Asha Kanini Software Proposal

Background:

The Asha Chennai chapter of Asha for Educ

ation has been working with government schools to try and improve the quality of education since 2003. Our primary strategy has been to appoint teachers in schools that have insufficient number of teachers, provide training to our teachers and to government teachers, provide materials to aid the teaching at the school, and improve the infrastructure at the school to make it effective.

Using technology to improve the education has always been part of our goal. In the years 2005 to 2008 we developed ECTAL (Educational Contents for Technology Aided Learning), a comprehensive set of presentations to teach more difficult concepts in all subjects from 3rd to 8th standard. In 2008 we donated 100 computers from Inautix to the schools we support. We have been maintaining computer labs in these schools and have been using these to teach the children about how to use computers. We subsequently added English lesson recordings from Samacheer english textbooks to make sure that the teachers were able to use it to teach children to read with the correct emotions for the context and also to make sure that the words are pronounced properly.

Asha Kanini - Background

In 2015 we set out to tackle these issues and started more actively engaging with the classroom process and enhancing our content offerings by including content from government as well as free resources available from the Internet. These efforts over the last 3+ years is documented in our project page.

We identified the best content available for teaching English, Mathematics and Science and assembled them for use by our teachers. All these contents were mapped to the Tamilnadu Samacheer Kalvi curriculum. We created the Asha Kanini software for teachers to select the appropriate content available for the lesson they are teaching. Where we found gaps we also developed our own content to fill them. Appendix I details the contents that we currently have and which is made available through the Asha Kanini App. Appendix II details the features of the current Asha Kanini app as well as the features that are planned for the future.

The ultimate goal is for Asha to develop software that can be handed to the Tamilnadu Government for dissemination in all their schools and work with them to make the project successful. To achieve that goal we will break the goals down into two broad categories - Content and Software Platform.

Problem - Challenges and Learnings from the Past:

1. Teachers lack sufficient skills to effectively teach children in the primary schools. Their Maths skills are barely adequate for themselves to solve problems as this level. Their English skills do not even meet the requirement of a 4th or 5th standard student let alone be able to teach them.

2. Further the government teacher training programmes are also not effective in addressing these gaps. There are huge gaps between the intentions at the top levels of SCERT, Dept of Education etc. and what is actually seen in the classrooms of these schools.

3. The efforts the government has made in using computers for education has been failure. Teachers lack the knowledge to effectively use the computers or Internet to enhance their teaching. They even lack the knowledge and the support structure required to maintain the computers properly. The good quality contents provided by the government to all these schools lie unused. The Government has provided software to schools but the teachers are unaware of what to use and when to use the appropriate software.

4. Several studies are indicating how poorly the students from India and specifically Tamilnadu are faring in education. India (represented by 2 best states) ranked 87 out of 88 in PISA test of the achievements of 10th standard children. ASER survey conducted by Pratham has found that 50% to 60% of the children in 5th standard cannot read 2nd standard text book in their own mother tongue. Tamilnadu fares even worse than the Indian average!

5. Focus on rote learning using methods rather than understanding concepts. Mitigate by providing good quality content and the children get to see it and play with content besides stressing the importance of using the software and tools provided to teachers.

6. There is an abundance of content available to teach children even in languages like Tamil. But most of them are not necessarily of great quality. Further without clear guidance on which lesson these can be used with and how, they would be useless.

7. Governments want to promote technology and education. But their idea of technology aided learning is to have a smart class which will be used to show passive contents (videos or presentations) to children. Teachers are also not computer savvy and are happy to look at contents to help them teach passively, by playing a video and taking a break themselves. But studies after studies have shown that these passive contents shown without much interaction doesn't aid learning at all.

8. Software development and enhancement has taken a backseat as the urgency of other tasks take precedence and delays in delivery of the software does not break our backs since we have functioning software.

9. Scalability of the existing software requires a tremendous amount of effort for which our volunteers are unable to spend the time.

Existing Solutions:

We are focused on delivering content through our Asha Kanini software and on analytics from assessments, so we will look at both for existing solutions.

1. Content - The Government of Tamilnadu has started to deliver software for all the lessons through Diksha to the Government Schools. There are QR codes embedded within the lessons in the textbook. When these QR codes are scanned with a mobile phone, it takes them to relevant contents on the Diksha website.

This solution that Diksha provides is a walled garden where the navigation of the material is directed and the selection of material is limited. Asha Kanini will provide an open platform to be

able to include content from many sources and we select the best ones available. PhET is an example of a package we include in our content that is developed by Nobel Laureate Carl Wieman. There is no need to deprive students of such quality software when it is available for free. Our intent is also to drive the Asha Kanini App with the QR codes in the textbook and when the QR codes are scanned from within our App, we can show them the Diksha contents as well as other contents. We also hope to give the other contents we have collated to the government so that they can also show these contents when the teachers land on the Diksha website through the QR codes.

2. Analytics - Assessment is a key component of learning. It helps the students know where they stand in terms of learning objectives and the teacher know where the gaps are. Organizations like ASER and the Government have the ability to do large scale assessments. They are doing sample surveys like ASER or NAS/SLAS. However, there is no proper formal reporting mechanisms for the children or the teachers to view. There are overall reports produced that have some validity for the Government to see, but even that does not provide the metrics Asha Kanini would be able to provide (like correlation with teacher student ratio etc). The schools themselves conduct the Formative and Summative assessments. These are unfortunately very textbook based and rarely test the conceptual clarity of the children. Our written assessments provides this kind of clarity.

We use the assessments along with social and economic data that are available with the Government to try and correlate the results. We would use multi-factor correlation to identify potential causes for student performance.

Current State of the Project:

1. We have collated and mapped over 40 packages with excellent content. These have been mapped to TN curriculum for classes 1 to 8. These are detailed in Appendix I.

2. We have also developed contents of our own to fill gaps like English lesson recording, Maths Instructions and lesson plans.

3. We developed the Asha Kanini app to provide an easy interface to search and access the contents of these packages. Our Asha Kanini app that includes the 40 or so packages is currently used at over 80 government schools across Tamilnadu.

4. We conducted oral and written assessments at over 70 schools in 2017.

5. We created customized reports for each of these schools showing specific learning gaps at their school and schools across our entire sample and gave suggestions as to how to go about fixing these issues. The details of our assessment analytics is given in Appendix III.

6. Correlation analysis of assessment performance vs. social and other factors.

7. Developed a curriculum for teaching computer science for classes 1 to 8 including TuxPaint for class 3, OpenOffice and Windows for classes 4 and 5, Internet use and programming using Scratch / Blockly for classes 6 to 8 and had our teachers teach the students at the 80 schools we support.

8. We also maintain all the computers that exist at these schools and upgrade the ones that are worth saving.

9. We provide computers to some schools as we get donations from local companies of their used computers that they are ready to retire.

Content Goals:

1. Include contents that will cover all grades from k-12, initially focused on Tamilnadu curriculum, but make it flexible enough that it can cover other states in the future.

2. The educational contents landscape continues to change at a rapid pace and we need to keep abreast of learning methodologies. We should constantly evaluate new contents that comes up and include them as necessary in our curriculum. Note we actively seek these and keep finding new contents. Continue mapping new and old contents to an evolving curriculum. Tamilnadu education department is changing all the textbooks and also the teaching methodology to be followed in the government schools.

3. Develop lesson plans to act as a guide for teachers to teach a lesson. For basic topics like say Multiplication, there are just hundreds of good quality contents available. So to choose the right set to make a coherent lesson plan is a challenge. Further there are contents that can be used to refresh the memories of the children of the prior concepts before starting the lesson, there are contents that can actually be used to teach the children, there are contents that can be used for the children to practice the concepts after it has been taught, there are contents that can be used for revision and recall. Further there may be contents that are suitable for visual or auditory learners. The lesson plans are intended to act as a guide to teachers on effectively using the contents.

4. Develop online worksheets and assessments to target specific learning objectives to understand student strengths and weaknesses.

6. Categorize the software for passive and active learning. Passive learning would include watching videos, whereas active learning would involve the students being engaged with the software, like games or quiz sessions as part of the lesson.

7. Develop a computer curriculum for grades k-12, starting lower grades with usage capabilities and office software including spreadsheets and presentations and higher grades with basic programming concepts using block programming languages like Blockly and Scratch and introducing them to more advanced concepts including data structures, networks and security.

Software Platform Goals:

Installation:

1. Considering many rural areas in Tamilnadu do not have great internet connectivity, we would try to make much of the software available offline, by downloading the content and installing it on the local computers.

2. We currently have one of our technicians install the appropriate software on the school and teacher computers. For Asha Kanini to be more widely used by other Government schools and private schools or even individuals, we need to make it installable through a CD or be downloaded from the web. We need to create an install script that will not only install Asha

Kanini but also a lot of the supporting software like Open Office, Adobe PDF Reader, Java, Flash and so on.

3. Since the full contents are over 80GB and a DVD can only contain some 4.7 GB, we will be developing ways to download packages as well as individual content within packages. This would be essential for large scale deployment of the software.

4. Make sure that all the software we use is thoroughly tested for security holes.

5. Make sure that we conform with all the copyright requirements specified by the software developer.

6. As the Government is planning to provide Android based tablets to many students, we would need to start exploring the possibility of making at least some of our software available on mobile devices.

7. Create a mechanism for registration of the schools and teachers using the software. Validate this data to ensure that we can keep track of installations and collect usage statistics.

8. Ability to scale the software. We now rely on our teachers to use the software and report both positive and negative observations and manually fix issues that may come up. We expect the software to be used by all the Government schools in Tamilnadu and we need to have it be robust and be able to scale to accommodate thousands of users.

9. As the number of users grow, our database of teacher information and user statistics will grow substantially and we need to be able to manage that growth.

10. Trouble reporting (automatically collect logs etc.), and documentation (online help files etc.).

Content Viewing and Interaction:

1. Develop tutorials for the computer curriculum and provide teachers with assessment tests that they can track and monitor how much the students are able to grasp and if our teaching methodology is really working..

2. Deliver the lesson plans electronically and allow the teachers to mark them as they use them and the software they used.

3. Develop an English read-aloud application that can play a natural language read out of a text and highlight the text being read out. This will help the students pronounce words correctly and understand intonation.

4. Collect the usage data to understand usage patterns once installed.

5. Provide an interface for teachers to put in Likes and Ratings to understand usefulness of particular content. Dynamically recommend appropriate software for use in classes based on these ratings.

6. Develop software for delivering worksheets and assessments electronically to students that test specific concepts that a student in each grade needs to have mastered.

Data Analysis:

1. Analysis of usage patterns, likes, ratings, social and economic variables and how they correlate with learning outcomes will help us recommend appropriate content to teachers in various schools. This might vary between schools or areas of the state.

2. Do correlation at a student level. i.e. between oral and written performance, between Maths and English performance etc.

3. Do correlation across time. Correlate the performance at student or school level across years for Oral, written, English, Maths etc. performance.

4. If Government provides access to more social data, interface with that data and correlate against that data.

5. Do multi-factor predictive study to understand the causes of performance of schools.

6. Enhance DB and processes to support scaling to 1000s of schools.

Requirements:

Developing with just volunteers is not effective. To take this to the next level of handing it over to the government and working with them to ensure that it is used by a large number of schools and teachers, we need the following developers.

1. Two software developers with knowledge of the latest technologies including SQL databases, Javascript and supporting software like NodeJS, ReactJS and so on. One of these developers will also act as a team lead and manage Asha Kanini, System Admin and Analytics.

2. One software developer with the ability do big data analytics and use AI techniques to identify usage patterns and to dynamically change and reorganize recommendations to be used. It would also make it easier for teachers if we can suggest software by analyzing a particular teacher's usage patterns in collaboration with what has been most effective for other teachers. This engineer would work on assessment data and other data we collect from likes and usage patterns.

3. One software developer to develop and manage installation software and keep a record of all our installations.

Besides these we also need money for the following.

1. We need to travel to the districts and meet the CEO, DEO etc. to ensure that they order the schools under their control to look at and use this software.
2. We will also need to travel to address district level or block level meetings of HMs to explain to them how the software and the contents should be used.
3. We currently host our software in a very small Linode instance. We will need a bigger instance (probably with AWS or Google) to host the server. We will also need domain names, certificates etc.

Asha Kanini Budget				
Type	**Number**	**Cost per month**	**Duration**	**Amount**
Asha Kanini Senior Developer - Team Lead for all engineers on the project (loaded cost incl workstation, computer hardware, and any travel expenses, bonus etc.)	1 engineer	1,00,000	2Yrs * 12 months	24,00,000
Asha Kanini Junior Developer (loaded cost)	1 engineer	50,000	2Yrs * 12 months	12,00,000
Data Analyst (loaded cost)	1 engineer	50,000	2Yrs * 12 months	12,00,000
System Engineer for Installation, Scaling, DB and Server Maintenance (loaded cost)	1 engineer	50,000	2Yrs * 12 months	12,00,000
Travel to Rural areas to train govt school teachers, hold meetings with education dept officials etc.	2 trips per month	15,000	2Yrs * 12 months	3,60,000
Hosting of our server, domain name registration, certificates.		$100 (Rs 7500)	2Yrs * 12 months	1,80,000
Purchase of software and services from outside. We may need to buy some software like say InstallShield if open source software doesn't do the job. We may need to outsource something like logo creation etc.	Rs 50,000 per year.			1,00,000
Documentation, administration, contingencies etc.	Rs 30,000 per year.			60,000
Total				**67,00,000**

Impact:

1. Empower government teachers to use computers effectively to teach primary and middle school children.

2. Create a radical change in the way that children learn in Tamilnadu by shifting focus from grades to learning.

3. Create a scalable model that can be used all across Tamilnadu for the effective use of technology to improve education at the primary school level. Put together contents and develop software to enable this.

4. A majority of the children in Government schools will have access to the best available teaching techniques and software irrespective of whether they live in a city or in a remote rural village.

Metrics:

1. We currently have our software working in the 80 schools we support. We will expand beyond that and have schools we don't support start using our software. By the end of the first year we expect to have 300 schools signed up to use our software and hope to have 50% of these schools use our software actively.

2. We expect to have 3,000 schools signed up by the end of the 2nd year and have 50% of those schools use our software actively.

3. We plan on getting the Government involved early to start encouraging schools to use our software. We can point to a level of success we have had with the schools we currently work with.

4. We hope to have the Government start using our analytics platform based on their own data relating to several metrics.

5. We would also try and get the Government to use our computer curriculum that we develop for classes 1-8 as there is no formal curriculum for computer education currently followed by the Government.

Project duration:

For the project to become really scalable with widespread adoption, we expect it to take us two years at which point there will be additional development and maintenance requirements. The project will be ongoing beyond the two year timeframe, however, we expect the Government of Tamilnadu to take ownership and pay for the development.

Appendix I

This includes content that are homegrown and content that are included in Asha Kanini developed by third party developers.

Package	Description
Azim Premji Foundation	Games etc. from Azim Premji Foundation. We do not have everything yet. It may grow by another 50%.
Basic-Mathematics.com	Online Maths games.
Boowa and Kwala Baby games (www.kidsites.org)	Site contains several games suitable for young children that are based on the characters Boowa and Kwala.
Clock	A small application just to teach analog clocks for children.
Count Us In	A set of simple math games downloaded from ABC Australia.Can be played on the system.
DPE Phonics	Lessons on phonics by state education dept. Relates to the cards that some of the schools have.
E-Speak	Videos on English. Just 4 VCDs.
Ectal V6	Presentations developed by Lakshmi and her teachers at Olcott Memorial school alligned to TN state board curriculum of 2005-06.
English Lesson Recordings	Recordings of the lessons from all the English text books by Mrs. Rekha Balakrishnan.
English Club (www.englishclub.com)	A website with a nice set of games in English.
Fun with English	Just 2 lessons in English. Not yet mapped.
FunBrain	A website with nice collection of English and Maths games.
Gcompris	A collection of 150 games on Maths and English suitable for primary school children. This is downloaded and installed and thus can be played offline. Note the space required for this is in the system directories and not in our Kanini directory.
Hello English	20 lessons in English developed by RIE-SI.
ICT Games (www.ictgames.com)	A website with a good collection of Literacy and Numeracy games.

Khan Academy Tamil	Tamil translation of the video from Khan academy that pertains to primary schools. Need to be checked and updated.
Manga High (www.mangahigh.com)	Manga High provides good quality animated games to explain Maths concepts. It also has some multiple choice question worksheets.
Math Games (www.maths-games.org)	A collection of online games from maths-games.org. This also provides links to games from other sites.
Math Pickle	Great set of offline games downloaded from www.mathpickle.com.
www.mathsgames.com	The website has a good collection of Maths games also developed by Manga High.
www.mathgames.com	Site offers lots of different contents on Maths including games and MCQ questions associated with grade / skills.
Maths Instructions	Instructions for all lessons from Mrs. Meena Suresh. Tamil instructions for Term II and Term III lessons are still required.
NLVM	A great set of virtual manipulatives for Maths.
One Stop English	A set of English games downloaded and can be played offline. Other contents of the site www.onestopenglish.com have not been mapped.
Oswego	Various Maths games. It also has the options for us to create our own games within some templates they have given.
PhET	An excellect collection of games and simulations for Science and Maths. Unfortunately more suited for middle and high schools. Note the space required for this is in the system directories and not in our Kanini directory.
Ramanujan Museum	A collection of games and worksheets for the teachers to use in their classroom provided by Ramanujan Museum.
Rhymes & Stories	Rhymes and stories downloaded from youtube that are suitable for being played to the children when they have no other activities or in some cases alligned to their lessons.

Schoolhouse Bingo	This is a commercial software for generating good educational Bingo games. The package here contains only the generated games and not the software.
Simply English	A good set of audio lessons for children. However the accompanying book for conducting activities is missing.
Starfall	The website has good collection of animated videos for beginning learners on phonics etc. Most of these were available as youtube videos which are shared here. Some extra content also available only on the website.
Tamilnadu Textbook Poems	This is a DVD created by Tamilnadu Government. It contains song adaptations of many of the poems found in the Tamil textbook. It is of good quality.
TN text books	PDF versions of the Tamilnadu Samacheer Kalvi textbooks.
Toon Masti	A collection of animated lessons in English and Hindi developed by Ernst & Young foundation. This is orginally mapped to the NCERT syllabus. Many of these can also be mapped to the TN syllabus.
Top Marks (www.top-marks.co.uk)	Lots of good Maths and English games.
TuxMath	A set of arcade based Maths games from the creators of Tuxpaint. This is also downloaded and installed and can be played offline. Note the space required for this is in the system directories and not in our Kanini directory.
TuxTyping	This is a set of games for teaching children English and typing words on the computer. Note the space required for this is in the system directories and not in our Kanini directory.
Vocabulary.co.il	Games that develop vocabulary and teach English grammar.
whatToLearn.com	Website with a number of Maths games and also tools to create your own games.

Appendix II

Current features in Asha Kanini

1. Package can be installed very trivially by just copying the package directory into a known location. Currently supports 40 packages.

2. Handles all content types required by the contents in these packages.

3. Allows for searching the contents like class, term, lesson, subject and package name. These criteria can be combined in any combination.

4. As batch file based installer that check and updates packages that have changed.

5. Shows contents that require network greyed out if network is not available. Operation with local contents will not be disrupted in anyway by network unavailability.

6. Support for Unicode titles, file names, descriptions etc. The content can appear in any language on our Asha App UI. The button and menus in the UI itself are for now only in English.

7. Basic monitoring of Asha Kanini usage.

8. Scripts available to convert an excel file that maps the contents to lessons, into a format that can be understood by the Asha Kanini app.

Appendix III

Current features in the Assessments Server

1. Teachers enter the marks in an excel sheet for both the oral and the written assessment. These results are uploaded to the database using perl scripts.

2. Provide a way to view the average mark of all schools with indication of which school/classes have performed above a mean + sigma level and which below mean - sigma level. Comparision with averages at all schools, averages of boys, girls, averages by school groups (for instance schools where we send regular teachers vs those where we only send computer teachers).

3. Average marks of the classes within a school and indication whether they have improved over last year or become worse.

4. Average marks of students in a class in a school. Indication of whether the student has improved in oral assessment.

5. Comparision of oral performance of one school or all schools against another school, school group, average score of all schools, average scores across TN or India (from ASER data).

6. Comparision of an individual teachers section against that of the whole school relative to their class.

7. Correlation of the school performance against the following factors:

- Attendance (on the days of the assessments).
- Teacher student ratio.
- School strength
- Strength declining factor (percentage by which strength has declined or increased over the last two years).
- Percentage of SC/ST and just ST students in the school.
- Infrastructure grade for the school given by Dept of Education.

The last four of the above information is obtained from DISE website (schoolreportcards.in).

8.Correlation between English and Maths performace of schools and between Oral and written assessment performance of schools.