EDUCATIONAL INNOVATIONS

Prof. Vijaya Sherry Chand

CONTENT

FOREWORD

The Honey Bee Network gives voice, visibility and velocity to creative and innovative contributions of common people at grassroots for achieving inclusive development. The Honey Bee Network has emerged over the last thirty years as a new social movement in support of knowledge-rich, economically poor people. It nurtured innovations from and for grassroots. In order to enrich the ecosystem for inclusive and empathetic innovations, The Network organised the Fourth International Conference on Creativity and Innovations at for/from/with) Grassroots [ICCIG-4] Jan 28-30, 2019 in collaboration with GIAN and SRISTI besides RJMCEI, IIMA, NABARD, and numerous other partner institutions. The purpose was to pool the insights from the local ground and global playfields of ideas, institutions and initiatives by government school teachers, grassroots innovators, scholars, policymakers, senior managers, young students, farmers, teachers, NGOs, international organizations and other community members/social organisers etc.

One of the key themes of the ICCIG4 was Educational Innovations. Collaboration between Gujarat Grassroots Innovation and Augmentation Network (GIAN) a Honey Bee Network Institution and Institute of Teacher Education (IITE), Gandhinagar among many other Institutions supported the creativity and innovations presented by school teachers at the conference.

There were several questions discussed in various sessions: How have school teachers and educational administrators/policymakers tried to improve inclusion teaching and learning quality, and connections with local communities including parents of the children. Since most children in government school come from relatively disadvantaged background How have educational policy makers taken care of Angular Excellence, that is nurturing children who excel in one or two subjects but are below par in all others? What are the latest trends in democratizing the access of disadvantaged children to the high-quality content and mentors? How can the policy makers learn from innovations by teachers and community members?

Fifty innovative teachers have presented their innovations at the conference. This book is based om the collection of cases of innovative and experimenting government school teachers. cases These were scouted and documented over the period 2015-2019 by SRISTI and Education Innovations Bank, RJMCEI, IIMA assisted by GIAN team. The case studies are from the states of Gujarat, Maharashtra, Rajasthan, Himachal Pradesh, Sikkim, Jammu & Kashmir, Kerala and Chhattisgarh. Major Categories of the educational innovations presented here deal with reducing absenteeism, community involvement for overall school development, enabling the specially abled – Inclusive education, innovative teaching learning methods for Maths and Science, comprehensive development of schools, effective use of information and communication technologies in education, and development of effective and interactive Teaching learning material for classroom.

Baldev Pari a teacher from Gujarat has conducted around 35 different FREE ICTE workshops for teachers of various districts. He did it in online mode during pandemic. He is providing free educational material through his website www.baldevpari.com since 2011 . His website contains about 1100 poems, videos, papers, value education videos and useful literature. Today, the website has more than a million subscribers. He has created a studio at home at a cost of Rs 7.5 lakh through his own savings.

Imran Khan a teacher from Rajasthan designs and develops apps voluntarily. His 80 apps cover a variety of subjects related to the school curriculum. Imran has created apps for primary and secondary classes and for competitive exams. There are 20 million users of his apps. His apps are used not only in India, but in 50 countries. Some famous apps of Imran Khan are Project Dishari, Alwar Shakti, Digital Mewat, General Science, Maternal Care, SSC Exam, Kids General Knowledge, etc. Presently there are over 4,85,000 users for Dishari app which was launched in 2017 for the benefit of the college students to help prepare for competitive exams.

Shri Panu Halder, a teacher from Chhattisgarh used to do some innovative experiments in science, and this led him in 2000 to establish a network of enthusiastic youth called 'Nature-Bodies.in'. He started many community-based projects that have addressed both livelihoods and the depletion of natural resources. Shri Halder initiated a "journey of exploring nature"

by starting a Public Biodiversity Register - a knowledge bank consisting of the information regarding the importance of every species present in a particular area. More than 15000 species have been documented, and the work is still going on. The students of his team have started a new initiative called #ExploreGreenTreasure in which they focus on common plants having good medicinal properties.

Sudhir Nanche a teacher from Maharashtra has prepared a Mathematical Box, with 30 different educational aids. The box attracted a number of children to re-join the class. The materials used are: Flannel Board, Graph Board, Multiplication/Napier strips, Fractional discs, Frame of nails, Magnet Board, Place Value Board, Multiple Hexagon, Spike abacus, Place Value Chips, Volume Box, Decimal Fractional Changes, Number Theory Chart, Electric Circuit, Two- & Three-Dimensional Diagrams etc. The different teaching aids are fitted inside these compartments. There is a Flannel Board inside the lid and a Graph Frame on the outer side.

Rameez Sudaan a teacher from Jammu & Kashmir introduced an 'Innovative Model School' with initiatives to change the perception change about public schools & restoring public confidence. He worked on several other ideas such as consolidation or merger of schools, renewed focus on pre-primary, leapfrogging with Information and Communication Technology (ICT), creative work on curfew Days, skill development for girls, photography workshops, , Community outreach programmes etc. The campaign which relied on public participation through improved education standards and positive parental perception about the school, managed to increase student admission and the enrolment from 175 in 2015 to 305 in 2018.

We hope this book will provide meaningful idea about the work done by outstanding innovative government school teachers. Since these teachers were not deterred by the constraints. Their stories we hope, might inspire and motivate many other teachers facing similar problems. We congratulate all the teachers who participated and presented their innovations at the conference and wish their valuable contribution to the educational innovations will inspire many more in the system.

Prof. Vijaya Sherry Chand

Prof. Anil K Gupta

ACKNOWLEDGEMENT

Indian Institute of Teacher Education (IITE), established in 2010 is a brainchild of the then CM of Gujarat Shri Narendra Modi. He wanted to establish an institute which would produce world class teachers and export them. At a time when the world is facing shortage of teachers, he wanted India to lead from the front.

A team of experts led by legendary Indian academician and philosopher Shri Kireetbhai Joshi and other scholars of national and international stature came together to design the curriculum of IITE.

One of the key objectives of IITE is "to introduce and nurture innovations in the education system so as to reflect India's ...inexhaustible creativity".

The creativity and innovations of teachers in the government school system was one of the key themes of the Fourth International Conference on Creativity and Innovations at for/from/with) Grassroots [ICCIG-4] held at IIMA in 2019. To leverage the synergy between objectives of ICCIG and IITE, it was decided to organise sessions in collaboration with Gujarat Grassroots Innovation and Augmentation Network (GIAN) a Honey Bee Network Institution.

I congratulate Prof Vijaya sherry Chand and Prof Anil K Gupta, their teams at GIAN and SRISTI, Education Innovations Bank, RJMCEI, IIMA for successfully organizing this conference. I also congratulate all innovative teachers who have presented their valuable work at the conference. I hope that the rich insights of innovative teachers shared in this book will inspire both the students and teachers for ensuring inclusive, innovative and effective education. There are obviously many challenges in the current educational system particularly in government schools. I compliment the editors and the whole team for putting together a very meaningful conference-based book which surely will inspire the future teachers and the mentors in the teacher training institutions around the world.

Dr. Harshad.A.Patel

Vice Chancellor

Indian Institute of Teacher Education

SCHOOL COMPREHENSIVE DEVELOPMENT

SCHOOL COMPREHENSIVE DEVELOPMENT

TONIC OF LOGICAL POWER

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Scan QR-code to watch video

Ashokbhai Mohanlal Parmar obtained a Primary Teaching Certificate in 1993 and started teaching in 1998 at Babiya Primary School in Mundra, Kutch. He later completed his graduation from Gujarat University, B.Ed. from Dr. Ambedkar University, and MA in Education from Jain Vishva Bharti. He is now engaged in doctoral studies (Teaching of Mathematics through Video Games) from C.U. Shah University.

In 2005, Mr. Parmar was selected as SRG (State Resource Group) member for mathematics. He became involved in Math textbook writing and editing for classes 5 to 7. In 2018, when the government shifted to NCERT textbooks, he translated Class 1-2 books and reviewed Class 3-8 Math textbooks. He was also involved in preparing numeracy material for Classes 1-2. He has also taught Math through satellite (BISAG) of the state government, besides being involved in various other distance education initiatives. He has also participated in the manual and video preparation of the NCERT Math kit.

To develop reasoning ability in children, Shri Parmar, in 2016, introduced the concept of puzzle solving. Every day during the morning assembly. He called this initiative "Tonic of Logical Power." Every day a puzzle was written on the board during the morning assembly. Students would note it down in their notebooks and solve it during the day. The next day, during the assembly, the answer to the earlier day's quiz was discussed. The number of students giving the correct answer increased noticeably over time. The puzzles included number patterns, word patterns, missing figures, cause-effect relation in numbers, problem-solving, social-relations web — all designed to develop mathematics ability. The activity gradually went electronic through WhatsApp groups. The names of the students giving the right answers were then circulated. This evolved into puzzle competitions, with three of the best students receiving books as prizes. Similar puzzle competitions were organized for teachers through WhatsApp groups. The main

Daily puzzle solving in morning assembly

Girl solving puzzles in the classroom

Solving puzzles in group

outcome was the development of reasoning ability, pattern understanding, and problem-solving ability in children as well as adults.

Mr. Parmar also runs a YouTube channel, in which videos related to mathematical concepts, word problems, and maths activities are posted.

Also, a Facebook page by the name Maths Puzzle is in operation. Every day a new post on maths problems and simplifying teaching of the subject is posted. Teachers from the state give puzzles on WhatsApp groups to their students to solve. The project is thus not limited to a school but expanded across the state.

The activity is monitored through the number of students who can provide the correct answer. Interest surveys have also been carried out, and about 60% to 70% of the students participating in the activity find it useful. In all, about 3000 students and teachers are part of the activity. In four and a half years, 1662 puzzles have been used, and the activity is still continuing. Parents are also getting involved now.

Mr. Parmar has been recognized for his work — he has received the best teacher awards at the district level and from various organizations, including the Gujarat Science Academy. He strongly believes that activities like "Tonic of Logical Power" improve the mathematical abilities of students as well as teachers.

QUESTIONS FOR TEACHERS
1. What activities can be done to explain the use of puzzles in everyday life?
2. What are the benefits of doing math with activity?
3. How should children be persuaded to analyze information?

QUESTIONS FOR TRAINEES
1. What qualities do children develop through group activities?
2. What activities can be organized for the development of reasoning in children?
3. What can be done to motivate children for self-study?

PERSONAL DEVELOPMENT SHEET

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Scan QR-code to watch video

Shri Nagla Sureshkumar Dhanjibhai became a teacher in June 1999 and has been working in Aansodar Primary School since November 2004. He holds an MA and a B.Ed and is a language teacher (English/Sanskrit) teaching Class 6-8. He has 21 years of teaching experience.

When he joined Ansodar Primary School in 2004, he found that students' attendance was very low; they did pay attention in class or do homework assigned to them; and parents too were indifferent as they felt that teachers did not put in enough efforts. In fact, they were not willing for any active participation in their wards' studies as they felt it was the responsibility of the school.

To start with, Shri Nagla arranged for a meeting with parents of students who had irregular attendance but to his dismay no one showed up. Undeterred, he decided to go to the village and meet them at their homes, after school hours, around 5 pm in the evenings. As a next step, he began holding Ratri Sabhas" or night meetings in the village to interact with the parents. During these meets, students showing outstanding performance were honoured, to acknowledge their efforts and at the same time, motivate the slow ones to up the game. The meets also helped to build confidence amongst the parents who were now more receptive to his ideas.

Shri Nagla, after establishing parental support, initiated the following activities:

- **"Ame Shu Shikhya?"**
  This is a form of a Report Card that lists students' progress in both studies and participation in various activities. The students have to get the report card signed from their parents so that they are aware of the progress made by their wards. This activity has greatly helped to change the perception that parents had of the school, that is, teachers don't make any effort to teach the children.

- **"Ame Pamya Lilu Nishan"**
  To curb the menace of low attendance, Shri Nagla came up with the idea of letting students mark their attendance themselves. So on the day they were present, they could mark a green tick, signifying present for themselves. The activity caught the fancy of the children and they became more regular in attending school and adding to their green ticks.

- **"Vaali Mulakat Form"**
  Parent visits to the school are recorded in a Vali Mulakaat Form (Parent Meeting). The form has several columns to register their feedback with regards to their wards'

Meeting with SMC members

Parents having Mid Day Meal with children

progress with special focus on what activities they liked or disliked. Shri Nagla used this feedback to address all issues.

- **"Mahoola Visits and Awareness programme"**
  Shri Nagla, along with other teachers, visited the village every Sunday to discuss various subjects of interest such as environment conservation, general sanitation, importance of balanced diet and maintaining good health etc. The students of classes 6 to 8 also accompanied the teachers and participated actively in these activities putting up plays and other demonstrations to amplify their message. The activities attracted attention of the neighbouring schools who also expressed interest to carry them out to inspire their students.

These meets became hub of several creative activities, for instance, students shared information about the books they had read; or they all got together to plant saplings; and during festivals they brought along sweets and snacks. Students also formed teams and visited all houses in the village to collect leftover rotis to feed the stray cows and dogs.

The students also carry out some form of self-assessment every week. For example, they find out which street is the cleanest, how much water is used and wasted in a house, and so on.

Children adhering to hygiene

With the school showing results, many donors and some companies with CSR funds have come forward to extend support and contribute to the infrastructure. In fact, some children have left their private schools to study in this government school. The school has improved its grading from "D" to "A" and maintained it for three years now.

QUESTIONS FOR TEACHERS
1. What activities can be effective in encouraging children to come to school?
2. What information can be requested in the parent visit form to increase the parent's attention (accuracy) towards the meeting?
3. What steps should be taken to make the parent aware of his/her child's study?

QUESTIONS FOR TRAINEES
1. What steps can be taken to find out the cause of irregularities in children's schooling?
2. What extracurricular activities can be done to make schooling more enjoyable?
3. Apart from the activities done by the teacher to increase the regularity of the children, what other activities can be carried out here?

OVERALL SCHOOL DEVELOPMENT BY INNOVATIVE ACTIVITES

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Question Box

Shri Chaudhry is credited with developing an innovative "Question Box" for introvert students who were too shy or lacked confidence to ask questions from their teachers in the classroom. The Question Box consists of a cardboard box placed in a corner of a classroom. The children can note down their question and put in the box, without writing their names on the paper. The teacher will then take out the papers and address the questions in the class.

He also helped the school to create a constitution so that the students could understand the meaning, that is, a book of rules and laws formed by the people to guide their actions.

Children's Newsletter "Nanhe Ustad"

So far, 8 monthly and 2 annual issues of children's newsletter — Nanhe Ustad, for children, edited by children and written by children have been published. These newsletters are treated as children's assets and form part of the school's permanent records.

Come Clean — receive award

The child who comes to the school clean and tidy throughout the week and also contributes in keeping it spic and span is given a clean student award. The Sanitation Committee comprising of both teachers and students get to decide who will receive the Clean Child Award. Three children are

The candidate for the post of the chairman of the drafting committee is ready for election in a row

nominated for the award, one by the Sanitation Committee, one by the children, and one by the teachers — the winner is then selected by direct voting. All children have the right to vote.

School place naming

Every school has classrooms, playgrounds and verandas, which can be constructively used to aid teaching. For instance, the classrooms and verandas have boards on which both teachers and students can display educational material, for instance, images and anecdotes related to freedom fighters, scientists and other famous personalities to create awareness and inspire the students. These places could be divided into different sections with each section given a unique name and dedicated to a particular activity. The purpose of this activity was to develop the cognitive and emotional values of the children.

SMS homework

He also introduced the concept of using the SMS service as a means to connect with parents of the children. Homework activities were conveyed to the parents through SMS and so they could ensure that their wards completed the work assigned.

Saturday culture School

This program is organized every Saturday. A bal sabha is held and there are several cultural programs on display, to create awareness and stimulate creativity in the children.

Child cabinet

To promote democratic sentiments, there is a children cabinet in the schools with members democratically elected through a secret ballot similar to India's electoral process. The students select a Prime Minister, Deputy Prime Minister, Kitchen Minister, Sanitation Minister, Library Minister and Sports Minister. These ministers are assigned duties which they have to discharge to the best of their abilities. All issues also have to be resolved democratically.

Computer and ICT based education

Shri Chaudhry also started smart education for children with the use of digital technology. Audio and video aids from the Internet are used to support teaching. Besides, live chats are also held via video conferencing.

Involving children with environmental protection, nature and wildlife

Every year on the occasion of Rakshabandhan, all children take a vow to protect the trees by tying
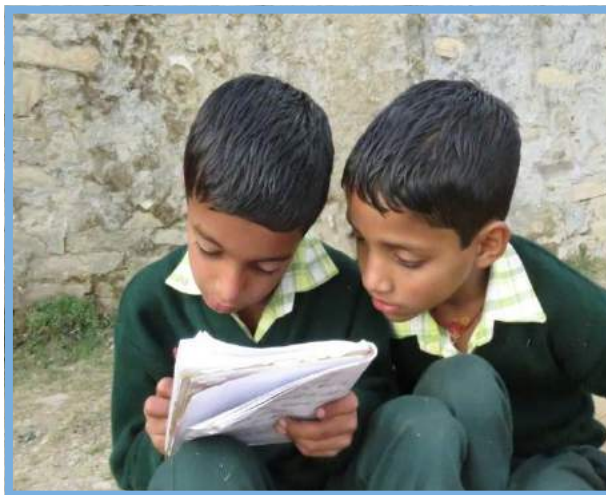
Members of the Cleanliness Committee and the Morning Assembly Committee making their draft

Shruti Rana chairman of the drafting committee MDM committee working on its draft

Dismissing unacceptable rules while discussing draft

rakhi on the trunks or branches of the trees. The aim of the activity is to create an emotional bond between the children and nature and inculcate in children the value of nature conservation.

From the year 2016, the first week of October is celebrated as Wildlife Week. The school also opens on holidays during this Week. Children are given different activities every day.

Outputs

All these out of the box teaching activities have shown desired results. The children are more regular in attendance, their performance has greatly increased, they are more immersed in the lessons and are active participants in their learning journey.

Shri Chaudhry has been honored by the Government of Himachal Pradesh and various other organizations. He has also organized workshops for other teachers of the district.

Another interesting activity that Shri Chaudhary has introduced is the Honesty Shop, where students can make a purchase on their own and put the money in the cash collection box. This shop has been running since 2016.

School Facebook page
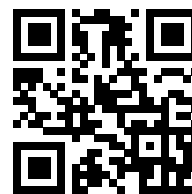
Shiksha Vahini Online e-magazine dedicated to teachers and learners

QUESTIONS FOR TEACHERS
1. How will the question box be useful for improving the education level of children?
2. What kind of environment must be created for children to express their views at school?
3. What activities can be organized to boost the confidence of children?

QUESTIONS FOR TRAINEES
1. How can ICT based education enhance the quality of education?
2. How does digital education motivate children for self-study?
3. What skills will be developed in children by forming a children's ministry?

TRANSFORMATION OF PUBLIC SCHOOL EDUCATION — AN INNOVATIVE MODEL SCHOOL CONCEPT IN KASHMIR

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Born and brought up in the border town of Uri, famous for its good climate and scenic landscape, Rameez Ahmad Sudhan, believes education should be based on social justice, equality and equity. He introduced an "Innovative Model School" the details of which are presented below. He is actively involved in online teacher training programmes, and community classes. Besides, through the 'Art of Giving initiative' he is also reaching out to children during the Covid crisis to provide psycho-social and emotional support to the children. Shri Rameez holds a Master's degree in Science and a Diploma in Disaster Management, and has done a certificate course in Remote Sensing & GIS. He is deeply interested in exploring how conflicts affect education and how these can be resolved to the best of the students' interest.

Conflict affects education; for example, in 2016-17, a total of 130 days of the school academic calendar were lost to strife. Any such disruption leads to non-performing teachers, weakened infrastructure, poor public perception of education, decline in students' enrolment, and low motivation all around.

Shri Rameez initiated a three-year long programme in June 2015 titled "Model College School Initiative" in Old Town, Baramulla (J&K).

Environment week celebration

Phase 1

Plan "Change". The first step was to understand the nature of change to be brought about in school, and its impact on the stakeholders, particularly students, teachers, parents and community at large.

Location of the school. He chose the district headquarters as the location for the college school. The aim was to reverse the downward trend of educational parameters in eight schools—these were clubbed into one functional institution, the Model College School. For better resource augmentation and visibility of the progress made, periodic review and timely monitoring were stressed.

Vision.

1. Education provided in the Model school would be holistic and integral touching upon the physical, emotional, vocational and aesthetic development in addition to academics.
2. Selection of students will be through an independent selection test.
3. The school will have adequate ICT infrastructure, Internet connectivity and full-time computer teachers. Special emphasis may be given to the teaching of Science, Maths and English in the first phase.
4. A good library with books and magazines for students and teachers will be provided.
5. Necessary infrastructure will be provided for satisfying teaching needs, as also for sports and co-curricular activities. There will be sufficient scope for sports, recreation and outdoor activities.
6. The school will also create facility for activities emphasizing common heritage, art & craft.
7. The Teacher-Pupil Ratio would not exceed

Students watching Motivational movies

Prayer meet

1:25. Further, the classrooms will be spacious enough to accommodate at least 30 students.

8. The school will have to follow the National Curriculum Framework 2005 and its subsequent versions as adopted by Government of India from time to time. At the same time, the curriculum should take into account the local culture and environment, and learning should be activity-based.

9. The school curricula should include the material items that inculcate leadership qualities, team spirit, participation abilities, development of soft skills and ability to deal with real-life situations.

10. Health Education and health check-up will be introduced in these schools.

11. Field trips and educational tours will be an integral part of the curriculum.

12. The school may provide NCC training to students to inculcate the value of nationhood, as also to make them appreciate a disciplined way of life.

Phase 2

Make Change. Innovative solutions to challenges faced by the school & its perception management.

Perception change about public schools & restoring public confidence. Understanding why there is such a divide between what "we, teachers think of ourselves and how others view us" revealed many significant gaps. Rameez first prepared the students for a Teacher's day event, in which a cultural item "Nanhe Munnay Bache" was presented at University of Kashmir. This brought out a fresh perspective about public school children.

School Education Committees (SEC's). The next on his focus was to bridge the gap between school administration and parents. For this, two major events were organized: a mega Parent Teacher Meet (PTM) and renewed public engagement to bridge the mistrust and neglect between parents and teachers. This was followed by periodic monthly PTMs.

Consolidation or merger of schools. The model schools came about after the merger of eight individual non-performing schools; now the merger seemed to be working.

Renewed focus on pre-primary. School readiness is an essential concern for students entering the educational system, especially those who are from diverse backgrounds. Young children between birth and age five make rapid developmental progress. Students enrolled earlier and for a longer duration demonstrate better short and long-term results. Students therefore participated in a full day pre-school program.

The school was in the direct line of fire due to frequent stone pelting incidents; however, the parents' faith in the school remained unshaken. There was constant communication between the parents and the teachers during these difficult times.

Shift system of classwork. With insufficient infrastructure, increased enrolment became an issue. To resolve the issue, Rameez Ahmad came up with a two-shift system of class work, the first shift working from morning 7:00 am to 1:00 pm and the second from 1:00 pm to 5:00 (evening). In this way, a healthy student teacher ratio of 1:25 was maintained.

Leapfrogging with Information and Communication Technology (ICT). A pertinent issue in Kashmir was the absence of connectivity and frequent disruption of electricity—many government schools are still to be electrified. So, the way forward was pen-drives or offline mode of transactions like personal laptops, documentary screening sessions, and audio-visual aids. Civil society members who were witness to this new means of learning wanted to be part of this

renewed education system, and donated a few items for the school including a 40″ colour TV set, inverter, lighting equipment and stationery.

Creative work on curfew days. The Extended Learning or home-based tutoring by staff after school and during the unrest of summer 2016 resulted in increased gains in academic skills and also plugged gaps in the summer learning loss. The students also engaged in various activities in school like pickle making and cooking. Besides, there were also personal hygiene lessons for girls.

Activity-based learning. Routine rote-based learning got a break as clubs for various subjects were formed to make education easy. The clubs helped in providing a quality teaching experience within and outside the classes given the paucity of laboratory and other logistical support driven by increased enrolment, totalling to more than 300 students.

Skill Development for Girls. In collaboration with a college for women a skill development programme in boutique technology was started for girl students for skill enhancement in cutting, tailoring and other crafts.

Photography workshops. To reconnect and re-imagine the old town as a socio-cultural milieu Rameez Ahmad conducted a photography workshop. The workshop helped to build in students mutual respect; take pride in what the parents did for a living to support the family; and appreciate the rich architectural heritage of the area.

Sports Events. Given that there was limited sports infrastructure in many schools, inter-school tournaments were held where the schools had such facilities.

Art and craft classes. Students were encouraged to take part in a variety of art and craft classes.

Community outreach programmes. The students were engaged in various community mobilisation programmes to sensitise people on pressing issues of environment, road safety and sanitation.

Phase 3

Sustain Change. With the capability generated and the trust earned, it was important to motivate the stakeholders to drive the change further. However, in the fast-changing context, the school has to take permission from the administration to allow teachers to stay in the place for a substantial amount of time so that the progress achieved can be sustained.

Review. Demographic information was collected for 180 children and 135 parents. Open-ended questions were asked to gain parents'

inputs. In addition, quantitative data on the progress was also collected.

Children Response on School Progress is given in the table below (number of students participated — 180).

STATEMENT	RESPONSE	
	YES	NO
Does your teacher encourage you to Improve your performance?	171	9
Does your teacher help you in understanding ways to improve your grades?	143	37
Does your teacher appreciate you when you work hard towards scoring well in a test or perform well in extra-curricular activities?	166	14
My teacher has fair rules for the class and is extremely impartial.	122	58
Do you have supportive classmates?	111	69
Do you think the students are happy to be in school?	133	47
My teachers make learning enjoyable.	159	21
My teachers give us time to explain our ideas.	122	58

The pass percentage of Class X examination has shown phenomenal increase in just three years. From no one passing in 2013 and 2014, the percentage went up to 50% in 2015, 93% in 2016 and 100% in 2017.
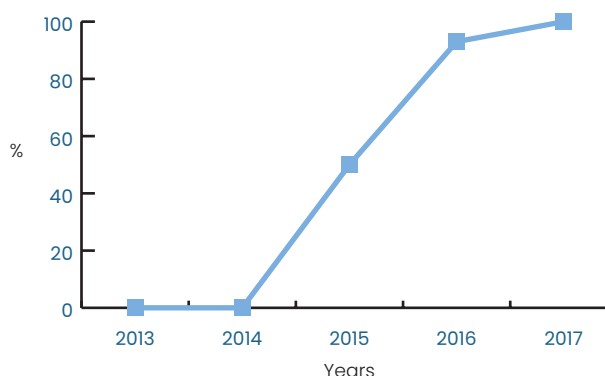
Enrollment Increase. The campaign which relied on public participation through improved education standards and positive parental perception about the school, managed to increase student admission and the enrolment from 175 in 2015 to 305 in 2018.

Reverse Migration from Private Schools. Sixty-five of the new enrolment was of students who had gone to private schools but came back for readmission to the model school.

Accountability of teachers. The Biometric attendance system that was introduced improved the attendance of teachers (94% in the 180-day school year).

Parents were highly satisfied, with 97% reporting that their children enjoyed the learning

Celebration with community members

Activity bases learning

process. There has been a revival of faith in the public education system owing to the visible and incremental yet marked change in students' performance and greater accountability at the school level. Gains in vocabulary and general academic skills have been observed among children.

Encouraged by the success of this initiative the J&K department of education is setting up two state-wide innovative programmes, "NANHE QADAM" and "LAB SCHOOLS". The former is an innovative kindergarten program under which five preschool centres per district have been set up in the first phase. The idea is to catch the talent young and steer the children in this age group towards proper development, growth and prosperity. The Lab School is one in which a school has meagre resources but a potential to be developed. One such school has been adopted in every zone of the district for revival.

"When you do things from heart it feels like a river is moving inside"

Mevlana Rumi

QUESTIONS FOR TEACHERS
1. What activities can be undertaken to maintain a positive learning environment in the school?
2. What are the physical facilities in the school that help the children to study?
3. How to assess the knowledge of children to know the achievement of knowledge?

QUESTIONS FOR TRAINEES
1. What kind of activity can be done for the children to participate in the classroom teaching-learning process?
2. How can reference literature be used to provide children with information other than the curriculum?
3. State things to keep in mind when using ICT in the classroom.

DESIGNING VARIOUS CHILD CENTRIC PROJECTS FOR VALUE EDUCATION AND EXTRACURRICULAR DEVELOPMENT

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Scan QR-code to watch video

Mrs. Vanita Rathod has been serving in Government School for 15 years as HTAT Principal, including the last seven years in School No. 93 in Rajkot. The number of students in the school was 300 at the time she joined and the infrastructure was extremely poor. There was no separate arrangement for sanitation for boys and girls. The school had "D" grade in Gunotsav. Given the lack of infrastructure, facilities and motivation, students' attendance was very low.

Details of Innovation Experiment

Observing the current status of the school, Mrs Rathod thought of implementing different projects and with that aim in mind, formed a committee for each task. These committees consisted of only student members and each student was assigned a task to complete. The aim was to ensure their involvement and build in them a sense of responsibility. The committees took full responsibility for the implementation of any project. The following projects have been implemented.

Creating a positive and inspiring atmosphere. Motivational speech is organized every fortnight. Well-known people who have achieved success in their respective callings are invited to address the students and inspire them to dream and turn the dream into reality. Students are encouraged to make notes and set their own goals.

School library. Instead of distributing sweets on birthdays, the children were asked to donate a book to the library. Similarly, teachers were asked to donate ten books each on their respective birthdays. Other NGOs in the vicinity also donated books to the school. In this way thousands of books were added to the school library every year. Donors have donated five cupboards for the library.

Improvement in physical facilities. Starting from 2012 and till 2020, the school has received more than Rs. 18 lakh donations, physical facilities have been developed based on private and public participation. Water harvesting arrangements have also been made for rainwater harvesting. A smart class has been created with funds received through a donor. Two projectors have been received through Gyankunj. Each class has a green board and water cooler; lesson diary, school shoes, school bags for each student and gifts at various festivals.

Children and teachers discussing in a prayer meeting

Children learning while playing

School garden

Book Exhibition Book Rally. In order to encourage reading habits in the students, book exhibition named Granth Pooja, is organized in the school on 14th February every year. Students form a human chain and hold books in their hands to encourage people to read.

Green school. More than two thousand plants have been planted in plastic bottles, PVC pipes, green coconuts, waste tires, waste jeans pants, shoes, earthen pots and plastic containers. A vertical garden of 250 bottles has been created on the two walls of the school. More than 200 medicinal trees have been planted. Before the mid-day meal, the students use soap-nut grown in the school for hand washes. The school has also built nests, watering pots, swings for the birds and also arranged bird feeders. Each student is assigned the responsibility of taking care of one tree and they are required to water them after school hours.

Child health. The school arranges a separate school health check-up for students twice a year. The students undergo physical check up to test eyesight and dental hygiene amongst others. They are also tested for hemoglobin and students with low hemoglobin are given iron and folic acid tablets. Students with low hemoglobin also have a thalassemia test and a ferritin test every year. Several seminars are organized to spread awareness about health-related issues. Parent-teacher meetings are also held to discuss the subject for each child.

The FIRST AID BOX of school is also innovative. It contains things like tea powder, turmeric, alum, fennel, sugar, and ajown to treat students by naturopathy.

Girl child education. To encourage girl education, the school has set up a separate toilet for them with a vending machine to dispatch sanitary pads for girls of Std. 6 to 8 free of charge. There is also an incinerator donated by a donor.

Sports. A sports project has been introduced by the Sports Authority of Gujarat. The students of Std. 6 to 8 are provided special sports training when they come to school in the morning and from 3 to 6 in the afternoon. Starting from 2015 and till today, students have shown excellent performance with some achieving winning positions in Khel Mahakumbh held at the state level every year. The school has got two coaches from the Sports Authority, in addition to the two full time coaches for training students in athletics and basketball.

Creativity Development. Notice boards have been installed in the school for students to display their own work. This activity helps to stimulate their creativity and increase their confidence. The students can post material related to their subjects and other areas of interest.

Honesty Shop. The school runs an honesty shop comprising of all the stationery items that students need in their class. There is no manager to run the shop. All the items are available at wholesale rates and students run this shop on their own.

Short Film: Art Development. So far 13 short films have been made about school students for the art development among school students. In 2015,

"Sacho Saharo" film was appreciated, "Punya" was screened by NCERT in 2018 and "Sachi Duniya" was honoured by GTPL in 2019. School students have started giving their programs on television and radio stations. "Ladko Baal" drama was aired on the radio with school students to bring out the child's dormant powers.

Spread of Gandhian thought. On Gandhiji's 150th birth anniversary, 150 school students enacted the role of Gandhiji. They drew a 50-meter-long map of India in the school ground with a portrait of Gandhi ji fixed at the centre. Each of the 150 students who enacted the role of the great leader, presented one of his thoughts to the gathering.

Other activities. A Special Training Program (STP) class was initiated in the year 2015. About 250 out-of-school students have been benefited from it till date.

The number of students in the school has increased from 300 to 650 over a period of eight years. The students have demonstrated excellence is competitions held at the district and state level, for instance, science-maths exhibition and Khel Mahakumbh. The school's reputation has gradually spread across the Town Primary Education Committee, Rajkot. All the students of the two closed private schools in the area are now enrolled in this government school. It is now rated A grade in the Gunostav.

Awards and Recognition

Ms. Vanita Rathod has received a number of awards in recognition of her efforts, such as the Shri Aurobindo Society, New Delhi's National Unity Award 2019, and the state-level award of the best H-TAT principal of the Government of Gujarat for the year of 2020, among others.

She has been honoured for her children's stories (Gujarat Sahitya Academy), poems (Akshar Maitri Sahitya Vartul), work on Ghayal Saheb the ghazal writer, and her work on Gujarati (Gujarat University, Ahmedabad).

Students and teachers than planting plants

QUESTIONS FOR TEACHERS
1. What physical facilities must a school have?
2. Why is it important to pay attention to the teaching ability of children?
3. How is the use of digital media useful in education?

QUESTIONS FOR TRAINEES
1. What activities can be done to develop the creative power of children?
2. What activities can be done to develop qualities like honesty in children?
3. Why is it important to be aware of children's health?
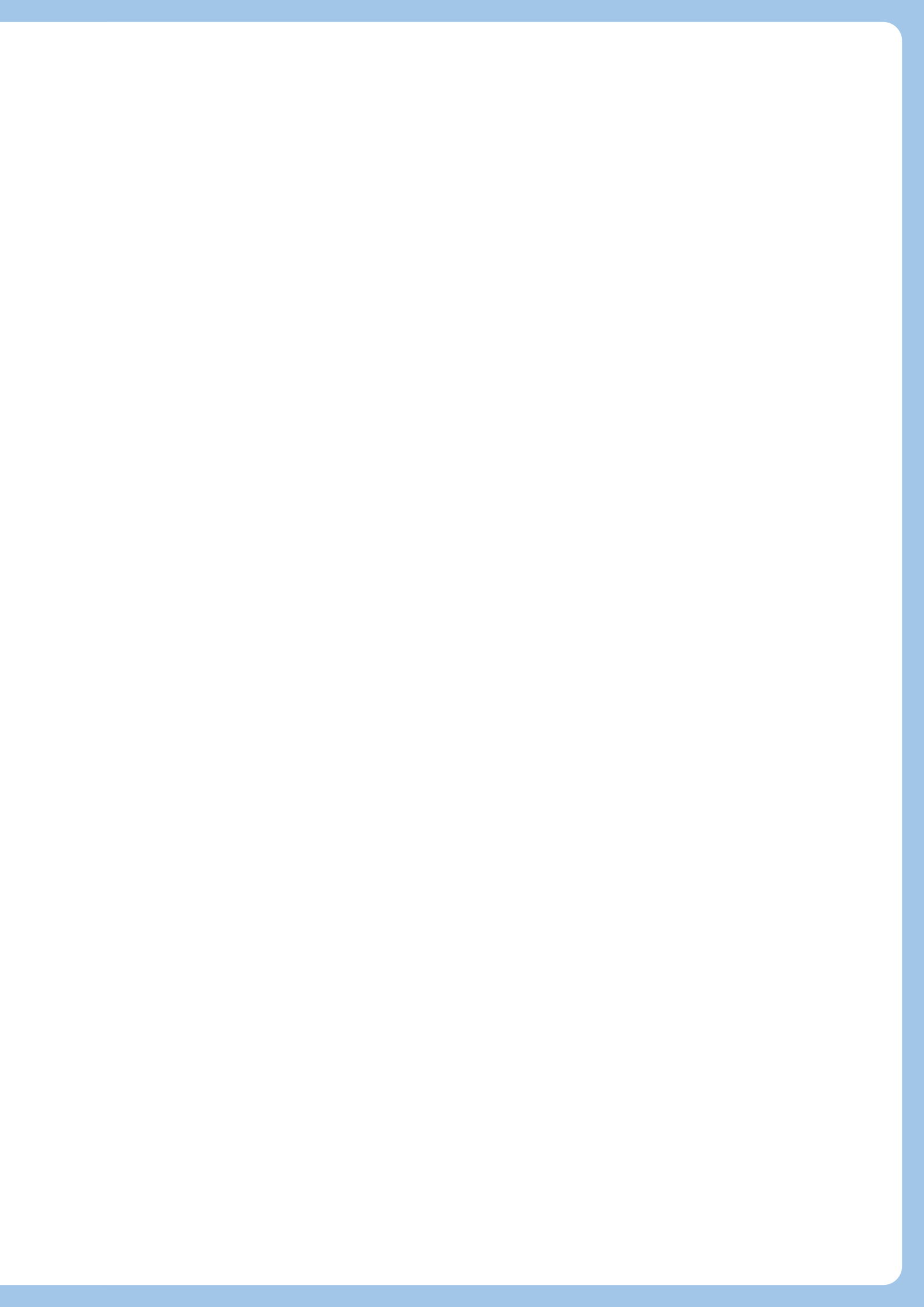
USE OF ICT IN EDUCATION

ICT IN EDUCATION

TEACHER	Baldev J. Pari
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WEBSITE	www.baldevpari.com
YOUTUBE	baldevpari pari

Scan QR-code to watch video

Shri Baldev Pari Pari has an M.Sc., B.Ed. (Mathematics), M.E in Education and has been teaching for 21 years at the secondary level. In 2010, Baldevbhai started learning the basics of technology. His friend Ghanshyambhai initiated him into technology. Drawing inspiration from another innovative teacher Jitubhai Gojariya and his blog, Baldevbhai also created his blog. From 2011, he started uploading his creative experiments, quizzes, and puzzles on this blog.

Teachers had many technology questions: how to create educational digital material, how to create a blog, how to conduct searches using the Internet, how to create a flash quiz, how to use YouTube, and several others. Shri Pari decided to fill this gap and arranged a discussion forum called "Digitization in education".

He made available all the subject-specific material relevant to each unit, such as reference materials/educational videos/poems/papers on his blog so that other teachers could easily download. To introduce teachers to this work, he held a workshop in 2015 at Bharati Ashram located at the foothills of Girnar, Junagadh. About 90 teachers of standard 8 to 12 gathered for this workshop. At the time education minister Bhupendrasinh Chudasama was also present and spoke to the participants for about an hour. Baldevbhai himself bore the non-food expenses of the workshop while teachers managed their food. Some of the topics covered in this workshop included information on electronic devices and their use, basic Internet education, ICT for classroom implementation, information about blog and how to create digital educational material. The workshop was followed up through regular telephonic discussions.

A DVD containing useful materials was provided to the participants. It contained primary and secondary materials such as reference materials, poems, Mp3, video, etc.:

- Chapter wise MCQ quiz for standard 9, 10, and 12 which is very useful for the teachers;
- Information on useful educational mobile applications for primary and secondary classes;
- How to create a blog;
- Different tips on using the Internet;
- How to create a flash quiz;
- Reference literature on special school level celebration of certain days.

Mr. Balderpari giving ICTE training to other teachers

Workshop video
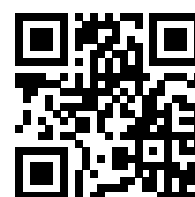
Free ICTE training

Studio developed at Home

Another 19 workshops followed up this activity, all held on voluntary basis.

Up to now about 30 workshops have been conducted. Two of these conducted in Surat and Navsari were streamed live on YouTube too. About 2500 teachers have benefitted.

Shri Pari then made a studio at his home for recording videos and delivering online lectures, spending about 2.5 lakh rupees. To deal with the COVID-19 situation, he has developed one application of videos and quizzes for 1 to 12 standard students, available on the Google play store. Also he takes classes for 10th standard students in math through YouTube.

Many teachers have given their opinions through WhatsApp. Many teachers routinely contact him through phone calls and express their happiness upon learning about technology. One student, Chandanbhai Rathore, attended the second workshop and decided to contribute to this task. He is still associated with Shri Pari.

Regular updates are provided on the website — www.baldevpari.com. During the lockdown, Shri Pari uploaded 900 videos based on mathematics for standards 5 to 10.

Shri Pari has received several awards, including the Sandipani Award by spiritual guru Rameshbhai Ojha at Porbandar in 2015, Best Teacher of the state in 2016, Best Teacher Award of the Teacher's Development Council at Goa in 2016, Gujarat Best Science Teacher Award at Delhi's Sidsar in 2017, President's National Best Teacher Award, NAT in 2018. Several NGOs have also recognized him.

QUESTIONS FOR TEACHERS
1. How can ICT be used effectively in education?
2. What activities can be undertaken to provide quality-based study to children?
3. What are the things to keep in mind when using videos taken from YouTube in the classroom?

QUESTIONS FOR TRAINEES
1. How can ICT be integrated into education?
2. How can ICT be used to motivate children for self-study?
3. What activities should be done to increase the creativity of children?

COMPUTER LAB ON WALL

TEACHER	Shri Bharatsinh Devusinh Vaghela
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Scan QR-code to watch video

Shri Bharatsinh D. Vaghela joined as an upper primary social studies teacher in August 2013 at Suthar Falia, Ruvabari Primary School, Ruvabari village of Devgadh Baria taluka of Dahod district in Gujarat. For two years (2017–19), he worked as CRC Coordinator in Ruvabari Cluster.

Computer Lab

There was a computer lab in the school, but students were not interested in it. Shri Vaghela tried to talk to the students and provoke interest, but to no avail. In fact, he realized that the students hated the lab and the computer. He then developed a questionnaire to seek their feedback. The students were not happy with the substandard condition of the lab and poor working conditions of the computer. Also, they were uncomfortable about the fact that the computer was put in their classroom. Thus, if class 6 students were in the classroom, the other children found it uncomfortable to use the computer. The children also had the habit of dumping waste (paper or chocolate wrappers) behind the computer. During the monsoon or when cleaning the classroom with water, there was the fear of electrical short circuits. Also, there was the fear of theft. Other schools had reported theft of their equipment.

The situation was discussed in a meeting attended by the principal, teachers, students and SMC members. Shri Vaghela then involved the principal and the students in working out a plan. First, the benches around the computer were shifted temporarily to another room. The plank on which the monitor and keyboard were placed was taken out. The students had fun watching how easily the screws opened and how the table plank became free. They were fully involved in redesigning the computer lab. The idea was to fix the keyboard on a plank, and shift the monitor and CPU to the wall. The latter task was difficult. After working out the measurement details, the design of the height and the seating arrangements were worked out. The tools needed for the job were obtained from the parents. The monitor

Students helping to create a lab on the wall
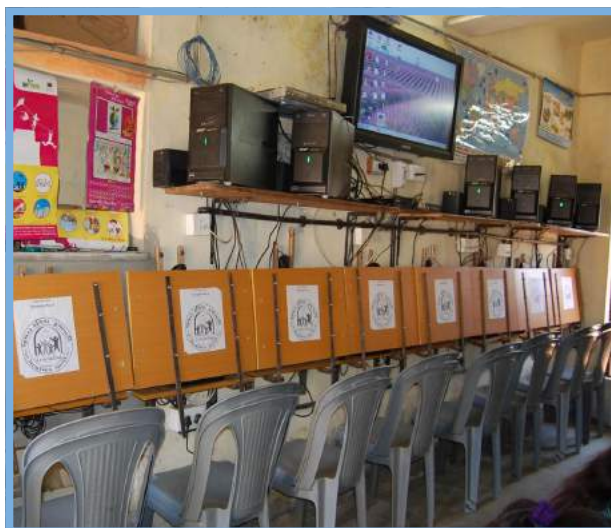
Computer Lab on Wall

Students working on a computer

Children studying after putting a computer on the wall

was permanently fitted to the wall; the keyboard was fitted in such a manner so the entire set up was protected by glass. This also meant some welding work had to be done in a shop. The CPU and battery were also fitted on the wall a little above the monitor using spare planks that were available. The wires, network cables, and other parts were also neatly organized. Now the entire computer lab seemed to be mounted on two walls of the classroom. The computers were numbered and a projector connected with one wall acting as a screen.

The new design was appreciated by the parents and others who now saw the free space for the children for their tables. The entire lab functioned nicely and each tool fitted permanently in its place i.e. on the wall. Since the wires were high up on the wall, the students felt safer. It was now easy to clear the floor. Since the equipment could now be locked up at the end of the table, the fear of theft reduced.

Officials from the taluka and the Education Inspector visited the lab. The questionnaire used earlier was re-administered to collect anonymous feedback. The students were happy with the new arrangement. Now, two groups of children could sit at the same time, one looking at one wall and the other working on the computers. It was easier to control dust and prevent damage from water. The children started to use the computer more often.

Many teachers have visited the lab, especially after the work was displayed in an Innovation Fair at the district and then at a state-level Innovation Fair held at Gandhinagar. The school which was rated D in the initial Gunotsav, moved to B and now has been rated A. Today, students from other states who come with their migrating agricultural labour parents also study in the school and are as regular as the village children.

QUESTIONS FOR TEACHERS
1. What should be done to make children interested in learning computers?
2. How are computers useful for childrens' self-study?
3. What are the things to keep in mind while using a computer with children?

QUESTIONS FOR TRAINEES
1. What are the benefits of doing group activities?
2. What will you do to make computer facilities available in the villages?
3. What can you do to help your children understand how to take care of a computer after using it?

BIOLOGY DGHD MICROSCOPE

TEACHER	Chiragbhai Sachaniya
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*Scan QR-code
to watch video*

Shri Chiragbhai Sachaniya joined as a Mathematics and Science teacher, Class 6 to 8 in Shri Golan Sherdi Primary School of Khambhalia taluka of Devbhumi Dwarka district in July 2010. He was transferred to Srinagar Primary School No. 32 in August 2013. Education qualification — B.sc, B.ed with chemistry.

At the Golan School in 2010, there were 70 students (Class 1-8) and three teachers. The school was in a very backward area. The parents were all daily wage workers, employed as labourers. Out of the 35 students in the upper primary section, Shri Sachaniya found about half did not have any foundations in science and mathematics. He wanted to convey concepts in an easily understandable format, and so decided to use flashcards. He began experimenting with animated videos, flashcards, and various tools. In order to make it easier for the students to experiment themselves, the flashcards were organized according to (1) list of tools, (2) intermediate process, and (3) results and outcomes. In 2011-12, he and his fellow teachers used laptops or mobile phones to show various animation videos. They were preparing printouts of flashcards from a nearby city. With these efforts, the students finally began to show some interest. However, three teachers having to share one laptop was a problem, and so one computer was borrowed from a nearby school.
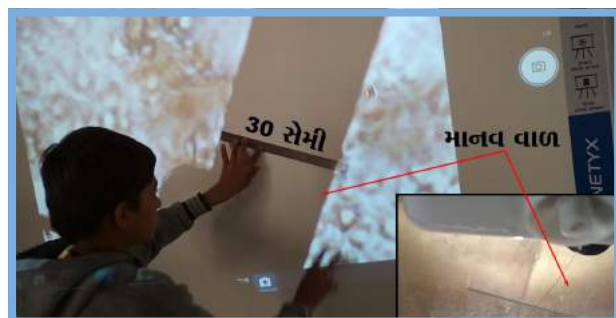
Using a microscope in the classroom

At Srinagar Primary School, there were 140 students in Class 1-8, and of these, 75 students were in Class 6 to 8; there were eight teachers. The school had an LED TV, 11 computers, DTH dishes, etc. for digital education. Shri Sachaniya started to use these along with animation videos and the flashcards which he already had. He used to identify relevant material from the internet at home and use it in school. Some experiments could not be undertaken due to insufficient equipment in the laboratory. Hence, he prepared a list of all tools required and tried to develop low-cost alternatives since the school grant was limited. For instance, a funnel that cost Rs. 250 in the market was made using plastic bottles in the school itself. His co-teachers supported him in

Making of a digital microscope

this activity.

In February 2014, with the school grant, an LED projector was bought and this was useful for digital education, especially for Class 6-8. At the same time, some reference literature was provided by the government and other agencies such as the Rotary Club. A dongle was bought to bring in internet connectivity.

Given the resource constraints, Shri Sachaniya was forced to innovate. For example, for the lessons on the cell, microscopes were

DGHD Microscope

needed. A microscope cost around Rs.2500 but he decided to construct a digital microscope (a digital camera connected to a monitor). Learning from the internet, he collected the required material spending only about Rs. 600: an old webcam, old DVD drive, a wooden block, transparent plastic stick, LED light, glue, USB cable, and materials to prepare slides. The main advantage was that all the students could see the magnified image simultaneously when the image was projected onto a screen.

With these methods, Shri Sachaniya tried to make education interesting. He also made the assessment more engaging. Methods of answering through games and group exercises were adopted. In 2014-15, he introduced online quizzes, Plicker, online games, for evaluation. In addition, many free apps and videos available on Kahoot, Playstore, YouTube, etc. were also used.

The students enjoyed learning through different methods and the results obtained after the assessment showed that they were writing their answers well, and were also able to answer orally. The digital microscope was especially helpful in sparking interest in biology. Other teachers learned how to make low-cost digital microscopes for their schools.

The school participated in the Educational Innovation Fair organized at the district and state levels by IIMA and GCERT.

Shri Sachaniya has been recognized for his work with many awards such as the State Level Innovation Fair Certificates in 2016-17 and 2017-18; participation in the Fourth International Conference on Creativity and Innovation at/for/from/with Grassroots (ICCIG 4); and a talented teacher award from the Government of Gujarat.

ACADEMIC YEAR	ACTIVITY	DISTRICT/STATE LEVEL
2016-17	The fraternity of mathematics–science through technology	State-level
2017-18	Digital HD microscope	State-level

QUESTIONS FOR TEACHERS
1. What activities can children engage with technology?
2. What activities should be done to make the children more interested in mathematics and science?
3. If you see such a problem in your classroom, what steps will you take to prevent it?

QUESTIONS FOR TRAINEES
1. Where are the teaching approaches used to teach subjects in mathematics to children?
2. State three ways to teach kids math–science subjects.
3. What homework should be given to help children become more active in mathematics and science?

PROVIDING SUPPORTING EDUCATIONAL CONTENT THROUGH QR-CODES IN TEXTBOOK

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Shri Jani has been teaching in Shahpur School in Bhavnagar district of Gujarat since December 2008. He is a graduate in History, English and Gujarati, and has a diploma in cooperative management. His main areas of interest are the use of ICTs in primary education, conducting innovative experiments in primary education (Innovation) and blogging about educational ideas.

He has developed a Digital textbook with QR codes for Class 4 English. The Shahpur Primary School is a multi-grade primary school. The village has a population of 1000; most of the village people are engaged in agriculture, agricultural labour and ancillary occupations. The school has 74 in Class 1-7 and four 4 teachers.

During the academic year 2019-20, the students of standard 6 and 4 had to be taught together in one class by a single teacher. When the teacher was engaged in teaching one class, the other class would tend to lose interest in studying or self-learning.This innovative project was undertaken to solve this problem. Also due to QR activity, there was marked improvement in interest shown by the students in the lessons, resulting in improved learning outcomes.

As the children learn English through playful self-learning methods owing to the QR-code, they tend to grasp the concepts better. The project uses innovative digital technology such as QR-codes along with Audio Book, Video Book, English Class 4 textbook with QR-codes, and English learning Android apps to help make learning interesting and immersive. The video links of unit-wise activity given in the Class 4 textbook have been introduced in the QR-codes. These Codes have unit-wise activities such as poems, riddles, prayers, story and action songs. Most importantly, the links for words given in the appendix of the textbook have been included in the QR-codes. The students can scan the QR-codes of their choice and can self-learn a topic or activity.

The evaluation is carried out activity-wise and the results are noted in the student-wise activity register. The evaluation of poems, riddles, rhymes, picture story, songs, textbook content,

Students scanning QR code

Students using QR codes from the textbook

Shree Shahpur Primary School   **Digital Textbook**   Std : 4

Activity Register

Sr No	Student Name	Unit 1 — Get Up And Dance							Unit 2 — Things around us													Unit 3 — My Family													
		Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 6	Activity 7	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 6	Activity 7	Activity 8	Activity 9	Activity 10	Activity 11	Activity 12	Activity 13	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 6	Activity 7	Activity 8	Activity 9	Activity 10	Activity 11	Activity 12	Activity 13	Activity 14
1	Rajan																																		
2	Karan																																		
3	Arjun																																		
4	Mohit																																		
5	Vaibhav																																		
6	Vikas																																		
7	Shruti																																		
8	Komal																																		
9	Meena																																		
10	Pushpa																																		
11	Poonam																																		

Digital Textbook

pronunciations, prayers, story and action songs is done through oral expression. The evaluation of simple words and alphabets is carried out using both oral and written methods. Evaluation was also conducted through creative expression, for instance, action songs and action verbs and through observation evaluation of learning outcomes in both oral and written formats.

These notes made it possible to assess how well the students had understood a particular unit using digital textbook and QR-codes. Also, it was possible to understand if there was new interest in a particular learning outcome due to QR-code technology. A note was also made on every student's progress in unit-wise activity, in coordination with learning outcomes. It also became possible to identify the extent of remedial work required in the type of learning outcomes and plan accordingly.

There was a significant growth in the oral practice and an increase in interest in the students, as well as a steady improvement in their listening and speaking skills. About 55 % of the children showed clear growth in learning outcomes.

In 2018-19, more than 50 schools of Bhavnagar district adopted this experiment and initiated learning of English language through QR-codes.

Shri Jani plans to expand the scope of his work to other classes.

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QUESTIONS FOR TEACHERS
1. What are the benefits of QR codes in teaching?
2. How do QR codes help children to self-study?
3. How can a QR code be used in a textbook?

QUESTIONS FOR TRAINEES
1. How can children be informed about QR codes?
2. How can parents be informed about the QR code?
3. What skills can be developed in children through QR code?

EDUCATIONAL APPLICATION DEVELOPMENT

TEACHER	Mohammad Imran Khan Mewati
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WEBSITE	imranapps.com

Scan QR-code to watch video

Imran Khan was born on December 5, 1978 in Khareda in Alwar, Rajasthan. When he was a student, he wanted to be a scientist. He completed graduation in 1999-2001 in Economics and English Literature and Public Administration. Later he did his post-graduation in English (2004) and Economics (2006). In 1999, he became a government school teacher after completing a two-year teaching course. He worked in Baran District for four years, before being transferred to a rural school in Jaton Ka Bas in Alwar District.

Problem behind innovation

In the era of social media, students are using their phones, tablets and computers to play games, watch videos, YouTube, and social media sites. Imran thought that it was possible to use this technology in education. He found that children learn easily by using technology in education. So, he decided to create interactive, engaging and entertaining lessons for students.

With no formal education in computers, he had to learn about computers from books and Google. In 2005 his younger brother, a B.Tech in computer science, left his books at home before moving to a job. Imran Khan used the books to learn how to create websites, fiddling with his computer and browsing through the internet. It was an eye opener — Imran Khan learned about the world of digital information technology. Later, he learnt to design and develop mobile apps based on inspiration from the District Collector Mr. Ashutosh AT Pednekar. Within weeks, he successfully designed his first mobile app in 2011, which was on General Science (Notes and Quizzes) for primary school children. Children's engagement was found to be encouraging and he recorded around 15 lakh installations because of its user-friendly and colourful features.

Innovation details

Imran Khan designs and develops apps voluntarily. His 80 apps mainly cover subjects related to the school curriculum. He has created apps for Primary and Secondary classes and for competitive exams. He has to his credit about 20 million users. According to the analytical reports, his apps are used not only in India, but in 50 countries. Some of his famous apps are Project Dishari, Alwar Shakti, Digital Mewat, General Science, Maternal Care, SSC Exam, Kids General Knowledge, etc. Presently there are over 4, 85,000 users for Dishari app, which was launched in 2017 for the benefit of the college students to help them prepare for competitive exams. The app also features news updates and job alerts. Imran provides a platform for subject wise online tests on a daily basis for competitive examinations. A total of 15 million test attempts have been recorded so far by Dishari users.

Imran Khan also created Digital Mewat, an app to help groups and volunteers at the grassroots level to propagate social reforms like stop the dowry tradition, encourage girl child education and extend educational support to potential students.

His latest creation is Alwar Shakti App for District Administration, Alwar. This app aims to strengthen youth and ensure positive engagement. It provides career guidance, skill development information, current affair updates, positive works and stories, etc. It is also an open forum for the users to discuss and seek responses from the panel of experts of the District Administration on various topics.

Imran Khan's apps can be freely installed. Keeping in mind the background of the beneficiaries i.e. 60-70% of the users being rural based, he has focused on developing apps which are rich in content, workable offline and free of

Imran Khan Mewati receiving honor from Vice President Vainkaya Naidu

complications. The apps are primarily in Hindi language and some in English. Rural students have limited access to resources like libraries or coaching centres, and so their availability has proved to be beneficial to the children in their learning process.

Evaluation

Feedback from users and regular updation of content make the apps up to date. Various users write about their progress in learning.

Result

Narendra Modi, the Prime Minister of India, mentioned Imran Khan during his speech at Wembley Stadium, London, in November 2015. Against a backdrop of news media debates about intolerance in India, Modi said that India is beyond news headlines and is much bigger than what people see on TV, adding, "My India resides in people like Imran Khan from Alwar." Soon afterwards, Imran Khan was given free Internet service by Bharat Sanchar Nigam Limited. MHRD minister Smriti Irani tweeted that Khan has done a "stupendous job". He received a call from the Minister of Communications and Information Technology Ravi Shankar Prasad, who congratulated him. Bharatiya Janata Party's state president Ashok Parnami assured Khan of assistance with apps under development. Rajasthan's Technical and Higher Education Minister Kali Charan Saraf rewarded him with INR 11,000. He also offered him the post of project officer in the Department of Science and Technology, but he "politely turned down" the offer.

Imran Khan is a member of the technical advisory of an institute under the Ministry of Electronics and Information Technology, Government of India and member of Alwar based team Project EKTA, which works towards strengthening elementary learning through online education and Alwar Shakti, a campaign for youth. He has been invited several times to enlighten trainee IAS officers on topics related to innovation and education. He joined TEDxRTU as speaker on 17 March 2018 at UIT Auditorium, Kota (Rajasthan).

Current Situation

Imran Khan is of the view that e-learning, digital learning is the future and it is important for the rural areas to have access to digital information and technology infrastructure. It will be a boon for the rural students to access and explore new horizons in educational and learning content with their own interest and at their own pace, without much expense. Information Technology will help in knowledge and skill development. Teachers, professionals from various fraternities and his friends extend their voluntary support for content

Some Educational Apps created by Imran Khan

Primary Apps:
- Kids GK
- Science Questions Answers
- Kings of Maths
- NCERT Science in Hindi
- Science Class 8
- Picture Book
- Kids Conversation
- Hello Maths

Secondary Classes Apps:
- Science in Hindi Class 10
- Social Science Class 10
- NCERT Science 10
- Physics
- Essay Writing
- NCERT Social Science
- Solar System
- NCERT Learn Science
- Human Body System
- Improve GK - 2
- Improve GK - I
- Maths Glossary
- Inspirational Moral Stories

Other Apps:
- Easy Yoga
- Inspirational Quotes
- Gajals of Karim Pathan Anmol
- GK talk
- Gyan Manzari
- चाँद अब हरा हो गया ह
- GK Oneline
- नीत १श्लोक
- MATERNAL CARE

Competition Apps:
- General Science in Hindi
- Project Dishari
- SSC Exam
- Indian Constitution
- Nursing Exam
- Hindi Grammar
- Rajasthan Geography GK
- All GK Question Bank
- History GK
- Rajasthan GK
- Geography GK
- Rajasthan History GK
- RAS TUTOR

- Science World
- Rajasthan Police Exam
- Uttar Pradesh GK
- RPSC GK
- RSCIT Hindi App
- Hindi Literature
- Indian Political GK
- Indian Scientists
- मुहावरे और लोकोष्तियाँ
- Mughal Empire
- Daily GK
- Chemistry Question Bank
- Computer Awareness
- Computer Fundamentals
- Antonyms Synonyms
- Economics GK in Hindi
- Educational Psychology
- 20-20 Maths Quiz
- 20-20 Biology Quizzes
- 20-20 Quiz General Science
- 20-20 Quiz History in Hindi
- India GK App
- World GK

development on varied subjects. They contribute to topics which could be early school subjects, preparing for professional courses and competitive exams, learning Sanskrit, or monitoring maternal and other health parameters, etc. Being a teacher has also enabled Imran Khan to add value to the educational content of the app.

Reach of Innovation

Imran Khan's passion for developing apps, his vision and intention have inspired many in India and abroad. The framework that he creates through his knowledge, passion and inclination matches that of professional standards, which is noteworthy. He is a role model for many youngsters including IT professionals in India and abroad.

Awards

- **Jamnalal Bajaj Award.** Imran Khan was awarded the Jamnalal Bajaj Award 2019 for Outstanding Contribution in Application of Science & Technology for Rural Development.
- **National Award to Teachers 2018.** He was selected for National Award in 2017 and was felicitated by the Vice President of India in Vigyan Bhawan on Teachers Day 5 September 2018. Imran Khan devoted this Award to all students studying in Government schools of India.
- **National ICT Award 2016.** He was awarded the National ICT Award 2016 for his ICT activities in Education by the President of India in Vigyan Bhawan on Teachers Day 5 September 2017.
- **Bhamashah Award.** He was nominated for the state-level Bhamashah award for giving up the copyright to 60 of his mobile apps on education and giving the same to the HRD ministry. The total estimated value of his apps are Rs 3.32 crores. Education Minister of Rajasthan Mr. Vasudev Devanani with Chairman of state assembly Mr. Kailash Meghwal felicitated him in Birla Auditorium on 28 June 2016.
- **State Level Teacher Award, 2016** by Hon'ble CM of Rajasthan Vasundhara Raje.
- **CNBC Cisco Digitizing India Award, 2016** by Hon'ble Union Minister of Urban Development Venkaiah Naidu.
- **Zee Business Makers of India Award, 2016**
- **Dr. APJ Abdul Kalam Award of Utkarsh Classes** by Hon'ble MoS Mr. P.P Chaudhary.

Details of Innovation adoption by other Schools

Mobiles are not allowed in schools so directly there is no adoption by schools, but according to Google Analytics, about 2.2 million users are using these apps.

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QUESTIONS FOR TEACHERS

1. How can digital media be used effectively in education?
2. What are the things to keep in mind while taking content from a digital platform?
3. What can be done to persuade parents to enroll their children in a government school?

QUESTIONS FOR TRAINEES

1. How can a mobile application be used in education?
2. What activities can be organized to engage children in the teaching-learning process in an interesting way?
3. What are the things to look for when creating an educational application?

AR VR TECHNOLOGY IN EDUCATION

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*Scan QR-code
to watch video*

Shri Aakhunji Imtiyaz Ahmad Gulanhusen started his career as a science teacher at the Shri Salpipaliya Taluka Primary School, Paddhari, Rajkot in July 2010. He was deeply interested in technology. The school had its own computer lab, where Aakhunji would spend most of his time honing his skills with the latest technologies. He was worried about the lack of engagement shown by the students in his class and felt that by introducing Augmented Reality and Virtual Reality (AR and VR) in the lessons, he could make the lessons more interesting, contextual and entertaining.

Shri Aakhunji augmented his knowledge using the Internet and taking help from his colleagues. At first, he would screen and download videos that could support his classroom teaching. The CRC coordinator, Shri Mansukhbhai Vadolia was particularly impressed by the videos and he had their CDs made to distribute in other schools in the cluster. Apart from videos, Aakhunji also downloaded images and other reference material from the Internet for use in class. While teaching Math and Science, he also introduced quizzes which greatly helped to improve students' level of participation in the lessons.

In the year 2013-14, Aakhunji went on to participate in various ICT related training programs, where he was initiated to the use of AR (Augmented Reality) and VR (Virtual Reality) technology in supporting education. Building on his knowledge, he downloaded an app, "Zookazam" on his mobile phone and used it in class VI to teach students about various animals. He would divide the class into groups and share his mobile with them to see animated versions of the animals. This brought alive the lessons and students participation and subsequently performance greatly increased. His actions motivated other teachers as well who began to use technology to support their lessons for classes I to V.

These are some of the apps that Shri Aakhunji used to support his lessons. AR (augmented reality) technology Apps and uses:

1. Merge cube for: solar system, layers of earth, volcano eruption, rocket etc.
2. Animal 4d: used for showing animals in the chapter adaptation
3. English ABC AR: for alphabet in English
4. Zookazam (paid): for showing animals in class
5. AR solid: showing 3-D shapes of maths
6. AR human body: for showing internal human organ in 3-D
7. Vuforia: for different organs in 3-D

Virtual reality VR Apps and uses:

1. VR sites: for social studies, showing 7 wonders sites in virtual reality mode
2. VR solar: solar system in VR mode
3. VR cell: for showing cell structure in VR mode
4. VR YouTube videos: for entertainment of students

School visitor looking in VR BOX

Use of VR technology in the classroom

principal to sanction a grant for a hundred 3D glasses. With these glasses, students could view three-dimensional educational videos. Shri Aakhunji also participated in a local Science fair where he organised a 3-D movie show for all the student visitors.

During the Diksha training in 2020, Shri Aakhunji trained teachers in ICT methods and arranged virtual cards and some QR codes for use in their schools.

The VR box helped students visit the sites under study in a virtual environment. This was useful in social studies since the historical places mentioned in the textbook could not be visited.

In 2017, as part of the "Gyankunj" Project, each school was supplied with two laptops. Shri Aakhunji could now use the laptops to teach the lessons and needless to say, they served the purpose better than mobile phones. Students' engagement with the lessons improved manifold and other schools in the cluster were also inspired to introduce ICT in their classrooms.

Shri Aakhunji's efforts were duly recognized by the DIET Rajkot. He was asked to be a trainer at the ICT workshops it organized.

As a next step, Shri Aakhunji explored the use of 3D and managed to convince the school

Evaluation

With the use of ICT in classroom teaching, Shri Aakhunji achieved the following:

- Students' engagement with the lessons grew manifold.
- About 80% students said that they found it easy to grasp the concepts.

Shri Aakhunji continues to experiment with technology. As a result of his efforts, his school was moved from C grade to A in Gunotsav. His work has been highlighted in Educational Innovations Fairs held at the District and State level. His work is available on www.inshodh.org website and his case has been used for training in Samarth 1 and 2 online professional development program for teachers.

Shri Aakhunji has formed a network of teachers interested in technology and connected with them through WhatsApp and Facebook He is now planning to find donors to provide laptops or tablets to the children he teaches in the school.

QUESTIONS FOR TEACHERS
1. How to teach children to use technology in the classroom?
2. After teaching the content to the children in the smart class, how do you evaluate how much the children understand the content?
3. What are the things to keep in mind while creating an application?

QUESTIONS FOR TRAINEES
1. What are the things to keep in mind while creating a QR code?
2. What would you do to make every child in the classroom use technology?
3. What are the results of teaching through QR code to children?

CLUSTER'S STUDIO: A PLATFORM TO SHOWCASE STUDENT'S TALENT

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Scan QR-code to watch video

Shri Maulik Patel joined the Lodra Primary School as a primary teacher in 2007. He was soon made a Cluster Resource Coordinator; after working for three years, he went back to teaching in Indiranagar Primary School in village Sandera. He once again became a CRC coordinator in 2017. Mr Patel was posted at CRC in Zazam, which is situated at the India-Pakistan border area. His job was to teach children the basics of technology as there was no other resource who could do it. Here, he had initiated a concept of one TV, one teacher in every classroom.

During his visits to the schools, Shri Patel noticed that only the bright students of the class were encouraged to answer and the slow and average students were mostly ignored. He understood that not all children could be academically inclined and those who were not good at studies could be apt at some other curricular subjects. He found certain children arriving at the school early to unlock the classrooms or tending to the school garden during their free time. However, the capabilities and work of such children were never acknowledged or honoured.

While thinking about possible solutions to this problem he wondered if there could be some platform where the talents of such students could be showcased and appreciated. He came up with the idea to have a studio in the school where all students could be encouraged to showcase their talents. This would help the schools to tap into their hidden capabilities and use them to build their confidence. He also wanted the villagers to be present to encourage the children. He

Video Broadcast of Students from School Office

discussed his idea with the school administration, teachers and principals and won their support. He therefore initiated the Cluster Studio where the work of each and every student could be recognized.

To show the BISAG programmes, he needed TV sets in the classrooms. In the village people were very poor and it was very difficult to get monetary help from them for new TV sets. He asked for and received donations in the form of old TV sets which he installed in the classrooms. The donor's name was written on each TV set. This way eight of the 13 schools managed to have a TV set in each classroom. Now he had the TV sets he needed for the studio.

From e-waste, he managed to find old cameras and lights. A studio-like set up was arranged in the principal's room. With the help of the local cable operator he also obtained a modulator to maintain the necessary waves for broadcast and also allow for the addition of more channels. The cabling of the entire system was done with normal cables.

BISAG was added since the state government telecast programs for classes 5-8 on it. Five modulators in a series were fixed.

With this, whenever a child is positioned in front of the camera, he/she is visible on the TV installed in every classroom. The children are excited and want to contribute. So the school announced that children should come forward to showcase their skills in story-telling, drawing, singing songs, playing musical instruments, making clay or paper toys, good handwriting, describing tours, giving information on gardening, cricket commentary, etc. They were given the liberty to showcase any activity of their choice through the studio.

Students watching the broadcast in the classroom

In the beginning, a few children hesitated or were shy to face the camera but gradually they were inspired and impressed by other children who freely presented their skills. When the children see their friends teaching or sharing knowledge, they easily and quickly pick up skills through peer learning.

Later Shri Patel and some teachers developed a collection of picture messages that appear in social media and created a DVD of photo albums. In this DVD they arranged a medley of all the poems in four languages as the background score. During recess time every TV in every classroom is left on. Several children stay back to watch these and learn from the activities on display. Children belonging to classes 2-4 were able to pick up poems recited by students in higher classes. The key was to develop listening skills.

TV in the classroom

The timetable of the syllabus on Vande Gujarat was put up in every classroom. Through use of modulators, every classroom could watch the Vande Gujarat channel that corresponded to their class. This was the best way to use the materials provided by the government.

In May 2017, training for about 178 mathematics teachers of Class 3-5 of the entire cluster was delivered through the studio. The children who wanted to appear on TV wanted their performance to be perfect and they went out of the way to improve their diction and pronunciation. This project also helped them enrich their basic language skills. It also helped the schools to encourage a varied set of skills in the children.

After the Corona outbreak, the studio was connected to the Internet; using Microsoft Teams, the schools are now engaging the children in learning from the safety of their own homes through their mobile phones. The teachers come to the studio and position themselves in front of the camera and talk to the children through this arrangement. They not only educate seamlessly but also engage children in psychological counselling in these tough times. Shri Patel is in talks with the village's local cable operator to arrange for broadcast through the TV channels instead of using mobiles.

Although this project has been implemented in all the schools of the cluster, five schools use

it actively. These schools include Kamliwada Primary School, Mota Ramanda Primary School, Diorda Primary School, Hajipur Primary School and Runi Primary School.

To encourage the children, their hoardings (10 feet by 15 feet) are put up on the wall of a school which is strategically located on the highway.

When Shri Patel took over as CRC coordinator, there were eight schools: two had A grade, three had B grade and three had C grade in Gunotsav. Later, the number of schools went up to 13. Today, all the schools have A grades. During the last 3 years, 85 children attending private schools have joined these government-run schools.

Without a doubt, most parents are overwhelmed to see their children live on TV. They are also happy that the children are able to showcase and build on their skills even if they don't show outstanding academic performance.

Now, even the people in the village have made it a habit to inquire which child had appeared on TV. Even during social gatherings, parents feel proud to tell their relatives and friends that their children have appeared on TV in the school.

Shri Patel mentions that it is very difficult to evaluate this project in tangible terms or documents. However, its success can be seen in the growth of students' self-confidence and their improved ability to express themselves. Today some students of the school have their own YouTube channels and they even record their own songs.

More information and demonstration of our experiment in the video format is available on YouTube
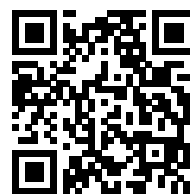
QUESTIONS FOR TEACHERS
1. How can children be encouraged to overcome their shyness and present their ideas to the class?
2. What activities can be done to develop hearing skills in children?
3. What extracurricular activities can be done to bring out the dormant powers in children?

QUESTIONS FOR TRAINEES
1. What activities should be given to enrich the knowledge of language in children?
2. What will you do to help your children remember the subject easily?
3. What can you do to help children learn through peer learning in the classroom?

USE OF TECHNOLOGY IN EDUCATION

TEACHER	Prajapati Mehulkumaar Mohanbhai
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YOUTUBE	Digital Education with Mehul

*Scan QR-code
to watch video*

Mehul Prajapati started his teaching at Dolatpura (Da) Primary School of Vijapur taluka of Mehsana district, Gujarat in December 2001. The school had been established only three months earlier. All the families in the village were engaged in agricultural labour and belonged to socio-economically marginalized castes. For three years the school functioned under a tree; in September 2004, two classrooms were built. The village got a paved road only in 2016. Over time, the school developed into a Class 1-8 school. In 2016 Mr. Prajapati became a teacher of Social Studies, teaching Class 5-8.

Mr. Prajapati has concentrated on leveraging technology to make education more engaging, and thus addressing irregular attendance of students. The challenge was even greater since the socio-economic background of the children meant that the children had no exposure to technology or digital gadgets.

Mr. Prajapati started by gathering information about the online teaching resources he could use to support teaching in Classes 5-8. Apart from the Internet he also explored other options to source these resources. He finally came up with material that included videos, photographs and printed material. He began to use these as supplementary material while teaching.

Students watching with the help of 3D glasses

He then used an open-access software to prepare quizzes for the lessons in social studies. These followed the multiple-choice question format. These quizzes proved useful in continuous and comprehensive assessment.

These initial efforts proved rewarding. For example, students found the information about 85 revolutionaries who took part in India's freedom struggle very motivating; the information was provided during the school's prayer meetings and on certain important days. Slowly, each topic had its own Power Point presentation, animations and videos. An e-library for social studies was thus created.

The quizzes were extended to a "question bar" — questions related to social studies were recorded along with the answer options in the voice record of the mobile and were used to rehearse before examinations. Students found this very interesting.

To provide the students a 3D experience, 50 3D glasses were sourced a cost of Rs. 1500. The students are shown 3D films on a big screen. They were also taught to use various Android apps in the tablet to access AR (Augmented reality) and VR (virtual reality) in digital education. In addition to this, 3D painting done by the students themselves was brought to life with the help of the QUIVER app and they were also taught how to use it.

The use of technology for continuous and holistic assessment of students includes the following:

1. Plickers tools;
2. Online-test (testmoz.com website use);
3. ZIP grade (omr scaning android apps);
4. QR-code (quick response code);
5. India-map (digital Android apps & Windows apps);
6. Google link and similar tools;

Method of scanning students' answers

Classroom equipped with ICT resources created through public participation

7. With the help of "Voting machine" mobile apps, students were able to conduct paperless elections and choose a children's parliament. They also learnt how to use an EVM machine.

Mr. Prajapati used his own laptop in the school to undertake the activities. His work was recognized by the government and Indian Institute of Management Ahmedabad. In February 2014 he was invited to a state conference of innovative teachers organized by IIM Ahmedabad, which put him in touch with many other teachers who were interested in technology. This enabled Mr. Prajapati to create multimedia classrooms in his school with public support. He began with Rs. 5,000 from his pocket and the school management committee raised another Rs. 25,000. He also donated money for a battery backup. By July 2014 the classroom was ready for use. His experiments bore fruit and students not only became more regular but also showed a marked improvement in their performance.

Mr. Prajapati is a regular participant in the various fairs and exhibitions organized by the government and other institutions. He participated in a large smart class initiative started by the state government. The aim of the initiative was to provide the necessary infrastructure to support technology in rural areas. In a village where most parents did not even possess a mobile phone, students could now benefit from the innovative use of technology. With connectivity provided by the government, the students could now make use of the internet.

While technology, Mr. Prajapati could assess children's learning outcomes through quizzes and other forms of online assessments. He could identify the weak areas in students and also in the lesson plans. Students became more engaged in the lessons and also began to go the extra mile to build on their knowledge. For instance, on being taught about historical figures, they would visit the library to find out more information about them. With most students now owning a mobile phone, they use it to record videos on subject of interest and upload them on the YouTube channel that Mr. Prajapati runs.

QUESTIONS FOR TEACHERS
1. What should be done to arouse the interest of children in extracurricular reading?
2. What are the things to keep in mind while teaching children to use technology?
3. What will you do to keep children from getting bored of social sciences and keep them interested?

QUESTIONS FOR TRAINEES
1. What to look out for in the classroom when using ICT?
2. What should be done to ensure that children do not make mistakes in reading maps?
3. What activities would you do to make the civic subject more interesting in the social sciences?

FUN WITH MATHS THROUGH EXPERIMENTS

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Shri Nagarjun Sharma has worked on simplifying the teaching of Mathematics making it fun to learn. He has also authored several books on the subject. Since his childhood, he showed keen interest in automated machines and toys and once even managed to prepare a steam engine. Due to his deep interest in science, he regularly participated in Science Exhibitions. Even after he started his career as a teacher, this interest continued. He would guide children in making new models for use in class and to exhibit in state as well as national-level Science Exhibitions.

Shri Sharma has taken part thrice in the north-western region competition organised by Science and Experiment Department at Nehru Science Centre, Mumbai. Among these entries, his models on Self Railway Crossing Signal System and working models to verify theorems of Geometry received wide appreciation.

Shri Sharma has been providing services to the Rajasthan government as a Science and Maths teacher for the past 26 years, ever since he joined on September 21, 1981. He was then promoted as a secondary level teacher and finally went on to become the principal at the higher secondary level, a post which he held for 2 years.

In 2010, he was transferred to Bhilwara as a Head Master in a government school. Here, he was teaching 9th and 10th standards. In order to utilise his free time constructively, he decided to make some maths TLMs for students. After 3 to 4 months of hard work, he was able to make TLMs for 6 theorems.

TLMs for Theorems

This book of innovations contains figures that are moving, hence, the pages need to be thick and smooth. Each page is laminated and has a transparent plastic page with required line/ scale or angle measure, two or three as per the requirement. The 40 pages in the middle have a bulge in the centre and so this book is separated into three sections. The first section of 13 pages thus become the first part; the second part consists of 14 pages and the third part has 13 pages.

Part 1. This part discusses the concepts such as shape of angles, angle type, adjacent angle, complementary and supplementary angle etc. Concepts such as vertical angles, based on parallel lines, the sum of the three angles of the triangle and theorems based on the relation between the exterior angles and the other angles as well as congruency can be shown in working condition.

Part 2. In this part, several concepts are brought to light, such as properties of a triangle, the corresponding angles of equal sides are also equal, the corresponding sides of equal angles are also equal, the sum of the two sides of the triangle is greater than the third side, the angle opposite the largest side of the triangle is the largest angle, etc. All these concepts and related theorems are explained using working models and are included in this part of the book along with the concept that the sum of the four angles of a quadrilateral is 360 degrees.

- Parallelogram-based theorems. In this part, the properties of a parallelogram, such as opposite sides and opposite angles are equal; each diagonal of a parallelogram separates it into two congruent triangles; diagonals of a parallelogram bisect each other; and other such theorm-based concepts are brought to life.
- Midpoint theorem. The midpoint theorem is explained which says that the line joining midpoints of two sides of a triangle is parallel to the third side and is equal to half of the third side. The straight line drawn through the middle point of one side of a triangle parallel to another, bisects the third side.
- Area related theorems. In the same plane, a parallelogram that is made between equal lines or the total area is equal to one or more triangles; understanding the area of the triangle, etc.

    Part 3.
- Symmetry related theorem. A line drawn parallel to one side of a triangle divides the

remaining two sides in equal proportion, the bisector line of one angle of the triangle divides the side opposite to the angle in the same ratio.

- Focal point related concepts. Circumcentre, focal point, perpendicular sides of a triangle, concepts based on the circles and the chords, equal chord makes an equal angle at the centre, the chord drawn at the focal point bisects the vertical chord, the equal chords are placed at equal distance from the focal point.

- Relationship between the arc and the angle of the circle. The angle made by any arc of the circle at the centre is twice the angle at the rest of the arc, the angles made by the same arc are equal, the angles opposite the cyclic quadrilateral are complementary.

- Intersection related. The two tangents drawn from a point outside the circle are equal, the tangent drawn at a point on the circle and the angle formed by the chord drawn from the same point are equal to the angle drawn on its alternate circle. The theorems of all the above parts are proven by moving one or two circles.

- An experiment to show that the sum of the three angles of a triangle is 180°. Method of preparation: first, take a blank paper and mark three points on it. Now, with the help of pen and scale, merge all three points with each other to form a triangle. After drawing angles on the three points, mark their names. Now, with the help of scale and scissors, cut out the outer part of the triangle. Cut the remaining triangle into three parts too. This will separate all three angles of the triangle. Now, bringing these three angles together at a point, we see that all three meet on a straight line. In this way, if one repeats this experiment by making triangles of different measurements, the result will be the same

each time, that is, all three angles will always be found on a straight line. This proves that the sum of the three angles of a triangle is always equal to 180 i.e., two right angles.

Shri Sharma first created TLMs with six theorems. The formats were displayed in the Science and Technology Department exhibition and Shri Sharma secured the first place. Subsequently, this work was part of an exhibition which had participants from states like Rajasthan, Delhi, Maharashtra, Gujarat, Madhya Pradesh and Chhattisgarh in the northwest region. The event in Mumbai (Nehru Science Centre) lasted for seven days. In this event, Shri Sharma met a gentleman who was so impressed with his work that he offered him a blanks check for this model. Although Shri Sharma immediately turned down the proposal, he understood that this project was worth pursuing in a big way.

In recognition of his work, Shri Sharma was made KRP for Mathematics Teaching Training by the Department. He got a place in the module writing committee of mathematics under the National Secondary Education Campaign and got the opportunity to write a full section of Geometry in the Class 9 and 10 Mathematics textbooks at the Board of Secondary Education, Rajasthan.

At present, this 40-page book remains an experimental book, which mathematics teachers are eager to use to support their lessons. So far, Shri Sharma has produced and distributed about 100 copies; 50 copies have been sent to Maharashtra alone. In this book, almost all theorems of Geometry have been proved by experiment. A maths laboratory has also been set up by making 1.5 × 1.5 square feet model in a private school in Pune, Maharashtra which was inaugurated by Maharashtra's Education Minister. Shri Sharma has created a math related institute "Boudhayan Sansthan" which conducts free mathematics workshops.

QUESTIONS FOR TEACHERS
1. How should the concept of geometry be explained to students?
2. How can geometry be associated with everyday life?
3. What activities can be undertaken to explain the concept of different shapes?

QUESTIONS FOR TRAINEES
1. What are the benefits of imparting knowledge to children with activity?
2. What must be done to enhance children's creativity?
3. Which group activities can be organized to explain different theorems and concepts of geometry?

DIGITAL SCHOOL

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When Shri Ravi Motiram Chavan joined the primary school at Ingolevasti (Khandali) in July 2007, he found that most of the 62 students were weak in English and math. He also found that many children attended an English medium school as the villagers were not happy about the quality of education provided in the government school. The school also lacked in infrastructure and was not even electrified at that time.

Shri Chavan came up with a plan of action to rectify the issues that plagued the school and enlisted the help of his co-teachers and the lower-level administrative offices. He then personally visited all households in the village to talk to the parents and seek their cooperation. He would also be present in school on Sundays to interact with his colleagues, parents and students. He realized that the school cannot just focus on education and that it needed to introduce both curricular and non-curricular activities. The school then introduced activities like sports, music, arts, drawing, and competition such as essay competition and a few other activities. Shri Chavan also started a tree plantation drive

Tablet connected to smart board

around the school and prepared herbal garden, to make the school a "green school". His efforts bore fruit and in a matter of two years, there was improvement and the school was adjudged the third-best in the block.

Buoyed by the activities and subsequent improvement in performance of their wards, the parents too began to take interest in the school and its various activities. Shri Chavan the proposed a "digital school" with the aim to use digital technology to take education to the next level. He broached the subject to the parents and with their help, obtained an electricity connection and a computer. He then collected several educational videos from the Internet and also taught the students how to operate the computer. While the students were very enthusiastic about the videos, Shri Chavan realized that one computer was not enough to cater to all the students. So he contacted Infosys, Pune, a large Information Technology services company, and emailed them the school's activities and plan to digitalize. The company responded positively and gave the school four computers. Thus, a computer lab was set up in the school.

The next goal was to acquire am LED projector and related hardware. With the help of SIR Foundation, Solapur and Precision Camshaft, a private company that was collaborating with SIR Foundation to encourage innovative teachers, the school was selected to be developed as a digital school under the company's CSR activities. The school now had an LED projector, a laptop, a tab, a printer-scanner, an interactive smart board and educational CDs. It also obtained, through Precision Camshaft, a solar power system to address the frequent power cuts. The school now had electricity 24 hours. The total investment made by Precision Camshaft was about two lakh rupees.

Students having fun in a smart class

Solar panel for running smart class

With a new Internet connection, the school could now use online assets such as videos, articles, blogs and more to supplement lessons. The school could conduct virtual field trips, hold skype calls with subject experts, and interact with peers in other countries. This virtual exposure helped to take education outside the bounds of the classroom, providing the students real-world exposure to their learnings.

Shri Chavan then suggested that the parents should buy tablets for their children. Twenty parents bought tablets and the students were able to use online dictionaries, and other applications.

Shri Chavan's efforts bore fruit and the school gained recognition from the community. The Gram Panchayat rewarded it with an RO water purifier and the Block Panchayat presented it with a smart TV. Students' enrolment also showed an upward trend with students studying in private schools wanting to find a place for themselves in this digital school. As word spread, other schools also began to show interest and learn from these initiatives.

The school has received many visitors, including education officials of Rajasthan and Maharashtra. It has also found plce in a series on government schools, "Majhi shala-Gunvattapurn shala" run by Sakal newspaper. Other newspapers (Divymarathi, Tarun Bharat, Lokmat, and Sanchar) have also carried stories on the school. It now has more than 130 students and the government has sanctioned additional teachers for the school.

Prominent personalities such as the EO of Solapur zillha parishad Solapur Mr.Sanjaykumar Rathod, BEO of Mohol block, Mr.Maruti Phadake, Bit extention officer Mr.Vikas Yadav, Cluster head, Mr.Vijay Kambale, SIR Foundation state coordinator Mr.Sidhharam Mashale, and Mr.Balasaheb Wagh have visited the school and examined performance of the students. All of them have expressed satisfaction over the activities. The school has received several awards at the district level. It was also selected for shala sidhhi national project in Solapur district and received "A" grade in this project.

The digitalized school is growing from strength to strength. Plans are afoot to install a CCTV camera for security and safety of the students.

Some other activates which are going on in the school are handwriting activity, Students birthday celebration, School Annual gathering, Letter writing activity, Water for sparrow and environmental activity, Social responsibility programmes, Homework via text massage on parents mobile.

QUESTIONS FOR TEACHERS
1. What steps should be taken by parents to send their child to government school?
2. What activities can be done to help children while preserving nature?
3. What precautions are required to build a digital school?

QUESTIONS FOR TRAINEES
1. What co-curricular activities can be done to increase creativity in children?
2. What activities can be done to integrate technology with the teaching-learning process?
3. What care should be taken when choosing different digital materials for teaching children?

MISSION DIGITAL SCHOOL

|	
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Scan QR-code to watch video

Pashtepada is a small hamlet, situated 40 kms from block headquarters Shahapur and 80 kms from district headquarters Thane. Mr. Sandeep Gund got his first posting in this village in 2009, with 350 populations, as a Zilla Parishad Primary teacher. The village was hard to reach; from last bus halt it took 2 kms of walk to reach Pashtepada. Nevertheless, the teacher was eager to start his work. When he reached his destination, he saw a neglected school building, and barely fifty present attendance of the enrolled children. Neither children nor the parents expected much from the school and its teachers. But Mr. Gund had high hopes and bright dreams for his students.

When he joined the school there were only 9 students in Class 1-4. That too all 9 were not regular. While he was doing a course Diploma in teacher education he has made one presentation in the form of PPT for teaching one concept to students and that PPT was so impressive that it was shared with whole class and other students of the college. From this he was motivated to take interest in technology in education.
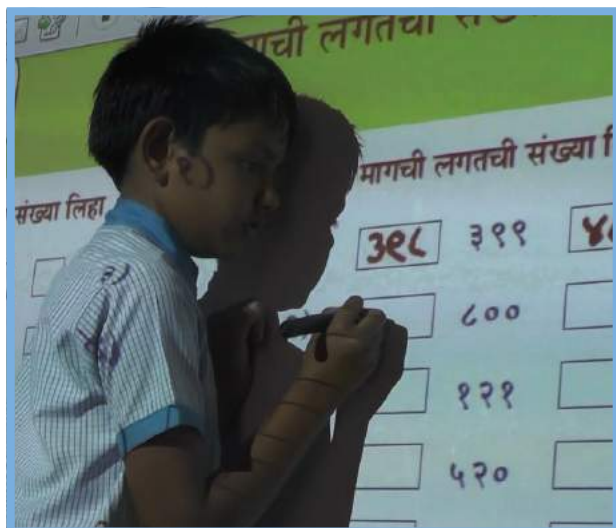
Student using smartboard

"As a teacher I decided to focus in what children take interest the most. Self-interest leads to wilful learning, ensures physical and mental participation and concentration, which is crucial in the learning process."

Bringing students to the school was the main challenge and since he had an interest in teaching with the use of technology, he started using his laptop for teaching. As there were only 9 students it was easy to teach them in a group and laptop screen size was enough for the group. The students were amazed by the method of teaching and started talking about the laptop, videos and PPTs at their homes. He thought that this can be presented at district level and should be implemented in the other schools also.

Then he searched for ways of using technology and found more interactive ways of teaching through technology and for that some tools and digital equipment were required at the school level. So he started contacting NGOs. With the help of NGOs and donations from individuals he created child theatre in the school in the year 2010. In that he had interactive smart board, IR camera, laptop, speakers and self-generated content. Now school strength was 21. His work spread to the teacher community. Some teachers started inviting him in their school to develop the children theatre. But the main problem was funding for the same. He . prepared one Document named Mission digital school, wrote his school experience in it, put the budget and pointed down benefits of digital education.

Now there was a tea.cm of 5–6 teachers who were going to nearby villages on the basis of invitations of the schools and doing "Ratri Sabhas" with them. Village people come to the Ratri Sabha and team of teachers used to do presentations before them, shared the journey of their school

School students using tablets

with them and welcomed them for crowed funding for making village school digitally equipped. Like this he went to around 200 villages and all 200 schools got digital classrooms. In some villages there was a problem of electricity so solar panels were set up.

As there was no internet facility in the Pasthepada Mr. Gund used to go to taluka place for making/downloading content for students. According to Mr. Gund teacher must generate content for the student themselves. In the beginning he could not get Marathi content from open sources so he scanned all text books and used to show on the smart board in the classroom. In 2010 they have got tablets from donations for all students. Experimenting on computer he developed simple learning lessons, got films, and made PPTs to show to children

Mr. Gund prepared a blue print of Digital Smart School, but the upgradation took place step by step, with gradual fundraising. This initiative is primarily supported by community, who donated in cash and through labour, and support also came from NGOs and other donors. Mr. Gund was a member of the Solapur Innovation and Research Foundation, a group of government school teachers that was supported by IIM Ahmedabad. His work was popularized by SIRF.

Mr. Gund's model was presented in 3rd International Conference on Creativity and Innovations at the Grassroots (ICCIG) at IIMA in January 2015. In ICCIG conference, Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI, www.sristi.org) recognized it. The model was exhibited in Rashtrapati Bhavan by SRISTI in March 2015. Then, the model was appreciated by Government of Maharashtra. A letter (GR) on this (Digital Model) was sent to all primary government school to digitalize their classrooms on 22nd June 2015. After this letter, many innovative teachers and Principals started setting up digital classrooms in their Schools. After his visit to Pashtepada School in April 2017 Mr. Anil Swarup, Secretary, Department of School Education and Literacy, GoI, promoted Mr. Gund's initiative stating "His digital revolution is exemplary" and shared his story to inspire digital initiatives elsewhere.

In June 2015 Maharashtra State Government launched "Pragat Shaikshanik Maharashtra" — a program to enhance learning achievements of school children. PSM was conceived in response to the appeal by Mr. Devendra Phadanvis, Chief Minister, GoM, who focused on quality education as one major goal in KRAs set for the state. Accordingly Mr. Vinod Tawade, Education Minister, GoM initiated formation of a comprehensive program PSM with Mr. Nand Kumar, Principal Secretary, School Education.

Today the students in Pashtepada School are free from schoolbags as each child has a tablet with pdf text books and references uploaded on them. Individual tablets also store student's worksheets and any projects they do in the school, so that they are accessible for evaluation. Examinations are online exam, therefore results are instant. The students do their homework in notebooks, so that their writing skills are retained and improved.

Self-learning is encouraged. Screen sharing by teacher and students, as well as sharing of e-content among one other takes place. Learning from surrounding environment is also encouraged. Students also create videos based on their field projects.

Tabs are also used as recording devices to record answers by students in their own voices, some classroom activities and lectures. Sometimes they are allowed to take the tablet home, so that family can see the content and performance of their children on tab or by connecting it to their TV. It is equally important to share what goes on in the school with parents.

The school is well equipped with digital devices like — Interactive Smart Boards, IR Camera, Interactive Projector, Interactive Monitor, E-Desk, E-Podium, and also has Digital Content library with Wi-Fi connectivity accessible to students. The school also has a Content Development Studio. Global virtual classes and tours also take place.

All these systems run on solar energy, a onetime investment of Rs. 1.25 lakh. The solar unit is portable, as the panels are foldable. Once charged the school devices can run for 5-6 hours.

This digital Classroom solution uses in-built content library comprising of 2D-3D images and multimedia content of almost all subjects which makes the learning process more interactive, student-centered and enjoyable. Some of the features are given below:

- **Visual Touch.** Visual touch technology is far superior to other portable technologies available in the market today like ultrasound-based triangulations, because of the speed of tracking and the multi-touch multi-user features.
- **Gesture Based.** This provides the user an ability to execute smartphone like gestures on the interactive workspace like pinch, zoom, pan, tilt and so on. This not only makes the teaching experience and the presentations fun and more interesting.
- **Real Time Writing experience.** A lot of users of traditional interactive whiteboard solutions complain about the writing quality of the digital screen. Based on its cutting-edge smooth writing algorithms, EyeRIS offers a pleasant writing experience to the users, which makes the use of digital workspace more fun and life-like.
- **Feature Rich.** Despite its simplified form, EyeRIS provides you an unprecedented interactivity, features and tools for creating your own Digital Workspace. It's like having an interactive whiteboard solution on steroids. Not only does it give you industry's largest surface area of beyond 160", but also an unmatched 255 simultaneous points Multi-touch Multi-user experience, fastest response time, and extraordinary cost-effectiveness.

Based on his research of student's performances Mr. Gund has noted benefits of digital learning. ABDL helps to accelerate grasping, improves retention, and reduces absenteeism. Parents and community are happy with these changes, as they feel assured that their children's future will be brighter with digital education.

PSM showcased best practices of learning across the state. Mr. Gund became one of the active members of the "Techno-savvy Teacher's" — a group of self-motivated digital teachers in the school who led the digital school movement in Maharashtra.

Earlier Mr. Gund organised training on request for teachers in his block and district. With support and encouragement from Mr. Nand Kumar, who shared success story of Pashtepada in his interaction with teachers, he reached out to other districts. Mr. Gund started getting invitations from other districts, and through 200 workshops he reached out to over 2,00,000 teachers, Cluster Heads, and Block and District Officers.

In his one-day workshops he made teachers familiar with digital learning, addressed their inhibitions of using technology, and convinced them about its benefits. "Do not teach computer handling to children, instead use them as learning medium for them — this is what I tell to all teachers, and build their confidence to handle digital devices", says Mr. Gund. Making his own journey a case study, Mr. Gund shared both major aspects — technology and community participation — integral to his initiative.

Children studying in a smart classroom

Digital School Mission inspires teachers to learn to use these tools and also provides necessary training and digital content. It allows for exploratory learning, which ensured students engagement in the learning process. Digital technology can be effectively used to enrich learning process and to make evaluation process efficient and effective. Mission Digital School has promoted digital literacy and appropriation of technology to facilitate children's learning process.

At a very basic level, for a small number of students, a mobile can be turned into a learning device. More advanced devices, such as interactive boards, projectors, access to wi-fi network etc. require more investment.

Challenges and obstacles

At the initial level teachers hesitated to learn to use technology, series of trainings helped to increase the number of willing teachers gradually.

Along with getting various devices, appropriate digital content also needs to be made available, which is one of the tasks assigned to tech-savvy team members in every district.

List Of Hardware/Software And Its Estimated Cost Required For Implementing "Interactive Tablet Class" Concept

SR NO	PARTICULAR	QUAN-TITY	PER UNIT COST, RS	TOTAL AMOUNT, RS
1	Interactive device IR Camera, Cybernetic model no.: 8090	1	35 000	35 000
2	Projector Sony Dx220 Display Type: LCD Light Output: 3200 Lumens Warranty: 2 Year(s) Features: HDMI Input Life of Lamp — Full Usage: 10000 Hours Life of Lamp — Eco Usage: 5000 Hours	1	31 500	31 500
3	Laptop Configuration Laptop i3 processor Ram: 4 Gb Hard disk: 1000 GB, Screen: 15.6" Colour: Black Acer OR Asus	1	28 000	28 000
4	Master Tablet iball Q1026-18 Processor: Quad core, Screen: 10.1" Resolution: 1024X600 Ram: 1GB Storage: 8Gb Battery: 4600Mah Android 4.4 kitkat	1	9 000	9 000

SR NO	PARTICULAR	QUAN-TITY	PER UNIT COST, RS	TOTAL AMOUNT, RS
5	Students Tablet or Lenovo tab3	20	5 000	1 00 000
6	Digital Content Library for networking between master tablet and students tablet	1	28 ,500	28 500
7	Any cast Wifi Dongle for screen Sharing	1	1 500	1 500
8	Komkin Educational syllabus for 1st to 8th standard (Windows based)	1	8 000	8000
9	Komkin Educational syllabus for 1st to 8th standard (Android based)	20	4 000	80 000
10	Projector Mount Kit	1	1 500	1 500
11	HDMI Cable (10 meter)	1	1 000	1 000
12	Power cable (10 meter)	1	1 000	1 000
13	Speaker 2.1	1	2 500	2 500
14	Web Cam	1	8 000	8 000
Total amount, RS				335 500

Impact and Key learning

Today Digital School Movement in Maharashtra has picked up. Over 89% of government schools are equipped with digital learning and over Rs. 326 crores have been raised through crowdsourcing to upgrade the schools (figures as updated by August 2017). This success owes its credit to persistent efforts of teachers like Mr. Sandeep Gund, who paved the way for digital education in government school when it was beyond imagination for many.

All this together has contributed in widening the scope of learning experience for children, children interacted with students from other countries through virtual classes and trips, and learning process has become more enjoyable for them.

QUESTIONS FOR TEACHERS
1. What steps should be taken to ensure that more and more technology is used for teaching in schools?
2. How does studying in a digital classroom change children's learning ability?
3. How should planning be done to maintain coherence between study by blackboard and study by digital technology?

QUESTIONS FOR TRAINEES
1. What can be done to encourage children to use e-learning?
2. What activities can be undertaken to develop functional skills in children?
3. What kind of care should be taken while using ICT?

AN ONLINE TEST BATTERY TO ENSURE ASSESSMENT OF AND FOR LEARNING

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NSS LP Kappu was established in 1964 as a rural private-aided school in the Ernakulam district of Kerala. The school teaches students from grades 1 to 4. Dr Nair observed that though schools claim to keep a record of the learning achievement of learners, most attempts at data tracking fail to demonstrate any sort of positive impact on learning. The assessments in schools do not cater to the larger objectives of fostering learning, but succumb to serve external demands like parental pressure and scrutiny from leadership, among other factors.

The examinations which are summative assessments happen three or four times a year and these exercises give the results not the feedback. Most of the examinations publish results long after they take place. The results are translated into grades or numerals which do not reflect what the learner has really learnt.

NSS LPS Kappu became a digital school in 2013. Though infrastructural development and pedagogical digitalization were achieved, basic operational skills of students like writing, numerical ability and basic arithmetical consciousness were below the desired levels. A study was conducted to evaluate the basic skills like writing, listening, observation, comparison, classification, analysis, synthesis, application of learning in new contexts of life and basic arithmetic operations. Discussions with Ms Naimisha Parmar, Head Teacher of Kalyanji Nu Paru primary school of Adalaj Moti, Gandhinagar, Gujarat led to the insight that fixing of learning achievements at micro-levels and parental involvement put together effectively would help. She and her colleagues had fixed all the curricular objectives from grades one to four at the micro level. Learning from this, an Android mobile application was developed with the help of a 16 year-old student in Trivandrum, Kerala. The application was installed in the parents' cell phones. Personalized and qualitative day to day reports of learning achievements level of each learner were sent to each parent for a trial period of 28 days. A post test was administered on the learners to evaluate the effect of the parental involvement and the reflective pedagogical practices of teachers after the launch of the application. The results of the post-tests were highly encouraging. This challenged the teachers to take up novel endeavors to involve the parents further.

"Know my child" served as a disseminating platform to record formative assessment needs. The success of this platform motivated Dr Vidhu and her team to bring about changes of the same pattern, in the summative form of assessment pattern too. Quizzino, the assessment software, was developed incorporating the ideas thus evolved. The online assessment battery has been administered on a sample in four schools (NSS LP School Kappu in Ernakulam district, Bharathiya Vidya Mandir in Kottayam district, Government LP School Cheriyakkara in Kasargod district, all in

Students using application

Kerala; and in Kalayanji Nu Paru Primary School, Adalaj, and Gandhinagar Gujarat). The results were better than in the control group with which the conventional approach was used.

This innovative online assessment tool helps learners, teachers and parents to get a vivid and analytical note on the achievement of each learner in the target area of assessment. The results are available as soon as the assessment is done. The result is qualitative and descriptive defining what the learner has learnt and how much she has to go further, in accordance with the objectives fixed by the curriculum in the respective target area.

Quizzino was launched on a regular basis in November 2018. Regular updates were made whenever there was a demand.

Restructured Quizzino as a complete learning management system called Darpan: May 2020

"Darpan" mobile application was set up to combat the impediments caused by the COVID-19-induced lockdown and unlock days. The application had modules for both synchronized and asynchronized learning modes with interactive spaces for learners to respond to learning creatively. This supported formative assessment. "Quiz me" a module in "Darpan" can be used to give slip tests and feedback periodically. Quizzino found its permanent space in Darpan as there is inevitable demand for online assessment in the scenario of pandemic. Darpan has as many as 16 modules which aim at fostering distance learning. Classroom' has video lessons, "Connect me" gives possibilities for realtime interventions and "Whiteboard" has options of live classroom settings. Darpan found its inspiration from Quizzino's success.

The analysis of the experience led Dr Nair to make the following observations:

- Learning becomes a meaningful exercise when there is emphasis on the process skills rather than on the product: viz. concepts and content.
- Teaching learning process becomes more effective when teacher, learner and parent get informed of what each child acquires. How much each child acquires, how far each child should be lifted along for reaching at the desired level of each curricular objective and when the teacher should resort to customized, personalized and multi-level learning systems, are important issues.
- Immediate and personalized feedback gives the learners opportunities to reflect and reconsider their learning styles, getting facilitated by the teacher to scale the higher steps of learning.
- Process-oriented classrooms have more relaxed atmosphere when compared to those where conventional methods are practiced.
- The strategy of immediate feedback resulted in improved learner progress on a continual basis. Teachers build on their professional skills to give immediate and quality feedback.'
- The programme has helped for a shift in rationale towards researching continuously for clear evidence about how to drive up individual attainment of learners; provide clear feedback for and from pupils to ensure clarity on what needs to improve; and how best it can make happen. This practice thus creates a meaningful and logical link between learning and lesson planning.
- Personalized learning is the demand of the hour and assessment for learning is at the heart of its philosophy.
- The test battery and the inbuilt feedback exemplifies effective assessment and lesson planning; and on its basis, establishes the learning goals, how to communicate the assessment criteria and how to create a learning ethos.

Current situation

The online tool has been restructured and reprogrammed as a platform for online learning and synchronized assessment as schools are forced to remain closed due to the pandemic outburst. The developed platform has slots for creative expression for learners and for teachers — it serves a customized online medium to interact and address the learners critically and inspiringly. The android application thus evolved has been catered to the stakeholders on Play Store.

Reach of innovation

The success of the online test battery in fostering the achievement level of learners inspired Dr Nair to try the innovation to frame assessment tools for language and math. One of the basic language skills, listening has ever been left unaddressed by the conservative examinations. The online test battery could bridge this gap, finding slots for assessment of listening skills as well. The introduction of innovation in the assessment of math has been highly useful to diagnose

Students using application

the problems of acquisition of skills like basic arithmetic operations.

The introduction of the innovation has urged teachers to use appropriate language and terminology which learners have developed and communicate the learning goes and assessment criteria and thus promote self-assessment through effective use of the assessment criteria.

These has been remarkable introduction of learning ethos in all the four schools, demonstrating the use of value-added data, fostering trust in professional relationships, and demonstrating that learning is valued and celebrated.

Dr Nair has received the National Teachers' Award from the Hon. President of India; Innovative Principal of the Year Award (International School Awards, Dubai); Outstanding Head Master Award (International Educational Summit and Awards. Bangkok); Outstanding Academic Leader 2018 (World Education Summit, Mumbai). She has also been honoured by the Kerala government for the mobile app "Navaprabha" for centralized consolidation of data, and for the monitoring of the programme by RMSA, Kerala.

Quizzino has been adopted as an aptitude test for students of Standard IX in all the schools in Kerala. The extended innovation of this software, called Darpan is being cloned for Student Police Corps programme, a project of Home Department, Kerala to conduct in-house training for 50 000 cadets in schools across the state. Darpan is used in seven schools to ensure learning during COVID.

School achievements

The school's research-based learning project as a part of "Sargavidyalaya" a government programme has been selected as the best in the district. The school has been recognized as one of the best 28 schools in the state by SCERT. The work has been presented in various venues such as the Conference on innovation in Grassroots, held at Indian Institute of Management, Ahmedabad, Indian Council of Social Science Research: National Seminar on Educational Innovations; the Prime Minister's Office has also recommended the school as a model. Other places where the work has been presented include Children's University, Gandhinagar, Central University of Gujarat, AG Teachers' College, Ahmedabad, HM Patel College, Anand, DIET Daryaganj, New Delhi, and Regional Institute of Education, Bhopal.

QUESTIONS FOR TEACHERS
1. What are the benefits of education testing?
2. How will testing change the teaching-learning process?
3. How will the test become a chain link to engage parents with school processes?

QUESTIONS FOR TRAINEES
1. How do different seminars help increase the effectiveness of the teaching process?
2. How does having information of children's knowledge change the teaching process?
3. How does testing become necessary to know and improve academic achievement?

THE MAGICAL WORLD OF THE INTERNET FOR REMOTE GOVERNMENT SCHOOL CHILDREN

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YOUTUBE	Shiksha Bharti

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Balaji Jadhav was born into a farming family in the Latur district. He completed his diploma in education and moved to Satara as a teacher at the Zilla Parishad Primary School in Shindewadi, in Maan taluka. Most families here worked at brick kilns, did other kinds of manual labor, or were shepherds. When he joined the school, the attendance sheet had 23 names, but only 10 or 12 students would be present on any given day. Those belonging to the shepherd community would wander to nearby villages with their families and flocks, while others found school too boring.

It made Balaji uneasy to see these children wandering about the village, and he was constantly thinking of ways to get them back into school. Before this, he had worked in a private school that did not have a clerk, so it often fell to him to fill in forms and do all the computer-related work. Being keen on technology, he browsed the net a good deal and gathered useful and interesting information. He decided to use computers to get the Shindewadi children to come to school. Shri Karade, the Principal, supported the idea, but the school did not have a computer. The people were too poor to contribute money, so Shri Jadhav bought a laptop with his resources.

The children loved watching cartoons and TV programs and playing video games, so initially, he let them watch the shows they liked and play games. The students were curious about the laptop and thrilled that the teacher allowed them to handle it. They would be impatiently waiting

Mr. Jadhav teaching students through tablet in classroom

School classroom equipped with ICT infrastructure

for their turn. Soon enough, they began to talk about these adventures to their friends who were not coming to school. This brought all the missing students back!

Introducing the online world to students

With the attendance barrier broken, the challenge was to get the students to progress academically. Shri Jadhav was a product of the "Latur pattern", a teaching method that has become known for excellent academic results from that region. He strongly believed that the students needed to do well academically, and started downloading games that would complement their syllabus. IThecholarship exam held particular significance in this rural area, and he motivated the Class-4 students to work for this. All who appeared for the exam cleared it, though none of them managed to get the scholarship. Shri Jadhav was disappointed, and tried to identify the areas that needed more attention. He downloaded relevant videos and created a huge question bank. These efforts bore fruit and in 2008, a few students from the school won the coveted scholarship for the first time. After that, the students of Shindewadi ZP School created a record of sorts by getting scholarships for the next seven consecutive years.

When the students won the scholarship for the second year in a row, both the Principal and the Extension Officer applauded his efforts. The questionnaires Shri Jadhav had prepared for his students were circulated to other schools. When students from over 60 schools got the scholarship, the Extension Officer encouraged Balaji to take the project to more schools.

The school now had 50 students enrolled. Even the brick kiln owners started sending their children to school, instead of patronizing the English-medium schools in the vicinity.

Around this time, Balaji learned about blogging from a friend, and in 2010, he started website — www.shikshanbhakti.in — in which he shared ideas on how to make the syllabus more interesting, suggested projects that could be complementary to the syllabus, and included the practice questionnaires he had devised for the scholarship exam. The response was very good. But some teachers pointed out that they had to get printouts of the question papers, and this was expensive. So Shri Jadhav learned HTML programming and made the question papers available online on the blog. These online tests are always multiple choice. After selecting the correct answers, when one "submits" the answer sheet, the result takes barely a moment to appear. It is then simple to check the answers and to get the correct answers for wrong responses. This, for the teachers, was like opening a treasure box. Once the online tests became accessible, almost 12,000 schools began visiting the website every day!

Shri Jadhav then realised that out of the 12000 schools that visited the website, almost 10,000 belonged to the urban areas of Maharashtra. For the rural schools he thought of using Flash software to create offline tests. First, he developed an off-line application called "Std4th", which had complementary projects for all the relevant subjects and tests. He designed the software so that it could be used with an android phone as well. This way, teachers could choose to download the App on their tablets or mobiles when there was Internet connectivity. Their students could later do the tests, and even get their results, offline.

He started developing these offline apps in 2014; the response from all over the state was good. That year, his blog received the Best Website Award from Yashwantrao Chavan Pratishthan. He was also chosen as one of the four best teachers from India by Google India. In 2014, when he received this honour, the other three chosen teachers for the award belonged to the IITs and worked in metropolises.

Children explore the world through the Internet

Shri Jadhav downloaded videos related to art and craft, gardening and music for the children. They would tour the world through YouTube or play videos on choreography and practice dance. This led to one student Prathamesh Mane's qualifying for the "Dance India Dance" competition in 2013 — a moment of great pride for the entire school. Others performed well in various district-level competitions.

Meanwhile, the Principal Secretary, School Education, and Sports, Shri Nandakumar, formed a group of teachers who were using and experimenting with technology in this manner. Today there is a force of such techno-savvy teachers in the state. Currently, the

Student recording story on tablet

teachers are making videos that are meant to serve as an additional resource in school education, to be made available through the MITRA app.

Since 2014, Shri Jadhav has conducted around 120 workshops on behalf of the state government for teachers and education officers in the state. He has demonstrated how to make one's own videos, upload them on YouTube, and use open-source software and other technology in these workshops. These workshops are usually held during the summer vacations, and on Sundays.

He also uses "Google Earth". This makes it possible for a child to tour the Himalayas while sitting in a remote village! He has even shown his students the Taj Mahal, from all possible angles! He is a "Google certified teacher."

Shri Jadhav also has a YouTube channel called Shikshanbhakti. The blog has a large amount of study material for students. In contrast, the YouTube channel shows how to browse, type in Marathi, make videos, and a tutorial in photo-editing and other such lessons that may be useful for teachers. For the last two years, he has also worked in Maharashtra state's IT cell for e-governance. This collaboration with the National Informatics Centre includes the SARAL system of the education department and other projects.

In 2019, Shri Jadhav was transferred from Shindewadi to the Pulkoti primary school. Here, the parents are slightly better off, so Shri Jadhav managed to mobilize resources for three tablets. The parents receive SMSs with a description of the homework given to students. This initiative has been much appreciated in the taluka, because now practically all students come to school with their homework done. It has also helped start a dialogue between the parents and the teachers. All the students have now received tablets donated by the Atul Foundation Gujarat.

He has received many awards, including from Google, Microsoft and the National E Innovation Award 2017, the Global Innovation Award 2018, Indian Icon Award 2018, Innovation for Education Award 2015, Digital Innovator Award 2015, Best Teacher of the Year Award 2018, and awards from many social organizations.
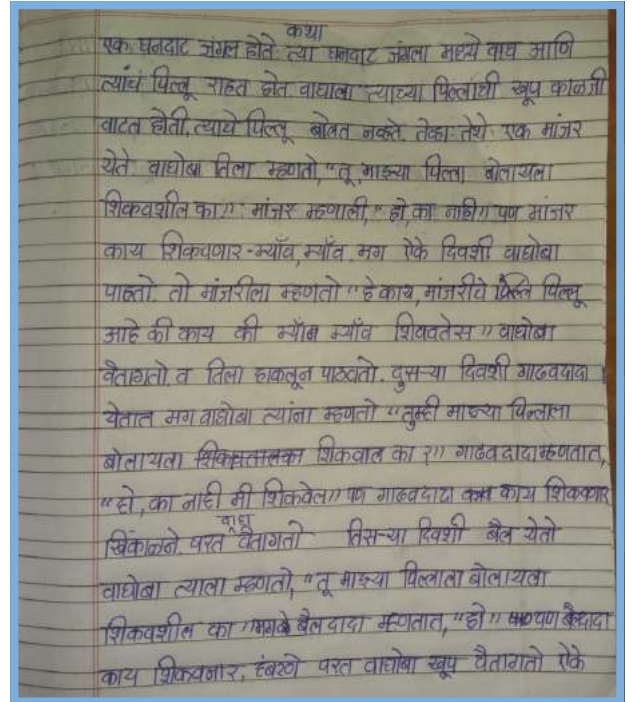
Story written by Std.3 student

QUESTIONS FOR TEACHERS
1. How to teach children to use the Internet?
2. How to be careful while taking various information from the internet
3. How can the Internet be used to give children group work?

QUESTIONS FOR TRAINEES
1. How do you ensure that children use the Internet as needed?
2. How to teach children to use tabs properly?
3. How does the Internet help parents to engage their children in school?

USE OF TECHNOLOGY IN EDUCATION

TEACHER	Dr. Mihir N. Solanki
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*Scan QR-code
to watch video*

Dr. Mihir Solanki holds MA, B.Ed and PhD degrees. He has been a language teacher since September 2011 in Mehsana Primary School No. 3, which is located 1 km from the bus station in the centre of Mehsana city. Given his interest in digital technology, he decided to digitalize the school, which now uses a variety of electronic teaching methods, such as online quizzes, videos, AR, VR, 3D maps, 360-view instruction, virtual classes, and so on to support learning.

His first attempt at digitalization was the first unit in Gujarati language, an introduction to nouns. The next unit was on authors, for which he sourced information from the websites of Gujarati Sahitya Parishad and Gujarat Sahitya Akademi and prepared videos that had poems, songs and animation. These digitalized lessons captured students' interest and improved their engagement with the lessons.

Dr Solanki then used the Internet, videos and blogs to update his knowledge. His next experiment was to create a flash quiz which was well-received by the students. He prepared 51

Students studying online

flash quizzes for different subjects, and shared these on his blog for wider reach. The quizzes were not limited to Gujarati, but included other subjects such as English, social science, science and mathematics.

He created a YouTube channel, "Shikshan dhara", nicknamed "Mihirkumar", that had a variety of educational videos for both students and teachers.

He was selected by the government for its smart class initiative, as a result of which his school received equipment for two smart classes. With additional resources, three digital rooms were also set up. With this infrastructure in place, it was easy to introduce digital technology such as Google Quiz, 3-D map, smart class, 360-degree views, AR-VR box, and AR-VR applications, among others.

The Flash Quiz was available online enabling students to attempt it anywhere and anytime. They could self-assess their performance and also share with their teachers for evaluation. His videos received wide reception even from students belonging to other schools. He went on to create 302 online flash quizzes for various examination topics and scholarships, and added 14 videos for English, 4 for Gujarati, 7 for scholarship exam, 5 for math games, 2 for Science and 32 for General knowledge. Besides, in the prevailing corona pandemic condition, he has prepared 28 quizzes to support self-study at home and another 212 videos for self- assessment by students. In this way so far, he has created 303 online quizzes, more are in the process of being made and posted day after day. Some specialities of these videos are: the order of questions and the order of answers in the online quiz change automatically. Quiz can be added with pictures and a review of the test can be seen at the end. Students can self-assess their performance at the end. Besides, using tools for

reporting and analytics, the students' results can be listed and summarized in an Excel sheet and the data then analysed for review and feedback at the class and individual level.

Along with, Dr Solanki also began use of 3D map and 360 degree view allowing students virtual tours of the places under study, for instance — Burj Khalifa, the Statue of Liberty and the White House The children could also see 3D maps of Taj Mahal and Girnar. He has also posted a video on how to use 3D maps on the YouTube channel to teach other teachers on using this technology. He also held a free ICT workshop for teachers so that they could maximum its use in education.

AR-VR technology was used to create a trial AR book for Gujarati standard -7 in the second session. When the mobile pointed on the picture of the author in the lesson of the book, his introduction appears on the mobile screen. Similarly, when the mobile is pointed over a poem, its summary appears, coupled with an oral recitation of the poem. This AR-Book can also be used by students at home. The students also have a lot of fun using it. In the district level Innovation Fair, the teachers also appreciated and liked this technology a lot. However, the book had some technical defects and so in not in use at the moment.

With the aim of popularising use of technology in other schools of the district under the Digital Education to Digital India program, the Mehsana district's ICT team conducts a free workshop on holidays. In the ICT workshop so far, about 700 teachers have taken ICT training and are making efforts to implement learnings in the classroom.

Under the guidance of Mehsana District Primary Education Officer Smt Smitaben Patel, Principal Officer of District Education Training Bhavan Mehsana Shri Vinodbhai Adhiyol and deputy District Primary Education Officer, Shri Pulkitbhai Joshi, various "Digital Education, Free ICT Workshops" have been organized in the district.

Online ICTE workshops in Lockdown for Teachers

Lockdowns were enforced across the country during the Corona epidemic. During this difficult time, the online Free ICT Workshop for digital education was launched on March 6, 2020. ICT team of Mehsana and e-education team joined hands for this work. Every day Dr. Solanki hosted a 2-hour session in the evenings for Free ICT workshop which was attended by an average of 70 to 90 teachers from different districts of Gujarat. During this time, he also conducted 20 online workshops benefitting more than 1309 teachers.

The links to his videos
on the use of 3D map

The links to his videos of the book
and of students using the book
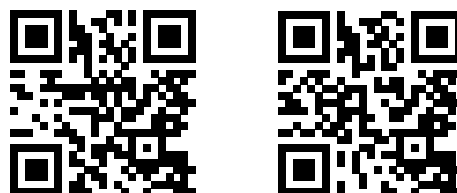
Virtual Classes for Children

Dr Solanki also began online digital e-classes on Zoom app to educate children and also share tips on the safety measures to adopt during the pandemic. This was in addition to their classroom lessons, given that all schools were closed due to the lockdown. A note of this innovative work was taken by IIM Ahmedabad, I to We Foundation, Doordarshan's D.D News and other newspaper publications. Currently, classes are being conducted using the virtual Microsoft Teams by Gujarat Education Department. During the day time, the parents are not at home as they have to go out for labour work. Taking a note of this problem and non- availability of mobile phones for the children at this time, the virtual classes are conducted during the evening hours from 6 pm to 9 pm.

Development of mobile applications for children

Dr. Solanki has created three mobile apps so that children can have fun instead of getting bored or wasting their time. Mehsana district was the first to make the innovative use of mobile application.

The first application — "Home is my school" was inspired by District Development Officer Shri
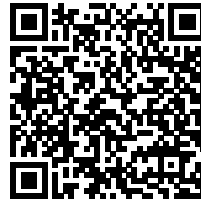
Mobile Application
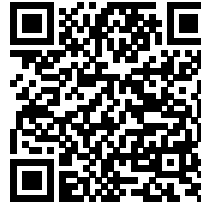
"Home is the school"

"Ganan"

"Study At Home"

M.Y. Daxini. In this application, students can self-assess themselves while enjoying the educational games. During the period of lockdown, GCRT under the guidance of the state government, Gandhinagar had conducted the program "Study from Home" and "Nest is safe and warm for the family". Under this program, the students from class 3 to 8 were given study related literature. He uploaded all the necessary resources so that children can access all the study materials at one place. To reinforce the literature subscribed by the education board, under the "Study from Home" program, he also created weekly quiz for every class. The application also includes math-related games for the students. Homework was also created in the app for students of Std. 6 to 8.

Also during the lockdown, Mobile app "Ganan" was found to be of great use to the children allowing them to practice math concepts and self-evaluate their performance. There are 15 questions given at a time in which numbers of the sums keep changing automatically every time the students play the game. This application is useful for students to practice their basic mathematical operators at home.
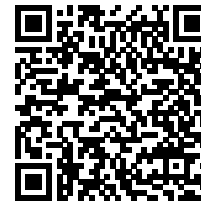
The school has been achieving A grade since the past consecutive 5 years in the "Gunotsav" and also received A grade in the teacher's grade. Also, 64 students have successfully attempted NMMS and PSE Scholarship Exam.

There is also an increase in the number of admissions from private schools to government schools. In the year 2019-20, 50 students from private schools sought admission in government school.

QUESTIONS FOR TEACHERS

1. What are the things to keep in mind before teaching children the subject in a smart class?
2. What should be included in the results of online assessment?
3. How to test content in smart class?

QUESTIONS FOR TRAINEES

1. What can be done to make children more focused in a smart class?
2. In Gujarati subject, children should not make mistakes in spelling and words, what should be done for that?
3. What is the difference between a normal classroom and a smart class?
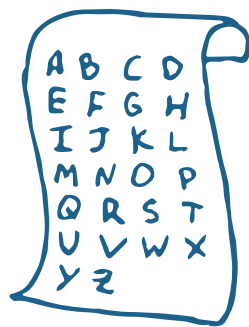
USE OF TLM IN EDUCATION

TEACHING ENGLISH BY USING PHONICS CHARTS

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Ms. Darshita Mahida holds an MA and B.Ed in English, and joined the Indiranagar Primary School in September 2011 as a language teacher. According to her, there is a general belief that English is not taught well in government schools, and it is difficult to teach to students belonging to the lower socio-economic strata, who constitute the majority in government schools. Such students fear the language. If children cannot read in English, how can they be expected to do the basic activity independently from the standard 6 English textbook?

In June 2017, Ms. Mahida decided to do an experiment with 21 students of Class-5 aimed at overcoming their fear of the language. She thought why not take advantage of the excellent reading skills that students exhibited in their mother tongue? With that in mind, she connected

Teachers looking at innovation materials

the basic alphabets of English language with their phonics to prepare a phonic model of English vowels which could be used in different situations. She also prepared a chart of the English alphabets, connecting them with the Gujarati alphabets. This was supplemented by a worksheet. She then prepared a micro-planning guide to make different kinds of literature.

She conducted a grassroots level study of basic alphabets and phonics of both English and Gujarati languages. She came to the conclusion that although the alphabets of both languages looked different, there were certain similarities in phonic usage. Hence, by using phonics to teach English, the process of reading could be greatly simplified.

Darshitaben's experiment was based on the similarities in the sounds of certain letters in English and Gujarati. Her material included a chart of phonics vowels; role plays and material for developing short stories; collections of different types of authentic materials for reading, like menu cards, tickets, advertisement, visiting cards, wrappers, etc.; charts for alphabet recognition; chart showing words having 2 to 9 alphabets from A to Z; reading activity of conjunct words with their pictorial representations; chart of irregular vowel and consonant words; worksheets for evaluation (identifying the alphabet and colour,

અંગ્રેજી મૂળાક્ષર અને તેના ફોનીક	
A – અ	N – ન
B – બ	O – ઓ [કાનો માત્રા]
C – ક , સ	P – પ
D – દ	Q – ક્વ
E- એ [એક માત્રે]	R – ર
F – ફ	S – સ
G – ગ	T – ત
H – હ	U – ઉ [હ્સ્વ ઉ]
I – ઇ [હ્સ્વ ઇ / આઇ]	V – વ
J – જ	W – વ [ભારથી]
K – ક	X – ક્સ / ક્ષ
L – લ	Y – ય
M – મ	Z – જ
TH – ધ	CHH – ચ / છ
BH – ભ	GHT – ટ

The English alphabet and its phonics

matching the given items, circling the correct spelling, matching a word with its related picture, reading paragraphs and charts related to various festivals etc. Ms. Mahida also used videos available on YouTube to supplement her lessons.

The steps followed were as follows:

1. The first step was the use of phonic model chart to recognize the alphabets. The children were shown related videos on YouTube.
2. On the basis of basic alphabet recognition, they were asked to read words with two of the basic alphabets and learn their meaning through pictorial representation. The children were also taught to construct sentences, read words, know their meaning and read the words on the chart prepared for this purpose. For example, (i) on: the pen is *on* the table; (ii) it: b*it*, p*it*, h*it*, f*it*; (iii) at: b*at*, v*at*, f*at*; (iv) ox: b*ox*, f*ox*.
3. Reading words with three letters, understanding their meaning and making sentences using these words.
4. Reading 4-letter words, understanding the meaning of the words and using them in a sentence.
5. Reading five letter words, making sentences and asking the children to make a sentence. For example, "night": good *night*, dark *night*. The teacher gives a sentence such as: "Good *night* students". Now students make new sentences from the word such as: "Good *night* teacher".
6. Making the children read words with 6 to 9 letters, explaining their meaning and asking them to read on the chart.
7. Asking the children to read the words from the pictorial representation chart and giving their meanings.
8. Activity of matching simple words with their meanings.
9. Reading conjunct words as well as words with prefix and suffix. For example, (i) cr: *cr*ack, *cr*eam; (ii) br: *br*ain, *br*eak; (iii) tr: *tr*ack, *tr*ain; (iv)tion: ac*tion*, reac*tion*, frac*tion*; (v) ght: ni*ght*, fi*ght*, ri*ght*, li*ght*.
10. Carrying out listening and repeating activities for irregular vowels, with related videos.
11. Conducting "read and understand" activity
12. Giving instructions in English and checking whether they are followed.

English word reading in the Classroom

13. Making the children read authentic materials of everyday use which are printed in English such as visiting cards, wrappers, etc. and encouraging them to ask different questions related to these materials.

14. Making children read paragraphs, stories, recipes, role play and encouraging them to ask questions. Other activities were to show them videos of recipes and stories from YouTube, and encourage them to complete their textbooks activity independently.

The evaluation was conducted through a Worksheet to identify the basic alphabets. The worksheet included questions such as search the alphabet and colour it, connect the alphabet to how it's written, circle the correct word etc. Oral questioning was also conducted related to all the above activities.

Ms. Mahida has obtained good results from her work. Students who feared reading English can now read English confidently and even try to speak in the language. The students of Class 5 to 8 do their textbooks activity independently. This experiment is continuing even now. Today all the children who did not even know the spelling of mobile are using the mobile phone to know and use different types of social media such as WhatsApp, Facebook, Instagram and YouTube with ease.

After creating this kind of innovative material for learning the English language, she plans to encourage multilingual learning in children. She wants to create material for languages such as Sanskrit, Hindi and Gujarati so that children can learn these languages in their leisure time and encourage self-learning. He is also planning to create language related games like for e.g. Language Ludo - in which students can self- learn the language through the game. Encourage multilingual use in the classroom, create Language Ludo and conduct innovative workshops for the language.

The work has been recognized as innovative by IIM Ahmedabad and she was honored with a certificate in 2018. The school has improved its performance in the government's grading exercise from B in 2016 to A the following year, which has been maintained.

QUESTIONS FOR TEACHERS
1. What activities should be done in the classroom to overcome the fear of the English language in children?
2. What are the things to keep in mind while teaching English to children?
3. What extracurricular activities do you do for your children to develop an interest in English?

QUESTIONS FOR TRAINEES
1. How do you know where the children are weak in English?
2. Children often forget spelling, so what activity would you do in the classroom?
3. What will you do to increase the children's English language skills?

LEARNING BY PLAYING: CREATING GAMES TO TEACH EDUCATIONAL TOPICS

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*Scan QR-code
to watch video*

Ms. Jineshaben Shah became a teacher in 1998 and then head teacher at Sajna Talavdi Primary School in 2014. This Class 1-8 school has 200 students. The attendance was, however a problem — the children were working with their parents leading to a problem for poor attendance. The boys helped in running roadside stalls and engaged in retail labor. The girls did housework in other people's houses. The playground was very small — just a square of about 60 feet and so not many games could be played there. Jineshaben gave birth to the concept of "Learning by playing" involving many innovative games made by using waste material. Over a period of about four months, a number of games were designed with the help of the children. The children could play the games during the recess and some even during regular classes. They also helped in conducting the activities: teams were formed and a register was prepared for the young students to play a game according to their level. And for the benefit of all the children of the school, day-wise and standard-wise planning was also done.

Some of the games were "The world of numbers", "My shadow", "My house", "My steps", "Get up and sit down". Math Checkers Game, Board Game, Puzzle Game for Fractions were created for easy addition and subtraction. Various games were created using balls and puzzles for teaching subjects like English and social sciences. The cost of making these games was very low but some donors contributed for the banners. These contributors included the local Lions Club, Madhuvan Foundation and some non-resident Indians.

The games have been tested by cluster and block resource centre coordinators and other teachers. They have also found place in Innovation Fairs.

Students have benefited greatly from the games, a fact that is well reflected in increased engagement with the subjects and the consequent increase in their performance. There has also been a marked improvement in their attendance and an interesting fact to note is that there are more girls than boys present in school on any given day. As a result, they get to wave the flag almost every day,

TLM for addition

Students learning tables

Student and teacher playing word game on the banner

The table below gives the details (for standard 1 to 8 students).

NO	STD	NAME OF GAME	DESCRIPTION
1	1–2	Anko ni duniya(world of numbers)	Alphabets and numbers in Gujarati and English banner
2	3–5	Maru ghar (My House)	Various shapes and colours information banner
3	6–8	Maro padchayo(My shadow)	Annexure between Maths and Language banner
4	1–5	Mara pagla (My Steps)	A banner about intelligence
5	1–5	Uthak bethal(Get-up-sitting)	Banner on physical strength
6	1–8	Chalo Nishale (let's go to school)	Maze-like game banner
7	3–5	Math Checkers	Multiplication Addition Subtraction Game Board
8	1–2	Mane jodo (Join me)	Card game about number knowledge
9	1–2	Maro number aapo (give my number)	Addition Subtraction Board game
10	1–2	Ketla thya (how many)	Addition Subtraction Board game
11	1–8	Bingo Ball	A game for numerical addition and subtraction of planets using useless bottles
12	1–2	Mane Nishan bano (Target me)	Numeracy game using different water bottles
13	1–8	Paherao ring (give ring)	Concentrate game
14	6–8	Fraction By Parts	A game for understanding numbers line
15	1–4	Maru fal mane aapo (give me my fruit)	Numerology game using useless hooks
16	6–8	Mane jodo (join me)	A game for understanding the flags of different countries in the social sciences
17	6–8	Fractional stairs	Game board for fractional understanding

which is a matter of great pride for them. About 75 children from private schools have come back to the school. There is a significant improvement in the academic quality of the students. They have been leading in NMMS, Navodaya and Std. 6 Scholarship examinations and have to their credit several Inspire Awards. The school's merit grade has increased to A + which is noteworthy. The students have been recognized as talented students by the Gujarat government.

Teachers from other districts have adopted many of these games introduced by Ms Jinesha. Government and private school teachers of nearby places visit the school to study these games and then implement them in their classrooms.

Ms. Jinesha Shah has received many awards such as the State Innovation Award, Nehru Science Centre Innovation Award, Makerfest Vadodara Innovation Award and India Star Proud Award.

Sijana Talavadi Primary School progress chart

Number of students

Quarter	Students
1Q 2017	200
2Q 2017	225
3Q 2017	230
4Q 2017	235
1Q 2018	200
2Q 2018	230
3Q 2018	235
4Q 2018	235
1Q 2019	220
2Q 2019	270
3Q 2019	278

Years

NO	STD	NAME OF GAME	DESCRIPTION
18	3–5	Give me Water (Mane pani aapo)	Multiplication game using a useless thermocol cup
19	6–8	Fraction bingo	Game board for fractional understanding
20	6–8	Machhliben kya chalya (where did you go fish)	Spellings game
21	3–8	Tables board	Clock learning game from useless water bottles
22	1–2	Tmaro ank kya (Where is your number)	An understanding game of numerology from a waste water bottle
23	3–5	Mane jodta su bane (What will you get after joining me)	A game of understanding small and large numbers and location value
24	3–5	Maro bhar ketlo lage (How much is my load)	Weightlifting game
25	6–8	Khuna ne jano (Know the angle)	Game for understanding different angles from Thermocol
26	5–8	Hu bije kya jau (Where else am I)	Game for understanding Ghadia, L.C.M. / H.C.F.
27	1–2	Maru kutumb (My Family)	Numeracy game
28	1–2	Mane pakdo to khara (catch me if you can)	Numeracy game
29	1–8	Rann ma sarjan (creation in the desert)	Alphabet game
30	3–8	Mane purn karo (complete me)	Attach the story from the ice cream spoon game
31	3–4	RollAShape	Game for shapes
32	3–4	Tangram puzzles	Game for understanding the shapes of tangram

NO	STD	NAME OF GAME	DESCRIPTION
33	5	Tu maro gunak, hu taro avayav	Game about factors
34	6–8	Fit Man Fat Man	Game for eating habits
35	6–8	Fire Safety Game	Fire safety game
36	6–8	Parts of the Body Game	Game for body parts
37	6–8	Board game	Game of volcano
38	6–8	Board game	Game about global warming
39	6–8	Maru jivan (my life)	A game about the life cycle of butterflies and frogs
40	6–8	Maths calendar	A calendar showing the various processes of mathematics
41	6–8	Word consonant number	Game for language comprehension
42	6–8	Bhai bhai hu kya chhu	Game for language comprehension
43	6–8	Play card game	Game for language comprehension
44	6–8	One minute please	Game for language comprehension
45	6–8	Anti-synonym word game	Game for language comprehension
46	6–8	The parable of the proverb	Game for language comprehension
47	6–8	Idiom	Game for language comprehension
48	6–8	Word game for word set	Game for language comprehension
49	6–8	An animal-bird proverb	Game for language comprehension
50	6–8	Conversely	Game for language comprehension

QUESTIONS FOR TEACHERS

1. What co-curricular activities should be organized for the development of functional skills in children?
2. What do you think about the fact that school should strive for physical development along with mental development of children?
3. What activities can be carried out for the physical development of children in school?

QUESTIONS FOR TRAINEES

1. What games can be played to explain maths to children?
2. What care should be taken while playing games to give children an understanding of the content?
3. What activities can be undertaken to motivate children to come to school?

THE MAGIC OF TLM IN ACTIVITY BASED LEARNING

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Scan QR-code to watch video

Shri Mukesh Padhiyar who is originally from Ahmedabad was posted at Shree Bela Primary School of Barvala taluka of Botad district as assistant teacher in March 2007 and then transferred to Refda in 2018. He holds a primary teaching certificate from CN Vidyalaya of Ahmedabad. His area of interest has been to create interesting teaching learning materials (TLMs) for children.

The magic of PRAGNA TLM

While teaching in class 1 and 2 Shri Padhiyar noticed high absenteeism in students. He was unable to give them individual attention that each class had around 89 students in Class-1 and 91 in Class-2. There was also a lack of adequate teaching resources to make learning interesting for the students. To overcome these issues, he came up with the idea to create interesting T.L.Ms for students. These activity-based learning methods are called "Pragna" in Gujarati. His ideas manifested in the form of Adarsh Pragna Varg (Ideal activity-based learning classroom) which involved the following activities.

Talking Walls. He decided to use the walls and staircases of the classroom and the school for creating the TLMs. The walls were around 25 to

Badge for Literacy

30 feet long and 12 to 15 feet wide. Mr. Padhiyar painted the walls and stairs in black at negligible cost. These black coloured walls and stairs were used to write and give more information about the current unit of the syllabus according to the Study card. After the unit was over, information about the next unit was similarly displayed.

Paver Block and Basement. Shri Padhiyar designed a project whereby the paver block and basement was converted into a type of activity centre. Games and activities including educational puzzles, numbers and basic alphabets were available here. The activities were such that the children could do them independently during thier free time and during recess hours.

Words–number garland. The classroom was decorated with garlands made from cuttings of about 1300 different words and numbers. This TLM familiarised the children with numbers and improved their vocabulary.

Study cards. Shri Padhiyar has created study cards that help the students in revising their lessons and strengthening their reading, writing and counting skills. The cards also accomplished the aim of Mission Vidya and remedial classes. Using the computer, he created and then laminated around 4000 cards for language and maths. The TLMs he created for the children are:

- Unit based cards — more than 1200
- Micro cards — more than 2000
- Strip T.L.M
- Reading Set — more than 15
- Reusable Card
- Counting Set — more than 10
- Portfolio Card
- Display Board Materials
- Lamination of basic alphabets and number dice
- Dice games card
- Rubber Stamp

- Word wheel
- Number wheel
- Word Arrow
- Number arrow
- Place value board
- All number knowledge
- Word-Number I-card
- Number knowledge Cup
- Emojis
- Basic alphabets, number game of snakes and ladders
- Puzzle
- Basic alphabets, number coins
- Games with hands
- Writing Proverbs
- Patterns
- Beading TLM
- Beads ladder, Mind game

These were also prepared Class 3-5 (for language, maths and environment).

Remedial kit. A laminated card kit has been prepared for students of classes 1 to 8 in need of remedial work in reading, writing and calculation.

Pragna learning through Animation cartoon. This was the first of its kind project created by Shri Refda Primary School. If students of class 3 to 8 learn using QR codes why should the children of Class 1-2 be deprived of this? In 2019, QR codes were prepared for the students of class 1 and 2 in the subjects of language and mathematics. For Pragna,
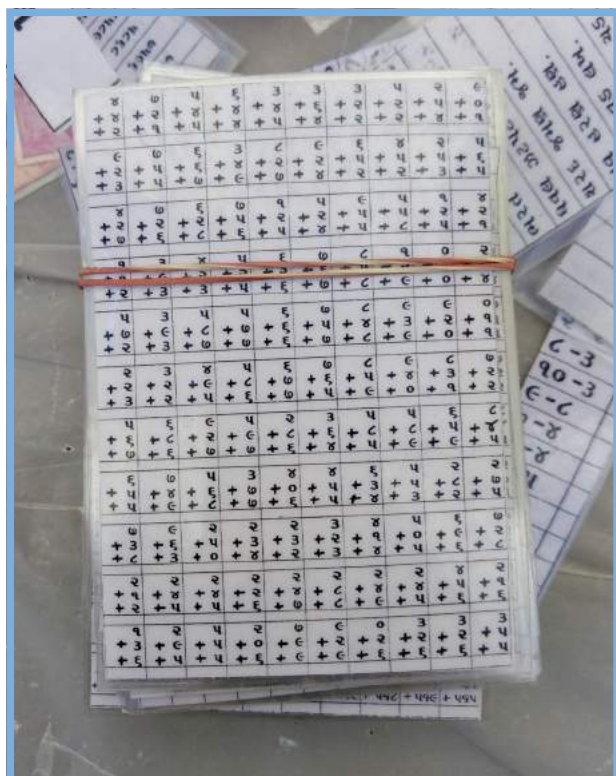
Numerology TLM

Additional Cards

different QR codes were prepared according to units such as children's songs, rhymes, stories and other academic and non-academic activities.

ICT was used to teach all the four groups that were part of Pragna. The study cards were animated to make learning interesting and also clarify concepts usin the well-loved cartoon characters.

Education through PPTs. PPTs were made as teaching aids to support reading, writing and counting activities. These PPTs are also made to give variety in the ways of learning.

Other material. Shri Padhiyar also made TLMs using materials such as leaves, coins, ice-cream sticks, glass, and old calendars.

Evaluation

With the introduction of TLMs, attendance increased to 92%. Also, academic scores of students improved. The school grade increased from C to A in Gunotsav. This innovative project was also recognised as suitable for replication, and up to April 2020 the kit had been distributed among 4321 schools who have also achieved good results. The Pragna Kit, Remedial Kit and Kit for Class 3 to 5 were also supplied at negligible costs.

TLM from waste stick of ice cream

AWARD	INSTITUTION THAT GAVE AWARD	YEAR OF AWARD	REGION
Best Teacher Award (Taluka level)	District Panchayat, Botad	2016	Botad district
Best Teacher Award (Taluka level)	District Panchayat, Botad	2017	Botad district
Best 100 Innovations	I.I.M, Ahmedabad	2014	State level
Certificate for being a Case Study at SAMARTH (I.I.M).	District Panchayat, Botad,Teacher's Union, Barvala	2018	Botad district
Certificate for Samarth Online Training Case Study	I.I.M, Ahmedabad	2018	State level
Certificate for SAARTH CONFERENCE	I.I.M, Ahmedabad	2019	State level
ICCIG International Conference	I.I.M, Ahmedabad	2019	State level
Innovation Festival	Nehru Science Centre, Mumba	2019	National

An A3 size reading set has been prepared for school children, which they can use with assistance of some caretakers. Currently, there are around 4000 micro cards and 7 to 8 Maths sets as part of the TLMs. These TLMs have been showcased in various exhibitions and fairs listed below:

YEAR OF INNOVATION FAIR	INNOVATION NAME	DISTRICT/ STATE LEVEL	VISITING TEACH–ERS (AP– PROX)
2015–16 Gandhinagar	Effective Education through fun activities (Shri Bela Primary School)	District – State	700
2016–17 Saputara	Group Education (Shri Bela Primary School)	District – State	1500
2018–19 Changa	Magic of T.L.M. (Shri Bela Primary School)	District – State	2100
2019–20 Ahmedabad	Pragna Education through animation cards (ShriRefda Primary School)	District – State	1700

These activities have had a strong impact on children. They are more engaged in the lessons, a fact which finds reflection in their improved grades. The impact of these teaching aids is not just restricted to the students. In fact, parents and guardians of the students have also started to make and use them to support learning at home. Mr. Padhiyar hopes that more and more schools adopt these TLMs to support their classroom teaching.

QUESTIONS FOR TEACHERS
1. What should be done to ensure that children are not absent and come to school regularly?
2. What are the things to keep in mind while constructing a TLM?
3. Kids can study as well as entertain, how can a game be played for that?

QUESTIONS FOR TRAINEES
1. In the classroom children can learn through peer learning, what should be done for that?
2. What activities can be done to increase children's reading and writing in the classroom?
3. What are the things to keep in mind while creating a QR code?

DEVELOPING READING THROUGH PICTORIAL STORIES

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Scan QR-code to watch video

Ms Niketa Vyas has been working as a primary teacher for about 20 years. She is credited with developing the concept of "Reading skill development by picture stories". She observed that most of the students in her school were migrant children having migrated with their parents from the Hindi heart-belt, from states such as Uttar Pradesh, Madhya Pradesh and Rajasthan. The children, therefore, found it difficult to follow Gujarati, the language of education in the schools in this region.

Ms Niketa began her career, teaching children of class 5 that had on roll 37 students. Many of these had been readmitted to the school under the provision for out-of-school children, as mandated under the right to education (RTE). So when Ms Nikita began teaching, she found that only three out of 37 children could read Gujarati. The rest could not even identify the Gujarati alphabets. She then come up with the idea to create teaching aids such as flash cards, line bars, and paragraph cards to bring the class up to date with the language.

She would draw pictures on the blackboard for each alphabet. For example, for G in Gujarati she drew Ganesha, Gajar (Carrot), and so on. She would change the letters every day and by and by thee students began to recognize the letters. The next step was to form words by combining the alphabets. Here, Nikita made sure to write the Hindi version of the word so that they could connect with it. From words, the classes gradually learnt to form short sentences, again prodded on with drawings on the board as illustrations. She then prepared photocopies of all the drawings and the associated letters/sentences to distribute amongst the children. They could color the drawings, and in the process, learn the Gujarati language. Needless to say, the children loved it. In the next step, Nikita would ask the students when they completed the coloring to make a sentence using a word beginning with alphabet in the drawing. She would help them along in making sentences.

Nikita then built on the activity to include stories. For example, she drew a "Nagada"

Students reading comic book

Group activity on comic book

Books by Niketa Vyas

(Drum) and asked the students to write a short story around it in a maximum of six sentences. Alternatively, she would draw a story in pictures and the students would then have to translate into words. She worked tirelessly and about eight months later, her efforts bore fruit — the students were more regular in attending classes and were soon able to read and write.

The students discussed their activities with their parents and friends, who too were captivated with the idea. Students belonging to other schools also took these photocopies to build on their knowledge.

Ms Nikita then came up with the concept of writing comics as supplementary reading material, and these were also published in a local magazine. She also prepared stories using only a fixed number of alphabets and words. In all, there are about 60 such stories in Gujarati and six in English. These stories are of great use to the students who find them engaging and immersive, and a great source of learning. As an added incentive, students performing well have their names displayed on the class blackboard, along with stars. Her teaching aids have also won the favour of her colleagues and many teachers

have borrowed the material to use it for teaching classes 1 and 2.

In order to take feedback on this activity, Ms Nikita organizes events such "Read the News Paper", to gauge students' reading abilities. Educational supervisors also pitch in to evaluate the students. The children have also won prizes in drawing competitions.

Gujarat State Textbook Mandal's Balsrishti Magazine has been publishing Ms Nikita's work over the last two years. Parents were so enamoured by the teaching methodology that they transferred their wards studying in private schools to this government school. One girl, Priya Saroj, did not know how to read, but this was soon rectified when she joined the school. Today she is familiar with three languages Gujarati-Hindi-English. Inspired by this, her mother was instrumental in encouraging other parents to send their wards to her school. As a result of her efforts, 36 children from her area are now studying in Ms Nikita's school.

All the stories, along with their pictures, which Nikita has created have taken shape of books, "Gujarati Sikho Part-1" and "Gujarati Sikho Part-2". Two other books have also been published, Pragya vanchan mala and Picture Story Series Part 1 to 2.

Ms Nikita then went on to teach standard 2, and found the same issues with the students she encountered in class 1. She took the same route to teaching, enabling students gain proficiency in the language.

Ms Vyas has received a number of awards, including Chitrakoot Best Teacher Award 2018 of Gujarat State Primary Teachers' Association, Innovative teacher award from IIM Ahmedabad, an award at the International Conference on Innovation at Grassroots Level in Education for the innovation of "Reading Skills Development by Making Picture Stories Without Conjunct Consonants".

QUESTIONS FOR TEACHERS
1. What should be done to encourage children to attend school regularly?
2. What can be done to help children develop their reading ability?
3. How can children be taught about different books?

QUESTIONS FOR TRAINEES
1. What are the fruits of reading picture stories?
2. How are picture stories useful in developing children's observation skills?
3. What activities should children do to increase their reading ability through self-study?

TEACHING LEARNING AIDS AND MATERIAL FOR LOCAL TRIBAL WARLI LANGUAGE

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Shri Rajan Garud started his teaching career in August 2009 in a school in Khorichapada village, Maharashtra. The school taught children from classes 1 to 5. From a young age, Shri Rajan had been interested in acting. Coupled to that, he had a good command over languages and was well-versed with various dialects. In 2009, he joined the school in Palghar district, he was faced with a communication problem as he was not conversant with the local language.

The Palghar district is home to many talukas in the mountainous regions, most of which are occupied by the Warli tribes. Given his interest in learning new languages, it was not long before Shri Rajan could converse in the local language. The medium of teaching in the school was Marathi, however, most students, belonging to these tribes, were unable to follow the lessons. The second issue was the complete lack of teaching aids. Needless to say, absenteeism was rampant and students displayed poor performance. Shri Rajan made up his mind to rectify both the issues with the aim to improve the quality of education and students' engagement with the lessons.

As a first step, he began teaching students of class 1 keeping them interested with poems, stories, rhymes, alphabets in their local dialect

Language learning activity

while also giving attention to Marathi and bridging the gaps between the two. In about six months, the students were able to show good progress; and those who were prone to miss school now became more regular. Encouraged by his success, Shri Rajan went on to author several books for children in the Warli dialect.

STANDARD LANGUAGE	WARLI LANGUAGE	FORMAT
Grandma's story	वाइ्घनिचा डांगर	Story
We also want mobile	आम्हांना हो पायज मोबाइल	Dialog
Std. 1st textbook standard language	इ.१ली वारली भाषा पाठ्यपुस्तक	Course
How deep is the water?	पानी कती ओढा ?	Dramatization
Vocabulary (standard language)	शब्दसंग्रह (वारली भाषा)	Vocabulary
Who will win	जखिल कोन ?	Comics
Alphabet	वारली बोलीभाषा वर्णमाला (व्यंजन,स्वर)	Alphabet

The aims of these books were to:
1. Provide class 1 and 2 students to express themselves in the Warli dialect.
2. Read poems
3. Learn songs and poems
4. Teach Warli alphabet at the end of the first session. E.g. a-anuna (sitaphal), a-r (python) to introduce the students in the alphabet.

Learning in their own alphabet helped to overcome the students' resistance to learning. Gradually, they gained confidence and were able to read, write and express themselves. Once they had gained confidence in reading and writing in the local dialect, Shri Rajan then slowly and

steadily transited them to the standard language and he met with similar success. This successful project was implemented for the 1st standard in the first 5 to 6 months. Alphabet reading phase took about 1 month for practice.

This initiative was first implemented in the school under the program "Adivasi Warli Bolibhasha Adhyayan Sahitya Nirmiti". He gave the children the task of compiling the names of birds, flowers, fruits, vegetables, and other common words. The children developed their reading skills, and then started reading books in the standard language. Shri Garud has developed other material which he has circulated to other schools in pdf form. He also developed a Warli teacher guide for other teachers.

Now students have developed reading skills also because books are in warli language. Then they were reading books which has standard language with meaning in warli language. And slowly they were started reading book of standard language too. Every student is reading material and textbooks with the same interest as reading dialect literature. This activity has been carried out in 5-6 months and the children have started reading happily.

Thus many study and study material has been prepared from warli dialect. Warli dialect is mainly used in school teaching as well as giving examples, local events, contexts, experiences are used in teaching. He has also made some tutorial videos also in warli language. Some PDFs of Warli words and its meaning also circulated with other schools.

He did evaluation of students with different projects like giving activity of making list of birds, animals, vegetables in warli language with the meaning in standard language. He observed that students were more excited to take this type of activates and their participation was encouraging to him. He observed the attendance pattern also and can clearly mark the increase in the attendance.

Most of the students in the school can now speak standard Marathi. They can talk to each other in Marathi language. They can also read stories and poems, and can perform drama in Marathi language. Most of the schools in Palghar district are using material developed by him. The Government of Maharashtra has given this experiment an innovation award. Shri Garud has received a number of awards including, the Guna Gaurav award from Palghar district Panchayat, and special merit award from the Tribal Development Minister, Maharashtra, the Avishkar Foundation Kolhapur award, and many others.

Scan QR-code to explore his work, including textbooks, in the blog *garudrajan.blogspot.com*
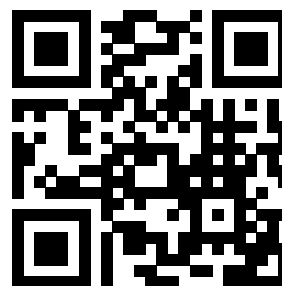
QUESTIONS FOR TEACHERS
1. What activity can be done to explain to children the difference between the local language and the regional language?
2. What activities can be done to clarify children's speech?
3. What kind of project can be undertaken to explain the importance of language purification?

QUESTIONS FOR TRAINEES
1. What role does reading play in speech purity?
2. What kind of competition can be organized to learn and improve children's language fluency?
3. What contribution can parents make to their children's language?

DEVELOPING TLMS WITH THE USE OF WASTE NEWSPAPERS FOR STUDENTS OF CLASS 1 TO 8

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Scan QR-code to watch video

Shri Ramjibhai has been working at the Tokariya Primary School of Palanpur taluka of Banaskantha district for the past 15 years. Years of experience have taught him the importance of teaching aids in teaching. He has been using teaching learning materials (TLMs) in his class and most of his aids are inexpensive and sourced from the surroundings. He even enlists the help of students in finding them, thus enriching their learning experience. Besides, the students also profit in terms of new skill development, and which they can use to their advantage.

During his work as a teacher, Shri Rotatar noticed that sharpening of pencils left behind shavings which he thought he could use constructively as teaching aids.

Firstly, during the Pragna (Activity-Based Learning) class, the students were asked to collect their pencil shavings in a cup which was placed in the room instead of throwing them in the dustbin. Next, in the drawing class, the students drew outlines of animals, birds, flowers, fruits and shapes. They then pasted the pencil shavings within the outlines, thus, giving creative shape to the pictures. The drawing teacher then collected the drawings and put them in file. The children also color these shavings and give wings to their creativity. The activity was a perfect example of best out of waste. Buoyed by his success, then turned his attention to newspapers, leveraging them for a number of activities some of which are listed below:

- Rhymes
- Collection of sayings and quotes
- Birds
- Animals
- Stories
- Puzzle and riddle collection
- Children's songs
- General Knowledge

An exhibition of innovative material produced by a teacher

Literature made from newz papers and other waste material

- Local historical knowledge of Banaskantha district
- Tourist spots in Gujarat
- Tourist spots of India
- Tourist spots around the world
- Akbar Birbal stories
- Thought for the day
- Inspirational stories
- Information about successful women and inspirational stories about women
- Political Science
- Collection of scientific knowledge (192 items in all),
- Information about Scientists both in Gujarati and English.

Some of his other innovations include: shapes of numbers from 1 to 100 from waste pieces of bangles; a file of all the important and significant days from January to December with pictures; yoga and health file; and a file on medicinal herbs. Story charts were also prepared; for example, 38 charts using collected articles, coloured pictures and stories related to Gandhiji. These charts were pasted on hard board, each of size 3 feet by 2 feet. This set was taken to other schools as well. However, it was difficult to carry these educational charts from one place to another and required some means of transport, and so this activity was discontinued. In its place, small cuttings from newspapers and hand-made notes were prepared and pasted on canvas cloth with Fevicol—the cloth was six metres long, and carried 500 pictures. This canvas cloth could be rolled up and carried easily by one person. This teaching aid has been exhibited in many schools within the district and outside. More expensive options of A4 sized colour printouts, and spiral binding the papers have also been tried.

Shri Rotatar has also prepared mathematical models:

- Number wheel — this wheel was meant to teach children numbers from 1 to 10.
- Place Value — this model for teaching place value had three circular wheels. These wheels had units, tens and hundreds on them.
- T.L.M to teach about triangles from its sides
- T.L.M to teach about triangles from its angles
- T.L.M to teach about even/odd numbers
- Laminated cards for days of the week
- Laminated cards to know names of months according to Gujarati calendar
- Laminated cards to teach numbers from 1 to 100
- Laminated cards to know names of months according to English calendar
- Number bar — colorful numbers from calendars and stuck on wooden strips, to teach numbers from 1 to 50.
- T.L.M to teach geometric shapes
- T.L.M to teach about cars
- Cards to teach fractions

The materials used include cloth, chocolate wrappers, pictures of vegetables, fruits, flowers and tools, feathers and leaves, and so on.

To gauge performance of students using these aids, an evaluation was conducted comprising of written and oral tests. The results were encouraging with students registering an

Ramji Bhai explaining his work at the Innovation Fair

This project has received a welcome response from children, parents and teachers in various districts. Both parents and teachers are appreciative of the activity voicing why they had not thought of using materials such as newspapers before to supplement students' learning.

Shri Rotatar is now planning to digitize this material for the benefit of other schools and students. Through these innovations, people will be able to learn how to use waste materials for constructive purposes. The teachers will also be able to make the best TLMs at a negligible cost.

Shri Rotatar's work has been recognized by many authorities including Mehsana Yuva Green Team, The Indian Red Cross Society of Palanpur, GCERT and IIM Ahmedabad (first Educational Innovation Fair and Mobile Discussion forum, Gujarat Vidyapith, and Bharat Vikas Parishad. Shri Rotatar wants to digitize his work so that it can be shared more easily; at present, he has to take leave to visit other schools. This innovative project was disseminated through social media such as Whatsapp groups, Facebook, Instagram, Twitter, Youtube, and Blog, in the form of videos and PDF files.

improvement in performance. The school's grading also improved to A. It also did well in various activities and competitions adding to its bouquet 16 certificates and 6 shields in just one year.

QUESTIONS FOR TEACHERS
1. What other activities can be done in school to increase the confidence of children?
2. What is the effect of teaching through educational products and teaching through narration method on the study of children?
3. What activities can be done for children to celebrate special days and explain their importance?

QUESTIONS FOR TRAINEES
1. For which standards does the use of educational tools seem more effective?
2. How do educational tools work to motivate children for self-study?
3. What items are available in the school to make educational tools?

USING TRANSPARENT PLASTIC SHEETS TO REDUCE NOTEBOOK PAPER WASTE

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*Scan QR-code
to watch video*

Shri Mingma Sherpa was born in 1967 and was the first in his family to get educated. Since the nearest schools were far away (Ghattey Dara School was seven km away and Singtam School was ten Km away) his early education was in a community school which was run in an evacuated PWD Bungalow. In 1974, he was admitted to the Guards School Gangtok in Class-2. However, after Sikkim became India's 22nd state in 1975, the school was closed. Shri Mingma then joined the Ghattey Dara JHS in Class-4 and studied there up to Class 10, which he completed in 1983. In 1985, he became a primary school teacher at Chubba Lower Primary School. He enjoyed working in rural areas with deprived people.

Shri Sherpa observed that he had to come up with a way to help pre-school children write confidently on paper. They would make mistakes and then rub off the paper, along with their mistakes, with a rubber or moist fingers. They would then start all over again on the next page, and in this way, end up ruining and wasting about one-third of their notebooks. The teachers would then ask the parents to purchase new notebooks for their wards; since the parents were economically

Children learning using a transparent sheet

backward, buying new notebooks was an added expense. As a solution to this problem, Shri Mingma came up with the innovative idea to use plastic folders as writing sheets.

The idea was to develop a transparent plastic writing pad through which the students could see the letters their teachers had written. They had to then trace the letters with a whiteboard marker. Any mistake they made, they could delete with the duster and reuse the plastic sheet again. His first such experiment was with polythene bags which were at first easily available but later banned from use.

For class 5, he came up with the idea to draw geometrical figures and ask the students to calculate their area using a grid. He then used the same method to teach numbers to class 1and 2 students, also helping them with their writing skills. The students therefore had greater motor control over their fingers before transitioning to the notebooks.

Similarly, he also created worksheet for the Nepali and English alphabets. By the year, 2019, he had sheets for addition, subtraction, number system, fractions, dot grid and square grid sheet, and four liner sheets for English writing.

The plastic writing pad proved especially useful with a child with disability, who could not hold a pencil. But he really enjoyed the plastic writing pad and was gradually able to improve his handwriting.

Shri Sherpa also provided the children with plastic laminated pads for home use — they could use them to do rough work and write the final answers in their notebooks.

Shri Sherpa has developed different types of Mathematics worksheets for school children. He constantly shares his work through WhatsApp. Some pre-service teacher trainees have adopted

Literature prepared by the teacher

Transparent sheet of English alphabet

his innovation. The parents are highly appreciative of his work since they don't have to buy expensive notebooks time and again. These laminated worksheets have been found to be extremely useful to teach basic English and math to kindergarten children and students of classes 1 and 2.

For example, there is a work sheet to practise small letters writing. This activity helped the children to differentiate between letters *b* and *d*, and correctly write letters such as *f* and *p*, *q*, *y* and *z*. The worksheet helped them to write letters such as:

- Middle-case letters: *a, c, e, i, m, n, o, r, s, u, v, w, x;*
- Lower-case letters: *g, j, p, q, y, z;*
- Upper-case letters: *b, d, h, k, l, t;*
- Lower-case and upper-case letter: *f.*

There was also a worksheet to teach writing numbers using the number pattern.

First Shri Mingma came up with the idea to create plastic sheets and then later plastic boards also. These boards were easy to carry and could serve as whit boards. These boards are relatively inexpensive and have proved highly useful during the COVID-19-induced lockdown and the consequent adoption of online teaching.

These sheets are also environment-friendly, as they are reusable and they have helped to solve the problem of paper wastage.

Children are now comfortable using these sheets and have shown improvement in their handwriting and even academic performance.

As per the information received from Mr. Provesh Bhowmik Lecturer DIET, Gangtok, Shri Mingma's innovation was adopted by the Pre-Teacher Trainees (DIET Gangtok).

Shri Mingma has implemented plastic worksheets in kindergarten schools to develop hand writing skills and encourage drawing activity amidst the children. He is now developing different types of Mathematic worksheets from KGS class to V in order to reduce paper use.

QUESTIONS FOR TEACHERS
1. How to get funds for white board for every child?
2. What activities can be organized to sensitize the children to prevent pollution from waste?
3. How do you manage to minimize pollution and proper disposal of school waste?

QUESTIONS FOR TRAINEES
1. What activities can be done to improve children's writing?
2. Plastic is used here, what should be done for its proper disposal?
3. How can parents be involved in a children's handwriting improvement program?
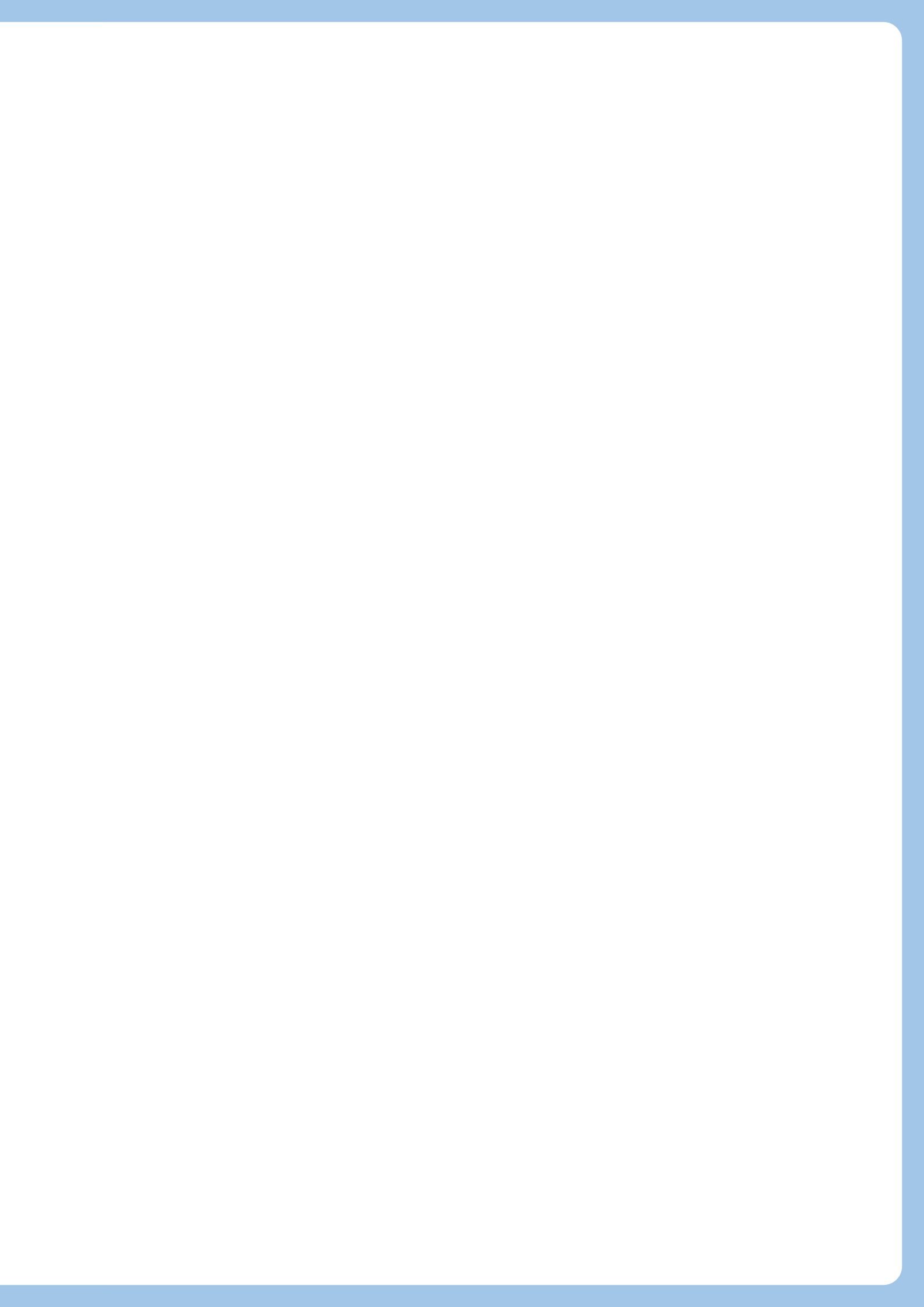
INNOVATIVE TEACHING LEARNING METHODS FOR MATHS AND SCIENCE

M&S CAN BE FUN

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Scan QR-code to watch video

Dr. Dhananjay Pandey, MSc (Mathematics), MA (English, History), PGDCA, PGDCPA, PhD has completed 26 years as government school teacher of math and science in 9 to 12 standards.

When Dr. Pandey found children facing difficulties in mathematics and science he approached a friend in the Institute of Advanced Studies in Education who advised him to counsel and listen to them quietly to create an atmosphere free of fear. He followed the advice and began to have one-hour discussions with the students every day after school hours. He would even eat with them during lunch. The students' fear gradually lessened and they began to ask him questions freely about anything they didn't understand. Their problems were very basic and fundamental. Dr. Pandey decided to use a few tools and begin with the basics. He also felt the problem was more acute at the lower levels, that is, in classes 6 to 8. He taught students using a number of waste articles thrown away by people and the tools available from the math-science kit. The key idea was to explain the principles behind the working of things. Thus, he developed a Geo Board to teach algebra.

Teaching aid for algebra

This tool was easy to use to teach class 6 to 10 students, covering Arithmetic, Algebra Geometry, and Mensuration. The board is just a rectangular frame of wood with nails at equal distances, and rubber bands and threads. It served as an activity-based tool to teach shapes and measurement.

The board involves the use of the following steps:

1. Test basic knowledge of parallel lines such as definition, corresponding angles, alternating angles, linear pairs, sum of interior angles, and opposite angles in written and oral form; 3 working days with Math book, geo-board: written and oral.
2. After the test, identify the students who are not interested in the subject. Two working days, written and oral test, results, interview with students and teachers.
3. Find out why students dislike math. Working days — 2, student test papers and oral interviews, interview and test papers with students and teachers.

Children doing scientific experiment

Exhibition of scientific model in Rashtrapati Bhavan

4. Creating interest in mathematics in students. Working days — 30. (1) Conducting various activities related to mathematics using Geo-board to check the theoretical truth. (2) Organizing math quizzes: To confirm the veracity of algebraic expressions, diagrams, parallel lines, and field theorems and questions by students through Geo-board.

The above should be supplemented with homework and practice in the classroom, and the use of questionnaires to test understanding.

The results were good, with the marks obtained by the students increasing over time. Dr. Pandey then thought of converting the Geo Board into an LED-based tool with sensors and microphones. He decided to take part in the test for NITI Aayog's Atal Tinkering Lab, and emerged as one of the top-10 participants after the interview round. With the funding now available, a tinkering lab was set up in 2016. Students of other schools who were interested in mathematical and scientific activities were also welcomed. Villagers and donors started donating items like TV, laptops, and other small and big machines for the lab. The students often work from 8 am to 10 pm in the lab. So far 12 students have got internships in MIT and IBM and 6 students have been given free admission in Laxmichand Institute of Technology, Bilaspur, All their tuition fees are borne by the institute. In addition, the students are also given a stipend of Rs 3200 per month. NITI Ayog has

Lecture in Atal Tinkering Lab

published the school's work. The students have also created a robot in the lab to assist in treating Covid-19 patients.

Dr. Pandey has represented Chhattisgarh in Western India Science Fair, Nehru Science Centre, Worli Mumbai many times. He has represented India in Avishkar Innovative Track in Dubai and his project was declared the best in the competition. The work has been presented to President of Russia, Shri Vladimir Putin and Prime Minister of India, Shri Narendra Modi, and to President Shri Ramnath Kovind at Rashtrapati Bhavan New Delhi.

QUESTIONS FOR TEACHERS
1. What activities must be done to teach science interestingly?
2. What are the things to look out for when conducting a math activity?
3. How should the connection between math and science be explained to children?

QUESTIONS FOR TRAINEES
1. What activities should be done to raise interest in the subject of Mathematics among the students?
2. What are the things to keep in mind when conducting activities that combine math and science subjects?
3. What activities should be done for revision ?

TEACHING MATH BY ACTIVITIES AND EXPERIMENTS

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*Scan QR-code
to watch video*

Dr Gordhanbhai Devjibhai Dihora (M.Sc., M.Ed., and Ph.D.) has been teaching Mathematics to grades 6 to 8 of Shri Trambak Primary School, in Bhavnagar district of Gujarat since 2010. According to Dr Dihora, the ancient book named "Vedant Jyotish" puts the subject of mathematics at a pedestal. He was deeply motivated by the thought and wanted to eradicate fear of the subject from the minds of his students and build in them a love and interest in the subject.

He gave emphasis to both practical learning of mathematics and textbook knowledge. He asks his children to practice Mathematics and make workbooks based on subjects they are familiar with, for instance, things in their households. The aim is to help them discover Mathematics and incorporate its concepts in their routine transactions.

During the recess hour, Gordhanbhai works on various activities such as puzzles, Vedic mathematics, mathematical dramas and songs, stories, seminars, fun with maths, simple clocks, wrapper project, mathematical sudoku, magic of maths and maths power magazine. Some of these activities have interesting concepts and names such as Kalbal, Magajmaari, Snakes and Ladders, Cut, Measure and Give (Kaapo, Maapo ane Aapo). Besides, he has also come up with the concept of an innovative exam known as the NMMS exam paper. The field work includes activities such as guessing the number of bricks used to build a wall, identifying the perpendicular angles in water taps and estimating the volume of water that can be contained in the water tank after taking its measurements. The students also visit homes in the villages to take measurements of the rooms and estimate the number of tiles that may be required for the flooring. To learn the Pythagoras theorem, the children are asked to measure the steps in the village.

The children also learn about perimeter and area by taking measurements of open fields.

Students participating in Maths Competition

School honors students who have won math competitions

They are asked to measure the units of electric supply consumed by each appliance in their house, estimate the total in order to prepare an electricity bill and then compare it with the actual electricity bill. They also calculate the quantity of water used in their households, in their streets and entire villages. To calculate the circumference, they measure the thickness of the trunk of a tree. In this way Dr. Dihora goes beyond textual knowledge and makes knowledge practical and contextual.

The children are evaluated through written exams, quizzes and performance in these activities. They have also taken part in a National Maths Convention which was organised by The Emerald Heights International School, Indore and the Ramanujan Maths Club. A large number of schools participated, and this school did well in all the events. This was a historic achievement and a proud moment for the village and the school as the children had never participated in any national level event ever since the school was established in 1956. So proud were the residents and sarpanch of the village, that they welcomed the returning team with flowers. Besides, they also took out a celebratory procession around the village to honour the children.

The children who travelled to Indore for the competition had to pay for their own travel expenses and they earned the money by working late in the evenings sowing onion crops. Impressed by their enthusiasm, the trustee of Emerald Heights International School gave the children a cash prize of Rs 1000 and announced that in future if they had to travel to participate in any competition the school would fund their expenses.

The local education officer has motivated Dr. Dihora to visit other schools in the taluka and talk about this innovative project. Dr Dihora has also held seminars at 13 schools of Ghogha taluka till date and a programme for six districts at Amreli town. A presentation was also made at the state-level Innovation Fair held at Sandipani Vidyapith at Porbandar.

All India Ramanujan Maths Club has awarded Dr Dihora with the "Best Teacher of the Year" award to honour his concerted efforts to teach mathematics to rural children. He also got the chance to present his project at various places. Apart from math, Dr Dihora has also worked on simplifying the English teaching. He had also implemented a program to get rid of plastic waste in the village. Under this program, every child had to bring 5 waste plastic bags to the school. The waste was sold and the money was used to buy stationery for the needy children and prizes for those doing well in weekly tests.

QUESTIONS FOR TEACHERS
1. Which assessment will be most effective in checking the achievement of knowledge of mathematics subjects in children?
2. What activities would be more effective in explaining the concepts of mathematics?
3. What are the things to keep in mind while conducting various experiments?

QUESTIONS FOR TRAINEES
1. What should be done to make the teaching-learning process effective?
2. What skills do children develop through activity learning?
3. How can the process of everyday life be associated with the concepts of mathematics?

SCIENCE ACTIVITY BOX AND SCIENCE TOY

TEACHER	Induba Kalubhai Bhaliya
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YOUTUBE	JIscience

*Scan QR-code
to watch video*

Ms. Bhaliya has been working at the Ranavshi Primary School in Una taluka of Gir Somnath district in Gujarat for the past 9 years. She has a degree in Microbiology and a B.Ed.

Ms. Bhaliya found that there was very little experimental work when activity-based learning was introduced in science and technology for Class 6-8 in the year 2012-13. The tools for conducting experiments were not easily available in the classroom. After about six months, she prepared a science activity box, and very quickly split it into two boxes, one for each semester.

The children prepared a list of things necessary to conduct these activities such as rubber, safety pin, pen, battery, magnet etc. Ms. Bhaliya collected whatever was available in the school, and bought the missing items from the market. She then prepared a list of the activities and experiments according to the textbook. Next, she put up a list of all the tools required for each activity on the laboratory wall. The items were all gathered in a cloth bag so that they were easily available at the time of conducting the experiment. Every day, after the prayer session, in the prayer hall, students were given information about one science apparatus or tool used in experiments. Apart from this, even in the laboratory, name of each apparatus was written on the item, which students could read and then hand over to the teacher when required. As the learning was being done with appropriate activity, the children could thoroughly understand the concepts and principles of each unit of the syllabus.

Teachers and students going to another school and explaining the scientific experiment

At the time of taking a class, Ms. Bhaliya would carry the box of science tools so that she could easily instruct the children about the activities related to the subject. For example, when teaching about magnetism, she would show the magnet and iron filings from the box. Gradually, the children became so interested in these activities that they started referring to the box as a "magic box". Whenever the material got used up, replacements were bought from the market.

Ms. Bhaliya also developed scientific toys to develop in children skills of observation and accuracy. For example, for the chapter based on magnets, the toys prepared included:

- pencil hanging in the air;
- skeleton hanging in the air;
- a jumping frog.

These toys helped the children understand the magnetic force of the magnets. Other scientific tools such as telescopes, infinity well, hand-pumps made from a pen, among others were also shown to the children from time to time. Also, every Thursday, scientific toys or experiments were demonstrated in the prayer hall. On the occasion of National Science Day in the month of February, Science Week was also celebrated in the school. Videos of all the experiments were also made.

The children's ability was evaluated based on their ability to answer questions related to the activities during the unit tests. Every Thursday, the children demonstrate scientific experiments they prepare themselves. They are also shown experiments to disprove superstition and develop in children scientific thinking or open in them new avenues of thought. The children conduct experiments by collecting waste from their surroundings and neighbourhood. They have also started to observe the trees, flowers in their surroundings and present their results, for instance:

- The structure of the leaf. Leaf venation.
- The number of petals in a flower.
- Why are the leaves red or green?
- Why does a milky substance ooze out of certain trees or plants?

Earlier only about five children would participate in the Science Week; that number has risen to 50 to 60 children. They have also started observing events such as solar and lunar eclipse. In fact, they have also created tools to watch the solar eclipse safely on their own. Some children have been selected seven times in the taluka level Mathematics, Science and Environment Exhibitions and five times at the district level. This science activity box was also selected at the Education Innovation Fair–1, at the district level.

Five schools at the cluster level and 10 schools at the taluka level have adopted this innovative project. Ms. Bhaliya has demonstrated the mobile lab and activity box at 15 schools in Diu.

The number of scientific toys has increased significantly over the years. The success of the project has gained media attention and been published in newspapers such as Phoolchab and Divya Bhaskar besides the BRC Centre. This activity box was one of the 16 innovative projects to be invited to participate in the International Conference held at IIM Ahmedabad in 2019.

Pencil hanging in the air

A scientific toy made by students

A tool that works on scientific theory

Ms. Bhaliya was given a best teacher award by Sandipani Vidyaniketan of Porabandar and spiritual guru Rameshbhai Oza and another award by Ramanujan Maths Club in 2018.

This innovative project has been uploaded on YouTube channel and there is also a blog on which you can learn about it.

QUESTIONS FOR TEACHERS
1. What should be done to make scientific toys at low cost?
2. What can be done to make children think in a scientific way?
3. What is the difference between demonstration method and experimental method?

QUESTIONS FOR TRAINEES
1. What are the things to keep in mind when teaching children to experiment?
2. How do you encourage kids to make science toys?
3. What extracurricular activities can be done in the classroom for the purpose of imparting knowledge of science to the children?

MATH AND SCIENCE TOYS FOR FUN LEARNING

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Scan QR-code to watch video

Shri Jitendra Panchotia has been a primary school teacher since 1998. He has done SSC, PTC. After joining duty, he completed graduation in Gujarati and History.

For about 15 years he has been teaching Mathematics and Science in Classes 6, 7 and 8. He has worked on different educational tools and educational toys to make Science and Maths subject easy and interesting for the children. He is currently teaching Classes 1 and 2.

While teaching class 6 to 8 students he found that they found it difficult to grasp subjects like maths and science. He realised that the students of Std. 6 to 8 find it difficult to understand the basic concepts of Science and Mathematics during class teaching which increased their disengagement with the subject. He came up with this innovative experiment to use educational tools to generate interest for these subjects. Shri Jitendra had seen these tools and toys in the various educational fairs he had visited over the time. Further, he had also attended a training workshop on scientific toys organized by DIET Rajkot in 2009, which prompted him to put his knowledge to practical use.

He began by organizing a low-cost three-day workshop for about 140 students from classes 5–7. The workshop met with success and became a bi-yearly affair. In these workshops, he taught students how to make scientific toys. The students responded well and made around 80 Science/Mathematics toys which were put to use in the classroom.

And as the workshops progressed more toys were made and used as teaching resources. Shri Jitendra then came up with the idea of a mobile kit, a set of four bags which contained the materials to make toys. Besides, these kits also housed the toys that students made and could be carried from one class to the other for use as teaching resources. The children were greatly motivated by the activity and would bring material from home or collect from surroundings to put to creative use.

Shri Panchotia had learnt how to make videos at the DIET Rajkot, training event and put his

Box for doing aditions

Science Toy Making Teaching Video

List of Scientific and Mathematical toys created by students

- Magical pipe
- Airboat
- Hovercraft
- Berlin fountain
- Obedient ball
- The principle of submarines
- Light box
- Magic box
- Inflate the balloon
- Waterlogging
- Centrifugal force
- Construct shapes
- The magic stick
- The reality of sum
- Throw dice and calculate
- Slope climbing ball
- Pearls climbing the slope
- Air jack
- Model of leverage
- Clapping bird
- Coloured fountain
- Bottle rotation
- Potential energy toy
- Magical ball
- Whirlpool in the bottle
- How to inflate a balloon?
- Number constructor
- Find the place value
- Construction of angle
- The math of the period
- Wheelbarrow
- Rotating object
- Butterflies in the mirror
- Parrots in a cage
- Slope climbing monkey

- A simple stethoscope
- Let's see the air
- Moving ball
- Ball moving due to air pressure
- Magic ball
- Shape of the lungs
- Burning candle
- Moving bus
- Slope climbing toy
- Bending strip
- Magnifying glass of the bulb
- Vibgyor
- Let's measure
- Air pressure fountain
- Diver
- Blow the chalk
- Pinhole camera
- Rocking doll
- Flying rope
- What do you see?
- Jump
- Let's inflate a balloon
- Measure 1 litre
- Flying bullet
- Centrifugal pearls
- Illusions
- Electrical conductor non-conductor
- Hydroelectricity
- Magical glasses
- Plain Jack
- Shape of the ear
- Air magnet
- Direction indicator

- Straw whistle
- Simple plane
- Floating rope
- Windmill model
- Flute
- Numerical wheel
- Mobile projector
- Simple filter
- Let's play
- Numerology while playing
- Jal Tarang
- Gravitational point bird
- Light travels in a straight line
- C- shaped periscope
- Paper cracker
- The principle of the motor
- Magical car
- Conversion of potential energy into kinetic energy
- Let's count
- Bending pencil
- Maglev train
- Centrifugal fountain
- Model of a flower
- Cup telephone
- Level from test-tube
- Magical spin
- Magical Rampuri Knife
- Simple pump
- Model of generator
- Wave model

knowledge to use by making videos and uploading them on the YouTube channel. His channel was titled, "Panchotiya Jitendra educational video" and children from other schools also got to benefit from the videos.

To further improve his innovations, Shri Panchotia regularly sought feedback from the students. For example, the first 20 minutes of the workshop was spent on a pre-test; later on post-tests were done to assess the improvement. The children showed increased interest in science and were able to explain several associated concepts. Their own creativity also came to the fore as they came up and implemented constructive ideas on their own. There was also a marked improvement in the attendance after implementation. Teaching also became simple and more effective.

These educational toys were also used to train other teachers. Students have also taken the responsibility to record videos when these toys are made and upload them on YouTube for the benefit of other students who also want to learn. Gradually word spread and now teachers and students belonging to other schools are also benefiting from these videos.

Shri Panchotia has been honoured with the Chitrakoot Award in 2017, the Sandipani Award, the state government's best teacher award, and some others

Children demonstrating graphs

QUESTIONS FOR TEACHERS
1. What should be done to make scientific toys made for less money?
2. What are the things to be taught while making math science toys for children?
3. What activities can be done for children to increase their interest in mathematics and science?

QUESTIONS FOR TRAINEES
1. What activities can be done to develop creative power in children?
2. How do you evaluate how much children have been able to understand the subject matter through a scientific toy?
3. What kind of homework should be given to children to be creative in mathematics and science?

TEACHING MATHS AND SCIENCE THROUGH CARTOONS

TEACHER	Patel Kumarpal Pravinchandra
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Scan QR-code to watch video

Shir Kumarpal Patel joined Mehtapura Beat Centre Primary School in September 2011 as Math and Science teacher of classes 6 to 8.

He noted that there was a diagram of the digestive system in the Class-7 science textbook. While diagrams such as these helped students to some extent, around 80% of them were still unable to identify and label the different parts during an assessment. He realized that children learnt by rote and a result, forgot what they had learnt in a short span of time.. He observed the same problem in Mathematics also. It is this observation that motivated him to use cartoons in the teaching process in order to capture and retain student' interest, engage them with the subject and ensure long-term learning.

So while teaching about the Solar System, he supplemented the lesson with an animated video sourced from the YouTube for display on an LCD. The children seemed to respond well to the experiment further inspiring Shri Patel to use digital media in learning. During the summer break of the year 2012–13, he spent his time he learnt to edit various animated cartoon characters such as Chhota Bheem, Motu-Patlu, Chutki, Malta using image editing software such as Adobe Photoshop and CorelDraw. He then developed cartoon-based flash cards on various subjects. He also searched for free Google images which he could use in his flash cards and charts. He then learnt to use software such as Picstart Photo Studio to make flash cards for Science and Mathematics on topics such as digestive system, respiratory system, human body, carbon cycle, plant parts, magnet types, molecular formulae, planets, symbols, and more. He also created flash cards for numbers from 1 to 100, number theory, divisible — indivisible numbers, square roots, cube — volume, timeline, and odd-even numbers.

Shri Patel used the animated cartoon characters that students so loved to his advantage. So he had the much loved cartoon character Chhota Bheem explain the digestive and respiratory systems while another character from

Science cartoons on the school wall
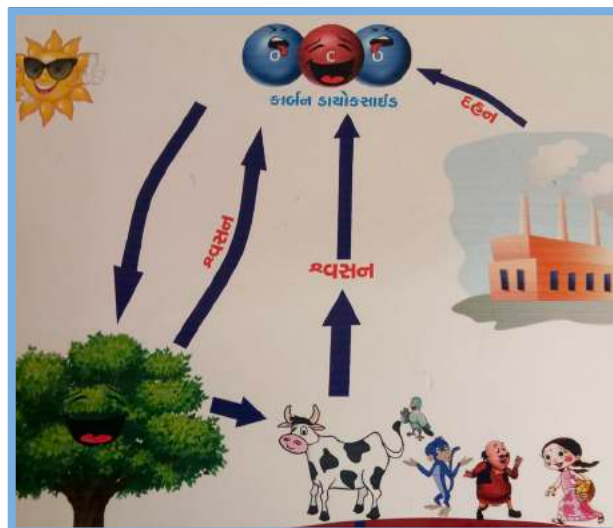
Drama on Science Issues

the Chhota Bheem series to explain the excretory system. He divided this activity into four steps to simplify learning: (1) Display the chart or flash card of the topic under discussion on the noticeboard 4 days before actually teaching in the classroom; (2) Clear children's doubts; (3) If a video of the flash card-based activity is available online, show it to the children using a projector; and (4) use the textbook to support teaching aids.

The children were greatly enthused by this method of teaching. Taking it a step further, Shri Patel decided to go one step further and use the method to conduct assessments. To the activity-based flash cards put on display on the notice board outside the classroom, he added two other types of cards, one with a noun and the second with a math formula.

Shri Patel prepared PDF files of the various cartoon sets he had created to teach classes 6 to 8 and shared with his colleagues so that they could also benefit from them.

In 2016-17, he came up with another fun-filled activity to encourage students' engagement with the lessons. Using some help, he painted the school wall, pillars, staircase and his classroom with cartoons providing information on various subjects besides Science, Mathematics and English. He also prepared PDF and digital files on various subjects. The school had received two projectors from the government and he used them to show animations, videos, cartoons and flash cards, especially when the children were free or when their teacher was on leave for the day.

Shri Patel conducts regular tests to assess the impact of his work. He has found that the introduction of these cartoon-based activities have helped to improve students' performance in science and math by about 25 to 30 percent. His work has been recognized by IIM Ahmedabad and GCERT at the Education Innovation Fairs. More than 280 teachers have adopted his work in their lessons. A good example is Manishaben, an English teacher teaching standard 6 to 8, who in 2014-15 used this set and then created similar activities to teach the language.

QUESTIONS FOR TEACHERS
1. What are the benefits of digital classroom?
2. How digital platform is useful for students for self study?
3. What care should be taken when teaching in a digital classroom?

QUESTIONS FOR TRAINEES
1. How can a flashcard be used to teach a science subject?
2. What can be done to make children interested in the subject?
3. What activities can be organized to help children speak English fluently?

EXPERIMENTS FROM WASTE MATERIALS TO UNDERSTAND SCIENTIFIC CONCEPTS

TEACHER

SCHOOL

PHONE NUMBER

E-MAIL

Scan QR-code to watch video

Shri Pandurang Hendar Bhoir has been a teacher since 1992. His area of interest is Science. He believes that Science needs to be understood, and that experimentation and observation are two necessary skills to achieve mastery over the subject. However, experiments are sometimes not possible in schools due to the lack of resources. To rectify the situation, Shri Bhoir decided to come up with his own resources and teaching aids. However, money was a concern and he was worried how he could deal with the costs involved in developing these aids. The school had purchased some teaching aids from the market but both the teachers and students were uncomfortable using them as they were scared to cause any damage. In fact, many teachers actually dissuaded their students from even touching them, fearing they would break.

It was in the year 2003, Shri Bhoir decided to use low-cost, or waste material such as balloons, pens refills, bottles, glass stove, straw, coconut husk fibres, steel plates, wooden waste material, bulbs, etc. With trial and error, he learnt to put these materials to constructive use. He has also prepared notes on how to use these materials as teaching aids and shared them with other teachers. Word soon spread and teachers belonging to other schools also followed suite, developing their own teaching resources from waste material. Shri Bhoir also receives invitations from other schools to demonstrate his experiments and teaching aids with a view to making learning fun, interesting and relevant for the students. To further spread the word, he has also launched his YouTube channel with videos showcasing his experiments and tools.

In Thane district, Science teachers regularly meet to discuss and share ideas. Shri Bhoir is an active participant in these meets and his idea are met with great enthusiasm. Teachers also use the opportunity to provide him feedback, which he then uses to further improve his aids.

Demonstration of the experiment in front of visitors

Some examples of his teaching aids for Science are given below. Please see the YouTube links for exact details (the language is Marathi).

Bernoulli's Principle

To explain the working of the spray pump, take an empty gel pen refill. Cut it into two and the place it on a waste ice-cream stick with the nozzle of the top half in front of the bottom half which is horizontal. When the bottom part of the top half is dipped into water, and air pressure manipulated by blowing from the horizontal half, a spray results.

Pascal's Law

Working of Air jack. This uses a thick plastic bag. A clean oil pouch with one corner snipped off is used, along with a plastic pipe and thread. The pipe is securely fixed to the opening in the bag. The jack can be demonstrated by blowing air into the bag. By putting a weight on the bag (e.g. brick) the students can see how easily the brick is lifted.

Newton's Law of Gravitation

Michael Faraday's experiment

After 2 years, Shir Bhoir could observer major changes in his students, with a majority of them now interested enough to even conduct these experiments on their own. They are now familiar with the instruments in the science lab and confident about handling them. Further, they also show more interest in the subject approaching him time and again with their queries. Shri Bhoir also conducted regular tests and found a marked improvement in the students' performance.

Shri Bhoir has, through the experiments and inexpensive teaching aids, has initiated the process of activity-based experimental learning, laying in his students the seeds of a scientific temper. He now aims to setup innovative science labs in schools using waste, reusable, and recyclable material.

Motivated by the success achieved by Shri Bhoir, several schools in the district too have followed in his footsteps. He regularly receives

Experiment Demonstration with Kids

Experiment Demonstration with Kids

Children's laboratory

invitations to showcase his skills in various schools. His school has participated in Maharashtra Shikshnachi Wari. Till date, 62 projects have been completed. He has received a number of awards at the district level and also from the Education Secretary of Maharashtra.

The teachers believe that it is the best approach to involve students in studies. Even they have urged to start such projects in their schools.

Parents have been thanking by various ways to imbibe scientific attitude in their child. Students feel more active while handling this experiments and enjoy such learning.

QUESTIONS FOR TEACHERS
1. What activities can be organized in the school to make the science subject interesting?
2. What should be done to motivate children to experiment with science and technology on their own?
3. How can children be involved in the process of making various educational tools from the materials available in the school at low cost?

QUESTIONS FOR TRAINEES
1. The subject of science and technology is related to another subject, how do you explain it to children?
2. What precautions should be taken to use digital media effectively while teaching a science subject?
3. What co-curricular activities should be undertaken for children to develop functional skills rather than study?

PEOPLE'S BIODIVERSITY REGISTER

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Scan QR-code to watch video

Right from the time he was a young science student to the time he studied Electronics, Panu Halder was curious about science and how it could be utilized for human welfare. He went on to become a lecturer in physics. Currently, he is a teacher at the Bharat Mata School, Bilaspur, and Chhattisgarh and is thankful for the opportunity to be a guide to his students.

Shri Halder was fond of conducting innovative science experiments in science, and his interest led him, in the year, 2000, to network and establish a community of young people with similar interest. He named the community, "Nature Bodies". Over the year, the group has undertaken several community-based projects to address both livelihoods and the depletion of natural resources.

According to Shri Haldar, the main problem in today's scenario is that we are losing a huge part of our biodiversity daily and numerous species are getting endangered, threatened or extinct. "We cannot prepare the strategy to protect unless we know the area of concern." He believes

Teacher giving information about Biodiversity Register

that once people understand the importance of various species in the environment, the problem of destruction of biodiversity can be stopped effectively.

The aim of his project is to conserve different species. Shri Halder has initiated a Public Biodiversity Register (PBR) - a knowledge bank that lists and provides information of all species of animals present in a particular area. In doing this, he strictly followed the rules and regulations laid down by the NBA (National Biodiversity Authority). The register is basically a compilation of the information about and need for a species, and its benefits to all form of life. The register is prepared area-wise and in the local language, and made available to the local people. The PBR primarily focuses on the threatened and endangered species which need immediate attention to protect them from extinction.

Step 1. In Surajpur, Chhattisgarh, this initiative was started on July 18, 2019. Surajpur is a rich bio-diversified region of Chhattisgarh densely covered with forest. The people are mostly dependent on the forest resources and this dependency has led to a conflict between mana and animal.

Step 2. Shri Haldar's idea to set up a PBR took shape when he visited a village called Bank, in the district, for a school eco-club program. The people, who were mostly from tribal communities, were dependent on the forest and its resources for survival. Unknowingly, they were destroying many species while fulfilling their basic needs.

Step 3. Shri Halder then approached the local government schools to interact with the students and make them aware about the various natural species. However, given their lack of knowledge and interest in the subject, it was difficult to initiate in them the value and importance of conservation. He then decided to

use festivals as a means to create a bond between them and the subject. This is because several of the festivals celebrated in the region give deep respect to some plant and animal species, for instance, Hareli, Nagpanchami, Govardhan Puja and and Cher-chera. He noticed a disconnection between knowledge and practice, which he then aimed to fulfil.

He then took the students for nature walks, asking them to keep a look out for various animals, plants and insects they came across, and share any knowledge they had about them with their peers. The students were then asked to discuss their findings with their families and add to their knowledge and awareness.

Step 4. Shri Halder then involved the students in games, based on the conservation of the environment and biodiversity. The students gradually gained interest and were inspired to participate and contribute to the PBR. Shri Halder and the students interacted with many people and started documenting the various species. The elders received first preference in the discussions, since the aim was to help transfer knowledge from one generation to the next.

Step 5. Information about the species, soil type, details of local inhabitants, their occupation, and dependence on biodiversity was collected.

The rules and regulations of NBA served as a guide. The raw data collection process took nearly one week. Many people were not ready to share their knowledge for fear of losing ownership. Their fears were set to rest when they were assured that they would retain ownership of their knowledge.

Step 6. Whatever knowledge was gathered during the day was shared with the local inhabitants giving them a sense of involvement and belonging to the project.

Step 7. After the data was collected, it was factually verified. This process took one month. It was the computerized and printed. The students then translated the data into the regional language so it could be of use to the local people. The PRB was thus available in English and the local languages.

Overall, the PBR is representative of the efforts of the people to share their knowledge to help in the conservation of endangered species.

Current Situation

More than 15000 species have been documented, and the work is still in progress. The participating students have now started a new initiative called #ExploreGreenTreasure with the aim to identify commonly found plants offering medicinal properties.

Students going to the village and surveying

Students surveying

Team of students and villagers

Reach of Innovation

From Bank village of Surajpur district, Chhattisgarh the journey has covered other villages like Thargi, Hariharpur, Asura, Mangata, Sadak Chirchari and Bharritola with the active involvement of school students in this region. The teachers have also been greatly motivated with the activity and there are now several conversations that take place about biodiversity conservation.

Behavioral change among the people is evident who are now making an effort to conserve the identified species. Shri Halder is hopeful that the rich biodiversity in the region will get recognition and the attention it deserves. The team's motto is: "If many little people in many little places do many little things, we surely can change the face of our mother earth."

Feedback

The teachers consider this nature activity to be ideal to instill bio-conservational values in the students, helping them recognize how crucial it is to save and respect all species including the endangered ones.

The students found it as an amazing platform activity that allows them to learn by doing. It has helped to develop in them a love for nature, and it is hoped that many among them would take up nature conservation as a career. The children are gradually developing empathy with nature, which is a very affirmative step towards sustainability.

Awards

National Winner of Best Eco-Club at Kevadiya, Gujarat.

QUESTIONS FOR TEACHERS
1. What activities can be organized to make children aware of sexual protection?
2. How should children be informed about the Biodiversity Register?
3. Which type of points should be given to children for field visit projects?

QUESTIONS FOR TRAINEES
1. What activities can be undertaken to give children contextual knowledge about the topic in addition to the textbook?
2. How can children be taught the process of documenting different species?
3. How would you explain to children what information they should take when surveying?

SCIENCE EXPERIMENTS THROUGH "LOW COST NO COST" TOOLS IN A SIMPLE WAY

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Scan QR-code to watch video

Shri Prakashchandra Suthar joined Timbi Girls School located in Amreli taluka as a teacher in February 1992. After working there for 5 years, he was transferred to the government-run Pipalva School in Lathi taluka. Here, too he served for 5 years until 2001 when he went on to join Keshargunj Primary School in Vadali taluka in Sabarkantha district. Another five yeard later, Shri Suthar was transferred to the adjoining Chulla School. Between 2010 and 2012 he worked in the same taluka as the CRC Coordinator of Mendh cluster. In 2013–2014, he was selected as the State Pedagogy Co-ordinator under the "Sarva Shiksha Abhiyan" at the state capital, Gandhinagar. He played a major role in the Pragna Campaign as part of the Quality Enhancement Cell. Shri Suthar has also worked as writer and consultant for 27 different types of literature/books meant for classes 1 to 5. He has also worked as the editor of the newsletter "Gyan Shakti" published by "Sarva Shiksha Abhiyan". Shri Suthar was also selected to be a part of the State Resource Group for the Science subject in 2003–04 by GCERT Gandhinagar. He has also written and reviewed


Students using scientific instruments

about 18 books, self-learning workbooks and experiment-based workbooks.

Shri Suthar was also the chief editor of the mouthpiece publication called "Sabar Shikshak Sangh" published by Sabarkantha district's Primary Teachers Union's from 2007 to 2010. He has been part of many workshops and research activities. Shri Suthar also runs his own Youtube channel called "Prakash Narbheram Suthar". Besides, he also shares his experience and thoughts in a blog sutharpn.blogspot.com. At present, he is working as the main teacher at Kanjali Primary School in Vadali taluka.

When Shri Suthar was transferred to Sabarkantha district in 2001, his duty was to teach math and science t students of classes 5 to 7. He found that the school did not have enough equipment, models or financial resources to teach science. As a result, students were largely disinterested in the subject. To rectify the situation, he collected some "Low cost No cost" tools from from his surroundings. He also asked the students to look for such tools to be used in performing experiments. Students' participation in the activity ignited their interest. Gradually, they were able to come up with an experiment kit that was suitable to supplement their science lessons.

In 2002, Shri Suthar trained teachers from other schools with the limited number of tools available at the Science Laboratory. During this session, the teachers informed him that while the training was good, they did not have these teaching aids in their respective schools. And the experiment kits were not sufficient for all students. Added to these was the fact that the equipment in the science lab was either lost,
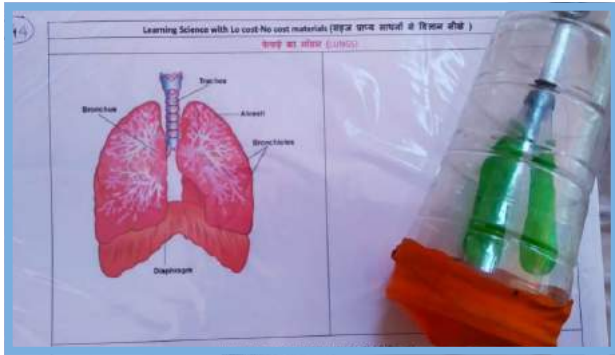
Sheets and tools for experimenting with science

Low cost experimental equipment

broken or worse for wear. Further, the schools did not have enough funds to buy new equipment or invest in experiment kits. Hence, it was difficult to implement these concepts in the classrooms.

In his earlier stints as a teacher, Shri Suthar had prepared a list of all the science experiments and activities for the classes he had taught. He realized there was no point in just focussing on theory when teaching science and the students could only learn by doing. The schools where he had taught had faced issues of funds and he had invested in some equipment from his own pocket, for instance, convex and concave lens, magnets, chemicals, dry cells, and more. Besides, he had also prepared about 70 "Low cost, No cost" models or instruments on his own leveraging his carpentry and painting skills.

To conduct an activity, Shri Suthar would prepare in advance. He would ask the students to be observant and collect resources from their surroundings. Once the activity was conducted all the resources were carefully labelled and stored in their classroom for further use. Over the period, each student had their own experiment kit comprising of resources they have collected from their immediate surroundings. They would then take these kits with themselves when they were promoted to the next class.

Coming back to the training which Shri Suthar had conducted for the teachers in the year 2002, he informed them of this innovation, that is, "Low cost No cost" instruments, he had implemented during his earlier stints as a teacher in order to overcome the issues of funds.

To further motivate the teachers, and also the students, he declared that he was willing to teach them to make and use these kits on all off days and further also share his "Low Cost No Cost" for their use without charging anything.

Shri Suthar received invitations from several schools to demonstrate his capabilities. In all such cases, he would communicate with the inviting school beforehand with a request for participants to collect these "Low Cost No Cost"

instruments. These resources usually included inexpensive or freely available things such as glass bottles, rubber corks, pieces of a mirror, thermocol sheets, card paper, wooden strips, old knives, thread, waste ball pens and refills, plastic pipe, sand, waste sarees, marbles, old bearings and nails. He would then visit the school during his off day and demonstrate the activity. He would also involve the students in conducting experiments using these resources.

With these simple solutions, he motivated both teachers and students to think out of the box and use commonly available resources to conduct the activities. The students and teachers too developed their own experiment kits, and thus, to a large extent they were able to overcome the obstacles of lack of funds.

In 2017, Ahmedabad-based "Sky Foundation", provided Shri Suthar the opportunity to conduct a Science workshop at Fikuri in Nuvakoot district in Nepal. In the year 2019, the innovator also shared his knowledge in Kashmir working with the Mehsana-based "Vishwagram" organisation. Under the auspices of Doda district's DIET, he also showcased his work and shared his knowledge with the schools in the district.

His innovative teaching method has been adopted by many B.Ed. and PTC trainees belonging to around 130 schools through the DIET, Idar. Besides, he has also conducted training for teachers of KGBV under the aegis of Sarva Shiksha Abhiyaan. Shri Suthar has also trained a number of teachers and presentedhis work through the BISAG Studio.

Shri Suthar has received many awards, such as the "Innovative Teachers Award" from IIMA in 2006; the "Chitrakoot Award" by spiritual guru Morari Bapu in 2010; the "Best Practices Teacher" in 2017 by DIET IDAR; Best Work by Sabarkantha District Teacher's Committee in 2017-18; "Prof. P.A Pandya Best Teacher Award" in 2018 by Gujarat Science; the Governor's award in 2018; "Guru Gaurav Award" in 2019; and the Zero-Investment for Education Initiatives award in 2019.

Some of these tools are listed in the table below.

NO	NAME OF EXPERIMENT/AC-TIVITY	TOOLS LISTED IN THE TEXTBOOK	MARKET COST, RS	TOOLS USED IN THE LOW-COST MODEL	LOW COST, RS
1	Light ray moves in a straight line	3 cardboards, matchbox, rod, stand, candle	50	3 empty matchboxes and incense sticks	1
2	Pin hole camera	Pin hole camera model	75	Empty plastic bottle	0
3	Possibilities of reflection of light	Transparent-Translucent-Opaque glass strips	30	A simple glass	5
4	Transparent-Translucent-Opaque	Transparent-Translucent-Opaque	–	A simple glass	5
5	Reflection of Light	Flat mirror, stand, pins, protractor, scale, laser torch	200	strip of flat mirror, thermocol sheet, simple strip stand	10
6	Smoke box to show reflection of light	Smoke box to show reflection of light	200	Flat mirror, empty ice-cream box, laser torch, incense stick	125
7	Regular and irregular reflection	Flat mirror, rough surfaced mirror	30	Packing paper	5
8	Reflection is reversed from left to right in a flat mirror.	Flat mirror, stand	30	Flat mirror, card paper	5
9	Distance between reflection and object	Flat mirror, stand, scale, candle	200	Flat mirror, scale	10
10	Periscope	Model of Periscope	200	An empty cover of toothpaste, two flat mirrors	2
11	Multiplier reflection	Multiplier reflection	150	Two flat mirrors of same size, glue stick	10
12	Kaleidoscope	Kaleidoscope	100	3 flat mirrors, adhesive tape, pieces of glass bangles	15
13	Technical terms related to concave mirror	–	–	Plastic ball, two rods of a cycle	12
14	Study of reflection obtained in concave mirror	Concave mirror, stand, curtain	50	Concave mirror, a simple stand made of strips, curtain	20
15	Lens of a bulb	–	–	Bulb, candle, wire rod	10
16	Base point of Elevation	Base point of Elevation	250	Simple piece of wooden strip, a small piece of wood, iron nails, waste bearing	5
17	Principles of lever	Principles of lever models, two weights each of 200 gms, 100 gms, 50 gms	250	Simple wooden strip, 8 coins of 50 paise, a plastic bag, two "S" shaped hooks	58
18	Measuring size of irregular shape	Marked cylinder, thread, an object of irregular shape	75	Empty water bottle, thread, an object of irregular shape	5
19	Measuring size of irregular shape	Container, marked cylinder, thread, an object of irregular shape	50	Empty water bottle, thread, an object of irregular shape, box of waste ball pen	5
20	Model of density	–	–	Piece of wood	0
21	Lines of magnetic forces	Magnet, iron powder	50	Magnet made from wire, iron powder	5
22	Compass	Compass model	40	needle, plastic strip	2
23	Sand-timer	Sand-timer model	50	Two small glass bottles, sand, piece of plastic tube	5
24	Sun dial	Sun dial model	50	Wooden piece, iron	0
25	Analysis of filter	Analysis of filter	250	Injection syringe	5
26	Distillation	Filtration container, condenser tube, beaker, cork with two holes	450	Aluminium bottle, plastic tube, brass valve of cycle tube, U-form pieces	10
27	Volta Meter	Volta Meter model	300	Plastic box, wooden strips, two plastic bottles, wires, dry cell	25
28	Conduction of heat	Stand, iron rods, pins, candles	100	Iron strip, pins, candles	5
29	Thermodynamics	Circular jug, tripod, spirit lamp, filter,	175	bulb, wire rod, candles	105
30	Release of heat	4 Glass bottles	100	4 Glass bottles	10

NO	NAME OF EXPERIMENT/AC-TIVITY	TOOLS LISTED IN THE TEXTBOOK	MARKET COST, RS	TOOLS USED IN THE LOW-COST MODEL	LOW COST, RS
31	The volume of liquid increases due to heat	Circular jug, tripod, spirit lamp, filter, thin flowing tube	100	Small glass bottle, rubber cork, refill	5
32	The size of solid increases due to heat	Link ball, spirit lamp, tongs	60	marbles, wire rod, candles	2
33	The quantity of gas increases due to heat	Circular jug, tripod, spirit lamp, filter, balloon	100	Glass bottle, balloon, candle	5
34	Air has a mass	Two balloons, thin wire, thread	10	Two balloons, thin wire, thread	10
35	Planets revolve around the Sun	Model showing that planets revolve around the Sun	200	Two stones, thread, empty thread reel	0
36	Light and heavy pressure of air	–	–	Small plastic bell, thread	2
37	Tornado	–	100	Two plastic bottles, adhesive	10
38	Smooth and rough surface	Smooth and rough surface model	100	Model prepared from wooden piece, two marbles	20
39	Potential energy and kinetic energy	Potential energy and kinetic energy Model	200	Wooden wheel, pencil and thread	5
40	Simple Stethoscope	Stethoscope	900	Plastic sieve, rubber pipe	20
41	Newton cycle	Newton cycle model	100	Waste CD, white card paper, adhesive, sketch pens	5
42	Action and reaction model	–	200	Waste ball pen, rubber bands	5
43	Pythagoras theorem	Pythagoras theorem	200	Piece of plastic tube, cardboard, thread, stone, protractor	15
44	Simple Telephone	–	–	Lids of two plastic bottles, thread	0
45	Couture	–	–	Plastic bottle, waste ball pen, adhesive, plastic bag, thread	10
46	Model of the lungs	Model of lungs	500	Plastic bottles, waste ball pens, adhesive, two small balloons, one big balloon, thread	20
47	Electrical Circuit	Electrical Circuit model	300	Piece of wood, push pin, piece of wire, battery bulb, dry cell	20
48	Atomic numbers	–	–	Piece of wood	20
49	Hovercraft	Hovercraft model	50	Plastic bottle, waste ball pen, adhesive, one big balloon, thread	0
50	Burnoli's experiments	Beaker, L shaped tube	75	Refill, seed of jujube fruit	0

QUESTIONS FOR TEACHERS
1. What should be done as a precaution to explain the experiments in science to the children?
2. What activities can be done to develop the skill of doing various experiments in science and technology in children?
3. How can children be taught the importance of reading a book?

QUESTIONS FOR TRAINEES
1. What games can be played to increase the interest of children towards science subject?
2. What activities can be organized to strengthen the content of science subject?
3. What kind of planning should be done before doing the activity in the classroom?

SCIENCE EXPERIMENTS AND ACTIVITY BOX

TEACHER	Gajjar Prahladbhai Narasinhbhai
SCHOOL	Shri Rajvala Primary School, Bavla taluka, Ahmedabad district – 382220
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E-MAIL	prahladngajjar@gmail.com

Shri Prahlad Gajjar joined as an assistant teacher at Shivrajpur Primary School in Dev Bhoomi Dwarka in February 1995. In March 2007 he moved to the Shri Metal Primary School at Bavla taluka, Ahmedabad district. At present he is working in a school near this school, at Rajvala. As a teacher with only PTC, he can teach classes from 1 to 5, but because of his deep interest in science, he is allowed to teach children of Class 6 to 8.

In June 2007, at Metal, he found that students had almost zero curiosity in science. Resources were scarce and children were afraid to use whatever little laboratory material was available. There was fear among the children regarding science. They only had textual or bookish knowledge. He began with the following questions:

- How to get rid of disinterest among children regarding science education?
- What are the possible ways of using science with technology?
- What should be the approach of teaching using insufficient resources or facilities?
- What can be done if the materials for teaching although available are not handy?

- What are the ways of conducting experimental work in science and technology?
- How can materials be child-friendly and handy at the same time?

He started with an activity called "Question box". Any student who had a doubt about something in the textbook or even not relating to it could write it on a note and drop it in the box. In a week's time, the teacher would open the box and select 2 to 3 questions and answer it through videos, photos as well as PPT. This activity was held in the children's assembly on every Saturday. In the beginning very few students would put in their questions, however within 6 months they had learned to ask questions.

During the second session of the academic year 2007–08, he noticed that when children were individually asked to conduct experiments in science, they were either hesitant to do so or had forgotten the process. In order to solve this problem, he made 5 different tables and named them Vikram Sarabhai, Dr Homi Bhabha, S.Ramanujan, Dr A.P.J. Abdul Kalam and Aryabhatt. Whenever the children were required to conduct experiments, they were divided into five groups and given one table each to conduct an experiment.

Students doing experiments

Science Box

This activity encouraged the students to conduct experiments on their own and also introduced them to scientific equipment and their uses. During every experiment, he first demonstrated it to the class and then the group would conduct the experiment. Through this exercise, the student gained sufficient information from the textbook and could relate to the information given in the textbook. Through this exercise including class observation as well as group activity he could conclude that students could overcome their fear regarding science and asked each other questions. They were also eager to conduct new experiments and there was an increase in their curiosity levels.

In the same year, he decided to form the "Science Congregation" to encourage their interest and understanding of science subject. About 3 to 4 gifted students from standard 6 to 8 were made members of this congregation. The task of members of this congregation was to meet every month to exchange views on science. They also made a note of things that were missing from the laboratories and how to replace them. They would also give information regarding special days during school assembly specially if it was related to a scientist. The congregation members also presented their own science models and selected one model for the maths-science exhibition organised at different times by the government. The members also discussed science experiments and create a group model to participate in the district level and state level exhibitions/ competitions. Over time the students' interest in science subject had increased to a great extent. Also, in the year 2009-10, the village people encouraged this interest by contributing around Rs 50000 to establish a laboratory.

Shri Rajvala Primary School was a very small school with only 68 students in 2014. In this school he continued all the activities of the Metal school like the question box, dividing children in 5 groups and creation of Science Congregation. The school's science education was getting better now due to availability of enough equipment. But children were finding it difficult to use the equipment. One child had an idea. He asked if we could group the tools required for each chapter? Other questions followed: "How could it be implemented? How can expenses be met? How and from where to get the materials?"

But work began and first the equipment required for 20 units of the first term was identified and arranged. Shri Gajjar received a donation of Rs. 5000 for this work, which was used to buy big, strong and translucent plastic boxes to replace the shoe boxes that he was using. Once he had to be away for a few days and so made notes for each activity along with the details and kept this card in each of the 47 boxes. Students were able to follow the instructions easily. They got interested and built around 200 toys from waste materials which were also arranged in different boxes. These included magnetic toys, illusion-making toys, puzzles and other toys. The children started learning through online mediums using teacher's laptop or mobile through a variety of applications such as Learnvita, various blogs, AR-VR technology, 3D videos, QR code , animation and YouTube. The school, however, did not have amenities like a computer or a projector and so learning through technology was difficult. Now the kids contributed a small sum of Rs 100 each to create a variety of tools on their own using 3D television, digital archiving, digital microscope, holograms

machine, mini projector, mobile TV Box, etc. Children managed to create a technology driven atmosphere using waste materials obtained from their surrounding environment. However, Shri Gajjar thought of building a workshop for children so that they are free to do their experiments and activities independently. He constructed a workshop in the school and children used it to do all kinds of experiments.

The children started participating in Science exhibitions and other competitions. In the long term, the school's grading and student numbers also increased. The parent community also built up a special connection with the school. Many students have entered higher studies in science-related fields. Some examples are:

SR NO	YEAR/ STANDARD	STUDENT'S NAME	NAME OF COURSE
1	2011/Std 8	Umangbhai Prajapati	Software Engineering degree
2	2011/Std 8	Sanjaybhai Patel	Electrical engineering degree
3	2018/Std 9	Hardikbhai Prajapati	Civil Engineering degree
4	2018/Std 9	Haribhai Patel	Software Engineering degree
5	2018/Std 9	Jayadeva Prajapati	Mechanical Engineering

Boxes for scientific experiments

Awards & Recognition

NAME OF THE AWARD	INSTITUTE GIVING THE AWARD	YEAR OF AWARD	FIELD
Best Teacher Award (Taluka level)	District Panchayat, Ahmedabad	2015	Ahmedabad district
Special Work Citation for Science	District Panchayat, Ahmedabad	2016	Ahmedabad district
Best 100 Innovations	I. I. M, Ahmedabad	2014	State level
Citation to honour publication as a case study in Saarth (I.I.M)	District Pancayat, Ahmedabad, Teacher's Group, Bavla	2018	Ahmedabad district
Sandipani Vidyaguru Award	Sandipani Ashram, Porbandar , Award given by Ramesh bhai Oza	2018	State level
Samarth Online Training Case Study Citation	IIM Ahmedabad	2018	State level
National Education Innovation Conference, Solapur	Sir Foundation Maharashtra, IIM, Ahmedabad	2018	National
Sarth Online Training Case Study Citation	IIM, Ahmedabad	2019	State level
ICCIG International Conference	IIM, Ahmedabad	2019	State level
Innovation Festival	Nehru Science Center (Mumbai)	2019	National
MakerFestival Platinum Awards with cash prize of Rs 18,000	MakerFestival, Vadodara	2019	State level
Zero Investment in Education Award	Arvindo Society, IIT Delhi	2020	National

Shri Gajjar has been helping other teachers through WhatsApp and face-to-face training. Nearly 200 schools have adopted his work.

Details of participation at Education Innovation Fair organised by IIMA and GCERT at the district and state-level:

SR NO	YEAR OF INNOVATION FAIR	NAME OF INNOVATION
1	2015–16	Conduct experiment in groups (Shri Metal Primary School)
2	2016–17	Spread awareness regarding science education among teachers (Shri Rajvala Primary School)
3	2017–18	My box is my science (Shri Rajvala Primary School)
4	2018–19	Digital educational tools

Given below is a list of all the innovative work done at the district and state level in Math-Science exhibitions:

SR NO	YEAR	STAND-ARD	NAME OF THE WORK / MODEL	THE REASON AND EXPLANATION BEHIND IT	DISTRICT/STATE LEVEL
1	2006	7	Detective equipment (students)	To prevent theft of school computers, they made a model at the cost of Rs 50 where a phone call is done as soon as the door is opened.	State level
2	2006	7	Honeycomb Mathemagic (teacher and students)	The model explaining the math involved in a beehive	District level
3	2010	7	Machine for fertilizers (students)	A machine which ensures each plant gets enough fertilizer and fertilizer does not get wasted not occur to the machine	District level
4	2018	8	Drug spraying pumps (students)	A spraying pump that sprays pesticides from the rear side so that it does not get sprayed on the face of the person using the machine.	National level
5	2018	7	Multiple farm tractor (teacher +student)	Mini tractor from the bike's engine	State level Inspirational Award
6	2018	7	Machine to get rid of birds from fields	A tool made to ward off herons and other birds at school	District Level
7	2018	7	Modern brooms	Creating a bigger broom for school cleaning	District Level
8	2018	7	Modern Pesticide Pump	Machine to spray pesticides	State level Inspirational Award
9	2018	6	Digital tools	Tools for providing digital education to children made at very low cost	District level

QUESTIONS FOR TEACHERS
1. What activities should be done to make the science subject interesting?
2. What care must be taken while experimenting in a science subject?
3. What should be done to overcome the fear of science subject?

QUESTIONS FOR TRAINEES
1. How can a science subject be made interesting through digital medium?
2. What do you do to explain to children that science is involved in everyday activities?
3. What precautions should be taken while designing a science workshop?

CONVERSATION WITH MATHEMATICS

TEACHER	Katakiya Raghavbhai Dhanjibhai
SCHOOL	Shri Mitiyala Primary School, Jafrabad taluka, Amreli district
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E-MAIL	katakiyaraghav222@gmai.com

Scan QR-code to watch video

Shri Raghavbhai D. Katakiya joined as an assistant teacher at Shri Mitiyala Primary School of Zafarabad taluka in Amreli district in August 2015. Mitiyala is a small coastal village with majority of people occupied in fisheries and salt pans. Though the region has many industries, the people in the village (total population is 3500) remain economically backward.

The children of class 1 and 2 displayed little interest in numeracy, and the attendance was very irregular. Shri Katakiya developed many activities such as jingles, nursery rhymes related to maths, acting , umbrellas painted with units, decorated string of weaver bird's nest, addition and subtraction using stick, magical bag made from discarded invitation card, pattern work of numbers on bottle gourd, ancient coins and currency notes that are no more in circulation, digital slate, stick,

Students solving Math Puzzle

tray, cup, self-talk with bhugala, biscuits, balloons, colored stones, match, sticks, branches, leaves, pieces, magical bag, coins, bottle lids.

Shri Katakiya also conducted lively and interactive teaching activities with puppies, parrots, pigeons, turtles, sparrow, sheep, and goat besides enacting solo act plays. This innovative approach to teaching helped to capture learners' attention, improved attendance, and their performance.

Initially, children would evade school but as news about these innovative activities spread, more and more students began to attend school. These activities also brought to the fore their creative abilities. For instance, on witnessing storytelling through puppets, the students too came up with their own puppets to narrate stories. Their interest in rhymes and action songs also increased and Shri Katakiya successfully leveraged these to make his classes interesting and engaging.

All these activities are conducted on Saturday and students are also provided snacks during the day.

Shri Katakiya realized that due to poverty children had to forgo sweets during festivals. He would send sweets to the children during the festive season, sponsored by an anonymous donor residing in the United States. Shri Katakiya has also received other contributions to invest in learning resources for the students.

Shri Katakiya's efforts bore fruit and students began to attend school with renewed enthusiasm. They now find the school to be fun, full of laughter and enjoyment. Their test results, especially in Science and Math have shown marked improvement.

His innovative experiment to develop numeracy was published as a case study on IIM Ahmedabad's portal inshodh.org.

Mitiyala Primary School is located in the coastal area of Gujarat and has managed to attract students from neighbouring areas. The school has received the Best School Award and School Hygiene Award.

His innovation was selected in two district-level innovation fairs in 2018 and 2019 organised by IIMA and GCERT Gandhinagar. Around 800 plus teachers from other districts have visited the stall and benefited from it.

Between 2016 and 2019, around 32 schools implemented this experiment. Shri Katakiya has also helped about 150 teachers over phone. All the literature related to this project has been provided to approximately 500 schools through social media. These schools have also provided their feedback through messages.

Shri Katakiya has received the best teacher award at the taluka and district levels. His work has been covered by various news channels such as Sandesh News, Zee 24 hours and DD Girnar. He now plans to make videos of the children's activities and send them to other schools. He has also implemented Chandreshbhai Borisagar's innovative experiment on "zero simplification" in standard 1 & 2. Overall, from 75% of children remaining absent the attendance has increased to 99%.

Math group activity

Learning through Math Umbrella

QUESTIONS FOR TEACHERS
1. How do children benefit from regular activities?
2. How can empirical knowledge be imparted to children?
3. What activities can be done to increase the regularity of children?

QUESTIONS FOR TRAINEES
1. How can knowledge be imparted with fun?
2. What are the benefits of involving parents in their children's study activities?
3. What changes do other activities have in children's studies?

LET'S LEARN SCIENCE AND MATHEMATICS BY PLAYING

TEACHER	Shivamkumar Bhaskarray Pandya
SCHOOL	Shri Sathra Primary School, Mahuva Taluka, Bhavnagar District, Gujarat
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E-MAIL	sbp1211989@gmail.com

*Scan QR-code
to watch video*

Shri Shivamkumar Bhaskarray Pandya holds a BSc degree in Chemistry, a B.Ed from Babasaheb Ambedkar Open University and a primary teaching certificate. He teaches Mathematics and Science. When teaching he realized that the children of the same age had different aptitude for learning, he thought of using teaching aids to bridge gap in learning and provide all students a level playing field.

He experimented and developed the following innovations:

1. A card kit to explain the term equation

Problems faced by school or students: chemical equations are introduced in standard. These equations are represented by the symbols and as also in the words form. The students are tested about these equations in the unit tests but are unable to answer correctly.

Problem solving: as a way out to this problem, Shri Pandya came up with the idea of using cards such that each word in the chemical equation formed a separate card. He made a total of 33 kits with such cards and gave one each to all students of standard 7. First, he taught the equations in the class using the blackboard and chalk. He then took a pre-test after which he asked the children to use their card kit to write the equations by themselves. He split the children into groups and asked each group to make equations using the card kits given to them. Then he asked them to individually carry out the same function. Tests revealed that 70 to 80 percent of the children were comfortable with the word equations.

2. Mathematics Science Model Workshop

Problems faced by school or students: in Mathematics and Science, children find some concepts difficult to comprehend, for instance, periscope, kaleidoscope, cube, cuboids, etc. As a result, children showed a lack of interest in studying these topics.

Problem solving: at first, Shri Pandya prepared a list of models that formed part of the curriculum of classes 6 to 8. For standard 6, the models include Kochar, thermos and cubes; for standard 7, cuboid, periscope, and kaleidoscope; and for Standard 8, episcope, and triangular pyramid. He then made a list of equipment required to create the models and was granted funds from the school. The children were then divided into groups according to the class they were studying in. One group was made for standard 6,

Learning shapes — Math activity

Teaching learning material making activity

Cooking competition as a part of science fair activity

one for standard 7 and one for standard 8. In the beginning, each standard was divided into two or three groups and the materials were distributed among them. They had to use the material to create a model. During the first 3 to 4 years, this Maths Science model workshop was conducted for one day but now it has been extended to three days. Children are given a list of the models they have to create along with material to use. In the evening at the end of the model workshop, the children are awarded first, second and third positions for their efforts.

The list of Maths models made during the workshop is available on Inshodh website of IIM Ahmedabad.

Implementation of innovative experiment: this innovative idea is implemented every year in the first week of February. In this process, children participate in one day, two-day or three-day workshops and make various models. In the Maths, Science model workshop conducted in February 2020, a group managed to prepare at least 48 models including a JCB, laptop, etc. This innovative experiment was implemented in 2011, and every year it evolves to include new models and experiences.

4. Maths Star

Shri Pandya based this innovation on math puzzles. He would present a mathematical puzzle during the prayer meeting. Any child who came up with a solution would get points. The child receiving the most marks would get the "Math Star" badge. This exercise helped children learn some basics of maths in a fun way.

Implementation of innovative experiment: Every child of the school was informed about this innovative idea. The children were made aware of the kind of puzzles to be presented in the prayer meeting and how to present its solution.

The puzzles developed a lot of enthusiasm and curiosity among the children. Over a period of time rewards were also announced for the children who came up with the correct solution.

Results: There was a change in the children's attitude towards the subject and they showed a marked increase in the subject. Prompted by the success, a similar activity was initiated for science.

5. Gyan Dhara (Knowledge Flow)

The aim of the activity was to promote a sense of spirituality in the students. From Monday to Saturday, during the daily prayer assembly, Shri Pandya announced a general knowledge question on the subject of spirituality. The children were free to discuss it with their parents and provide an answer. Next day again before the morning prayer assembly, each child would write the answer on a piece of paper and put it in the "Gyan Dhara" box. Shri Pandya then checked the box for the right answer, which he then shared with the students. Five children helped him select the correct answers. The children who had come up with the correct answer were duly acknowledged. Besides, they also received a point and those who received the highest score were rewarded on the last day of the week that is Saturday.

6. Besides, he was also conducted a **Science Fair at the school-level.**

Problems faced by the school or students: the children did not have a positive attitude towards Math and Science.

Problem solving: Shri Pandya decided to organise a Science Fair. At first, he made a list of experiments given in the classes 5 to 7 textbooks. For each of the experiments, a write up was created. The most daunting task was to prepare the children to participate in this activity. To encourage them, he told them about stories of great scientists and how they overcame all roadblocks to succeed in

their fields. These stories greatly motivated the students to give wings to their creativity. The first Science Fair was held at the school in 2011. The children presented 14 experiments in all. This was a humble yet successful beginning. This Science Fair was deliberately planned on 28 February which is celebrated as National Science Day.

The children are allotted the experiments to prepare about 15 days before the actual event so that they have ample time to practice. They are provided with all the necessary resource materials by the school.

Implementation of the innovative experiment: the Science Fair that was initiated in 2011, is being held even today with necessary modifications. In the beginning, the fair began with 14 experiments which have now risen to anywhere between 75 to 100 experiments today. Almost 80 percent of the students of standard 5 to 8 get an opportunity to participate in the fair, which is held on or around 28 February every year. Other nearby schools and government officials are also invited to visit and motivate the children. Students from other schools also come to see the Science Fair.

Result: children have become extremely self-motivated and there is healthy competition between them to outperform in their given tasks. A few other schools have started their own Science Fairs but on different days, so that they are able to attend the Science Fair held at Shri Pandya's school.

Shri Pandya is now working on making his videos of the Science Model Workshop, Science Fair and other topics available through YouTube.

The school is rated A by the government. Over the last few years, the children have been consistently participating in the district-level Science Fairs and in exams like NMMS, PSE, and Navodaya entrance.

Science game with students

QUESTIONS FOR TEACHERS
1. What should be done to explain the issues to the children?
2. What are the changes in the teaching-learning process by conducting various workshops?
3. Why is it important to involve parents in children's studies?

QUESTIONS FOR TRAINEES
1. How is a puzzle useful in explaining various concepts of mathematics?
2. How does group activity change the normal study?
3. What are the benefits of organizing science fairs in the field of science?

DEVELOPING STUDENTS' COMPETENCY, INTEREST AND SKILLS IN MATHEMATICS WITH MATHEMATICAL BOX

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Shri Sudhir Nachane was interested in mathematics even at a young age. He studied in a government school in a small town of Maharashtra. Even as a child, he would help his classmates with the subject. He completed D.Ed and B.Ed. and joined as an assistant primary teacher in a Zilla Parishad School of Anandnagar. He then completed his B.Sc. in Mathematics from Shivaji University, Kolhapur.

In the first school he taught, he noted that most students were from the scheduled castes and scheduled tribes, with their parents working as laborers. The students were weak in studies, found math hard, rarely attended school, and when they did, they disappeared after the lunch hour, without attending the math classes which was scheduled after lunch. To make the subject attractive for students, Shri Nachane came up with the idea to create some teaching aids to supplement teaching. He made floating picture boards, folding pictures, numerical charts and other such aids. He first used these aids in class to prepare students for the Scholarship Examination, and these found much favor with the students.

Math Box Training

He once came across a Mathematical box made by NCERT and was inspired to teach the subject through play-way methods, learn by doing approach and self-learning process. For these, he needed teaching aids, or teaching learning material (TLM).

Shri Nachane made a list of the Math topics for classes 1 to 7 with special focus on those that the students found difficult. He then conducted a pretest of 20 students from classes 4 and 5 to identify the learning weaknesses. In all, he made around fifty aids for Math and also some for Science.

Similar to the mathematical box prepared by NCERT, Shri Nachane came up with his own version of the Mathematical Box comprising of 30 different educational aids. He was assisted by his colleague Shri B. N. Khadatare, who had some experience in making multipurpose teaching aids. He then used these aids to teach math and managed to capture his students' attention. Slowly and steadily his class witnessed increase in attendance and interest in the subject. Some of the teaching aids include: Flannel Board, Graph Board, Multiplication/Napier strips, Fractional discs, Frame of nails, Magnet Board, Place Value Board, Multiple Hexagon, Spike abacus, Place Value Chips, Volume Box, Decimal Fractional Changes, Number Theory Chart, Electric Circuit, and Two & Three Dimensional Diagrams among others. The wooden box has dimensions of 60 cm x 45 cm x 6 cm. It has compartments of different sizes and the teaching aids are arranged in them. The lid is covered with flannel cloth. There is the Flannel Board inside the lid and a Graph Frame on the outer side.

Flannel Board. There is a Flannel Board inside the lid, covered by fitting Flannel Cloth. Geometrical structures and figures made from cardboard can be pinned on it for demonstrating various concepts.

Different parts of the math box

Number Theory Charts. They are used to teach Prime numbers, Composite numbers, even and odd numbers, divisibility, and finding LCM& GCD by play-way method.

Multiplication/Napier Strips. The plane side of a foot ruler is divided into 10 equal parts with colour. In the same way by taking 30 such rulers and dividing them into 10 parts and then writing numbers i.e. multiplication tables from 1 to 9 on it, one can teach any table from 1 to 9. Tables from 2 to 100 and there onwards can easily be taught with the help of these strips. They can also be used in multiplication.

Place Value Board. On the front side of this Board, the lines of one digit, 2 digit, 3 digit numbers are made and the values of digits 0 to 9 are written on it. Nails are used to hang the digits on the board. On removing the number, its place value will appear. The number and its place value are written on different strips, which are fixed with nails on the board. Any numbers, as given by the teacher, can be placed on the board with the help of the nails. Then the value of the same number can be seen from the board.

Nail frame. On the back of the board, 900 squares of 1×1 are made and these are then fixed with nails. With the help of the rubber band or wool, different geometric patterns can be made. These squares can be used to derive area, volume and perimeter of regular & irregular shapes. Graphs can also be similarly shown.

Magnet Board. By setting the magnet on the upper side of nail board, a magnet board is made which is then covered with paper. There are envelopes on which questions are written, and inside there are four options given (on cards). The student has to choose the correct option and place it on the magnet board. If the answer is correct, the card will stick, otherwise it will fall down.

Place Value Strips. There are 45 square strips of 2″×2″ and 10 strips of 2″×4″, 2″×6″, 2″×8″, 2″×10″, 2″×12″, 2″×14″, 2″×16″, 2″×18″, 2″×20″. One square strip is stuck on 2″×4″, two square ones are stuck on 2″×6″, three square ones are stuck on 2″×8″, etc. Likewise 9 square ones were stuck on 2″×20″ strip. Numbers are written on them, which indicates the place value. To know the place value of single number, students can expand the number accordingly.

Graph Board. On the outer side of the lid, squares are painted in black, which can be used in graphical representation.

Spike Abacus. A wooden plank with holes is prepared. In each hole a spike is fixed and in it, the beads are put to be used as abacus, Numbers and operations like addition, subtraction, multiplication, division can be studied with its help.

Electric circuit. It is made with wire, bulb and cells. Pairs of questions and answers are placed on this card. If a question in the pair matches with the answer, the bulb lights up. This aid is also very useful in self-evaluation. It has

Math Box

been used for teaching and practicing formulae and basic operations.

Fractional Discs. A circular shape is cut from a cardboard and stuck on a square piece. On another cardboard, another circle is cut and then divided into different parts. By fixing these parts on the circular board, a circle with two or more parts can be created. This is used to teach circle, radius, diameter, circumference, area, and fractions.

Multipurpose Hexagon. Six wooden strips of equal size are fixed together with the help of screws, to make a hexagon or other shapes. It is used to teach geometry.

Volume Box. A wooden box of 5″×4″×3″ with 36 small unit cubes is used to teach the concept of volume, and area, and also various related formulae.

Shri Nachane calls this box the Constructive Mathematical Box. Students' performance has been seen to increase by about 95% after learning through this box; many students have even passed the scholarship exams and pursued higher education in mathematics.

Building his experience, Shri Nachane constantly adds new creative teaching aids to the box. As cluster head, he trains other teachers in teaching math concepts using such aids. Recently, the Government of Maharashtra distributed a Math box to all schools, which was based on Shri Nachane's box.

The Constructive Mathematical Box i.e. TLM has won many Awards and Prizes at the district and state levels.

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QUESTIONS FOR TEACHERS
1. How to increase the effectiveness of teaching-learning process by using educational tools?
2. What activities can be done to teach mathematics in an interesting way?
3. What games can be organized to explain the concept of mathematics in everyday life?

QUESTIONS FOR TRAINEES
1. What educational tools can be used to explain geometry?
2. How is empirical knowledge useful in study?
3. What games should be organized to bring creative development in children?

INNOVATIVE SCIENCE EDUCATION

TEACHER	Darshan Lal Baweja
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Scan QR-code to watch video

Darshan Lal Baweja, a science teacher at Government Model Sanskruti Senior Secondary School at Camp Yamunanagar, has been serving in the department as a Science teacher, and as well as a Science communicator for several years. Since 1994, he has been developing low-cost learning aids to teach science. His students not only make these TLMs independently but also help him in making them.

Baweja makes concerted efforts to propagate science by participating in various events of the teacher-training Institute of Tejali in Yamunanagar, SCERT Gurugram, and in several fairs (science, religious and social), degree and B.Ed. colleges, and science activity stalls. He also holds workshops in various schools.

Baweja believes that a teacher should never wait for the ideal resources to teach his lesson, but rather should use the locally available resources to make learning aids on the spot. He believes "do it and also save it for the future". Baweja has used several items considered to be junk such as discarded empty bottles, balls, glasses, empty pans, tin cans, discarded injection bottles, syringes,

A teacher who teaches children to do scientific experiments

glucose bottles, matches, funnel, strainer, paper, PVC pipes, discarded fused electric bulbs, sketch pens, marbles, pencils, thermocol beads, useless speaker magnets, handkerchiefs, pieces of wires, plates, lemon, shampoo, soda, vinegar, discarded rose petals, polythene, nails, safety pins, push pins, all pins, discarded CD players, DC motors, candles, pieces of various metals, etc. to create several experiments and tools aimed at making science interesting for teachers and children of Haryana and other states too. He also trains the students to make several of these tools on their own.

According to Baweja, these simple science experiments he creates motivate students to perform science activities and are helpful in making learning simple. These science activities include various curriculum-based rules, principles and provide practical knowledge to children of class 6 to 10.

Apart from syllabus-related activities, Baweja has prepared several low or zero cost tools to perform other activities such as fun with science, hands-on activities, science activities that can be conducted in classroom, "Come and know nature", "My science box", science toys, measuring the circumference of earth and Sun dial.

Baweja provides demonstration and training for several syllabus-related science experiments, and explains various concepts using materials that are easily available at home or around the house. These activities include experiments like reflection and shadow formation, electric current and its effects, force and pressure, formation of vortex, electrical decomposition of water, Finding PM time, making clock based on sunlight, density of water, rate of breathing , polar nature of water, solubility of water, checking conductors and non-conducting materials, electric circuits, electric torches, dry cells, electromagnets, determination

Children doing scientific experiments

of sex in human embryo, force and type of force, Pascal's law, air pressure, hydraulic brake, friction force, suppressive force, electromagnetic induction, convection currents, thermal diffusion of air, Burnoli's law, Archimedes' principle, Boyle's law, Ohm's principle, Refraction of light, Reflection of light, Deflection of light, primary and secondary colours, conductivity/non-conductivity of electricity/heat, Chromatography, vortex current, electric motor, electric generator, resistance, fibres, Sand dials/clock, inertia, action-reaction, centrifugal force, rotational force, air flow, air expansion, boiling point, heat absorption by substances, combustion and flame, types of fire extinguishers, layers of soil, air circulation in the soil, food chain, food network, circulation system, candle flame, vein configuration in leaves, heat conduction in metals, dissection of bisexual flowers, production, transmission and expansion of sound, ores and mineral collection, creating hydrogen, oxygen, carbon dioxide gas at low cost, litmus sheet from flora, making an universal indicator, hydro-currency, full internal reflection, reddish hue of sun during sunrise and sunset etc.

Objectives behind conducting low/zero cost science activities

The aim of teaching and carrying out low/zero cost science activities is that children are able to do these activities from materials easily available at their home or from their surroundings without having to spend anything. Students should be able to conduct experiments on their own and do science activities so that they can develop an interest in self-learning.

Children can easily understand the complex rules/principles related to science lessons when they conduct experiments on their own.

While conducting activities, they can develop an efficiency in creative and constructive skills which helps to prepare them for innovation in

the future. Students should have the opportunity to assimilate the science subject.

Also, they may develop collaborative relationships with their classmates and teachers while doing these activities.

Opinions of various officials and academicians regarding innovative activities conducted by Baweja

"The Science teacher Darshan Lal presents science to children in unique and interesting ways through innovative teaching methods and also supports the department in training programs. His cooperation is commendable."

Mr. Anand Chaudhary
District Education Officer Yamunanagar

"I have known about these efforts of Shri Darshan Lal for the last 16 years. Low-cost science experiments have great importance in making science teaching interesting and efforts to achieve this by Baweja ji are commendable. He also helps SCRT in teacher training from time to time."

Mr. Manoj Kaushik
Spokesperson Physics and Training coordinator,
SCERT Gurugram

"For the last 4 years Shri Darshan Lal Bawejaji has been putting in commendable efforts for Teachers Training Institute, Tejali, in science-related training programs for science training, learning promotion program, science popularization program, science kit training, science training for primary teachers and DIET trainee teachers."

Mr. Dushyant Chahal
Acting Principal, DIET, Tejali

Children explaining scientific tools

## List of 100 science activities developed, innovated, and adopted by Darshan Lal Baweja

(sent to Shiksha Sarathi magazine started from October 18)

1. My pump.
2. Magic of stopping water through card/napkin/strainer.
3. My own rain.
4. My convex and concave lens (making water lens).
5. My spray pump.
6. There is a hole in my palm.
7. Hot air pushing the water.
8. How did one become two and two become four.
9. Make your own sand timer.
10. Identifying root and vein configuration.
11. Transpiration activity.
12. Germination and necessary conditions for germination.
13. My own water cycle
14. Study the different parts of the flower.
15. Dancing all pins.
16. Magnetic levitation.
17. Electrical decomposition of water.
18. How did iron become copper?
19. What is the distance of the object from its image?
20. Low cost my own electroscope.
21. Floating lemon.
22. Needles and paper clips floating on water.
23. Electric circuit.
24. Fan run car.
25. Make an herbarium and scrapbook.
26. Know the poles.
27. Siphon.
28. Dancing ball.
29. My obedient ball.
30. Toy telephone.
31. How clear the voice of sir.
32. Let me see if you can blow a balloon.
33. Paper whistle.
34. Dissection of Aak fruit.
35. Some boxes swim and others drown.
36. Drawing and observation of stomata.
37. Magnet hanging in the air.
38. Finding Solar noon.
39. Detection of somatic amplification from Bryophyllum plant.
40. How do balloons stick to the wall?
41. Electric conduction in graphite.
42. Physical and chemical changes.
43. To know and observe the microscope.
44. High glass observation and micro-photography.
45. Standardized rain gauge and measurement of rainfall.
46. Why do leaves fall? How do new leaves come?
47. Heat water in balloons and paper cups.
48. Putting soil mould in water.
49. Putting the pencil on the finger.
50. Take out the coin from the matchbox.
51. To know the properties of acid and alkali using litmus test and turmeric as an indicator.
52. Standing on paper cups without breaking.
53. Checking the purity of petrol.
54. To see the difference in densities of different liquids.
55. Dancing naphthalene tablets.
56. Find the rate of water inhalation.
57. How did potato go up.
58. Spinning thread.
59. Come, let's see the Spectrum.
60. Come and observe with binoculars.
61. Identify and observe combustion by heating magnesium metal.
62. Heat absorption, black white bottle.
63. Kaleidoscope.
64. Periscop.
65. Finding pupa.
66. Drip irrigation bottle.
67. Know your teeth.
68. Balloon screams.
69. Why do letters reverse from lateral reflection?
70. Thermal effect of electric current.
71. Concentration gauge.
72. Know metals, non-metals and alloys from samples.
73. How different are leaves?
74. Light travels in a straight line.
75. My friend Prism who gives me rainbow.
76. Teaspoons teach light reflection.
77. Fetoscope — Running Horse.
78. Magnet — Design of coins.
79. Why did the water flow faster from the lower hole?
80. Safe solar observation.
81. Get to know the parasite Amarabel.
82. The ball comes closer and closer.
83. See silkworm cocoon.
84. Let's make Tiktiki.
85. Finding directions.
86. Find the temperature difference between sunlight and shade.
87. Why is the candle extinguished?
88. Magnetizing needles.
89. Curiosity of tiny red seeds.
90. Innovative circuits that indicate saline water are conductors of electricity.

Activities during lockdown:

91. Bubble within a bubble and make one more bubble in it.
92. Big bubbles in the bucket.
93. How did the coin disappear?
94. Bees are our best friends.
95. Message related to prevention of mosquitoes circulated.
96. Getting water from leaves by solar heat.
97. Finding your own height and making a graphical representation.
98. Patterning of parts of a candle flame.
99. Spiral rotating by hot air.
100. Take out one glass from another.

## Special recognition as a science blogger for Science club activities
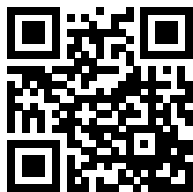
www.sciencedarshan.in

The above link is the blog of Vipnet Science Club which is maintained by Baweja.

It started when Facebook's group and pages were not very popular. Baweja documents club activities on this blog.

His work has often received departmental accolades. He also made a live presentation of this method of documenting (blogging) at the Regional Science Club Meet in Dehradun Central University on 15-17 October 2012, and now the feed of this blog is part of many newspapers and social media links. These efforts have brought the blog international recognition.
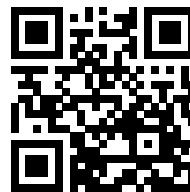
kk.sciencedarshan.in

Blog on why and how of science. This science blog by Baweja is for children and teachers to find answers to many such questions which arise in the curious minds.

QUESTIONS FOR TEACHERS
1. Which teaching activity will be effective in explaining science experiments?
2. How will you explain to children the things to keep in mind while experimenting?
3. What are the benefits of integrating a science subject into everyday processes?

QUESTIONS FOR TRAINEES
1. How should various digital media be used in educational work?
2. What purpose of education is achieved by the activity of cutting from newspapers?
3. What activities can be done to develop comparative skills in children?
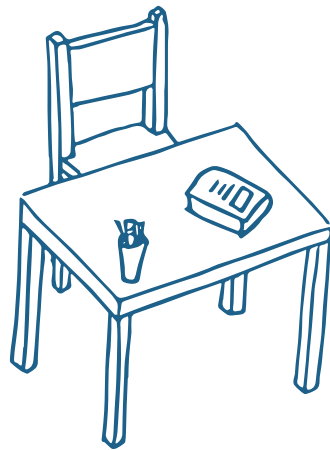
DEALING WITH ABSENTEEISM

DEALING WITH STUDENT ABSENTEEISM AMONG TRIBAL CHILDREN USING BHILI SONGS AND DIALOGUES

TEACHER	Balvantsinh Mansinh Parmar
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Scan QR-code to watch video

Shri Balwant Singh Mansinh Parmar was born on March 10, 1960, in Rampur (Kasanpur), a village in Morva Hadaf Taluka of Panchmahals. After his secondary education in Morva, he completed his primary teacher training in 1979 and started his teaching career. He completed his higher secondary education, B.A., and B.Ed. as an external student. He retired in May 2018.

Developing the idea

Students used to communicate in local dialects, whereas the teachers provided education in standard Gujarati. Hence, there was a gap in communication. His first appointment was in Lalpuri Primary School (Class 1 to 4) in a remote village. Shri Parmar stayed in the village itself and to generate interest among the parents, started "chotre betha vaat", a general discussion about various topics. Every day, for about an hour before school and after school, this forum was open to groups of interested parents. The topics covered school and schooling, education and society. This had a positive effect on parents who started sending their children regularly.

Shri Parmar attempted to learn the vocabulary of the area — there were two regions and the words used varied widely. For example, in the eastern region, some peculiar words included the following: hu (what), ter (then), vani (but), aan (me), ehiyo (Pronoun- masculine), ehi (feminine), ehiyu (for kids). In the western region, some words were very unique: for example, ta (then), shiya (boys), kancher (sound), ungar (this year), porgar (last year), ole (for), kan javana ho? (where are you going?). As can be seen, these words are very different from standard Gujarati. Shri Parmar compiled information on the local dialects and the words children used frequently. He then prepared a chart which gave the meanings of these words and their Gujarati versions. The chart was used in the classroom. He then extended the words to include native language songs, quotes, puzzles, sayings and proverbs. Students started learning better when they were taught using their own dialect. Since the transition to the standard language was also done, they also began performing well in the schooling language.

Shri Parmar also created children's literature, like "Gamta Gito-Vato (Bhililok Bolima)" (Liked Songs and Talk, in the Bhili Dialect), which had puzzles, quizzes, rain songs, science songs, and nature songs. When he was transferred to another school (Rampur), he created Nayka, a collection on tribal female heroic figures.

Storytelling in Bhilli language in the classroom
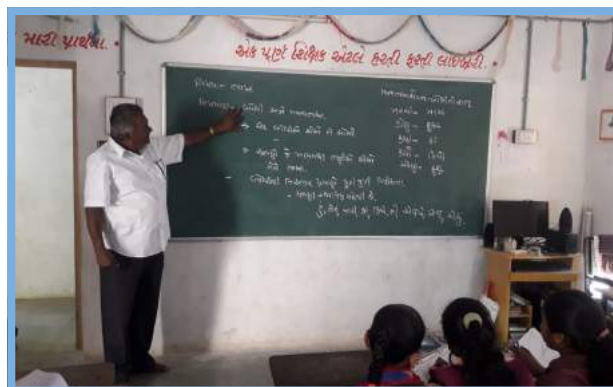
Teaching textbook language with the help of local language

While doing such activities, Shri Parmar monitored children's attendance and performance in tests. The improvement in attendance and performance were testimony to the benefits of his experiments. The problem of absenteeism was solved, and the project became a role model for other schools. Though the project was done many years ago, its continued relevance is indicated by the fact that it was selected as a case study for Samarth Online Professional Development Programme by Indian Institute of Management, Ahmedabad. Teachers who have used the idea have given positive feedback.

Shri Parmar has received amanyawards, including Best Teacher at the district level, Gujarat Sahitya Academy (Gandhinagar) award for original children's literature, IIM Ahmedabad Innovative Teacher, and many others. He has written many pictorial and other books for children.

Story Book and Songs Book in Bhilli Language

QUESTIONS FOR TEACHERS
1. Apart from folk songs, rhymes, and charts, what other efforts can motivate children to come to school?
2. What steps should a teacher take to help children become interested in teaching and make the classroom lively?
3. What activities can be done to make the children have more fun while teaching new points?

QUESTIONS FOR TRAINEES
1. What are the prerequisites for teaching children new topics?
2. What activities can be done in the classroom to make children understand the local and regional language content?
3. What activities can make the content more engaging?

WE ALSO SPEAK CHILDREN'S DIALECT

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*Scan QR-code
to watch video*

Shri Changa M. Kaag joined Miyal Primary School, Tharad taluka in Banaskantha district, Gujarat, on 3 October, 2002. After working there for ten years, he joined the Khoda Pay Centre School as the main teacher and has been working there since. He has been part of the team which authored the Hindi and Environmental Science textbooks. He has written various training modules and served as an expert at the state level.

When school enrolment at Miyal School was 350, as many as 100 children would remain absent every day. To solve the problem of low attendance, he met the parents. Since he was from this region he could converse with them in their own dialect. He decided to teach his colleagues the dialect so that they too could build relationships with the parents.

Initially, when he visited the children's home, they would struggle to communicate in Gujarati language. However, when he responded in their dialect, they smiled and shared all the information about their children. The positive effect of this exercise was that the child would be present in the school on the next day. In this way, by visiting parents on all the Sundays, he helped to ensure that attendance improved.

After the children started attending school, it was important to consistently maintain their interest level. During the prayer meeting on one day, there was a reading activity session being conducted where the children had to read a unit in Gujarati language called "Saad Vartyo". In this reading, they came across a word called "Kharkharo". He asked the children if anyone knew the meaning of this word. All the children were confused and he did not get an answer. He then asked if anyone knew the meaning of the word in their dialect. Now at least a dozen children were eager to answer. They answered that "Kharkharo" means to visit a house for condolence in case

a member of the household has died. Now he was ready with the next question. What rituals are performed when a person dies? The rituals included last rites, third day rituals and condolence meets. The children instantly identified the word "Besana" for condolence meet. In this way, he decided to talk to the children in their own mother tongue and explain the different concepts in their own language.

The local dialect was a variant of Marwadi. The teachers in the school also came from different regions.

SR NO	TEACHER'S NAME	NATIVE	LANGUAGE OR DIALECT
1	Patel Trikambhai	Miyal, Tharad, Banaskantha	Marwadi
2	Bhagora Popatbhai	Panchal, Meghraj, Sabarkantha	Dungri - Bhili
3	Kharadi Babulal	Itwa , Meghraj, Sabarkantha	Dungri - Bhili
4	Chaudhary Mitaben	Brahmanwada, Chanasma, Mehsana	Talpadi of North Gujarat
5	Patel Bhavnaben	Godhamji, Bhiloda, Sabarkantha	Sabarkantha rural dialect
6	Patel Nareshkumar	Muwada of Veera, Lunawada, Panchmahal	Rural dialect of Central Gujarat
7	Gupta Gulabchand	Amraiwadi, Ahmedabad city	Hindi – Gujarati
8	Patel Sangeetaben	Chari, Chikhli, Navsari	Surti dialect-influenced by Parsis

None of these teachers could speak the pure form of Gujarati language and used words as per their understanding. He then discussed the issue with the school principal who could speak Marwadi. Shri Kaag did some reading on the importance of the mother tongue, Gandhiji's thoughts, and UNESCO's articles on education, among others. He began by exchanging

Page No.:
Date:

મારવાડી	ગુજરાતી
આવોરા	આવો
રાંમ-રાંમ	નમસ્તે
કિકર હો?	કેમ છો?
બો	બેસો
કોર ઈ?	મજામાં છો?
સાલવેન જાજો	આવજો
કઉં કાંમ ઈતો?	શું કામ હતું?
કરે જો હો?	ક્યાં જાવ છો?
થાંરો નાંમ કઉં?	તમારું નામ શું?
કિયો ગાંમ?	કયુ ગામ?
થાંરી હૂદ કીયો?	તમારી જાતિ કઈ?
ઉટો	ઊભા થાઓ

Gujarati Marwari Vocabulary

information about certain rites, objects, actions in different dialects with the teachers. In this way, he would gather knowledge about different dialects while indulging in some pleasant conversation with them.

In May 2003, during summer vacation, the teachers noted down different words used in a normal conversation. These notes were made in such a way that the common word was written first in Marwari followed by what it was called in Gujarati. The list included the following commonly used conversational words:

- Welcome, applause
- Social customs
- Actions and location
- School items
- Food recipes and timing
- Kitchen equipment
- Names of birds and animals
- Seasons, directions, names of the months

This collection of words included those used in day-to-day conversation as well as commonly used in the curriculum of standards 1 and 2. He prepared photocopies of this list of words and distributed it among the other teachers in June 2003. This list of words was like a reference list for the teachers who could use it whenever they were stuck and could not find the right word while teaching in their respective classes as well as during any discussions or conversations held with parents. This exercise was successful.

Now the teachers would teach their subjects in the children's mother tongue, namely the Marwadi dialect. During the learning process and presentations held in classrooms, it was a matter

of great pride and happiness for the teachers when children were able to present their thoughts with confidence in their own dialect. All these activities resulted in improved attendance. As the same language was spoken at home as well as the school the children especially small children of lower primary classes, started showing motivation and enthusiasm in attending the school. The children started showing better participation in the school's academic work. The children's knowledge acquired prior to school could also be put to use in the educational process. In this way, student-centric education was encouraged and put into practice. The small children also started visiting farms, artisan workshops, dairy, etc along with their teachers. Parents started approaching the school to know about their child's progress. There was increased participation from parents in the school's cultural programs and parents' meetings. Some parents even started rewarding children with incentives or prizes. The school also received cooperation from parents in school work such as laying of pipelines, games/sports equipment as well as transport costs for children.

When Shri Kaag was transferred to the Khoda Pay Centre School which is in the same area, he encouraged his colleagues there to use the Marwadi dialect. Soon, all the 14 schools in the cluster were implementing the experiment.

With the support of the DIET Palanpur, local literature such as "Marwadi boli mara Malakh ni" and "Banas dhara no Marwadi Samaj" has been produced. A training workshop was also conducted at the DIET for Marwadi dialect and Miyal School was presented as an excellent example of this innovative experiment.

Shri Kaag has formed a team of eight teachers to prepare a dictionary of Marwadi language. He plans to upload it online so that it is available to any teacher or student at any time. This dictionary of Marwari dialect will have proverbs and quotes too besides words. Through this dictionary, any teacher will be able to study the mother tongue of the children very easily.

Shri Kaag has also picked up innovations reported on IIM Ahmedabad's website inshodh:

- **Children's Attendance Chart.** Every day, the children note the attendance and percentage of each class on a board put up at the school premises. Also, the class children and the teacher with the highest attendance percentage are honored during the prayer assembly on the next day.
- **My paper My exam.** In this experiment, a child is asked to prepare the exam test paper for anyone unit from his home and answers this test at the school.

Improving attendance was the first step towards quality. In 2002, only about 170 children of the 350 attended on average. In 2012, on average 500 out of the 547 children enrolled attended. With the increase in attendance level the school quality also improved by default. The participation at the state level in games/sports, as well as science fairs, improved. At the "Vanche Gujarat" event, a student of the school, Rameshbhai Bhikhabhai Nangu reached the state level by reading 500 books. Education profile has also reached "B" grade in the "Gunotsav" conducted this year.

QUESTIONS FOR TEACHERS
1. What should be done to increase the regularity of children in school?
2. What activities can be done to make the educational environment enjoyable?
3. What can be done to motivate children to read?

QUESTIONS FOR TRAINEES
1. What can be done to increase children's participation in prayer meetings?
2. How can children be involved in creating a dictionary of the pure local language?
3. What can be done to make parents aware of school activities?

INCREASING ENROLLMENT IN SCHOOL THROUGH COMMUNITY PARTICIPATION

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Shri Tarunbhai Katbamana was motivated and inspired by his Guru to take up teaching as a profession when he was studying in the 7th grade. This made him chose mainstream Arts rather than Science stream in higher secondary education. While doing his PTC course, Shri Katbamana learnt about teachers, how a teacher should be, qualities of teacher and that he is accountable for the whole society and not just the children. In 1997, Shri Katbamana was hired as a teacher in Nava Bandar Primary School. In 2004, under the Panchamrit program he spread literacy in the village. With the help and co-operation from villagers and his colleagues, the school improved to a large extent.

In 2012, Shri Katbamana appeared for the exam necessary for becoming the principal of any school, the HTAT exam. He then joined the Junagadh City Girls' School number 4 as a principal. He was previously employed in a school as a teacher in the rural area. The problems he faced there were totally different from those he experienced in the urban area such as Junagadh city.

Students learning calligraphy

When he came to this school in Junagadh in 2014, Shri Katbamana was very disappointed with the school's condition and he started doubting his decision to join this school. For the first three months, his mind was very confused regarding the situation of the school.

The first task he took up was to make a list of problems of the school, with the help of students, parents and teachers. It included dog menace on the path to the school, lack of proper seating arrangements for mid-day meals, some trees or plants in the school which were placed incorrectly and inconveniently, water tank right in the middle of the ground, students going to their homes during the recess hours, bad handwriting of children, building construction that led to lack of space, some school materials that lacked organisation, School GR was too long as it was in 11 different parts, irregularity of students, etc.

The list of questions, big and small was then discussed during a staff meeting. This was followed by different meetings. Several suggestions were given in the meetings based on which several solutions were implemented too.

Handwriting improvement through calligraphy. Some children had very poor handwriting, especially in home work. Shri Katbamana had frequent discussions with staff friends regarding this issue in an effort to find a way to improve handwriting. He ultimately found a way when he met a painter friend (Pravinchandra Kava). Kava suggested using invisible script (calligraphy) which was taught in initial drawing lessons. This script is used to write symbols just like it is in Gujarati script. It can help learn the curves required to improve student's handwriting. By teaching the basic curves for all the alphabets through this invisible script, which is a very short and simple method, all the students' handwriting

could improve. The writing of semicircle and the vertical line were repeated several times in the notebook for children of class 3 to 4 to initiate a handwriting improvement campaign. Only curves were practiced in the first month, words in the second month, simple sentences in third month, paragraph and transcription in fourth month, followed by evaluation in fifth and sixth months. The experiment yielded good results. Today, this method of using invisible script for handwriting improvement is being used in 36 other schools too. The students felt it was almost magical that their handwriting had become so good. Eventually the children showed keen interest in this campaign and started showing their handwriting to parents as well as neighbourhood. As a result, they were also encouraged and appreciated by the parents. Due to the children's enthusiasm, this method was discussed among other villagers and the news spread in the village by word of mouth without making much efforts. Older siblings of the school's students who were now in high school also improved their handwriting by practicing this method.

School Store. Another activity initiated by Shri Katbamana was School Item Store that was managed and maintained by students. Under the guidance of teachers, the children were given protein rich diet, such as peanuts, chickpeas, lentils of daliya for a token amount of Rs 5 which was less that the cost outside. The main purpose of starting this kind of School Store was to ensure that students do not eat packaged snacks and litter the school ground or campus with plastic wrappers. Through this school store, the school ended up earning a profit of Rs 12,000 in the first year. A committee comprising three teachers decided that this money belonged to the students and should be used for them. Steel boxes for snacks were purchased and distributed among all the students of the school. This experiment was noted by media too.

Medicinal garden. A Tulsi Van (Basil garden) was created at the school campus. Basil leaves picked from this garden are fed to the students thrice a week during prayer meeting. In addition to this the students were fed fenugreek leaves and spinach too. This reduced the rate of students getting affected with common cold or cough. The parents were made aware that besides education children's health is also a matter of concern. This also increased the trust of the parents in the school and increased their cooperation in school activities.

The solution to water scarcity. Although the school had several plants, herbs and trees in its campus, the problem of water scarcity still persisted. Despite having a proper water connection provided by municipality, there was a scarcity of drinking water at the school. A parent whose child studied in the school, heard about this problem. Being associated with a social organization, he took up this issue with some officials of the organisation. As a result, within seven days this issue was solved and water available through a bore well for the entire school.

Recognition for students' respect for parents. A Parents Convention and Annual function was held in the school where awards were given to parents. In addition, students were given awards in about 32 different categories every year. The first, second and third number rank holders of Std. 1 to 8 are given awards. The news about awards being given in different categories during the annual festival was spread in all the areas surrounding the village. People came to know that this school honours the skills of the students. As a result of this kind of initiative, some students from private schools left their schools to join government school.

Drinking water facility. The school is frequently visited by members of the Satyam Seva Yuvak Mandal. The administrator of the Mandal, Mansukhbhai came to know during a conversation that it would be highly beneficial if the school's children could drink cold water during summer. The school got a very large water cooler as a gift. Besides this, through the donation, a large water tank with a capacity of 1000 litres was also constructed.

My English in my pocket. The students of Std. 6 to 8 had poor reading skills in English. This issue came to light when all the students took the reading test. This issue was discussed with the students and in the parents' meeting too. It was also discussed among the teachers and it was decided to create a guide book for English that contained some limited words. This booklet called "My English in My Pocket" was distributed among all the students. Some words included in the booklet were permanent in their minds now. So, they could easily read English if it appeared on TV. The children also started reading English printed on the packaging of merchandise. Everyone enjoyed learning. As a next step the children were made to read paragraphs. They were also taught the English alphabet so that they could pronounce words correctly. This was followed by the main purpose of this exercise which was to be able to read the textbook. Gradually, this task was also undertaken. In this way more than 90% of the students in the classroom started reading English.

For evaluation too, the children were asked to prepare some paragraphs using the words included in the booklet for evaluation and read them out. Everyone participated in this activity and the result was good. The children also did some homework which included reading English on TV and presenting the details in the school. They could also read English names of items found in the market and their details and presented them in front of everyone.

Science exhibition for parents. It was observed that students showed less interest in science and found it difficult to understand some concepts. Moreover, they had hardly heard of several scientific terms. To generate an interest in an important subject like science among students and their parents, it was necessary to provide an environment conducive to create a scientific temperament. Among activities planned to make science interesting for everyone, Shri Katbamana thought of arranging a science exhibition for parents. During this exhibition, the students would conduct experiments in the presence of their parents.

The students were made to understand that if their parents attended this exhibition, they would be able to see their children's experiments and even learn more about Science. Moreover, the students would be able to remember every experiment when they could do it by themselves. The school's science lab was opened and made available to all the students. They were given access to all the tools and asked to prepare an experiment to be demonstrated at the exhibition. They were free to choose an experiment given in the textbook or any other experiment that is connected to science and technology in everyday life. The students enthusiastically started working for their experiments with guidance provided by Mathematics and Science teachers. The teachers of the school took keen interest in this new activity and provided students with whatever help they needed. Most of the parents of Std. 6-7-8 students attended this exhibition.

The science demonstration was very fruitful for the parents. Now the parents also take interest in this activity and help their children to bring tools or materials for experiments from home or from the market. Now this activity takes place on a permanent basis and is organized twice in a year.

3D Theatre. Some students of Std. 1 to 8 were often irregular in school. The task of bringing them to school regularly was sometimes arduous. Frequent meetings with parents and counselling with students also did not yield results. So, Shri Katbamana came up with an idea of conducting a new activity to solve this issue. For this purpose, a three-dimensional film theatre was set up. The theatre was built in the school's computer lab at a negligible cost. The existing system in the lab was used to show films. Also, they bought about 20 3D glasses each costing only Rs 18. A grant from the Mathematical Science Society was used to cover these expenses. At this 3D theatre a film show was organised for the children first. Then, a show was also held for the S.M.C. members. Everyone appreciated this activity undertaken by the school. This also resulted in increased attendance of the students. Several students would come to the school under the pretext of watching movies. The films were often related to topics in the curriculum, so the interest could be maintained and an environment for good teaching was created among the children.

Increase in admissions to the school. Every year the school conducts a survey of children below the age of 5 years. As a result of the survey, conducted in the surrounding areas, they found many reasons for parents not sending their children to government school. It was found that the parents were not aware of all the activities conducted by the government school and hence some of them preferred to send their wards to private schools. While others took this decision under peer pressure. Some parents also cited a reason concerning falling of a neem tree during the past in this school which had caused a major accident. A second survey was then conducted by forming a team of 2-3 teachers. This team all went around the area and also held a small parent meeting. In these meetings, Shri Katbamana tried to convince the parents that Girls School No. 3 had all the facilities that are not possible to get even by paying fees in a private school. He also informed them about all the activities of the government school. The school even sent a special invitation to parents to witness the efficient management of the school. In the meantime, the teachers discussed among themselves regarding details of the survey and decided to go around the village again. In this way, the school actively spread awareness regarding the school and gave all details to the people of the area just before the vacation started.

When the school re-opened after vacations, more people started visiting the school. Some parents went to see classes and teachers informed the parents about all the facilities of the school. There is a hostel situated in close proximity of the school. All children staying in this hostel study in private schools. The principal of this hostel had heard a lot about different features of this

school. Shri Katbamana had two meetings with this principal. Followed by these meetings, a total of 27 students from his hostel enrolled into this school instead of private school. More and more parents too started talking about the school. The newspapers also took note of this and made a short documentary about the school. This documentary was showed on TV too in the form of news. Through the medium of TV, news spread to the several areas around the school. There was intensive communication with parents too.

A list of benefits of studying in a government primary school was prepared and noted down by 225 students of Std. 6-7-8. The next day, these children discussed these benefits with their family and others in the neighbourhood. Thus, through word of mouth, awareness regarding this government school was spread in 675 houses.

In 2013–14, 75 children studying in private schools enrolled into this school.

The school then conducted a meeting of all the parents who had switched from private schools to government school. They too agreed to reach out to more and more people. SMC members also accepted this responsibility willingly.

Honours and Rewards

Shri Katbamana has been honoured as an Innovative Teacher at district level and state level Innovation Fairs for his work. His innovative ways of teaching have been considered as a case study in online training for HTAT, and the training for teachers of IIM Ahmedabad, Samarth 1 and 2. He has been honoured for this innovation by IIM Ahmedabad in Sarth 1 and 2.

QUESTIONS FOR TEACHERS
1. What activities can be organized to improve handwriting of children?
2. What can be done to increase the regularity of children in school?
3. Why is it necessary to have the necessary educational facilities available in the school?

QUESTIONS FOR TRAINEES
1. Why is the participation of parents in school programs necessary?
2. What are the benefits of forming an SMC?
3. What other activities can children do in a computer lab?

COMMUNITY INVOLVEMENT FOR SCHOOL DEVELOPMENT

MY SCIENCE IN MY BOX — STREET LABORATORY

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Shri Dhaval Patel holds an MA degree. He was appointed as a teacher in Dholakada Primary School in September 2003. He has 16 years of experience in primary education. Dhaval noted due to the shortage of teachers in the school, the students could not get the required attention and as a result, their basics in academics were very weak. As a result, their interest in studies was low, especially in subjects like Mathematics and Science. He felt that he could bring about a change and plug gaps in knowledge by focussing on the practical aspect of Science and not just focus on theory.

To increase interest in Science, Dhaval developed a Science in My Box (of "Street Laboratory") to motivate the children with the aim to give practical context to the theory. However, shortage of tools was a problem and so he begs to collect whatever he could from his colleagues and friends. The next problem he faced was of storing them in the school premises and as a result, students would find it difficult to locate the tools when they had to conduct experiments. To find a solution to the problem, he approached the district's science teachers' forum for suggestions. Based on their suggestions, Shri Patel organized the resources textbook chapter-wise in plastic bags and this process continued for some years. In 2017, with the guidance of the CRC Coordinator and science teacher Ms Kiranben Patel, and the assistance of students of standard 6 to 8, chapter-wise "experiment boxes" were created for every class.

The idea behind these experiment boxes was to systematically collect resources so students could easily access them and spend time constructively in conducting experiments rather than waste time on finding materials. Apart from the resources, the boxed also contained instructions to conduct the experiments.

All the tools for conducting the experiments for Standard 5 to 8, along with instructions, methods and observation for each experiment are kept in the box. The details of each instrument are provided during the prayer assembly to ignite the students' interest. Moreover, the name of the experiment is written on each box so the children's teams can use them independently without any confusion.

The box also contains a list of precautions to be taken while conducting the experiments.

Children doing scientific experiments
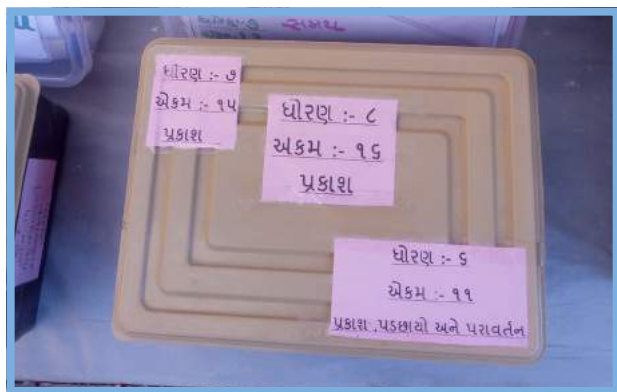
Science tools box

Children experimenting on the street

The children demonstrate the experiment once every month. They also enthusiastically narrate and inform their families and neighbours about these experiments.

The teachers took note of the difficulties, if any, encountered by students while conducting the experiments on their own, and provided appropriate solutions. In case a tool in the box did not meet its purpose, it was replaced. The boxes were presented in a Science Fair in 2018 as well as an Innovation Fair. During the nights, the villagers were also provided a demonstration of the experiment boxes. However, the schools could not sustain this activity for long as it was difficult to allot time that was suitable to everyone. Besides, there were the issues of seating arrangements and lack of street lights. The villagers' help was then sought and all issues were resolved.

Shri Patel's work was recognized by IIM Ahmedabad and then by the Nehru Science Centre, Mumbai.

As a result of his efforts, the term-end examination results in Science improved; the results of the unit tests conducted by the school also saw a marked improvement. Children's interest in Science grew and those in the lower classes (below Class 5) also began to show interest in the experiments.

The added benefits of the activity are that children now have something constructive to do and they don't waste their time watching TV or playing on their mobiles. Besides, they have also conquered their fear of Science. The school has witnessed an increase in attendance.

Shri Patel's academic innovations have found place in the Innovation booklet published at the district and as well as the state level. His work was also used as a case study in Samarth online professional development of teachers by IIM Ahmedabad. Teachers in about 25 schools are using this method to impart lessons in Science. Shri Patel is now the key resource person at the state level and also a master trainer at state-level science training. His teaching methods and innovations are shared on various teachers' WhatsApp groups.

Teachers, parents and students have welcomed this way to teach Science. The C.R.C and the B.R.C have shown much appreciation for the activity during the school visits and also offered their suggestions to further improve it.

QUESTIONS FOR TEACHERS
1. What other activities can be done for children besides experimenting in science?
2. What study activities would you like to do in the classroom to make children interested in science?
3. What are the things you should keep in mind so that children can identify and experiment with every tool in school?

QUESTIONS FOR TRAINEES
1. What are the things to keep in mind while experimenting with children in the laboratory?
2. What activities will you do to increase the practical knowledge of children while teaching science subject?
3. What extracurricular activities would you do to help children develop reasoning skills?

ESTABLISHING DIGITAL CLASS THROUGH COMMUNITY PARTICIPATION TO ENHANCE TEACHING–LEARNING PROCESS IN SCHOOL

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Imrankhan S. Mogal has been working as a teacher for about 10 years (as of 2020), first as a primary teacher for nine years and then as a secondary school teacher at the Smt. M. M. Mehta English Medium school, Palanpur in Gujarat. He has also worked as a lecturer in the B.Ed. College, Deesa, Banaskantha. He teaches English and Social Science.

Digital Class: The need

After teaching for about seven years in a primary school, Shri Mogal realized that equipping the schools for 21st century digital literacy was a challenge. The school did not have enough resources to provide its students facilities that would compare with those in good private schools. This motivated him to decide to work for change. He felt that starting a "smart classroom" and creating "smart teachers" would change the low engagement witnessed in students both in the class and in attendance. The low engagement resulted in poor outcomes in every subject. However, having multimedia facilities in all the classrooms was not an easy goal to achieve.

Imran Mughal teaching using smart boards in the classroom

Setting it up

The first problem was the shortage of funds to buy the necessary equipment. The amount needed was too large for the local villagers. Shri Mogal had earlier worked for some time in a private school, and he decided to contact his past students from there. He created a WhatsApp group of the students and also tried to connect with them through Facebook. He presented his proposal and asked them for funds. Some ignored the request; others came forward to help. The students contributed amounts ranging from INR 1500 to 5000. Since the amount collected was not enough, Shri Mogal contacted his relatives and fortunately received help. Finally, he could set up 4 LCD TVs, 4 CPUs, speakers and other necessary equipment.

The persons who helped in setting up the Digital Class were the following:

1. Pathan Asif Khan Faridkhan
2. Joshi Divyesh
3. Patel Digesh Becharbhai
4. Sukhadiya Pranav
5. Bhuva Piyush
6. Patel Dhaval
7. Soni Maulik
8. Shah Darshil and Shah Dhruven
9. Amit Solanki and Chaudhary Ambrish

Outcomes

With the use of the digital classrooms, Shri Mogal found the students more engaged than before with the lessons. The students who used to be absent became regular. Some students who seemed as if they would quit school actually went on to complete their studies. Subjects like math and science became more interesting. The parents and the school management committee were supportive of his work and showed willingness to take the project forward. At present, the school

Using Smart Board Touch Screen

Children watching educational videos using LED screens in the classroom

has 3 rooms equipped with LCD TV and 2 with movie projector. The software is either the one provided by the government or other software such as Learnvita. The associated material is supplied by the Rotary Club. Sometimes, students also watch reference videos available on YouTube and other channels.

Awards

The District DMO identified Shri Mogal among the best innovative teachers of Deesa Taluka. Kala Srushti Foundation also honored Shri Mogal. The Rotary club of Deesa presented him with the best teacher award.

Reach of Innovation

There are eight schools in Shri Mogal's cluster and many teachers of the clusters have attended Imran's digital class. Many of them have adopted the intervention. Three of them have the following to say:

"The concept of digital class has changed the way of teaching and learning. Our students are showing keen interest after their classroom was equipped with digital equipment. They are eager to learn with audio-visuals."

Chiragbhai V Rathod
Teacher at Rasana Nana Primary School

"The establishment of Digital Class with the help of the community is the best option chosen by Imranbhai and his school. The idea is really thought provoking. It has connected the two poles, society and the school."

Uttambhai V Rajput
Teacher at Pritinagar Pay Center School

"As a Principal I have observed many schools but the change brought about by Imran Mogal with the help of the society is really worth appreciating. It has added new vigor among the students."

Hareshbhai Parmar
Principal at Pritinagar Pay Center School

QUESTIONS FOR TEACHERS
1. What are the things to keep in mind before teaching children the subject in a smart class?
2. How to test content in smart class?
3. After showing the kids videos and photos, what do you do if they don't understand the content?

QUESTIONS FOR TRAINEES
1. What is the difference between a normal classroom and a smart class?
2. In a smart class, children have to be taught content and at that time the lights go out in the classroom, what would you do in such a situation?
3. What can be done to make children more focused in a smart class?

MY VILLAGE IS MY SCHOOL: SCHOOL DEVELOPMENT THROUGH COMMUNITY PARTICIPATION

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*Scan QR-code
to watch video*

Shri Goswami became a teacher in June 1999. Since 2009, he has been working in the Fachariya Primary School. This is a small Class 1–7 school in Dhaari taluka on the outskirts of Gir in Gujarat. The population is only 486 people. There were just 27 students in the whole school. The previous teacher had left after an altercation with the villagers.

When he joined, Shri Goswami found that the records of 2007 to 2008 were totally missing. The condition of the school was very poor. It had just two dilapidated rooms with tiled roofs, no flooring, broken compound wall and one broken door. The children of Fachariya village shifted to private schools. The villagers had often requested the authorities for good teachers. In the end, the villagers locked the school premises for 4 days. It was next to impossible to conduct any academic activity in such extreme social and physical conditions.

Shri Goswami started with varied activity-based education. He started prayer assembly, yoga class, games and story-telling creating a bond between the school and students. The school timings were extended from 8.30 AM to 6.30 PM and it also remained open on Sundays and other public holidays. The students had the freedom to come and go as they wished. They were encouraged to operate the school by themselves. Shri Goswami created a ministers' committee and assigned different duties to each student. A temple to the Goddess of Education, Saraswati, was set up in the school campus. Night school and programs for improving handwriting and value-oriented activities on holidays were started. Regular activities included children's assembly, language week, clockwork yoga, night school, fun on holidays, computer education, health assembly, handwriting improvement program, language corner, storytelling, "my day", tours and picnics, regional tours, children's fair, life skills fair, Annual day, National festivals, birthday celebrations, street plays, village cleanliness activity, Save Water, Save the Lion, tree plantation and people's awareness campaigns.

The next step was to create a feeling of "My village is my school". He held meetings with the parents of the students who had shifted to private schools, different communities and the women of the village to get them involved with the school activities. The school also honoured people in the village for the various skills they exhibited. He also interacted with the various government officials requesting them to help with the street lights, cleaning of the streets, dustbins and the school's water tank.

Shri Goswami also honoured the memories of the villagers who had died. The idea was to extend the concept of school to the entire village, involving all people in its various activities.

An "assembly for awareness" was started — one night in a month. There were discussions on various topics such as religion, education, patriotism, women's development, ending

Prayer meeting organized by children in the village

superstitions, street plays, environment awareness, and saving the lion. People connected with these subjects and actively participated in them.

Prayer meeting organized by children in the village

A whole range of other activities such as farmers' fest, vaccination camps, pest control, and entertainment programs, brought the community closer to the school, resulting in the formation of a school management committee.

When parents found it difficult to come to the school, he and the other teachers decided to meet the parents at their homes after they returned from their fields or work. This was called "Otla Parishad" or verandah meets. On the 14th and 28th day of every month in the evening from 5.30 to 6.30, a women's forum was held.

The school prospered, and 19 of the 22 children who had left returned. The confidence of the people in the school improved, so much so that when the villagers collected Rs 15 lakh for a temple, the responsibility for its construction was handed over to the school. The strength of the students increased from 27 to 56 students. The school was selected to be the best school in the taluka in 2015-16, and its performance in Gunotsav improved from D grade in 2009 to A grade in 2014-15 and has been maintained for four years. People have contributed to build a compound wall and the main gate. The school now has good facilities such as TV, Dish connection, Bio-gas, 3 printers, DVD system, Tape recorder, microphone system, photocopy machine and an RO system for water purification. Two more rooms, a mid-day meal kitchen and toilets for girls have been built. Donors for school tours and school dress have been booked for a time period of 3 years.

Shri Goswami has received a number of awards at the taluka and district level; he also received the Shikshak Bhushan Award, Goa in 2015. The work has also been recognized by IIM Ahmedabad.

QUESTIONS FOR TEACHERS
1. What should be done to increase children's attendance?
2. What should be done to bring the children going to private school back to government school?
3. What programs should be done to bring awareness in the village?

QUESTIONS FOR TRAINEES
1. What issues can be discussed in a parent meeting?
2. What activities can be done to make children like to come to school?
3. What activities can be given to children to help them understand their responsibility towards school?

USING STUDENT, TEACHER AND SMC CARDS FOR ACADEMIC, SOCIAL, PHYSICAL AND INSTITUTIONAL DEVELOPMENT OF SCHOOL

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Scan QR-code to watch video

Shri Nareshkumar M. Joshi became a teacher in September 1992. He has also worked as CRC Coordinator and DPEI for about 15 years. He became head teacher of the nearly 150 years old institution, Kanodar school in August 2012.

Many children were going out of the village to study at private schools in the nearby town of Palanpur. The members of SMC did not seem to be focused in carrying out their work. There was a marked absence in the number of parents attending the parents' meetings and children's attendance was irregular. Shri Joshi first reached out to the SMC and the children and held a meeting to discuss the various issues plaguing the school at physical, educational, social and organizational levels. A five-year plan, along with annual plans, was made to remedy the situation. Shri Joshi came up with the idea to use a student card as a tool to determine what work they had done. The parents were told about the card. Every month, on a Saturday, when parents visit the school, they go to their ward's class, see their work and sign the card as acknowledgement. Shri Joshi used this opportunity to share the issues plaguing the school and seek their help. The parents responded constructively, and as a solution, they all worked together to reconstitute the SMC. A public electoral process was adopted and each newly appointed member was given a letter mentioning their responsibilities. They were also made to take an oath to fulfil their responsibilities to the best of their abilities.

The SMC members took their responsibility seriously and local artisans also pitched in to contribute with both time and skills for the betterment of the school One SMC member came up with the idea of issuing cards to the SMC members too. All members also began to maintain diaries listing their contributions and ideas. One member, Malukaben Mookhey, continues to maintain a daily book even today. In 2018, cards for the guardians were introduced. Today this card system is an important part of the school management.

His efforts bore fruit and found reflection in improved student attendance and performance. Enthusiastic members also began to share their cards on their social media accounts. They exhibited as much excitement and involvement as the children themselves. No child wanted a negative note on the card, and so if anyone received one, actions were immediately rectify it. Further, Shri Joshi also launched a WhatsApp group for parents to keep them abreast of the various activities being held at the school.

All these actions bore fruit with students showing improved performance. The WhatsApp group also encouraged involvement of the parents, and they came together to resolve various issues associated with the school. For instance, they came together to collectively fund a magnificent gate for the school.

Retired teachers too have formed a WhatsApp group called "Gaurav Kumbh" which

Students participating in school work

Recognising good work of SMC members

Recognising good work of SMC members

is actively supervising the reconstruction of the school's 146-year-old building, which involves the participation of about 3,000 people of the village. The children who were attending private schools in Palanpur came back to join the school in Kanodara.

Even during the Corona Pandemic, meetings are regularly held through the WhatsApp group. To evaluate the effectiveness of home learning, S.M.C members visit homes and interact with the parents.

This innovative work by Shri Joshi has been recognized by IIM Ahmedabad and displayed at the Innovation Fair organized by IIM Ahmedabad and GCERT.

Shri Joshi has received a number of awards and the school has received a "Best Green School" of Gujarat award. Through BISAG, the SMC's work has been disseminated to other SMCs. Work is underway to build three multimedia halls with the involvement of all the village people. The school is about to celebrate its 150th anniversary and all alumni are being invited.

QUESTIONS FOR TEACHERS
1. What activities can be organized for the children to come to school regularly?
2. What issues can be discussed at the parent meeting?
3. What are the things to keep in mind when appointing S.M.C. members?

QUESTIONS FOR TRAINEES
1. What should be done for children to come to school with completely done homework regularly?
2. What co-curricular activities can be done to keep children entertained while studying?
3. What should be included in making of a monthly card?

VALI SHALA: A SCHOOL RUN BY PARENTS

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Scan QR-code to watch video

Ms Pooja Paija has been working as a teacher since 1988, and has been the principal of Shri Dharampur Primary School for about eight years. When she took over as principal in 2012, the number of students were very less, with most parents sending their wards to a private school. There was no connection between school and society. The parents of children paid no heed to their studies. In fact, teachers would often complain that the parents did not come even when they were specifically called to discuss their wards' performance. Students had to suffer because of this complete disconnect. The parents were unaware of what the students did at school; the teachers, on the other hand, could not ensure they did some lessons or homework, post school hours.

Ms Paija realized that she would have to come up with a constructive solution to the

SMC member checking homework at Vali Shala

problem. As a first step, she formed a peer learning group to do remedial work. The group consisted of talented students from Classes 4 and 5 and they were tasked to help their juniors in study for about one hour every day during school hours. Motivated by the success, the principal then extended the activity to the after-school hours. She also arranged a meeting between the parents, SMC members and teachers to be held at the school. She proposed that all villagers should come together to help the students improve their performance. As a first step, she requested the villagers to provide a venue for students to gather for after school hour's studies. Two SMC members responded to the request and allowed the children to gather in their courtyards to study.

In June 2014, she introduced the concept of a 14-day parent school. She divided the students into two groups, one comprising students of classes 1 to 4 and the second with children of classes 5-7. In the evening, after the school hours, the children assembled at the house of a parent for two hours, from 5.30 to 7.30. At first, the nominated monitor of the group conducted their attendance and reported to the host parent. The monitor then followed up with their work (reading and writing, and revision of whatever was learned in school). Parents and other volunteers helped to ensure that the students focused on their work. The children were also taught other things by the host parent, depending on their time availability. These included milking cows, bathing buffaloes, cutting vegetables, cooking, sowing seeds in the farm, embroidering, watering the plants etc. On the 15th day, a "Mahashala" was organized at a public place and this was attended by the principal, CRC, parents, villagers, and as well as alumni. Information was given about the activities done by the students during the 14 days. The next set of two people was selected to conduct

Use of TLM at Vali Shala (Parent School)

Math activity with students by Parents

the parent school. A 99-member "Pamrat" group was formed on WhatsApp to let the villagers know about the various programs and activities at the school. Any information related to the parent school is uploaded on this group.

Educational progress of children is tested through various competitions conducted in the school. In the beginning, the children were not self-disciplined. Over time, they learned to follow and play by the rules. Ms Pajja was thus able to build a bridge between the school and parents, and in due course, the bond grew stronger, much to the benefit of each stakeholder. So inspired were the villagers that many of those who had sent their wards to private schools now re-admitted them to the private schools. The school achieved Grade ``A" in Gunotsav. The Gram Panchayat allotted 3 vigha of land for sports. Inspired by the school activity, a donor provided air travel from Rajkot to Mumbai for all the children. The school had a Facebook page, and impressed by the activities showcased there, a UK-based donor donated a study table and computer. The school was selected in India's Best 35 Innovative Teachers Festival.

Opinions of teachers, parents, students on the new experiment:

- Teachers: "*Constant practice helps to reinforce concepts. Communal learning at the parent school has helped students to improve their performance. This is all the more true for students who were not doing too well in their studies*".
- Parents: "*There has been a dramatic shift in the students' performance. They are more motivated to study. They are more connected to the rest of the village community and are more willing to attend and participate in school activities*".

Even during COVID, the "Parent School" continues to conduct its activities, but while following all recommended precautions.

Ms Pajja's experiment had been selected as a case study for the online program Samarth conducted by IIM Ahmedabad. She has been honoured for her work by the state government, IIM Ahmedabad, and Open Page (NGO). She has also been featured in the newspaper, Times of India. She received the best teacher award at taluka, district and the state level. Her innovation was selected in 3rd State level innovation Fair for presentation at the Chintan (Contemplation) Camp.

QUESTIONS FOR TEACHERS
1. What can be done to motivate parents to enroll their children in government schools?
2. What can be done to ensure that the educational achievement of the children is passed on to their parents?
3. Why is it important for children to be aware of their studies?

QUESTIONS FOR TRAINEES
1. What are the benefits of studying in a group?
2. What changes have taken place in the teaching-learning process due to the parent school?
3. What skills do children develop through peer learning?

OVERALL SCHOOL DEVELOPMENT BY CHILD FRIENDLY ACTIVITIES

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Ruheed Gul Baldev, hailing from Anantnag Kashmir joined Department of School Education Kashmir in the year 2003-04 as a Para Teacher (Rehber-e-Taleem Teacher) in Government Middle School Ruhu, Anantnag. He found that student enrolment in the school was quite meagre and the teaching process not up to the mark. The biggest hurdle in the success of the school was student absenteeism. Shri Gul began visiting children's homes to talk to them and their parents. He even went to the extent of helping them to bathe, wear their uniform and then escort them to school. The school started at 10 in the morning, and so he would reach the village about 2 hour in advance to motivate the students to attend their classes.

He initiated child-friendly activities and voluntary groups comprising of both students and teachers such as maintaining discipline, environment, school time table, and lawns; serving Mid- Day Meals (MDM); spreading awareness in the community on the need to safeguard the environment, eliminate social evils, etc. He came up with a unique MDM menu in consultation with dietitians. This menu became a success story in the entire district and all schools followed it. Not

School Community

only this, the school has initiated a disciplined way of serving and taking meals, according to the local tradition.

Shri Ruheed then invited the children to articulate one demand each that they would like to make. All the children unanimously voiced that they wanted beautiful uniform and identity cards like the children of the nearby private school. Since these children belonged to the Economically Weaker Section they could not afford uniforms. Shri Gul then launched a donation contribution drive, beginning with his own contribution for the cause. As para teachers were paid only Rs. 1500 per month, they could not contribute large amounts. The contributions were also in kind—cloth for the uniforms and I-cards from a stationery shop. He was thus able to secure uniforms and ID cards for all the 120 students enrolled in the school. So enamoured were some of the parents by his enthusiasm and the changes they were witnessing that they re-admitted their wards from the private school to this government school.

The children too began to take more interest in the studies and their attendance greatly increased. He also introduced the concept of hands-on activities, outdoor activities, play-based learning to make learning, fun, easy and relevant for the students. Students began to stay back beyond 4 p.m. and also even come on Sundays to enjoy the school environment.

Subsequently, shri Gul was transferred to the Government Girls Higher Secondary School Anantnag, for a temporary period to teach Botany to classes 11th & 12th. The children of Government Middle School went to the Chief Education Officer to lobby for the cancellation of the order, but the Administration did not listen to them.

In 2007, Shri Gul cleared the J&K State Service Recruitment Board exam and was selected as General Line Teacher and so he resigned

Teachers and children than experimenting in school

as a para teacher. He was placed in the District Resource Group as District coordinator, Girls Education. He pushed for the implementation of KGBV (Kasturba Gandhi Balika Vidyalaya) scheme for out-of-school girls belonging to the ST/SC/Minority category. He went from habitation to habitation mobilizing girls belonging to the ST community to enrol in the KGBVs, and organized a number of preparatory camps for mainstreaming them. He was then posted to DIET Anantnag to organise teacher trainings in the district. He has also been involved as resource person for UNICEF, Save the Children, and CHINAR International. He helped CHINAR International adopt a village in far flung areas such as Zampathri Shopian. Shri Gul was then made part of the Innovation Cell of the Directorate of School Education Kashmir, where he has introduced a number of projects, as follows:

- SUPER-50: free coaching for NEET, JEE & Civil Services;
- Winter Tutorials for classes 8th to 12th: free Tuition & Remedial Education;
- Winter Camps for classes 3rd to 7th: free Tuition & Remedial Education;
- Draft for SCERT: Initial Draft for SCERT for J&K formulated by a state group in which Shri Gul was a lead;
- Draft for restructuring of DIETs;
- Academic Planners for the schools of Kashmir Division;
- Online Monitoring Academic Support to Teachers & Schools;
- Establishment of Lab District and Zonal Schools;
- Idea of Model KG Classes (Nanhay Qadam);
- Proposal & concept note on School Readiness programme (KG for all Schools;
- Early Childhood Care & Education (ECCE) Manual for Teachers;
- Draft on Integrated Model Schools for J&K;
- Concept Note on Reduction of School bag weight and homework burden;
- Contributed in development of Peace Module;
- Mental Health Programme in Pilot Schools.

During these COVID times, the Innovation Cell, District Resource Group & Zonal Resource, Groups under the guidance of Shri Gul, trained teachers on digital platforms and provided all the necessary support to teachers, schools and children to adopt online education. Almost 40,000 teachers were trained to use digital platforms and about 2.50 lakh students were linked for online classes.
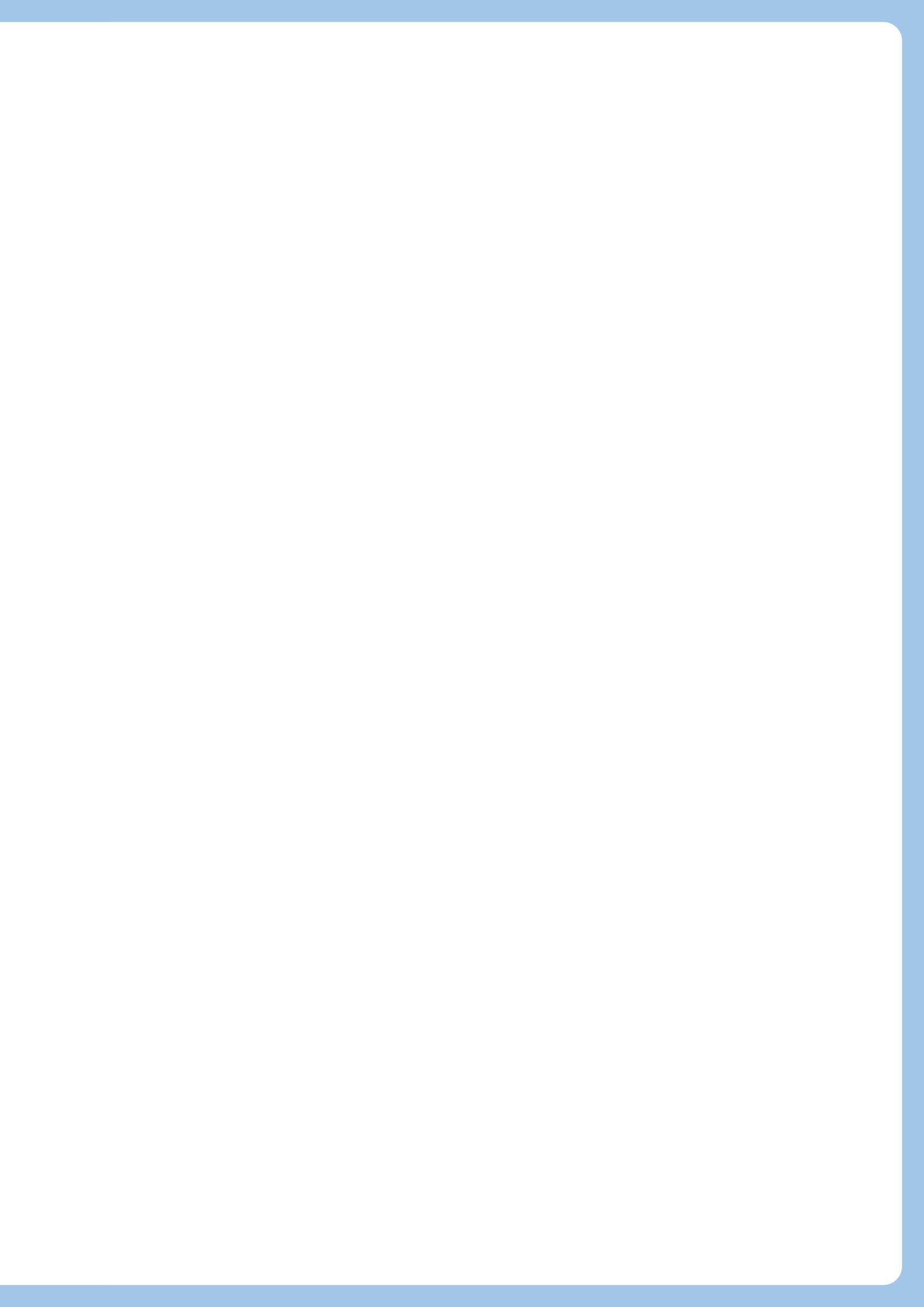
QUESTIONS FOR TEACHERS
1. What should be done to encourage children to come to school?
2. What programs can be organized for parents to enroll their children in government schools?
3. What skills do project work develop in children?

QUESTIONS FOR TRAINEES
1. What are the things to keep in mind while making a lunch list?
2. Whose help can be sought to fund a school work?
3. Under KGBV (Kasturba Gandhi Balika Vidyalaya) scheme, parents can send their daughters to school, what can be done to explain that?

ENABLING SPECIALLY ABLED

ICT TRAINING FOR VISUALLY HANDICAPPED

TEACHER	Yahya Hakimuddin Sapatwala
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Shri Yahya H. Sapatwala, who is visually handicapped from birth, holds an M.A., (Master of Arts) and an M.Ed. He has been working as a lecturer in Experimental Work (Research) at District Institute of Education and Training, Vadodara (DIET) since 1999. He is also a visiting faculty at M.P. Bhoj Open University, Ambedkar Open University, and Gujarat University.

The computer has simplified several tasks; however, it is difficult for blind people to use digital technology. So how to make the computer accessible to the blind? To answer this question, Shri Sapatwala began to do some research on the subject. During this time, he had to go to Delhi for some training and there he learned that visually handicapped people could use computers with the help of special software. He himself is associated with Andhajan Mandal Ahmedabad. He spoke to Shri Ranchodbhai Soni, a teacher here who was also blind but could work with computers. Shri Soni trained Shri Sapatwala over six days and taught him how to use a computer.

Mr. Sapatwala then turned his attention to studying software in Gujarati and English which could help the blind to work on laptops. For this, he studied the Gujarati-English keyboard to learn Microsoft Word, MS Excel, Power Point, etc. with the help of "Screen Reading Software" known as Non-Visual Desktop Access (NVDA). He started using what he had learned at DIET Vadodara.

Mr. Sapatwala frequently serves as an expert in various state-level trainingworkshops organized by Gujarat Educational Research and Training Council Gandhinagar (GCERT). During such trainings, he noticed that other blind teachers in primary schools across the state had the same problem with the use of computer technology. He then submitted a proposal to the Director (GCERT), Gandhinagar that computer training should also be imparted to the blind teachers. This was conducted from October 2016 to March 2017.

The training is for 12 days, in two parts. In the first, the trainees are taught the basics of using assistive technologies to use the computer, and in the second, their doubts are clarified. Three institutions of the state having the necessary physical facilities and experts were selected to provide the residential training. These included: (1) Andhajan Mandal, Ahmedabad (2) Navchetan

ICT training session

DIET training centere

Andhajan Mandal, Madhapar (Kutch) and (3) Andhajan School, Shivarimal (Dang). Teachers were sent in batches from the districts allotted to the institutes, 20 in each batch. A total of about 400 teachers affected by blindness received computer training.

Most of the trainers and experts were also visually handicapped. The training strategy was designed to give maximum opportunity to do practical work. Sometimes, several issues were also discussed through Skype connections among the three centres.

Since the screen reading software works through sound, headphones were installed with each computer to prevent noise in the room.

The training kit provided by the institute includes software as well as Braille literature:

1. Braille literature
- Windows Short Cuts Key Commands for NVDA
- Gujarati Keyboard (Kakko)
- MS Office Short Cuts
- Gujarati Paragraphs for typing practice

2. Software
- Gujarati Indic Input
- NVDA
- Add Ons

3. Hardware
- 8 GB Pen Drive
- Headphone

4. Tutorials
- Window 7
- NVDA
- MS Word

5. Literature
- Poems and Prayers
- Stories for Children
- Bal Shrushti

The experiment was evaluated on the basis of a 42-question questionnaire which included the following three main points:

1. How did the teachers feel about not being able to use the computer?
2. What and how did they learn to use the computer during the training?
3. How will they incorporate their learning in the classroom?

The main findings were:
- The teachers were confident about their abilities to use the computer.
- After the training they were able to use the Internet, create their own Word, Excel or Power Point presentation.
- Some teachers implemented the use of computers in their classrooms
- Encouraged by the training, some enthusiastic trainee teachers also bought their own computers or laptops.
- Most importantly, they were recognized in their respective schools as computer-knowledgeable teachers. As a result of this training, some teachers came with the prior approval of the institute for more practice even during the holidays.

While the government considers this kind of training important, Shri Sapatwala feeds it is imperative that such training be conducted every year.

Shri Sapatwala has been honoured by Rotary Club, Juhu (Bombay), the Giants Group of Bombay, GCERT, and has received the Dr. Jagdish Patel Award in 2013 and SRISTI SAMMAN in 2018.

QUESTIONS FOR TEACHERS
1. How can ICT be used for blind people?
2. What are the schemes developed by the government for blind children?
3. How can a blind children use a computer?

QUESTIONS FOR TRAINEES
1. What can be included in Braille literature?
2. What are the difficulties faced by blind teachers in teaching?
3. How can educational work be made easier for blind teachers?

VOICE OF VOICELESS: SPEECH DEVELOPMENT PROGRAM FOR HEARING IMPAIRED CHILDREN IN PREPRIMARY STAGE

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Shri Yogeshkumar Bhange is a teacher in a government primary school and a member of State Innovation and Research Foundation, Maharashtra. His son Prasun suffered from hearing disabilities in his childhood. Shri Bhange became aware of this issue when his son was two years old. When Prasun was two years old, Shri Bhange realized the problem. He lived in a small village with no medical facilities and so he went to a district hospital from where he was directed to Pune for BERA (Brainstem Evoked Response Audiometry). This was in 2004. Shri Bhange realized that he had taken a lot of time to realize that his son had a hearing problem, and so felt that there would be other parents facing similar problems.

While he began therapy lessons for his son in Pune he enrolled him in a school with normal children and not in one for the disabled. Some parents facing similar issues of disability in their children would approach him to seek his advice. All parents could not go to Pune for therapy and so Shri Bhange's wife Jaya Bhange formed a group of such parents to share what she had learnt during these sessions. In 2009, she formed an NGO, "Voice of Voiceless" (VOV).

Training to parents

The focus was to detect hearing impairment in children between the age group of 0–3 years. Shri Bhange strongly believed that if the disability was detected early, with therapy it could be treated and the affected children could attend normal school. Shri Bhange than came in touch with CORO INDIA (http://coroindia.org), an organization working to empower leaders in marginalized communities. The organization taught the couple the importance of research and how this could help to impact policy. With an advanced fellowship VOV conducted a survey of hearing impaired children in the age group of 0 to 6 years in Solapur District. The following insights came to light:

- PHCs are not equipped and specialized for necessary treatment of hearing impairment .
- According to the parent survey, it was found that every child was vaccinated.
- Government has set up "Aanganwadi" for the children of 0–3 years of age. An Aanganwadi worker can conduct surveys but is not scientifically trained to identify a deaf child. Also, there is no scheme for providing Speech Therapy to the identified children.
- The health department organizes camps for vaccination but there are no arrangements for testing the hearing ability of a child.
- The social welfare organizations provide hearing aids but that is given only after the age of 5; the actual impact could be created if the child is tested before the age of 2 years.
- Education department have teachers who provide education to the deaf children but they get this job when the actual age of learning to speak is

People at school visit

long gone. As a result, these children become permanently dumb and are unable to share their joy or pain with the world.

VOV came up with a cost-effective and innovative hearing ability test in 2014. The test could easily be implemented by anybody: take a metal bowl and a plate, and create a clang of metal on metal when the child is occupied with some other game. If the child does not respond, she is identified as possibly hearing impaired and is referred for advanced scientific test "BERA".

Shri Bhange approached the collector to identify hearing-impaired children; CORO and Precision Camshafts supported them with funding: 4250 Anganwadi workers were trained in 2 months to conduct "Plate bowl test" and how to communicate with such children and their parents. The idea was to diagnose the hearing disability before the child reaches 3 years of age, so that she/he could be trained to speak.

BERA takes about three hours and costs around 1500 rupees per test. The plate-bowl test is a cost-effective approach to identify the problem in the early stage. The "Taat Wati Chacani" (thali-katori or plate-bowl) was successfully conducted in Solapur District in September 2014. A total of 289,000 children were covered, and 147 children were identified. These children were sent for BERA test and early treatment of therapy sessions have started for them with the help of initiative "Taat Wati Chacani".

Shri Bhange is now planning:
- to increase the participation of government agencies;
- to identify hearing and speech impaired children through "Taat Wati Chacani" in 3 talukas of his district;
- to conduct speech therapy sessions for hearing and speech impaired children in these talukas;
- to conduct home to home speech therapy.

This innovation was presented at The Fourth International Conference on Creativity and Innovation at/for/from/with Grassroots [ICCIG 4] at IIM Ahmedabad. The Head of UNICEF India, Dr Yasmin Haque greatly appreciated the work. The innovation was also presented at the Lal Bahadur Shastri National Academy of Administration Mussorie in 2019 in a workshop of Grassroots innovations.

www.voiceofvoiceless.org.in
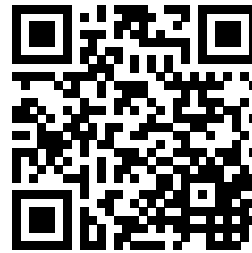
QUESTIONS FOR TEACHERS
1. How can education be given to children who cannot hear?
2. How can children who cannot speak and hear be identified?
3. How can creativity be developed in children who cannot hear?

QUESTIONS FOR TRAINEES
1. What is BERA?
2. How can children who cannot hear be taught to speak?
3. How to check if a child can hear?