Azim Premji Foundation

"SHORT SNIPPETS GO A LONG WAY IN MAKING CLASSROOMS EXCITING"

Summary of a pilot study on Alternative Technology Experiment in classrooms

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Introduction

Azim Premji Foundation is a not for profit organisation with the vision to significantly contribute to achieve quality universal education that facilitates a just, humane, equitable and sustainable society. The Foundation partners State Governments across the country in implementing initiatives that have the potential of improving the quality of Education. Amongst the various initiatives that were initiated/supported by the Foundation is the Computer Aided Learning Programme

The Alternative Technology Experiment (ATE) was borne out of the learning from nearly 7 years of engagement with the Computer Aided Learning Programme (CALP) in 13 states across India and in about 16017 schools by the Azim Premji Foundation. The ATE was formally initiated by Technology for Education (TfE) function of Azim Premji Foundation.

The CAL programme was essentially based on provision of computers by the respective State Governments to Government Higher Primary schools and Azim Premji Foundation supporting the programme by providing Digital Learning resources (DLR), without any costs, and also facilitating training of Master trainers and in the initial phases extending monitoring support through the field staff of Foundation in respective States. The objective of the programme was to attract and retain children in school and to enhance the learning experience for children.

The experience with the programme brought into sharp focus the inherent issues with use of technology in a resource poor context. These included *infrastructural issues* such as poor availability of power and equipment maintenance, untenable student-computer ratio; *pedagogic and capacity related issues* such as lack of adequate knowledge of teachers on the concepts dealt with in the DLR, long (30-40 minutes) duration of the DLR, perceived lack of alignment with the syllabus, lack of comfort with use of technology; *logistical issues* such as time tabling for the computer lab etc.

This led to some rethinking on a different approach to the use of technology in schools which could address at least some if not all of the above issues. This re-thinking could be captured as under:

It was felt that the use of technology in classrooms would be greatly enhanced if,

1. Use of digital learning resources did not depend entirely on the extensive use of computers.
2. Equipments that were used required less power, had inbuilt power back up and thereby mobility between class rooms.
3. Moving children from class room to lab environment was obviated and there was also no need to rework on the time table.
4. Inadequate student – computer ratio did not hamper the learning process.
5. The digital resource had a shorter duration that did not pose any threat of jeopardizing the academic calendar and facilitated use for the entire class in a single period. This was critical as it removed the need for the teacher to plan separately for

the 'left out' group as in the case of group of children who were not inside the computer lab.

6. Teachers could afford to spend time in viewing the digital resource and could build the lesson plan around the snippets and also prepare themselves for delivering the lesson along with the digital resource.

7. The use of the device required minimum technical capability.

8. Teachers were in control of both technology and the learning process which would tremendously increase their comfort levels.

The Alternative technology experiment involved the introduction of an *LED projector*, a *laptop* and 8 *short duration video snippets* in 12 select schools. To begin with, ATE envisaged the use of these video snippets in classrooms through a portable LED projector fitted with an in built battery. However due to certain extraneous factors the batteries could not be procured and the projectors were introduced in schools without them. Eventually, the laptops that were already provided to these schools came to be used for viewing the snippets.

Beginning in the year 2008-09, the experiment was conducted on a pilot basis in 12 schools situated in Bangalore urban and in rural areas of the districts of Ramnagar, Mandya and Kolar. These 12 schools were already part of the Computer Aided Learning Programme (CALP) having computers provided by the Foundation (in 9 schools in 2002) and by State government of Karnataka (in 3 schools in the years 2003/05) and content i.e., Digital Learning Resources (DLR) provided again by the Foundation.

Preparations and introduction of the alternative technology in schools

The alternative technology experiment in the 12 experimental schools was supported by Quest Alliance (USAID, Alcatel Lucent) and Qualcomm. With the support of participating agencies/corporates, the schools were provided with additional computers, laptops, LED projectors, content specially developed for whole class viewing (short duration video snippets) and internet connectivity with subscription support for two years. At the close of the Quest project in 2008-09, Foundation had obtained concurrence to use the available funds for purchase of short duration video snippets. Preceding the purchase of video snippets, TfE had facilitated a comparative study/analysis of short duration video snippets developed by 4 developers in two workshops comprising of teachers and members of our Academic and Pedagogy team which were held at Shorapur and Bangalore. Subsequently, with the support of A&P team, TfE could zero in on 8 snippets[1] related to concepts taught in 5th standard (Mathematics and Science). The snippets were introduced in the 12 schools June/July 2009 after a preliminary study by the Research team of Azim Premji Foundation.

Preliminary study:

A preliminary study was conducted prior to the introduction of LED/content to ascertain the current pedagogic practices of the teachers, the topics they considered difficult to teach, their attitudes to the DLRs currently available to them. Briefly, the findings were that teachers,

[1] The snippets comprised of Bharatiya Vidhya capsules procured from JIL Information Technology limited (part of Jaypee group)

(i) followed the traditional modes of teaching,

(ii) did not use the available DLRs to any significant extent.
(ii) had low confidence / fear of using technology

The preliminary study to a certain extent also served as a training needs analysis which informed the process of training of teachers on both technical and academic related concepts, a pre-requisite for the project. Attempt was made during the training to also improve the attitudes of teachers towards use of Digital Learning Resources. Subsequently, the LED projectors were introduced in the 12 schools along with day long academic and technical training for specified teachers and head teachers in each of the schools.

Objective of evaluation of the LED experiment

After more than a year of the introduction of the alternative technology in schools, it was necessary to find out if the short duration video snippets had been used and how. An evaluation study was conducted with the objective of determining the various factors that contributed to the use or non use of the resource by teachers to inform similar future initiatives. The research question therefore was, "***what are the factors that have contributed to the use or non use of the video snippets by teachers of the 12 project schools where they were introduced under the ATE project?"***

Methodology

In order to facilitate the evaluation process, the research question was broken up into smaller issues /questions:

1. Ascertain logistics/ subject content and pedagogy related issues faced by teachers while using the DLR
2. Explore the different ways in which the DLR has been used by the teachers
3. Explore the variety of ways in which teachers have extended the use of the DLR (e.g. creating other TLMs based on the DLR content)
4. How did the teachers actually go about using the video snippets in the classroom?
5. Did the students find the content useful, if so, how?

As most questions that need to be answered at the end of the evaluation are of a qualitative nature, the methodology chosen was as follows:

- school visits
- one on one interviews
- class observations and
- focus group discussions

School visits: Visits were made to each of the 12 schools to individually ascertain whether the DLR resource was used or not. Checklists were used to gather data through observation of the school, by talking to the head and teachers who were meant to use the DLR. The school level details were gathered on the usage of the resource, the level and nature of involvement of the Head Teacher, issues related to access and logistics etc. If the school was found to have not used the resource to any significant extent, there was no further data

gathered beyond the checklist which also included information on the broad reasons for the non use of the resources.

One-on-one interview: This was conducted in schools that were identified as users of the technology. All teachers who had used the video snippets and were present in the school at the time of the visit were interviewed (The teams' visit was intimated to the schools and a request made for the concerned people to be present that day). Teachers were approached individually and a detailed account gathered using a structured interview format on aspects relating to their use of the resource namely on logistics, content, pedagogy. The Head teacher of the school was also interviewed to gather information on the technical and logistical support that was made available to the teachers for the use of the video snippets.

Group discussions: In some schools, particularly those in which the technology was used rarely, where the situation warranted a discussion involving all members present, an FGD was done with teachers. A section of the students were involved in a short interaction with the objective of ascertaining the students' response in terms of relevance and learning if any.

Class observations: This was conducted in one of the schools to give an indicative if not representative idea of the teachers' best effort in handling the resource in the classroom. This observation was meant to provide insights into gaps that may exist in the manner in which the resource was used and assess if the intended objective of the use of the DLR matches with the actual one.

The following Research tools were developed to aid the data collection (see annexure)

1. Checklists for school visits
2. Semi structured schedule for interviews with teachers
3. Format for observation of classroom demos,
4. Discussion points for teacher and student group discussions

Summary of the findings

The findings of the evaluation collected through the school visits, interviews, discussions and observations can be represented under three major headings namely logistics, content and pedagogy. A detailed account of the above issues for *each of the 12 schools* has been provided in the annexure. Presented here is a compilation of the findings across all schools to give an over view of findings.

There were some general observations made across the schools that do not exactly pertain to the manner of usage of the video snippets by the schools but rather to the introduction of the alternative technology (Laptop/LED projector/video snippets) by the Foundation itself. These need to be stated at the outset. As already stated in the introduction, the ATE involved introducing the LED projector which along with the laptop would be used by the teacher in the classrooms to primarily project the specially developed video snippets. The original plan of the ATE was to provide the LED projector with an in built battery but this did not happen due to certain extraneous factors. Therefore, the lack of a portable power source to run the LED projector, led to it *not being used at all in the classrooms as envisaged*. This was because most classrooms either lacked the required electrical plug points to connect the projector or they did not have reliable power supply in the classes or both. In most schools, the LED projector was never used in the classroom. Wherever it was used, the CAL room or the computer lab was typically the space that was chosen due to the UPS that was already available there. Alternatively, in many schools, the teachers had taken the laptops into the classrooms and used them directly for students to view the snippets.

On a slightly different note, it needs to be specially mentioned that the encouragement given by the Foundation field coordinator of the project to all schools, head teachers and teachers to use the resources without fear has had a significant impact in increasing the usage. Almost in every school, the teachers and head teachers quoted him as saying that they should not fear about any damage and he would be happy if the equipment was damaged due to use rather than remain unused. The flipside to this was that in a couple of cases, the laptops did get damaged but could not be repaired due to the expiry of the annual maintenance contract soon after being introduced in schools[2].

Findings on logistics related issues

The main issues with regard to logistics were:

- Factors pertaining to use of the resources provided under the ATE project in the school.
- Access of the teachers to the resources.
- Technical issues and problems involved in the use of the resource such as availability of power.
- Comfort level and technical competence of the teachers.

Out of the 12 schools where the DLR was introduced, it was found that it was used in 8 schools. The use ranged from fairly good use and moderate use in 4 schools each. Non use was limited to 4 schools[3].

Teachers' use of video snippets in the classroom in the 8 schools in the project period (2009-2010)				
Name of school	**No. of Teachers that used the video snippets**	**Average no. of students per grade[4]**	**No. of times of use of snippets by each teacher**	**Pattern of LED projector/ Laptop use**
GHPS, Nagawara	2	32	4-5 times	Projector & laptop in a specially dedicated classroom
GHPS, Tagachgere	3	32	3-4 times	Projector & laptop in the CAL room and laptops in classroom
GHPS, Gandhinagar, Kolar	2	43	3-4 times	Mainly laptop in CAL room/ classroom
GHPS, Chikkatirupati	1	24	4-5 times	Projector & laptop in CAL room
GHPS, Sheegehalli	2	28	3-4 times	Initially projector & laptop in CAL room, later only projector in CAL room
GHPS, PC extn., Kolar	1	28	2-3 times	Mostly on laptop in classroom/ CAL room
GHPS, Malluru	1	61	2-3 times	Projector & laptop in CAL room
GHPS, Mandur	1	37	3-4 times	Projector & laptop in CAL room

[2] There was some lag between the sourcing and deployment of the laptops.

[3] *Fair use*: All the video snippets were used by the designated teachers at least a few times among students along with some degree of integration with the regular topics being taught; *Moderate use*: A few of the snippets were used by the teachers at least once or twice as part of regular teaching; *Non use*: Teachers had just shown the snippets to students but not as part of their teaching or not used them at all.

[4] In all schools students of grades V-VII were involved

The maximum possible utilization of the alternative technology could be said to have happened in one school (Nagawara) where the Head Teacher made some innovative utilization of the solar power provided to the school under a different project. He also designated a vacant classroom for the set up and teachers wanting to do a class using the snippets could bring students to this classroom and the connection to the solar panels meant assured power supply. Such champions were found in a few other schools as well (Tagachegere, Chikkatirupati, Mallur) and they were people who for whatever reason took a special interest in the use of the technology. It could however be seen that they all had one thing in common, they were all comfortable or at least not threatened by technology. The presence of such a person who was slightly more technically savvy with the technology seemingly made all the difference in the technology being used or completely discarded. Such *champions* came from unlikely quarters as a PT teacher (Chikkatirupati), or a Head Teacher (Nagawara), and a fellow colleague (Tagachagere and Mallur). They had not only used the resources fairly extensively themselves but also ensured that the others used the resources optimally by helping them entirely or handholding them while using the technology. However a flip side of this was that when the champion left the school (Mallur) the use of the resource suffered significantly.

In general however, in nearly all schools, a few teachers expressed varying levels of discomfort with the use of the technology. They were comparatively more at ease with the use of the laptops than the projectors. The issues could be as minor as being unclear about which electrical cord went into the laptop and which went into the power and so on. Despite assurances teachers were mainly apprehensive about making a mistake leading to damage of the equipment.

In some schools there was a computer resource person already in school (not as part of the project), which was a factor that also contributed to the usage of the resource (Sheegehalli, PC extn. Kolar, Mandur). This was not without drawbacks either because, the teachers seemed to rely almost entirely on the resource person and except for one or two really interested ones, did not make any attempt to learn the technical aspects. When the computer resource person moved on (Mandur), the usage was affected.

Apart from the above there were some curious logistical issues that developed in certain schools that affected the use of the resource. The allocation of responsibility of the resource was typically entrusted to a teacher depending upon either their interest in technology (Tagachagere), or availability of time (Doddashivara, Maddur). This did not always work in the best interest of all. While in the case of the one school (Tagachagere), the teacher acted as a catalyst, but in the case of another (Doddashivara), it was the opposite. Here, the Hindi teacher who was given the charge of the computer lab along with the digital resources it contained, to all appearances seemed to have made it difficult for the other teachers to access the same. In another school (Maddur), the computer lab in charge reportedly wished to control the use of the resource and did not allow free access to fellow teachers.

There was yet another instance of an individual's actions influencing the pattern of the use of the resource. The Head Teacher of one school (Hemmanahalli) denied free access of the laptop to teachers by retaining it at his residence. The LED projector was also never used in this school as the power situation was reportedly quite critical.

Apart from individuals and their influence on the pattern of use of the resource, there were other technical hindrances that contributed to the low or non-use of the resource. The laptop given to one of the schools (Maddur) developed technical difficulties very soon after deployment and could not be rectified even after concerted efforts by the Foundation field

coordinator of the project. In some schools there were some minor technical hitches which the schools were unable to sort out on their own. Sometimes an interested teacher or Head teacher, with the support of the Foundation field coordinator of the project rectified the problem (for e.g., Tagachagere, Nagawara). In a few other cases, the school teachers/ heads failed to bring the issue to the notice of the member (Gandhinagar, PC extn. Kolar, Mallur). This was most notable in the case of a school (Gandhinagar) where the Head teacher was known for his activist role in the community in solving long standing problems. He however had not taken the initiative and contacted the Foundation field coordinator of the project to report a technical problem in the LED projector.

In two of the schools, there was an unprecedented and exceptional problem that affected the use of the resource. In one school (Sheegehalli), the laptop was stolen leading to severe break down of interpersonal relationships between the Head Teacher and the rest of the school. The existence of the CAL room resources helped the use of the LED projector in this case. Whereas in another school (Maddur), not only was the laptop damaged but the CAL room was also ravaged by rains ruining all the computers, leading to the complete non use of the LED projector.

Finally it must be noted that as per the recommendations of the preliminary study of the project, a detailed training was conducted both on academic as well as content related issues. A significant number of teachers recalled the training but could not remember the technical aspects. Except for one teacher (in the Gandhinagar School) the rest had not endeavored to retain the training manuals for their reference. Nearly all teachers who had used the resource either minimally or frequently felt a refresher course would be useful to brush up on the technical aspects.

Findings on content related issues

The main issues related to content were those that relate particularly to the snippets that were provided to the teachers which include,

- Patterns of use of different snippets and reasons for the same
- Relevance of the content of these snippets to the classroom as perceived by the students and teachers
- Problems and issues connected with the content of the snippets and suggestions for further improvement and development if any

In general, teachers seemed to consider the snippets to be a valuable resource. The main reason at least as stated by the teachers was the closeness of the content to the subject matter given in the textbook.

Name of the snippet	Used for Grade level	Subject/ topic
Waste disposal methods	4,5,6,7	Science/ Gobar gas
Formation of soil	6,7	Science/ Soil
Removal of impurities of water	4,5	Science/ Water
Soil erosion	6,7	Science/Soil
Forces	4,5,6	Science/ Force
Patterns and designs with circles	5,6	Math/ Circles
Geo-board	5,6,7	Math/Geometry
Volumes	5,6,7	Math/Geometry

Teachers also felt that the snippets had the following positive features:

- Attractive – the colorful visuals and animation that held the attention of the students and helped them to connect and retain what they learnt about the topic in class.
- Unusual - the format of the snippets was unusual in that it was without audio and was very short and focused
- Interesting – the snippets were visual representation of interesting and uncommon phenomena/ processes that cannot be easily described in words such as formation of soil, waste segregation. They also provided the teachers with useful information on the topic.
- Relevant – the teachers appreciated the fact that the content was on topics that they taught and were in the textbooks.

Among the eight snippets given to teachers, all of them were used by teachers and declared to be useful. There was no snippet which the teachers felt would not be useful or would not be relevant to the students' learning. However there were a few snippets that seem to have been popular among teachers a little more than the others. These were geo board, volumes, waste segregation, soil formation and patterns with circles. Removal of impurities of water was perhaps the least mentioned.

I have learnt about geo boards even in teacher training but after seeing the snippets I made one myself and then got a carpenter to make few more for the students to use in class. It was very useful" – Primary Teacher, GHPS, Sheegehalli

It was seen that the snippets had an undeniable 'stickiness' about them which came across from the way teachers and students alike were able to recall the topics with ease even in schools where the resource was used just once or twice. In a couple of schools where the teachers had reportedly just seen the snippets once during the training could clearly recollect nearly all of the topics (Maddur, Doddashivara). Some teachers even claimed that they themselves gained greater clarity on the concepts after viewing the snippets. They felt that since the concepts were on hard to explain topics, it would help students understand and retain the concepts better.

"Recently we had celebrated 'Kanakadasa Jayanthi' in school. I had to prepare a speech for this. I couldn't find any information in books. I decided to try the internet and I found what I needed" – Primary Teacher, GHPS, Gandhinagar, Kolar.

Teachers who had gained a certain amount of comfort in using the technology also had begun exploring on other possibilities for using the same resource. Here was where the internet card given to the teachers had come in handy. Teachers had used the internet to search for further resources and had probably found it the easiest to download images related to topics they were teaching and show these to students.

Teachers did express their wish to have snippets on more topics but un surprisingly, these were all topics from the syllabus. The closer the snippets were to the textbook content the greater was their perceived relevance. An example of this could be found in a remark made by one teacher on the snippet that shows children how to make designs while reinforcing the concepts related to circles. The teacher felt that this would merely get children interested in

the designs and instead it would be better if the snippet dwelt on specific concepts like chord and segment in circles. A list of subject wise topics requested by teachers is given in the annexure.

Findings on pedagogy related issues

The main issues related to pedagogy were

- Manner of usage of the snippets among the students,
- Effectiveness of the teachers' handling of the snippet as part of the regular teaching learning processes,
- Integration of the use of snippets in the classroom processes, suggestions for further improvement in this area.

The best way in which the resource had been used was as one of the TLMs as part of a lesson taught by the teacher on the topic (As observed in Nagawara and as reported by teachers in Tagachegere, Gandhinagar, Sheegehalli and Mandur). In these schools, the snippet viewing was only a part of the entire lesson which included teacher explanations, exploring use of manipulatives like the geo board or practical experiences like waste segregation and visit to a local gobar gas plant etc.

> *"We had dug pits in the school compound for bio degradable and non degradable substances as shown in the snippets. Our teacher also took us to see a 'gobar' gas plant in the village after seeing the snippet on making of gobar gas"* - Students of class 7, GHPS, Tagachegere

The other end of this spectrum was where teachers had merely shown the snippets to the students allowing them to make their own sense of the topic (as reported in Chikkatirupati, PC extn. Kolar, Mallur and Kootagal). Students to their credit did recollect the topics further endorsing the stickiness factor of the snippets even in the second category of schools. However, when probed as to how the snippet that was only for four minutes could be viewed by students for an entire period on their own, the teachers admitted to using the projector (to show snippets or cds) to keep students occupied when a teacher was absent or could not be present in class for whatever reason (Mandur).

As stated before, teachers could immediately relate most of the topics of the snippets to their syllabus and this was perhaps a big reason for some of the early adoption which going by previous experience in the Foundation is usually not the case when it comes to technology. The teachers typically went about deciding on the snippets they would use with students based on the topics they were teachers at a given point of time. Teachers were either allowed freedom to choose what they wanted or the HT assigned specific topics to each teacher (eg. Tagachegere). In the latter case, it had the advantage of all snippets being used by at least one teacher as opposed to some being left out.

Teachers mentioned that they would watch the snippets themselves more than once and then would plan a lesson based on the topic. Some teachers mentioned that they also discussed among themselves before planning. They would then begin the lesson with the students with the usual introductions and then do the classroom activities. The students would then be brought to the computer lab and shown the snippet. Or alternatively, would be shown the snippets in the classroom using the laptop. The teacher would typically show the snippet once and then play it once again this time pausing every now and then to explain.

Used purely on their own, the snippets did not lend themselves to more than traditional teacher talk in the classroom with the visuals providing an element of novelty and interest. It would be safe to say that for the most part the snippets had only been used in this manner. It however cannot be denied that the learning of the concepts by the students had nevertheless been achieved irrespective of the manner in which they had been transacted by the teachers in class. However as demonstrated by one teacher (see box), the snippets could be integrated effectively into the lesson and classroom process made more interactive. This teacher had also extended the use of the snippets by developing accompanying TLMs which was perhaps the ideal way to use the resource.

It was a class 6 Math lesson, and the Head Teacher was teaching the topic of 'area and volume of quadrilaterals'. The classroom was fitted with the LED projector and laptop. The solar power given to the school under the EDC programme had been innovatively connected to LED equipment thereby ensuring uninterrupted power. The HT began with a verbal introduction showed students the related snippet on geoboard. An actual geoboard was shown to students with a demonstration of the shapes on it. This was followed by a snippet on quadrilaterals. The teacher also uses some low cost TLMs to demonstrate the concept of volume. Towards the end, students are given some problems. The HT later said that the snippets had given him the idea of preparing the TLMs which were highly useful in reinforcing concepts.

There were a few other pedagogical issues that could not be satisfactorily explained by the teachers:

i. How long could they conduct the session in the computer lab when the snippets were themselves not more than 5 or 8 minutes?
ii. Bringing students to the computer lab would pose problems in terms of availability of space for all students to sit comfortably and watch.
iii. The computer lab could be in use by another class which meant that teachers would need to coordinate with the other class teachers to ensure availability of the lab space at the right time.
iv. Bringing the students back and forth would require considerable amount of time and that may by itself act as a deterrent for repeated use. Teachers did admit that bringing students to the computer lab was probably not the best solution and therefore they sometimes just took the laptops to the classrooms and had students view the snippets. But here again the issue of visibility for all students would become an issue.

A typology of use of the video snippets by teachers

A brief typology of the manner in which teachers used the video snippets is given here (For a detailed account please see annexure iii).

Type-A schools:

1. Teachers either chose the video snippet according to topics they currently taught or were assigned specific snippets by the Head Teachers.
2. In one school, students were brought to a designated room where the class was conducted and snippets were viewed as part of the lesson. In most other schools, teachers conducted class in the usual manner and at the appropriate time during the lesson students were either brought to the CAL room or the laptop was carried to the classroom for the purpose of viewing the snippets. Teachers found the latter to be less time consuming and therefore have done that more frequently.

3. Teachers could themselves gather more information on the concepts by viewing the snippets. In some cases they had derived ideas from the video snippets to develop further TLMs (e.g., geoboard, geometric manupulatives). Some of them tried to integrate the lesson with the DLR by getting students to segregate wastes by making garbage pits in school, taking them to visit a gobar gas plant in the village, by structuring activities around the concepts in the snippets.

Type-B schools:

1. Teachers had chosen snippets according to the topics each of them taught. They conducted the lessons as usual in class and brought students over to the CAL room to view snippets and would explain the same to them.
2. Sometimes, students were made to view snippets without adequate explanation, as a means to keep students occupied when teachers were absent.

Type-C schools:

1. Students merely viewed the snippets without any lesson being structured around them.
2. The resource was never used in any manner either by teachers or students.

Issues and Challenges

The major issues and challenges that arose during the implementation of the pilot deployment of the LED projector and laptop can be summarized as under.

1. **Infrastructural issues**: Lack of regular power supply and thereby the reliance on the UPS in the computer labs for use of the digital resources has meant that the snippets were not used in classrooms as originally envisaged. This had significant implications in terms of pedagogy as students had to be pulled out of the classroom to view the snippets rather than being integrated seamlessly into the lesson. This also had implications in terms of frequency of usage of the snippets as teachers found it cumbersome to take students out of class every time the resource needed to be used.
2. **Technical issues**: The failure of the technology and the inability of the teachers and head teachers or in some cases even the Foundation (due to unavoidable factors such as the expiry of AMS) to rectify these problems presented a significant challenge in some of the schools and resulted in the project coming to a standstill.
3. **Issues related to teacher competency**: Teachers expressed varying degrees of comfort or discomfort in dealing with the technology. Despite what seemed by the teachers' own admission a memorable technical/ academic training, teachers for the most part, had difficulties such as connecting the LED projector and the laptop/ computer, rectifying small problems like the screen not appearing on the projector, volume settings being low and so on. In some cases even the computer resource persons available in school were unable to rectify these seemingly minor issues.
4. **Issue of sustainability**: It was evident that the presence of at least one interested teacher or motivating head teacher was a pre requisite in pushing the use of the resource forward. It was also observed that if that particular individual moved out of the school for whatever reasons, the program could not be sustained and suffered a setback.

Factors that contributed to the implementation of the project:

1. At the level of content, the video snippets were perceived by teachers to be useful and relevant:

    a. The very short duration of 3-5 minutes and content completely aligned with identifiable text based topics contributed to the 'stickiness' of the snippets.

    b. Teachers felt that viewing the snippets in addition to their explanations helped students to learn and retain the concepts better.

    c. Teachers could themselves learn new things themselves about the given concept.

2. In terms of pedagogy, the video snippets lent themselves to being used by teachers alongside their regular/traditional form of teaching.

3. Some teachers were able to take ideas from the video snippets to create hands-on TLMs to promote participation by children in the class room.

4. In terms of logistics, the presence of one interested teacher per school made all the difference in the use or non use of the technology.

5. In schools where the resource was used, the head teachers were either found to play an active role or at the least a non-interfering one.

6. To a certain extent teachers seemed to have overcome their fear of technology. They however seemed more comfortable with the use of laptops than the LED projectors.

7. The LED projector could not be used in some schools due to technical factors but teachers were undeterred by this and used the laptop instead for students to view the content. This was clearly an evidence of their motivation to use the snippets.

8. The use of laptops in classrooms was at a sub optimal level but the fact that teachers did use them to show the snippets is an indication that a classroom based digital resource of shorter duration would have a greater potential for usage than a computer lab based one.

9. The internet facility was a further aspect of the alternative technology that induced a few of the teachers to download images for projecting/showing in class rooms or access information through Google/Wikipedia.

Factors that led to the non implementation of the project:

1. Absence of a reliable power source and sometimes even the lack of plug points in the classrooms were a significant impediment to the use of the alternative technology.

2. For the experiment to be executed exactly as envisaged, the laptop and the LED projector needed to be used together. But due to the lack of an inbuilt battery as originally envisaged, the projector could not be used in the classrooms.

3. Due to these infrastructural issues, in schools where the projector was used, students had to be taken to the CAL room which was contrary to one of the key premises of

the project which was to integrate technology with regular classroom teaching to as to avoid moving children from one place to another.

4. Teachers continued to have difficulties in handling/ connecting the LED equipment competently. They seemed relatively more comfortable with the laptop the use of which was, as already stated, at a sub optimal level.

5. Besides the above, one emerging concern was that, in terms of pedagogy, the snippets on their own did not contribute to any major change in the traditional teaching methods that the teachers were familiar and comfortable with. Typically teachers could continue with their usual teaching and include the snippet at some point in the lesson as a novelty factor.

Conclusions and Recommendations

1. Despite the shortcomings, the evaluation study clearly shows that the short duration video snippets were used by teachers to a greater extent compared to other kinds of technology and digital resources (particularly the existing DLRs) that teachers have hitherto been exposed to. The study therefore recommends the format of short duration snippets as a model for creation of digital learning resources.

2. The study found that the classroom based DLR or resources which facilitate whole class viewing had a greater acceptance among teachers over a computer lab based learning resource. It is regrettable however that the use was only at a suboptimal level due to the use of laptops in the place of the LED projectors. This makes it exigent to make available a portable, classroom based technology complete with in-built batteries as originally intended for the LED projectors. It is also necessary to ensure that classrooms are fitted with electrical outlets and plug points.

3. The finding that the presence of a technically savvy 'champion' in the school helped promote the use of the DLR is something that could be leveraged in future initiatives of this kind. Such potential 'champions' could be identified and helped to play their role more effectively. This will of course need to be done with sensitivity to local conditions and teacher sentiments. Attention must also be given to the sustainability of such efforts in the event of a 'champion' leaving the school.

4. While there was acceptance of the resource among teachers there were technical and pedagogical issues in their using the content effectively. It is therefore recommended that the introduction of the resource be accompanied by hands-on technical and pedagogic training, the latter particularly in terms of learner engagement, for teachers and heads in a phased manner perhaps over a longer period of time.

5. While the objective of using the Digital Learning resources i.e. short duration snippets by teachers as part of teaching learning process was largely met (either through LED projectors or laptops) it should be further explored on how further empowerment of teachers can happen through redesigning of content with teacher involvement and integration of the same with improved pedagogic practices.

6. It also came to light that timely support in the initial stages of using the technology played a major role in its continued usage. It also was equally the case that inability to ensure the same resulted in the discontinuance of the usage. It is therefore imperative to ensure ongoing support and handholding of teachers for a longer duration especially to tide over technical glitches that may arise.

Directions for future research

The ATE appears to be a very promising approach to addressing the issues relating to greater and better use of digital technology in class rooms. There is a clear need to carry out a more extensive and detailed research on this. There is an opportunity for research and action on several lines. The following ones could be pursued more specifically:

- Integration of a classroom based technology with classroom processes while at the same time ensuring improved pedagogic practices of the teachers.
- Creation of content for the Digital learning resource in a collaborative manner with teachers in keeping with the larger aims of NCF 2005 in order to ensure greater receptivity and potential use of such resource.
- Evaluation of solutions to address the problems of electric power. (Separate efforts have since been initiated by the Foundation to develop appropriate power / battery back-up for the LED projectors.)

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