# Creating Teachers Communities of Learning



# Report on the Subject Teacher Forum Program
## IT for Change

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# 1 Background

This report discusses ITfC work in creating a 'Teachers Communities of Learning' through the Subject Teacher Forums, Karnataka in Mathematics, Science and Social Sciences in four divisions across Karnataka , being done with Rashtriya Madhyamik Shiksha Abhiyaan (RMSA), Department of State Educational Research and Training (DSERT),  Karnataka. The program was based on the extensive and intensive use of public software applications in mathematics, science and social science subjects to create a resource rich learning environment.  The complete project  is broken down into three phases spanning over three school academic years.

**Phase 1 (2011-12) :** Basic computer literacy, Basic Web 2.0 Tools, Computer Aided Tools, creating local open educational resources and cascade training plan in 15 districts across Karnataka. The project used public software educational tools in mathematics, science and social science. A list of tools used is provided in Annexure A

**Phase 2 (2012-13) :** Basic computer literacy, Basic Web 2.0 Tools, Computer Aided Tools, creating local resources and cascade training plan in remaining 15 districts across Karnataka.  Strengthening mathematics, science and social science forums in the phase 1 districts. Additionally the language and art teachers forums is being started in select districts.   The project will continue  to use public software educational tools in mathematics, science and social science as well as languages and art. The creation and review of local open educational resources will continue. Creation and linking of block level physical forums with the virtual forums.

**Phase 3 (2013-14) :** This phase will cover remaining districts in creation and strengthening of mathematics, science, social science, language and arts forums and open educational resources. Establish processes within the system for local school based technical support, email group, web portal maintenance, resource review and sharing.  The project will continue  to use public software educational tools in mathematics, science and social science as well as languages and art.

# 2 Goals of the programme

The larger goal of the Subject Teacher Forum is to strengthen subject matter expertise amongst teachers and increase the range of curricular resources available to teachers for use in their classroom transactions and to support new models of teacher professional development based on creating 'teachers learning communities'. In this new model, in-service teacher development is continuous, as the teachers are in touch via email groups and web portal virtually, apart from the workshops. This enables their learning to be self-directed, self paced, peer based and mentored. Using public software tools and a virtual platform for creating and sharing open educational resources we have begin to address two core areas to enable deepening of subject knowledge among high school teachers.

## 2.1 Subject Matter Expertise

Teachers gained understanding on the usage of many new and innovative resources and tools that are available on the public software platform.  They learnt to navigate and surf  for material from a rich variety of teaching-learning as well as informational resources  already available on the internet. Apart from this  teachers learned the skills of using technology based  public educational tools listed in Annexure A. Since these tools were public software tools, they could be freely shared and this enabled many teachers to create their own resources integrating the local context and the

syllabus thus allowing them to innovate different methods for teaching specific topics enriching their own professional expertise. The interactive nature of the tools also helped teachers who engaged seriously with the programme become constructive learners thus enhancing their own subject knowledge. This in turn will help them use constructivist pedagogical practices while teaching children in classrooms, which is the way forward as suggested by the NCF 2005[1]. The teachers also discussed the NCF 2005 subject position papers in detail, and created open educational resources that are available on the web portal[2] in each of the subject tabs. RMSA selected a few resources in each subject, created using public software tools, and published them as books and distributed it to all participating schools in the 15 districts. PSC also created a handbook and guide for teachers to use for computer literacy, web tools , educational tools and processes for creating open educational resources. All resources created both by Public Software Centre, as well as by the teachers are available as OER, under the creative commons licensing model. Thus the use of a large variety of public software tools helped teachers to deepen their professional skills and expertise.

## 2.2 Subject Teacher Networks

The models of teacher forums that conform only to physical meetings at regular intervals, in the current context of a knowledge and information society are becoming inadequate. Also where physical forums have been absent teachers are working largely in isolation. To address this issue, all teachers participating in the Subject Teacher forum Programme were part of a virtual forum (email groups[3]).

# 3  Programme Description

PSC conceptualised and designed the Subject Teacher Forum (STF) programme[4] of RMSA, Karnataka, and provided training and support in the use of public software to empower teachers to become digitally literate, use public software educational tools to advance their own subject understanding, engage in discussions about the discipline (Mathematics, Science and Social Science), participate in an online community of learning and create and share open digital resources. The work spanned across high schools that have ICT facilities provided by the government across 15 districts in Karnataka. 15 workshops have been conducted by PSC and the high school teachers to create 240 resource persons, who trained around 2500 teachers in more than 800 schools in the 15 districts.

## 3.1 Status of Programme

### 3.1.1 State Resource Person Workshop

PSC facilitated the creation of 30 State Resource Persons (SRPs) for each subject. The training was conducted in 3 parts spanning over 4 months. The workshop covered basic computer literacy, skills on usage of public educational tools, NCF 2005 discussions. Teachers also began the process of creating open educational resources in the first workshop, they completed and refined their learning resources as assignments between and post the workshops. In part 2 and 3 workshops teachers discussed peer reviewed and refined their resources and also practised the use of educational tools. In the final workshop they planned how they would facilitate the workshops for the Master

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1  National Curriculum Framework 2005.
2  Http://rmsa.karnatakaeducation.org.in
3  mathssciencestf@googlegroups.com and socialsciencestf@googlegroups.com
4  http://RMSA.KarnatakaEducation.org.in

Resource Persons.

The email lists mathssciencestf@googlegroups.com and socialsciencestf@googlegroups.com were created at these workshops. Teachers emails were included in the list. For many teachers  email ids had to be created, skills built on how to use emails and then added to the group. The teachers are expected to post regularly on this forum, share their resources, ideas as well as some of the challenges they face in teaching-learning processes.

### 3.1.1.1  Workshops follow up

The participants were expected to send emails regularly to the mailing list. The groups needed to complete their resource books incorporating all the feedback received during the workshops. Each participant was also expected to submit an individually created resource book[5]. The teachers had gone back  to their schools and installed Ubuntu. Some of them faced problems such as lack of sufficient RAM, old computers, no access to computers etc. Some follow-up activities from PSC included making sure PS was installed in schools, addressed any technical issues that they faced, continuous feedback of assignments submitted by email and keeping the forum active. In the final workshop the participants created presentations and plans for their training sessions. Each group had to coordinate presentation material for facilitating different sections of the MRP workshops. All the presentations were shared on emails.

PSC participated in two batches of 30 teachers in each of the subjects: Maths, Science and Social Science. The facilitators of this workshop were the state resource persons. The 5 day workshops started from understanding the philosophy of public software, basic computer literacy, basic web tools,  discussions on the National Curriculum Framework 2005 – the subject position papers, public educational tools  and discussions on the resources created  by the SRPs. All MPRs were added to the email group.

## 3.1.2 <u>District level (Teachers) Workshops – Cascade Model</u>

The Subject Teacher Forum (STF) Maths, Science and Social Science district level training began on  24th January 2012 in parallel in  16 districts in Karnataka. Teachers from ICT Phase1 & Phase 2[6]  programmes for high schools participated. The following education districts were part of the programme. : **Belgaum, Bidar, Chikkodi, Chitradurga, Dakshin Kannada, Davengere, Dharwar, Kodagu, Koppal, Madhugiri, Mysore, Sirsi, Tumkur, Uttar Kannada, Yadgir.**  The MRP's trained at the state level were the faculty and resource persons for the district level workshops. Many of the SRPs also helped whenever possible travelling to neighbouring districts to participate in the cascade. The IT for Change education team also visited most of the districts participating in one to two days of the 5 day workshops. These workshops covered approximately 2500 teachers in more than 800 schools in the 15 districts.

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5   Annexure 2 contains information on all the themes that the participants are working on.
6   Under the ICT @schools scheme, Government of India  sanctioned computer education in another 480 secondary schools during 2005 – 06 and the ICT @ schools have been implemented in 2007-08. ICT @schools scheme is extended for 1571 Govt. High schools in 2008-09.  ICT @ schools is being extended for 2633 aided high schools and 1763 government secondary schools in 2010-11. Source: http://dsert.kar.nic.in/html/chapter06.html

### 3.1.3 <u>Master Resource Persons (MRP) Workshops</u>



*Illustration 1: State Resource Person explaining the theme plan resource*

#### 3.1.3.1 *Support for the district level workshops*

Support for the cascade model district level workshops were multidimensional. The support included

- Ensuring lab readiness in all districts. The labs selected for the workshops were the computer labs in each of the District Institute of Education and Training(DIET). This included conducting a meeting with the all Education Technology staff to brief them about the programme as well as train them to install Public Software in the labs. IT for Change technical support also travelled to some districts to trouble shoot and ensure lab readiness – computer hardware installation, software installation and internet connectivity.

- Providing virtual support during the programme - http://rmsa.karnatakaeducation.org.in/?q=node/201 . This web page included all documents, presentations, videos and other support material that the MRPs needed for the training.

- Setting up video conferencing with the Director, RMSA and Director DSERT in several workshops so that the teachers could directly interact with the directors.

### 3.1.4 Other Workshops

PSC also conducted capacity building workshops for multiple stakeholders of the programme. This included

1. The staff of  DIETs  that were providing programmatic support for the training of teachers at the districts. The DIET staff functions included providing lab facilities and other system programmatic processes such as travel, boarding and lodging for the training.
2. Other NGOs working with the schools with technology so that the different trainings  and integrated towards a common goal. The NGOs included America India Foundation and Vendanta Foundation. The staff of these NGOs working in these schools were trained in basic Ubuntu technical support as well as some of the public application software so as to provide teachers with initial technical troubleshooting and problem solving.
3. RMSA office in Bangalore also migrated to public software to ensure consistent communication between the participating districts, schools and state office. This also ensured a systemic integration of public software.

Apart from the above, other outputs from our work using public software with the Karnataka education system project include

1. participating in several committees set-up at national level by MHRD, NCERT, NCTE relating to ICTs in education (elaborated in advocacy section)

2. participating in several committees set-up at state level by DSERT relating to ICTs in education (elaborated in advocacy section)

3. participating in writing a resource book/ text book on ICTs in education for Karnataka

4. Training members of NGOs like American India Foundation, Vedanta Foundation, RV Educational Consortium in use of public software

5. Training members of DIETs and BRCs in public software through programs such as Kalika Balaga and Samartha

6. Creating videos / CBTs in use of public software tools (called spoken tutorials)

The following were the outcomes from the project

1. Around 2000 teachers were trained in using public software applications in mathematics, science and social science

2. Awareness about the role of public software in teacher education amongst policy makers in different states in India as well as central government level

### 3.1.5 Public Software Tools

The teachers (SRPs) who participated in the workshops are now comfortable creating text digital resources. The specifics included –  creating table of contents, adding hyper links, creating a theme based documents based on a given template.  All of them have email accounts and are part of the email lists that were created . As many of the post workshop requirements required the participants to email, they also gained confidence in using their email account to communicate. As they required to browse  the internet for additional information they are now familiar with the web 2.0 basics – how to search for specific information, download files, images and videos.

### 3.1.6 <u>Open Educational Resources</u>

As the objective of the subject teacher forum indicates, our aim is to enable teachers to create their own resources as they are most equipped with the knowledge of the local context and their students. In this effort, teacher resources have been created by the teachers based on a template provided. Teachers selected topics from the syllabus and mapped out a concept map, built a theme plan on how the topic could be taught by building it from the 6th standard to the 10th standard. A book of these resources for each of the subjects was published and made available to every participating school (one set of these resources has been handed over to UNESCO). PSC also created four prototypes, two in science , one in social science and one in mathematics covering the following topics : Measurement, Light, Bhakti Movement and Fractions.

### 3.1.7 <u>Web Portal</u>

A platform for sharing resources virtually has been created (http://RMSA.KarnatakaEducation.org.in)and has begun to grow.  This portal enables the teacher community to discuss and debate about relevant topics.  It also organises useful and relevant information available on the Internet. Newly created resources or existing resources freely available that have been modified by teachers to the local language and context are continuously reviewed and shared on the portal for the community. The web portal has been created using public application software – Drupal.  The list of resources available currently are in Annexure C.

### 3.1.8 <u>Public Software Educational Tools</u>

We are all witnessing widespread developments in IT Education. More and more ICTs (Information Communication Technology) are  being used in almost all aspects of our lives. In our education system all teaching-learning methods are witnessing a shift from teacher centred teaching to a more learner centred one. The possibility of making this shift is high by using computer aided tools to bring to life abstract mathematics and science concepts.

National Curriculum Framework (NCF) 2005 talks of a major shift in teaching education programme from passive reception to active participation in learning. From learning within the four walls of classrooms to learning in the wider social context. From knowledge as "given" and fixed to knowledge as it evolves and is created. From linear exposure to multiple and divergent exposure. Moving from  a teacher centred lecture driven classroom to more learner centred classrooms. Using these computer  aided tools as teaching-learning aids will enable teachers to make these shifts suggested by the NCF 2005.   The children will be able to construct their own knowledge  by using these computer tools. To enable children to connect these learnings and utilize the tools to the best possible extent, it is essential for subject teachers to facilitate this learning experience. It is therefore important for the teacher to understand how to use these various tools and become confident users of the same to bring about maximum understanding of the subject using these tools as aids.

Keeping this goal in mind,  the teachers have learnt how to use many public educational tools that are available, such as GeoGebra and Kturtle  in mathematics. PheT and Step in Science and Marble and KGeography in Social Science. Some of the resources created using GeoGebra and K Turtle are available on the web portal - http://rmsa.karnatakaeducation.org.in/?q=front&quicktabs_4=4#quicktabs-4

### 3.1.9 Handout for teachers

In order to facilitate quality transaction in the cascade workshops in each district, PSC created a 60 page handout that includes explanation of the template, basic computer literacy, computer aided tools and Ubuntu installation process. RMSA has published this book for all participating teachers.

### 3.1.10 Peer Discussions & Reviews

During the workshop, while the resources the teachers created were being reviewed, many interesting debates and discussions came up. They included subject based as well as teaching process based discussions . Some specific subject based discussions included concepts in local governance, mining ,agriculture, rational and irrational numbers, Euclidean geometry, kinetic and potential energy came up. Some of the teaching process based discussions included philosophies of learning – Bloom's taxonomy and changes to it. Advancements and changes in learning psychologies, Vygotsky's social constructivist theory and the review of the NCF 2005 position papers. .The peer discussions and debates that took place made the workshops come alive and often clarified many misconceptions for many teachers.

While the subject knowledge and the teaching learning process was an enriching experience for the facilitators and teachers, what was a new and significant process for the teachers was peer reviewing and discussing. Many of these teachers were exposed for the first time to a non-hierarchical space for peer reviewing and discussions. This synchronises well with the process of creating open digital resources, where the creator is open to feedback to improve the resource created or is able to envision that their resources may be used by anyone – sometimes modified as well.

### 3.1.11 Policy Advocacy

PSC undertook a number of activities advocating the use of Public Software in public education system.
- Public Software Centre made formal presentations[7] on the adoption of public software in education to senior policy makers at central and state government levels, including to the
  - Joint Review Mission (JRM) of Sarva Shiksha Abhiyaan,
  - Education Secretaries in a MHRD workshop at NCERT, on guidelines for ICT@School program, which is a large centrally sponsored scheme for promoting ICTs in school education.
  - SCERT directors in a MHRD workshop at NUEPA, on the ICTs for Teacher Education
- As a result of our consistent advocacy and discussions with the central and state governments, we have been invited to participate in formal work-groups including
  - At central government level (MHRD)
    1. Member and coordinator of ICT and Teacher Education subgroup – MHRD Committee to draft new guidelines for revised teacher education scheme (prepared the ICT guidelines for TE institutions)
    2. Member - NCTE[8] Committee on Distance Education and use of ICT in Teacher Education (prepared ICT guidelines for distance education and teacher education)
    3. Member of NCERT committee for Quality Education
    4. Member of ICT curriculum for schools committee, NCERT, India
  - At state government level

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7   All presentations are available on www.ITforchange.net/Education
8   National Council for Teacher Education is the apex national body for teacher education. NCTE prescribes curriculum for teacher education, establishes assessment and certification for TE institutions etc

5. Member of ICT curriculum for schools committee, DSERT[9] Karnataka
6. DSERT Pre-Service curriculum revision committee (we shared a position paper on 'ICT mediation in teaching-learning')
7. Prepared the text book for integrating ICTs into teaching-learning for Class VIII.

- Bi-monthly public software e-newsletters were shared with the officials in education and other departments in the governments across India and across different mailing groups
- Meetings were held with the FOSS Centre, Department of Information Technology to discuss similar program in other states in India
- PSC also shared our work at the FOSSK4 International conference of Government of Kerala, and submitted a paper at the NIME National Conference on Mathematics Education – Southern Region titled "Teaching Mathematics in the Digital Age"

## 3.1.12 Films – Transforming Teacher Education with Public Software

As agreed on in the MOU with UNESCO, PSC made two films to convey the core principles of PSC's intervention with the public education system. The main idea behind the film is to enable policy makers and administrators of other states in India and also other countries to get a clear idea of the principles, planning and processes involved in adopting public software in their public education systems. The process of making the film gave many opportunities for the team to reflect on our work in the process of communicating our work with Karnataka and its public education system. The film includes workshop footage, covering two teachers in their work in schools and interviews with key stakeholders of the programme. Two films have been made, titled **"Transforming Teacher Education with Public Software "** one detailed of a little over **20 minutes** duration, and a shorter version for about **6 minutes**.

**"Transforming Teacher Education with Public Software "**
**23 minutes** duration - http://www.youtube.com/watch?v=D-kgSW_o9z8&feature=youtu.be
shorter version - http://www.youtube.com/watch?v=lcBas7ehQaM&feature=endscreen

While making this film, many participants and stakeholders of the programme were interviewed. These short interviews have been shared on the web portal as separate film. They were used extensively by the MRPs in the district level training. The short films included :

1. Interview with the director of RMSA, M.N. Baig describing the principles of the programme.

2. A talk by Director, IT for Change describing the need for teachers to purchase laptops and internet connectivity on their own for their professional development.

3. Interview with Professor Padma Sarangapani, Tata Institute of Social Science about teacher education and teacher's professional development needs.

4. Four Interviews with SRPs in different subjects, describing the programme and and its impact.

Please see Annexure B for the links for all the videos.

## 3.1.13 Custom Public Software – GNU/Linux Ubuntu DVDs

All participating teachers were required to install Ubuntu operating system in their school laboratories and were given a DVD to install. PSC customised the Ubuntu Operating System to include all educational tools, software for typing Indian languages and any other software that was

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9 DSERT is the SCERT of Karnataka, the apex state level body for curriculum design and teacher education.

used by the programme and not available in the base operating system. PSC also designed a sticker for the DVDs. The image of the DVD sticker is shown below. PSC burned more than 800 DVDs for each of the participating schools. A token amount of Rs 50 was collected for each DVD to reinforce the understanding that free software is not muft (gratis) software  but muka software (giving freedom) and that each of us has a role to support and grow the public software ecosystem. Many DIET faculty also installed this in their computers and all DIETs in Karnataka have been asked to install Ubuntu and create 20 seater labs for training teachers and teacher-educators on public software.

### 3.1.14      <u>Work in other states in India</u>

PSC engaged in active advocacy as well as submitted programme proposals to three other states including Tamil Nadu, Gujarat and Uttrakhand.  PSC also visited Tamil Nadu and Gujarat and initiated talks with the officials of the education departments.
MHRD (TE) has asked the education departments of Andhra Pradesh, Mizoram and Tamil Nadu to explore a similar program in their states.
Uttarakhand has responded positively to the proposal and we are awaiting their response to take the programme forward.  West Bengal has also written to UNESCO.
**In the next phase, we need to expand the program further to these and other interested states**


## 4  Going Forward

The phase 2 and 3 of the programme  in the years 2012-13 and 2014-15 will integrate this programme into all (34)  Karnataka education districts.  The remaining ICT Phase 3 Programme schools will also be covered based on the roll-out schedule of the ICT Phase 3 programme. Additionally Language and Art teacher forums will also be created and these teachers will be trained as a part of the programme. Local technical support will be a focus in phase 2 and phase 3 of the programme to build technical capabilities at the block level among teachers.

In parallel there are plans to expand the programme to elementary schools to cover upper primary schools that have computer infrastructure available in their schools. PSC also plans to train the DIET faculty so that they are ready to provide technical and academic support  during the district level training.

The virtual forum will move towards creating, reviewing uploading resources. A framework for resource review, building local capacity in the DIETs for resource review, uploading and web portal maintenance are in the plan. Districts will also create local email groups and physical forums to compliment the state-wide virtual subject forums.

The ultimate goal is for the system to integrate the ICT programme into its regular curriculum, processes and plans so that they are able to use public software in current and future ICT programmes with minimum external support.

In addition, the aim is also to expand the program in other interested states in India as well as in the South Asia cluster.


## 5  Abbreviations

| DIET | District Institute of Education and Training |
|------|----------------------------------------------|
| DSERT | Department of State Educational Research and Training |
| MHRD | Ministry of Human Resource Development |

| | |
|---|---|
| PSC | Public Software Centre, IT for Change |
| RMSA | Rashtriya Madhyamik Shiksha Abhiyaan |
| SCERT | State Council Educational Research and Training |
| STF | Subject Teacher Forum |

# 6 Annexure A – List of *Public* educational tools used in the program

| Subject | Public Software | Description |
|---------|-----------------|-------------|
| SCIENCE | Kalzium | Kalzium shows the periodic table and the properties of elements. It is an encyclopedia, explaining states of matter, evolution of elements. Basic equations can be balanced using this tool. |
| | KStars | Desktop planetarium-Astronomy with over 130000 stars, all planets, etc. |
| | Stellarium | This is a desktop planetarium software that shows exactly what you see when you look up at the stars. |
| | PhET | Fun, interactive simulations of physical phenomenon |
| | STEP | Fun, interactive simulations of physical phenomenon |
| | KTechLab | Can be used to build your own circuits and explain various components |
| MATHS & LOGIC | GeoGebra | An algebra and geometry package providing for both graphical and algebraic input, very versatile to create lesson plans and resources for maths learning |
| | Tux Math | A fun game through which children can practise their addition, subtraction, multiplication and division. |
| | KBruch | This tool can be used to explain fractions as well as for the children to practice arithmetic problems. |
| | KTurtle | A  fun tool to teach children programming and logic |
| SOCIAL STUDIES | KGeography | Quiz on different states and capitals across the globe |
| | Marble | This acts as a dynamic desktop atlas. |

*Illustration 2: Public educational tools bundled with Ubuntu*