. As the post-implementation data can be gathered only after the annual exams are complete, we propose devoting three months following the school intervention for data gathering, analysis, report writing and submission.

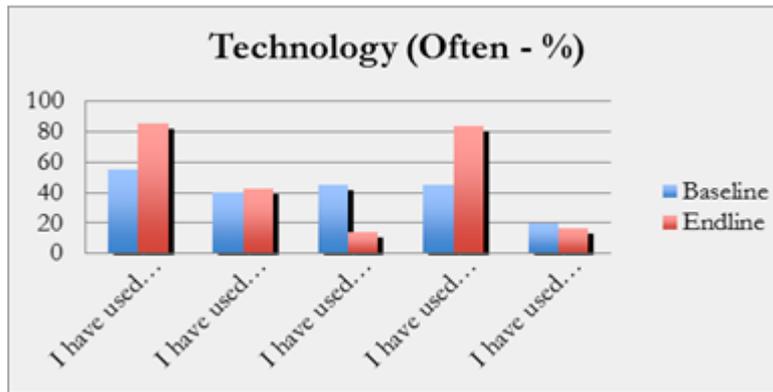
Incentives: Cooperating principals will be awarded school-wide technology enhancements and girl students will receive a mentor from the local Verizon offices. The program will also provide certificates to teachers and students acknowledging their success in completing the training program.

Sustainability: The program is designed to be sustainable by focusing on the following activities: building the capacity of principal and teachers, inculcating vision and value for STEM education for girls and providing skills to teachers in education technology and effective pedagogy. The pilot phase in India is showing positive indicators toward schools' ownership and commitment, which strengthens the program's sustainability.

Additionally, the most unique aspect of the program is that the intervention takes a holistic approach to gaining educational advancement. The participating girls are provided with a nurturing environment, including mentoring, exposure to positive role models and leadership and skills building, in order to generate interest in STEM. Additionally, since parents are decision-makers for or influencers of their daughters, the program will work with parents to provide community support to enable girls to make an informed decision on their post-secondary and/or career opportunities.

Conclusion

Verizon Innovative Learning Program has **increased the number of educators with enhanced proficiency in education technologies for instructional purposes**. Below graph proves that education technology can be very effective among educators in teaching Math and Science.



The number of teachers using computer often in the classroom have increased from 55 per cent to 86 per cent and those using internet often has increased from 45 per cent to 83 per cent. The percentage of teachers using computer for teaching showed a slight increase from 40 to 43 per cent and those using internet for teaching showed a slight decrease from 20 to 17 per cent.

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Contact email: RNath@iie.org / ranjeet.nath1982@gmail.com