Learning Lab: Inclusive Education using Mobile Devices

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0.0 Paper Summary

This paper will first discuss key educational challenges faced in developing country contexts such as India. These challenges form the operational backdrop for the Learning Lab initiative. It will then seek to outline the role that ICTs can play in ameliorating these conditions, with a special emphasis on Mobile Devices. Following this the document will seek to describe guiding principles for the implementation and use of Mobile Devices. The paper will also briefly outline learning scenarios of value to students, teachers, parents and the community at large. Finally, it will describe aspects of research design, field activities, key findings as well as future directions.

1.0 The Need for Learning Lab

Children in India have almost 100% access to primary school education. Enrolment figures have also risen steadily over the past decade due to expansion of schools and provision of midday meals. However, these positive statistics are in sharp contrast to indicators of low scholastic achievement; numerous studies have revealed student's inability to secure even a basic competence in literacy, oral expression, numeracy and problem solving, even years after attending school.

The most significant reasons for such low academic achievement in developing country contexts are, poor infrastructure of schools, escalating drop out rates, rigid and outdated curricula, lack of classroom resources and poor teacher training and motivation. An analysis of these complex and interrelated factors reveals the urgent need to develop new interventions to capture and sustain student interest and achieve life long learning. The Learning Lab initiative is a response to these educational challenges and seeks to create engaging educational content and innovative Mobile ICTs mechanisms to enhance learning outcomes.

1.1 Lack of Infrastructure

Figure 1: Most government schools lack even basic amenities such as furniture and toilets

A majority of government primary schools in the subcontinent are ill-equipped to facilitate animated learning. While some schools lack basic amenities such as electricity, drinking water and toilets, others do not have proper furniture, playgrounds or adequate lighting and ventilation in classrooms. Though it might appear unrealistic to expect the introduction of relatively advanced teaching aids such as ICTs in such a setting,

governmental agencies and policy makers may no longer have the luxury of addressing inadequacies in a piece-meal manner. Therefore, frameworks that address both immediate and higher order needs are to be created to perceptibly transform the classroom experience.

1.2 High Dropout Rates

Attendance figures at schools receive a temporary boost due to enrolment drives, but retaining these freshly admitted students is an uphill task due to high teacher absenteeism, lack of adequate numbers of staff and low teacher motivation. In the absence of adequate guidance, learners are unable to cope up with curricular demands and choose to dropout of schools. However, projects such as Instructional Radio Instruction (IRI) have been successful in tackling such challenges. IRI has pioneered the broadcast of educational material over radio and has made up for the lack of trained teachers in remote areas. Therefore one can imagine that innovative and engaging educational content delivered through appropriate ICTs may well play a similar role in ameliorating challenges of student retention.

1.3 Lack of Teacher Training & Motivation

A number of factors have lead to a widespread lack of teacher training and motivation. South Asia has one of the highest pupil-teacher ratios in the world and teachers in this region are often overworked and underpaid. Moreover, women teachers are grossly underrepresented in the profession, despite affirmative action in hiring and training them. Apart from these challenges, teachers are under pressure on account of their being young, inadequately trained and not very well educated themselves.

Recognizing these lacunae, distance education programs such as Indira Gandhi National Open University (IGNOU) have devised several technology mediated programs to remotely train teachers. While ICTs have played a valuable role in teacher training, the integration of ICTs in curricular activities may also make it easier for teachers to generate and sustain student interest in subjects as varied as science, social studies and languages.

1.4 Transmissionist Learning Approaches

Educational surveys have revealed that teaching activities are often limited to reading from textbooks, keeping children busy with written exercises, making them read aloud or memorize passages. Children are rarely encouraged to ask questions, or interact with their peers and teachers. As a consequence of this almost exclusive emphasis on learning by rote, students tend to perform very poorly on items requiring comprehension, problem solving and life skills. Other key drawbacks concern the content and design of curricula that has low or no relevance to the everyday activities of children. Resources such as textbooks, maps, charts are also in short supply in most schools. Learning Lab has been conceptualized to address these very shortcomings. Firstly, it seeks to overcome the fallouts of unidirectional teaching methods through the gradual introduction of more inclusive and activity based learning on handhelds. It is also hoped that the creation of educational content based on community resources will make lessons more relevant to students.

2.0 Mobile Device Based Learning Scenarios

The Learning Lab initiative seeks to evolve a set of guiding principles for the implementation and use of Mobile ICTs, keeping in mind the educational challenges unique to the subcontinent. Our longstanding expertise in the ICT domain has also been valuable in our efforts to envision a range of possible use cases, applications and services for mobile devices, which are described below:

2.1 Student-Teacher Centric Learning Scenarios

Studies show that the use of handhelds in the classroom enables learners to transition from an occasional, supplemental use of technology associated with computer labs, to a frequent and spontaneous use of devices to enhance learning. For instance, graphing calculators and 'probe ware' have been found to be especially valuable in field settings when students wish to collect data and visualize it in real time. On the other hand, the desktop functions as a data aggregator and is most useful when students need to analyze data in detail. Teachers may also choose to use the mobile-2-desktop synching function to compare and visually represent the findings of the class as a whole. Over time the desktop may come to function as a repository of knowledge for use by school and community members.

One can imagine several other educational activities using handhelds to enhance learning anytime and anywhere. For instance, students with a camera enabled mobile phone can annotate their everyday biology assignments with pictures of local flora and fauna. Else they may choose to make field notes and share short messages amongst peers using SMS. Handhelds can also come to function as a ubiquitous educational resource, if graphing tools, language dictionaries, logarithmic tables, historical and geographical factoids are bundled along with the device. These functionalities are exciting as they can create opportunity spaces for self-directed learning among students.

Research has shown that Mobile Devices are uniquely placed to foster participatory approach to learning. For e.g. classroom response systems that collect and relay individual student responses to a teacher-initiated question, may aid the spontaneous clarification of common misconceptions among students.

The use of GPS in a mobile form is also an interesting aspect of learning, which can enable students to interpret their neighbourhood and community resources in a new way. Creating such personally meaningful maps may also enhance their conceptual understanding of topics such as social science and geography.

2.2 Infrastructure-Centric Learning Scenarios

The inclusion of the mobile device can prove to be most effective only when it leverages pre-existing technological and community based resources. Moreover, it is important to understand that the Learning Lab project is unique in that it does not adopt a technologically deterministic approach, rather it strives to let user needs and contextual factors shape the choice of technology.

Figure 2: Mobile Devices can be used in conjunction with pre-existing ICT resources

In keeping with this view, the project seeks to explore ways in which the Mobile Device maybe complemented by the T.V, radio or desktop. For instance, Mobile Devices maybe used in conjunction with a public broadcast system or a local cable T.V. network, thereby making educational lessons available to a distributed populace.

2.3 Community-Centric Scenarios

Handhelds have the potential of improving administrative processes and allow parents or other stakeholders to be involved in their child's education in a more proactive manner. For instance, handhelds can enable administrative officers track activities in remote rural schools in a more effective manner. GPRS enabled handhelds may also be included among ICTs used in distance teacher training programs. Moreover, Mobile Devices could be used by supervisory authorities to record data pertaining to individual school performance during field visits. Aggregating this data on a desktop resource can automate and ease the laborious process of evaluating school performance and aid policy making and educational planning.

3.0 Field Research: Strategies and Activities

Field research for the Learning Lab Initiative is currently in progress in Bangalore city in India. Our research methodology comprises of the following components:

Figure 3: The Domlur Government School

3.1 Identification of Field Locations

Initial stage of the field research involved identifying appropriate local government schools in urban and peri-urban areas based on openness to experimentation with technology, availability of basic instructional facilities and amenities such as electricity and water.

3.2 Selecting Field Recruits

The next stage involved selecting field recruits in these schools from a group of 13-15 year old students with a mix of boys and girls. As a part of selection, groups of students were administered a lateral thinking questionnaire, which aimed at bringing out their modes of expressivity. Apart from this assignment specific recruitment tools were also employed. Other criteria included socio-economic class, language as well as interest in exploring technological devices. This part of the field engagement was an active iterative process that sought to build a successful rapport between our field research team and the recruits. The willingness of students to participate in this research as well as the consent of their parents and teachers were considered for final selection.

3.3 Implementing Educational Assignments

The selected students were involved in a set of activity-based learning assignments that were designed in consultation with an educator and other external evaluators. Activities were both curricular as well as non-curricular in nature. Through these activities, students were encouraged to move out of the classroom and bring into play new ways of exploring and understanding their environment, and visualizing this new knowledge. In order to facilitate these various learning activities, an array of mobile devices ranging from GPS devices to rich media capable mobile phones was given to the students. The student recruits were also provided device instructional support including training workshops and freelance device trial sessions.

3.3.1 Assignment I: Curricular Learning Outside the Classroom

Students were divided into four groups of three each, given a camera enabled mobile phone and asked to randomly select a problem statement out of a set of four based on math and science. In general, students exhibited enthusiasm and enterprise while carrying out the assignment. Some groups shared the device as a team whereas others chose to be led by a single student. Students were able to iteratively refine their photo capturing skills upon receiving feedback from their peers or by looking at the image in the phone. Finally, students collated their group project onto a desktop computer and shared findings with peers. Students were able to make a number of creative associations between the assignment and their environment. For example, students captured the images of ‘roads, signboards, a celebrity poster’ as examples of communication devices.

Figure 4: Students using image capture for a science assignment

3.3.2 Assignment II: Exploring Locative Media

The second assignment consisted of a series of non-curricular activities. The activities were designed in collaboration with a research graduate from RCA.

In order to gain insight into students' attitudes and approaches to visual expression, they were asked to draw in response to a variety of questions such as, 'What are the places you would show me in Bangalore? Which is you favourite festival? Present your idea of 'personal space' through a drawing'

Figure 5: Students proudly display their drawing assignments

Many of the drawings made by children were interpreted as being aspirational in nature. Following this, 3 boys and 2 girls were recruited for the subsequent parts of this assignment. Tasks differed in their degree of complexity and extent of technology usage. Individual task statements were as follows:

a. Draw your way to and from home to school using pen and paper.
b. Use GPS devices to create GPS tracks of the same route.
c. Synch this GPS data onto a digital map of Bangalore with a desktop computer.
d. Textually annotate landmarks of your choice by using the 'way point' function on the GPS device and layer this information on the digital map.

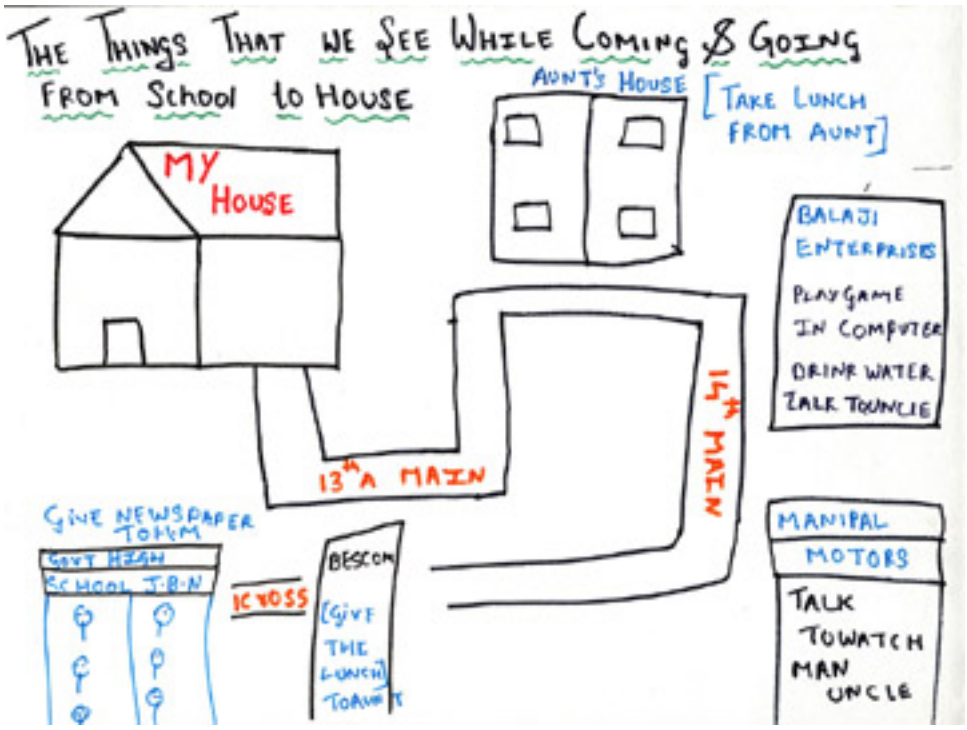

Figure 6: A student creates a route map of his path from home to school

After this set of tasks, students were given an analog camera along with the GPS device. They were instructed to keep the GPS device 'on' throughout to plot their track and assigned tasks such as:

e. Take pictures of your favourite things to familiarize yourself with the working of a camera.
f. Click images of landmarks or things that catch your attention enroute to school.
g. Capture images of things that make you happy, are forbidden to you or things you dislike.
h. Manually locate these photos and layer them on the digital map using the GPS data you have collected

Figure 7: Students are introduced to the GPS device through training workshops

Figure 8: A student captures his parents at home to annotate his affective map

The ‘affective’ maps that synthesized photographs and individual GPS tracks overlaid on digital maps were uploaded onto an internal website. This assignment was also paralleled by a task that instructed students to create a physical map of resources in their neighbourhood to represent locations which had a personal connotative element.

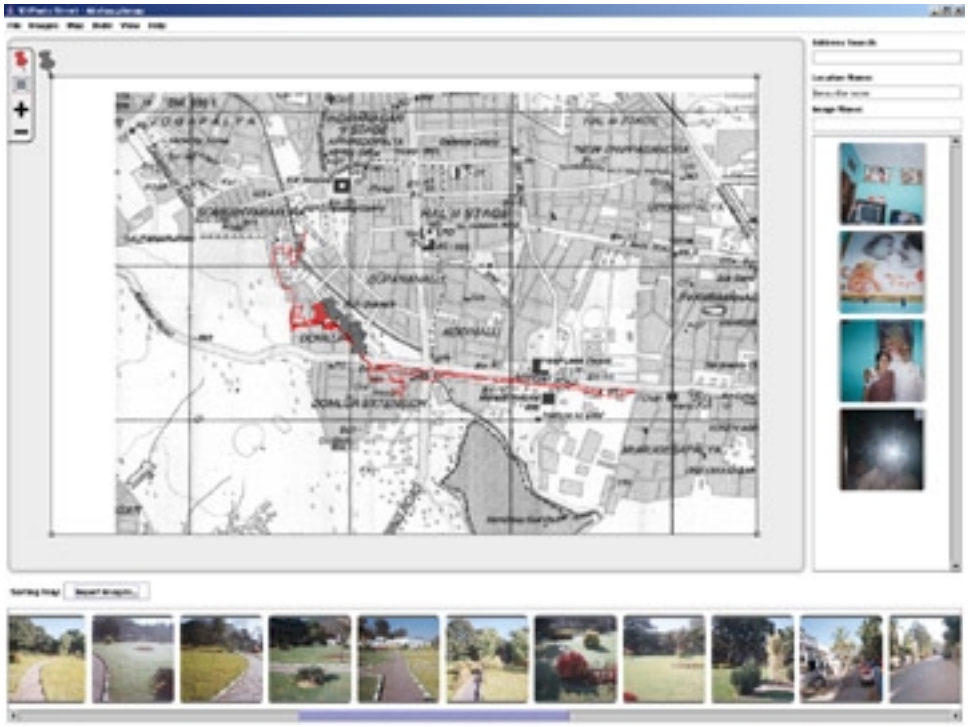

Figure 9: An example of an affective map layered with GPS track data

These exercises helped students develop a highly personalized and individualistic understanding of spaces around them.

4.0 Conclusions and Future Directions

Our engagement with research subjects was documented aurally, through still photographs and video. An analysis of these various kinds of data revealed that children that were keenly interested and perceived definite value in the research tasks they engaged with.

Researchers also noted that students demonstrated a progressive level of comfort with devices. They were able to navigate device interfaces and comprehend concepts such as GPS successfully. In light of this we hope that students will be able to use advanced features with an increased degree of confidence and intuition.

Due to the model of iterative engagement, students were given a chance to work on small experiments before progressing to more complicated tasks. During this course of interaction, students took greater initiative in planning and structuring activities and were able to devise creative strategies for the completion of projects. Their ability to collaborate productively and communicate within a group was also enhanced. These observations lead us to hope that students will continue to use such ‘self directed’ and ‘participatory’ approaches for learning even in the later stages of research.

However, the key outcome of the research was that students were able to make connections between textbook based information and the world around them in new

ways. These positive feelings are echoed in the words of a student who said “I wish all my classes were as exciting, and then I would never be caught dozing in class…”

In the next phases of research we seek to test the feasibility of distributing educational lessons over the mobile phone. We will also seek to better understand the notion of play and gaming practices in order to develop new edutainment applications for handhelds. We hope that in the coming few months the Learning Lab initiative will also broaden its ecology of institutional and technology partnerships and carry out field testing in increasingly diverse educational institutions.

5.0 References

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