Technology Enters the Classroom: An Evaluation of Educational Technology Initiatives in Punjab

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Abstract

This article provides a critical review of educational technology initiatives of the Punjab government. The attributes of meaningful learning with technology are used as a criterion to evaluate the benefits of technology initiatives in the education sector. An historical perspective of the integration of technology in Pakistan is given in the beginning to have a clear idea as how technology was introduced in the private schools in 1990s and what are the latest trends in these schools? The initiatives of Punjab government are then elaborated by discussing the following projects: Daanish Schools, School Reform Roadmap, Technology to Improve School Processes and Digitized Textbooks and Intelligent Tutoring System. After an analysis of these initiatives, a review of educational technology initiatives in developing countries is done to compare the successful and not so successful projects of educational technology. The article concludes with suggestions for educationists and policy-makers in Pakistan.

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Introduction

In the 20th Century, programmed instruction was the first technology developed for educational purpose. Initially, technologies were used to teach students in the same way as the teacher does in the classroom. Since technologies at that time were not sophisticated enough to enable collaboration or communication among students hence technologies were used to present content to students. Students learned information presented by the technology just as the teacher delivers information in the classroom, however, the questions and answers that the teacher employs to engage students were missing in technology delivered lessons.[1] At first, computers were also used for drill and practice in the classroom.[2] The educators began to realize that computers can be used as productivity tools later in the 1980s.[3] The concept of learning with technology embodies using technology as a partner in the learning process where technology is not acting as a teacher but the student is the teacher who is using technology to represent what he knows in a number of ways.[4]

Meaningful learning with technology is based on the principles of constructivist approach. In constructivist approach students are active rather than passive and they interpret and process the information that is received through the senses. According to Jonassen, technology can be used for meaningful learning if it is used as a tool that supports knowledge construction. It can also be used as "information vehicle for exploring knowledge to support knowledge

1 Richard E. Clark, "Reconsidering Research on Learning from Media," *Review of Educational Research* 53, no. 4 (1983): 445-459.

2 Henry Jay Becker, *How Schools Use Microcomputers: Summary of the First National Survey* (Baltimore, MD: Center for Social Organization of Schools, The Johns Hopkins University, 1985).

3 Henry Jay Becker, "How Computers are Used in United States Schools: Basic Data from the 1989 I.E.A. Computers in Education Survey," *Journal of Educational Computing Research*7*,* no.4 (1991): 385-406.

4 David H. Jonassen, Kyle L. Peck & Brent Gayle Wilson, *Learning with Technology: A Constructivist Perspective* (Upper Saddle River, NJ: Prentice Hall, 1999), 7.

construction". Technology can also be an intellectual partner that supports learning if it helps learners to reflect on what they have learned and let them construct personal representations of meanings. While reviewing the educational technology initiatives in Punjab, the researcher has reviewed the use of technology with a focus on the attributes of constructive learning with technology to see if technology is being used in the following ways:

1. As a tool that supports the construction of knowledge;
2. As information vehicle that helps students to explore knowledge in order to support knowledge construction; or
3. As an intellectual aid that helps students to reflect on what they have learned; and
4. As a tool to collaborate with others so that they can construct personal representations of meaning.[5]

In the late 1990s, when computers were introduced in Pakistan, they were usually placed in a separate lab called computer lab. The computer lab provided a solution to the problem: how can schools most easily deal with an innovation about which the personnel in the school had little knowledge but a lot of anxiety? This approach also satisfied the queries of parents who wanted their children to be educated with the latest teaching approaches and up to date knowledge. Hence, computers were isolated in their own spaces, with their own teaching personnel and their own curriculum. The placing of computers in labs was an administrative decision and was not taken keeping in view the educational needs of students.

The biggest challenge for the Information Technology (IT) teachers and the administration was regarding the content to be taught in the labs. The solution given by the IT teachers was to teach students about computer hardware, software and Microsoft Office. The IT curriculum was taught as a separate curriculum and did not have any link with the

5 David H. Jonassen, *et. al*, *Learning to Solve Problems with Technology: A Constructivist Perspective,* 2nd ed., (Upper Saddle River, NJ: Prentice-Hall, 2002).

content that students were learning in other subject areas. In the computer lab, IT teachers taught students to use paint for drawing, MS Word for writing and they created presentations in Power Point. While writing in Word or creating presentations students just copy pasted the information from different sites. Some schools also let the students play online games or games available on CDs. Even when drill and practice software was used in IT classes it did not have any link to what the students were learning in other classes and there was no evidence to the use of software and improvement in the learning of students. By placing the computers in the computer labs, the teachers were totally removed from using computers and they dropped their students at the computer lab so that the IT curriculum could be taught to them. Certain schools placed a higher emphasis on IT skills and also taught programming to students and the mode of teaching was for students to follow instructions of teachers and there was no room for discovery learning.

This practice of isolation of computers and the separation of IT curriculum would have continued had it not for the latest research in instructional design which advocated change in the whole approach to teaching and learning by integrating computers and other technologies in different subject areas to improve student learning.[6] In the US, for the teachers to have access to computers, the computers were no longer isolated in the labs, rather were placed in the teachers' classrooms. Depending on the funding given to a particular school district, laptops were also given to students and they could use it at school and also take it home. The report to the president set the tone for the integration of technology in the learning of students. This report was written by the Panel of Educational Technology in 1998 and it was the first government publication that advocated the use of technology in all areas of education following the constructivist learning paradigm. The report

6 Jonassen, Peck & Wilson, *Learning with Technology*.

advocated that students should be constructing their own knowledge, using higher order thinking skills and problem solving and linking their learning with real world experiences. This report served as a guideline and provided further impetus to the efforts of schools to integrate technology.[7] Research on meaningful integration of technology in education was done by a lot of researchers who outlined different ways in which technology can be integrated meaningfully in the classroom.[8]

The practice of technology integration was started in Punjab by two leading private schools. One school has branches all over the country so the task of training teachers was huge and the other school just has three branches in the same city so teacher training was relatively easier. Since the computer labs were already functioning in these schools therefore additional computers were not added in the classrooms and the initial focus was on training a group of teachers who could then integrate technology in different subjects. The IT teachers were hired to support the teachers who did not have adequate knowledge of computer skills. Teachers were trained by inviting tutors from abroad and by completing Diploma in teaching with ICT by Cambridge and these teachers then took leadership positions in their respective schools.[9] The workload of these teachers was reduced so that they could spare time to guide other teachers to start the process of technology integration. The process was slow as the computer lab was to be used for all the classes for technology integration as well as teaching of IT skills to students. First, IT skills were taught to students and then those skills were integrated with different subject areas. The small number of teachers who completed professional development started integrating technology in

7 *Report to the President on the Use of Technology to Strengthen K-12 Educationin the United States,* President's Committee of Advisors on Science and Technology, 1998.

8 David H. Jonassen, *Computers as Mind Tools for Schools: Engaging Critical Thinking*(Upper Saddle River, NJ: Prentice Hall, 2000).

9 Waqar, Y. "Technology Collaboration Model in a Private School in Pakistan," *Academic Exchange Quarterly*, 14 no. 3 (2010): 97.

their lessons but they did not have time or adequate training to train other teachers in their schools. Resultantly, technology integration practice remained confined to the teachers who got trained and the rest just left the class with the IT teachers during the technology integration time and the IT teachers having inadequate knowledge of subject matter could not integrate technology meaningfully. In the private school with few branches, the IT teacher was also trained to facilitate integration of technology with different subject areas and since the number of teachers to be trained was few in number therefore better results were achieved.

The focus of training in both the schools was to train the teachers in using different software programmes and then teachers would use these software programmes in their respective subjects. When asked about the advantages of using technology or the reason for using technology, the response by the administration and the teachers was to make learning easier and interesting for students. The purpose was not to let the students construct their knowledge or to link the learning of students with real world experiences as advocated by the research in instructional design and technology integration[10]. Also training was scattered and was not done to train the teachers to design a learning environment where students use technology as a tool and as an intellectual partner in knowledge construction. Due to the isolation between private schools and government education department the efforts were neither shared nor proper research conducted in this area. The initiative, however, started and would go through stages of development but as already mentioned that the focus was on adding interest and increasing motivation for learning and not on improving learning or involving students in higher level cognitive thinking.

Stages of Technology Integration

It is worthwhile here to note that new technologies go through a series of stages in schools. Larry Cuban proposed

10 Jonassen, Peck & Wilson, *Learning with Technology*.

that at first utopian expectations lead to massive funding and then disappointment with the results leads to blaming the teachers for being unwilling or for being unable to use the technology. The use of technology would then sink to the minimum level.[11] Cuban is talking about film, radio and television but computers also went through similar phases where people are enthusiast about the new programmes claimed that "programming, simulations, database creation, and other applications were the best educational use of computers. Expectations for each quickly led to disappointment, and just as quickly to a fixation on some new application as the answer."[12] If history is to be a guide for us then in order to avoid such disappointments we need to make sure that the efforts are not just focusing on mechanics and financing of wiring and connections and other areas such as the design of learning while using technology are also given equal importance. Now keeping this background in mind a review will be done of the steps taken by the Government of Punjab to integrate technology in the public schools. Due to the research in improvement in student learning with the use of technology that led to the integration of technology in the schools in the West, the educationists in Pakistan, international donor agencies, and the Government of the Punjab also got interested in using new technologies to bring educational reform.

A brief review of the problems being faced by the education sector of Pakistan would help the reader to critically evaluate the steps taken by the government. According to the UNESCO report on education in Pakistan,[13] 21.4 million school going children are between the age of 5-9 years. However, due to a number of reasons such as shortage of nearby schools, teacher shortage and

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11 Larry Cuban, *Teachers and Machines: The Classroom Use of Technology since 1920* (New York: Teachers College Press, 1986).

12 Howard Budin, "The Computer Enters the Classroom: Essay Review," *Teachers College Record* 100, no.3 (1999): 656-670

13 UNESCO - Education for All 2015 National Review: Pakistan. Retrieved from http://unesdoc.unesco.org/images/0022/002297/229718E.pdf

absenteeism, poor teaching technique, dismal school environment, poverty, insecurity, natural disasters 66.8 percent continue till grade 5 and 33 percent drop out before completing primary grades. In addition to retention of students who drop out of school there are 25 million out of school children[14] who do not have access to basic education. The poor quality of education is also a major concern as indicated in the UNESCO report.

Daanish Schools and IT Labs Project

The Government established Daanish Schools as centers of excellence for students belonging to low socio economic backgrounds the admission in these schools is on merit and students are not charged any monthly fee.[15] Generous budget was allocated on setting up Daanish schools as each school had the facility of computer lab, hostel, transport, library, playground and well-furnished classrooms. The estimated cost on the building of each school is 1 billion in addition to an estimated Rs. 21 million annual operating expenditure.[16] These schools are costing government Rs. 16,000 per child per month.[17] The computer labs were set up to teach computer skills as a subject to students. Learning computer skills is viewed as the only use of computer labs. With the huge amount spent on the infrastructure and the high amount of expenditure per child, this model is neither sustainable nor replicable. This was the first step of the government to provide access to technology in schools.

With the intent to bridge the digital divide, the Government of Punjab also set up IT labs in over 4,000

14 25 Million Broken Promises: Alif Ailaan. Retrieved fromhttp://www.alifailaan.pk/broken_promises

15 The Punjab Daanish Schools and Centres of Excellence Authority Act 2010. Retrieved from. http://punjablaws.gov.pk/laws/508.html

16 The Punjab Daanish Schools and Centres of Excellence Authority Act 2010. Retrieved from. Retrieved from http://punjablaws.gov.pk/laws/508.html

17 Aroosa Shaukat, "Education Policy Seminar," *The Express Tribune,* March 12, 2012. Retrieved from https://tribune.com.pk/story/356969/education-policy-seminar-daanish-schools-may-not-be-as-beneficial-but-not-useless-either/

secondary and higher secondary schools across the province.[18] The utilization of these IT labs by Cambridge education was evaluated in terms of increase in the number of students who opted for the IT subject and the utilization of computer labs by teachers and students.[19] The proficiency of teachers is judged in computer skills. One of the outcomes of the project is that the interest of students and teachers in studies has increased with the use of computer labs. However, other than teaching IT skills, it is not clear how the labs are being used by students and teachers.

When the Punjab government opened computer labs in Daanish Schools, the private schools that had started technology integration in computer labs realized that technology needs to be made available to the teachers in the classrooms and other than computer labs additional areas need to be set up in the school where students can go for technology integration. Keeping this perspective in mind, separate rooms were set up in these schools called resource rooms where students would go with the subject teachers to integrate technology. Smart boards were also provided in some branches of the school to optimize student learning in different subjects. Now almost all the elitist private schools have smart boards in their primary classes. The optimal use of smart boards is still to be seen as teachers are not trained in pedagogies and the focus right now is on using smart boards to show the content and worksheets of textbooks. According to the research in the use of technology in education, the purpose of introducing technology is to help the students to construct knowledge, use higher order thinking skills and problem solving and link their learning with real world experiences. The vision of why technology should be integrated is not perceived by educationists in Pakistan

18 Computer IT Laboratories for Punjab Students. Interface Education. Retrieved from http://www.interface.edu.pk/students/Sep-09/Punjab-IT-labs-PITB-employees.asp

19 Study on effectiveness of IT labs in high schools and higher secondary schools in Punjab (March 2012). Cambridge Education. Retrieved from http://www.pesrp.edu.pk/downloads/library/TA.

and hence expensive technologies are randomly added in schools with the hope that technology will improve student learning. Mostly, smart board is being used for the same purpose that a projector can be used and a few students get a chance to touch the board to observe its interactivity. Since the focus is just on adding interest in student learning and to enhance the image of the school so IT teachers download software programmes to be used on the smart board. The purpose, however, is not to use smart board as a tool to construct knowledge.

School Reform Roadmap

The Chief Minister of Punjab launched Punjab's Roadmap for School Education in July 2011 and on this occasion the head of DFID Pakistan as well as Sir Michael Barber were also present. Roadmap initiative was started to set targets for education and then to have follow up meetings under the leadership of Chief Minister to get an update on the targets.[20]

Technology to Improve School Processes

The Government of Punjab has also involved Punjab Information Technology Board (PITB) in education initiatives. The PITB is the government's central IT organization that aims to leverage technology solutions to improve public service delivery, and to enable timely data-driven decision making. In support of the Chief Minister's Education Reforms Roadmap, the PITB has introduced several technologies that enable real-time data acquisition, better monitoring of school facilities, as well as teacher presence.[21]

To tackle the issue of tracking education subsidies and fee vouchers, the PITB has introduced a smart-phone based computerized attendance system and an online dashboard that reports attendance records in real-time for students using Education Voucher Scheme (EVS) of the Punjab

20 School Education Department, School Reform Roadmap. Retrieved from http://schools.punjab.gov.pk/schoolroadmap

21 "PITB: An Unheard Story in Pakistan." *The News*, September 15, 2015.

Education Foundation (PEF). The PEF has recently rolled out the system for selected schools in central and southern Punjab—with plans to scale-up fairly quickly during the next six months.[22]

Ensuring that M&E officials make timely visits to schools and send-in survey results accurately and on time, has traditionally been a challenging task. The Program Monitoring and Implementation Unit (PMIU) under the School Education Department has employed a Province-wide workforce of 950 Monitoring and Evaluation Assistants (MEA), that visit each of its 56,000 schools at least once a month, and submit a comprehensive report for each schools, covering key aspects including teacher attendance, current state of school facilities, as well as enrolment. The MEAs now submit their reports in real-time, during their on-site visits to schools, with the help of a tablet-PC based software developed by the PITB. The software at the backend consolidates the data on a central server, and makes information available via a web-portal, to the PMIU and district monitoring teams. In addition to real-time reporting, the tablet-PC based application has enabled PMIU to track and monitor the MEA performance—since each time the MEAs submit their reports via the tablet-PC, the system logs the date, time, and location from where the information has been sent. So the MEAs now have to be on-site to fill out the forms.[23] The focus of this initiative is on monitoring and evaluation and not on improving quality of education.

Digitized Textbooks

The e-learning initiative of the PITB has made textbooks freely available online and the textbooks also have a lot of supplementary material in the form of simulations and videos to help the students to understand concepts in Math, Physics, Chemistry and Biology. Initially the content was

22 Punjab Education Foundation (PEF). Retrieved from http://punjabeducationfoundation.blogspot.com/2014_01_01_archive.html?view=classic

23 Marian Sharaf Joseph, "Pakistan Taking the Lead in the Neighbourhood," *MIT Technology Review*, August 14, 2015.

made available for grade 9 and 10 students of Matric. Later, Science books were digitized for grades 6 and 7 as well. To make this content easily accessible, there are plans of establishing e-libraries at popular public places and parks. Digitized content is also augmented videos, simulations, animations and games to make learning interactive and fun.[24] There are also plans of providing school teachers with tablet-PCs that have built-in multimedia projector, so that the content can be shared with students within the classroom. The area of teacher training, assessment and research is also being planned.

The e-learning initiative was started to improve the standard of education and learning experience for public school children. However, this solution was offered without doing a thorough study of the problem of education in public schools. The suggested solution is to provide teachers with tablet-PCs that have built in media projector, hence another technology has been offered as a solution to a problem without analyzing the problem and how the proposed technology can be helpful in student learning. While content is being added in the e-learning initiative on an ongoing basis it is not clear how this content will be used in the classrooms. There is also some discussion on teacher training but since the PITB is providing technology solutions so the training will probably focus on training the teachers to use the tablet-PC in the classroom. There is no realization that there is a deeper problem of changing pedagogies to involve the students in construction of knowledge. Technology hardware and software is considered a panacea to the problem of education in public schools in Punjab. Solutions are designed to implement technologies and the impact is evaluated by measuring the use of technologies. Assessing student learning becomes even more complicated when the traditional assessment mechanisms currently being conducted by board for grades 8, 9 and 10 and by the

24 Aroosa Shaukat, "Being imaginative: PITB Compiling Games to Make Learning Fun," *The Express Tribune*, August 9, 2016.

PEC for grade 5 focuses the reproduction of knowledge by students instead of assessing conceptual understanding.

Intelligent Tutoring System

Another initiative of the PITB in education was the use of mobile phones as it is the most prevalent technology in different sections of society in Pakistan. Mobile based SMS tutoring system for low end phones was designed to access student learning and to provide tutoring based on their responses in Mathematics and English for grade 5 public school students. Students receive an SMS on their parents' phone regarding the content they are studying in Mathematics and English in school. SMS is generated by the teacher and is sent to the whole class. When the student replies correctly to the SMS question he is given another question of the same level and after two correct responses he moves to the higher level of questions. In case of incorrect answer, a hint or scaffold is sent to the student to guide him to arrive at the right answer. Hence, the whole tree of learning is designed where a student progresses at his/her own pace. Tutoring is done by sending hints or scaffolds and assessment is done by sending content questions to students. The system starts at the lowest level of question pertaining to a certain content area and then moves to difficult concepts. This initiative is designed according to the curriculum and the teacher is the one who initiates the SMS messages for the class. Hence, it can be presumed that the initiative will be accepted by students and teachers.[25] The results of the initiative have still to be seen.

Another international organization, working under Sir Michael Barber, is purchasing tablets for public schools of Punjab so that these could be given to DTs and DTs then fill in the school evaluation form easily on it. Assessment of different subjects will also be available on the tablet that DT can use to do random assessment of students in the classroom. This would provide information on the learning

25 Yasira Waqar, "Towards a Model of M-Learning in Pakistan," *Journal of Research and Reflections in Education* 8, no. 2 (2014): 125.

taking place in the classrooms. This project will be done independently and there is no link with teachers or with schools. The focus is assessment of school facilities and also assessment of students of grade 3 in basic literacy and numeracy.[26]

Educational Technology Initiatives Enabling Access to Technology

Michael Trucano, senior ICT and education specialist at World Bank while reviewing the use of educational technologies in developing countries states that a compelling reason is never given for choosing tablets over laptops or desktops or anything else. The general worldwide trend is just on buying technology that will be used in schools. The question being addressed is not, "what challenges are we trying to solve, and what approaches and tools might best help us solve them?', but rather, 'we know what our technology 'solution' is, can you please help us direct it at the right problems?"[27] Several countries have done large scale programmes with different educational technologies and students are being provided access to technologies in classrooms. A brief review of educational technology projects of Uruguay, Thailand, Peru and India will be done to understand if providing access to technology has an impact on student learning. In all the examples delineated below students were provided maximum access to technology in the form of their own devices. The use of technology will be seen to see what challenges have been solved by providing access to technology and if technology is being used meaningfully by students based on the principles of meaningful use of technology shared by Jonassen.[28]

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26 Aroosa Shaukat, "Real-time Data: PITB to Monitor Education Indicators via Tablet Apps", *The Express Tribune*, May 31, 2014. Retrieved from http://tribune.com.pk/story/715531/real-time-data-pitb-to-monitor-education-indicators-via-tablet-apps/

27 Michael Trucano. "Big Educational Laptop and Tablets Projects," *World Bank Blogs*. Retrieved from http://blogs.worldbank.org/edutech/big-educational-laptop-and-tablet-projects-ten-countries

28 Jonassen*, Computers as Mind tools for Schools*.

Uruguay provides free laptops to all students studying in public schools. One Laptop Per Child (OLPC) is part of the educational landscape but the school reforms after this initiative are still to be seen. Michael Fullan in his report after the first five years of the project states that since there were no advances in pedagogy (how we learn), in technology (especially around engagement) hence no change could be seen in the school in teaching and learning."[29]

Thailand started 'one to one computing' with tablets instead of laptops. A review of the project in *The Economist* stated that the project was a vote-catching policy and the focus on tablets diverted attention from the other problems of education system. The children's education achievements are on the decline despite huge amount is spent in schools. The article concludes by saying, "Giving every child a tablet computer is a nice gimmick, but it is unlikely to be the key to educational excellence."[30]

Peru gave close to one million laptops to students through an initiative that started in 2008. The focus was poor schools and schools located in remote communities. The results of the project compiled in a report provided food for thought for educationists around the world. The reports states that "expansion in access translated into substantial increases in use both at school and at home. No evidence is found of effects on enrollment and test scores in Math and Language."[31]

India's latest project is the Aakash Project, under which a 35$ tablet introduced in 2011. Some proponents have described Aakash as a herald of a new 'Internet Revolution' for education in India and claim that it will do for education what mobile phones did for personal communication in the

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29 Michael Fullan, "Ceibel: Next Steps. The Final Report," Michael Fullan Enterprises (2013).

30 Education in Thailand: "Let Them Eat Tablets," *The Economist* (June 16th, 2012). Retrieved from http://www.economist.com/node/21556940

31 Julian, C., C.Santiago, Pablo, I., Ana, S., Eugenio, S. Technology and Child Development: Evidence from the One Laptop per Child Program. Inter-American Development Bank (2012).

last decade. Critics have noted that computer and $100 laptop project (OLPC) also held such high expectations. Historian Carey and Quirk point out:

> At the root of the misconceptions about technology is the benign assumption that the benefits of technology are inherent in the machinery itself so that political strategies and institutional arrangements can be considered minor.[32]

The focus of the initiatives mentioned above has been on providing technological access to students with the hope that it would improve learning of students. Technology by itself cannot improve anything unless it is integrated in the design of learning as a tool that students use to construct knowledge. Simple access to technology without a clear link with the problem to be solved and the context in which technology would be used does not achieve any educational outcomes.

Successful Educational Technology Projects in Developing Countries

There is a plethora of problems that developing countries face in providing quality education to students in public schools. The educational challenges mentioned in the UNESCO report on education in Pakistan 2015 are:

1. Lack of access to education;
2. Poor quality of education;
3. Equity and
4. Governance.[33]

External factors adding to the problems are poverty, law and order situation, and devastation due to natural disasters such as earth quakes and floods. Lack of access to education is also due to dearth of nearby schools, shortage of teachers and teacher absenteeism, poor teaching skills, depressing school environment, poverty and insecurity. The main reason for poor quality of education in Pakistan is

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32 James Carry and John Quirk, "The Mythos of the Electronic Revolution," *The American Scholar*39, no. 2 (Spring 1970): 219–241.

33 UNESCO - Education for All 2015 National Review: Pakistan. Retrieved from http://unesdoc.unesco.org/images/0022/002297/229718E.pdf

inappropriate teaching method and the reasons are acute shortage of well-trained and motivated teachers, non-availability of textbooks, school lacking basic facilities such as toilets, clean drinking water and electricity. Besides, there is also budgetary constraint as Pakistan's overall national expenditure on education as percentage of the GDP has remained around two percent. Hence, the choice of technology also depends on the expense involved and if its use can be scaled up. Motlick emphasizes that mobile phones can greatly benefit the learners in Asia and Africa compared to that of Web based learning. He elaborates that mobile phone are widespread, easy to use and are familiar to learners.[34]

The problems of education mentioned above are not only faced by Pakistan but also by other developing countries and our neighbouring country India. Considering all these shortcomings, a project using mobile phones was designed to enhance literacy skills in rural India. The project was conducted with children from rural, low income families as an after school initiative. Cell phone games were designed keeping in mind the local ESL needs and games covered listening comprehension, word recognition, sentence construction and spelling at various levels. The programme was conducted with children after school for 38 days. Result of the pre and post-test show improvement in literacy and skills of students. A qualifying test was conducted in the beginning to select students having basic literacy and the knowhow of mobile key pad.[35]

A study by Velghe[36] indicates that the use of mobile phones by women who are outside the scope of formal

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34 S. Motlik, "Mobile Learning in Developing Nations", *International Review of Research in Open and Distance Learning,* 9, no. 2 (2008). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/564/1071.

35 J. Valk, Ahmed T. Rashid, & Laurent Elder, "Using Mobile Phones to Improve Educational Outcomes: An Analysis of Evidence from Asia," *The International Review of Research In Open And Distributed Learning* 11, no.1 (2010):117-140. doi:http://dx.doi.org/10.19173/irrodl.v11i1.794.

36 F. Velghe, "I Wanna Go in the Phone': Literacy Acquisition, Informal Learning Processes, 'Voice' and Mobile Phone Appropriation in a South

schooling leads to out of school learning practices. The study was done on an impoverished community in Cape Town to find out the informal learning practices of illiterate women and women with low levels of literacy. Mobile phone was used as a learning tool and learning was done in a social activity where anyone with knowledge of mobile phones could teach others.

In Sub-Saharan Africa mobile phones are the most prevalent technology being used by youth and adults. The evidence of positive educational value of mobile phones is on providing access to information directly related to the curriculum. This is extremely helpful since textbooks and PCs are sparsely available. However, in the absence of a clear school policy, many problems have been reported on the use of mobile phones in schools[37].

In the three projects mentioned above the purpose of using mobile phones and its link with the problem being addressed was clearly articulated and hence results could be measured. In the example of Sub-Saharan Africa the positive educational impact of mobile phones is only providing access to educational content. Technology in the three cases mentioned above is not solving all the education problems and the design is measuring only specific impact of the use of technology. In the case of using mobile games to improve literacy skills, specific gains in particular areas of literacy could be measured since the design of the game had features to engage and teach the students and then progress them to higher levels. This design of learning works well for out of school children since pedagogy and content are part of the application design. Teachers are not needed for instruction however an adult is required for supervision to

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African Township", *Ethnography & Education*9, no. 1(2014): 111-126. doi:10.1080/17457823.2013.836456.

37 Porter, G., Hampshire, K., Milner, J., Munthali, A., Robson, E., de Lannoy, A., Bango, A., Gunguluza, N., Mashiri, M., Tanle, A., and Abane, A. (2016) Mobile Phones and Education in Sub-Saharan Africa: From Youth Practice to Public Policy. J. Int. Dev., 28: 22–39. doi:10.1002/jid.3116.

ensure that children are interacting with the application for the specified period.

Conclusion

The overall process starting from development to the implementation of technology initiatives in Pakistan needs to be reconsidered. Technology without a design of learning cannot achieve any positive educational outcomes. The educators and policy-makers in Pakistan need to develop a vision for meaningful use of technology in education. The context of Pakistan and the problems being faced in the sector of education indicate that inexpensive technological interventions with the design of learning that can facilitate children to learn individually at their own pace are the most feasible solution to overcome the problems of quality teaching and can also be used to provide educational opportunities for out of school children.