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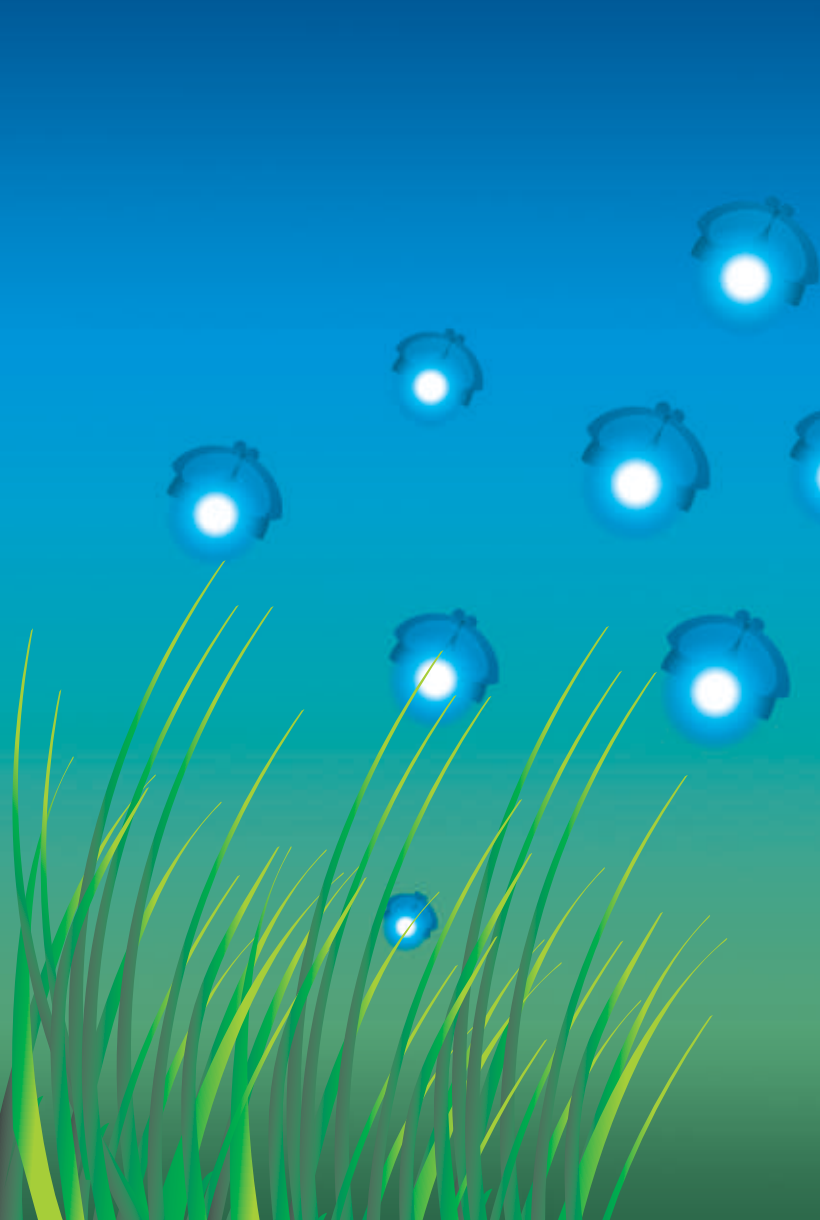


The Rise of the Fireflies

Igniting young minds through innovative learning

Foreword by
Padma Vibhushan
Dr. Raghunath Mashelkar, FRS

Best Practices Foundation
Innovating with the poor


DAY & NIGHT WORKING MODEL
GLOBUS

Foreword

During the Indian IT boom, it often used to be said that India's future is in IT, as in 'information technology'. I always had maintained that India's future is in IT, but as in 'Indian talent' that is spread across the length and breadth of India, covering its rural children.

This inspiring book provides the proof for this assumption through 50 brilliant case stories of economically disadvantaged children, who have demonstrated outstanding qualities of innovation and leadership. It shows how young minds can be ignited through learning that is achieved through an innovative and creative hands-on learning methodology.

The book has stories that will touch the hearts of the readers. For example, how a young Bhavani saw a Help India video about a child, who single handedly attempted to move a tree-trunk to allow an old man to cross the road. Inspired by the video, Bhavani started helping blind people cross the road. Going beyond, now she is creating recycled notebooks for the resource poor children, in the process also saving paper and saving trees. Young Divya is concerned about the inundation of nylon ropes in her village and has created a composite rope that combines natural fibers (biodegradable) – a strong and stable rope is the result. There are fifty stories in all, that are equally enthralling.

What is common in the stories of these '50 jewels of India', if I may call them so? First, each one of them wants to be a part of 'solution' and not a part of a 'problem'. Second, not only do they show innovation, emanating from their brains, and passion in their belly, but also compassion in their hearts. And finally, their high aspirations to climb the limitless ladder of excellence in their future; they may be poor in resources, but they are all rich in aspiration.

I visited the Agastya Science Centre a year ago and I was truly inspired by what I saw. Indeed, I have been a great admirer of Agastya's pioneering work over the years on sparking curiosity in rural Indian children. It has vividly shown us how children can show dramatic behavioural shifts, developing a questioning attitude, moving from rote learning to learning by doing and exploring, and from merely looking to observing, analyzing and synthesizing creatively.

This book is a testimony to the unlimited potential of our children, including the most resource poor. I applaud the efforts of Agastya, support by the Karnataka Government and the painstaking work by Best Practices Foundation in making this book happen. This book is a great gift to society.

R.A. Mashelkar, FRS

Padma Vibhushan Dr. R.A Mashelkar is National Research Professor, President, Global Research Alliance and Chairman, National Innovation Foundation. He served as Director General of the Council of Scientific and Industrial Research (CSIR) for over 11 years.

Acknowledgements

I am delighted that Best Practices Foundation had the opportunity to produce and publish this extraordinary collection of success stories of 50 children, 25 each of boys and girls, touched by Agastya International Foundation. Their voices have given life to this book and their stories are an inspiration of what can be achieved with an innovative, creative, hands-on learning methodology. Interacting with them both in rural and urban settings has redefined our notions of the role that education can play in moulding our future leaders and innovators.

The Government of Karnataka has been a key player in the success of Agastya's work with rural children across the state. The cooperation it has extended has made it possible for the organisation to achieve the scale it has in the state, which could become a model for other states to adopt.

The data for case studies were collected by the Best Practices Foundation Research team, comprising Sudha Menon, Tanisha Chaube, Shruthi Vissa and Angeli Persand across Agastya's areas of intervention. The case studies were authored by Shaila M. Faleiro. The photographs in this book were taken by Sudha Menon with the assistance of Priya Pillai. Sudha also designed the layout of the publication.

The title of this book is inspired by **Arun Maira's** metaphor to describe a rising, inclusive India.

Dr. Sangeetha Purushothaman

Executive Director, Best Practices Foundation

Introduction

In the next few pages are **50 inspiring stories** of children – 25 boys and an equal number of girls – who were impacted by Agastya's transformative vision to spark curiosity in rural India.

Agastya's unique ecosystem is an example of a successful, scalable, and replicable model for innovative grassroots education. This would not have been possible without the support of the Government of Karnataka, which plays a catalysing role in the exponential upscaling of Agastya's innovations among rural children. The change in these children were possible because of the influential role played by many groups including government school teachers, Agastya's instructors and social investors like the R. Jhunjhunwala Foundation, the Deshpande Foundation and the Oberoi Family Foundation. This is a unique example of a public-private partnership innovating in the field of science education in rural India.

Agastya-exposed students demonstrate high levels of leadership, problem-solving, creativity, curiosity and awareness. These skills, in turn, fuel five broad behavioural shifts – evolving from saying 'yes' to asking 'why', from looking to observing, from passivity to exploring, textbook bound to hands-on learning and fear to confidence.

The children in these case studies embody to different degrees, and in varying combinations, the key skills and behavioural shifts mentioned above. Their stories have thus been depicted according to the specific skills and behavioural changes that they have come to exhibit in the course of their time with Agastya.

Awareness

Knowledge among relevant stakeholders of alternative methods of learning and teaching science that is preferred

Curiosity

Behaviour characterised by exploration, investigation, observation, and a desire to learn more about new, incongruous, or unknown elements

Creativity

The ability to think beyond accepted norms or explore concepts or synthesise information to generate innovative ideas

Problem-Solving

The ability to recognize and understand the multiple dimensions of a problem and to address it by applying relevant knowledge

Leadership

The ability to guide and inspire others, and the capacity to think, act and direct their activities

Saving Paper, Saving Trees

AWARENESS

Bhavani Painchaingalu
Age: 13 years
Student of: Standard 7, HPS Vishweshanagar, Hubli

A Firefly
because she recycles notebooks

Bhavani, who has been visiting the Agastya Science Centre after school for about two years, says she learns "easily (at Agastya) because they explain everything with models". There is always something new and interesting to learn, and it's always through models or videos and other methods that are just as fun. She once watched a Help India video about a child who single-handedly attempts to move a tree trunk to allow an old man to cross the road. Inspired by the video, Bhavani now makes sure to help blind people across the road whenever she can.

Bhavani's father is a barber and her mother is a homemaker. The children in Bhavani's neighbourhood and school are expected to do a lot of copy writing so they tend to run out of notebooks fast. Bhavani's special initiative has been to make recycled notebooks for them. At first she tore and stapled pages from old notebooks to make new ones for herself. Seeing that her friends could use them too, she began making notebooks for them as well. Then, realising there was a much bigger need, she campaigned with a group of friends in her slum. The teens collected a stack of notebooks donated by the community. Tearing out the unused pages, they stapled these together, wrapped them in newspaper for a cover and distributed them to students in need. Together, the girls made about a dozen 40-50 page recycled notebooks.

Bhavani intends to go places, literally and otherwise – she dreams of travelling, becoming a policewoman, posing for pictures with celebrities, making a project and explaining it to famous people, and being recognised and appreciated and making her parents proud.

Textbook to Hands On

Strong Ties with Nature

Divya's project on composite ropes, selected for the nationally reputed IRIS science fair, was born from her observation that nylon rope had inundated her village market and jute, hemp, cotton and *Agave americana* rope was all but unavailable. In the course of her research, Divya learnt that unlike nylon, natural fibre rope degrades in water but fibres can be combined to make the rope as strong and stable as synthetic rope. She also discovered that nylon rope is slippery when wet.

Divya's experiments with composite rope were first initiated at the Agastya Science Centre. She fastened an agave rope to a rod and suspended weights from it to determine when the rope would snap. Repeating the exercise with hemp and jute, she realised that combining natural fibres resulted in rope that was both strong and stable. A threadmaker was approached to combine the fibres in the requisite number of strands and combinations. Elongation tests conducted at BVB Engineering College revealed that besides being eco-friendly, hemp and cotton can support heavier loads than nylon. Composite rope made from these fibres is strong enough to tether livestock and is less likely to slip than nylon.

When she grows up, Divya wants to become a scientist. She hopes her family will allow her to pursue her dream. The 14-year old has come a long way since she first started going to the Agastya Science Centre two years ago. "It was terrifying," she says, recalling how she was required to explain concepts on stage. "I had terrible stage fright and always worried that I would mess up". Today, when asked what she would say to other girls her age, she says, "You will definitely be interested in the models, they teach you to experiment and discover things. Don't worry if you find it difficult at first. You will figure it out. Even if you make a mistake, know that you have nothing to fear".

AWARENESS

Divya Kammar

Age: 14 years

Student of: Standard 8, HPS Bhairidevarakoppa School, Hubli

A Firefly

because she created organic rope as an alternative to nylon rope

Fear to Confidence

Making Lemonade from Lemons

AWARENESS

Geetha Dinni

Age: 17 years

Student of: First year, PUC (Arts), Jagajyothi Basaveshwara College, Bijapur

A Firefly

for innovating a drink with natural preservatives

"Everything has a use and purpose," says Geetha, who has been visiting the Agastya Science Centre for six years now. This belief extends to every aspect of her life. She uses waste paper and fabric scraps to craft roses, and old socks to make dolls. Agastya holds such an important place in her life that she approaches an instructor even when she makes a mistake in the kitchen.

Geetha is interested in science and wanted to take it up in high school, like her older sister did. However, financial troubles at home prevented her from doing so and she had to settle for Arts instead. She is now determined to stand first in Arts and compensates for being unable to study science formally by coming to Agastya with her brother, reading his science books and sharing all she learns with the children in her village. When she learnt about rainbows, for example, she explained the concept right away to children in her neighbourhood. Her students astounded their teacher by explaining it in class before she could.

Like her peers at Agastya, Geetha is excited by innovation. In 2012, her project for the national IRIS science competition drew from her observation that farmers often carried a mixture of jowar and buttermilk with them to the fields. Experimenting with it, she saw that the mixture remained fresh for up to a week. Intrigued, she took the mixture to the Agastya Science Centre. Her instructor directed her to the Agriculture University in Bijapur, where she met a lecturer who sent it to the Food Research Institute in Solapur. There, tests revealed that the mixture contained a souring agent that acted as a natural preservative and prevented it from spoiling.

Being unable to follow her first dream is far from the end of the road for the young woman. She continues to seek opportunities to pursue what excites her and looks forward to "helping other students forced to follow a line of education that might not be their first choice".

Looking to Observing

The Miracle of Scientific Discovery

AWARENESS

Girish began visiting the Agastya Science Centre only two years ago but is already an old hand at innovations and demonstration. Girish's father is a mason and his mother is a homemaker. He has an older brother in standard ten.

Girish has made a model of a robot with his friend Chandini and another that explains how light is transmitted. A third model, also with Chandini, was of a pulley made from waste that would make it easier for women to draw water from wells. He demonstrated this at the Agastya Science Fair sponsored by Hewlett Packard. Although they did not win a prize, they were both awarded certificates of merit for their initiative.

Girish's big interest, apart from model making, is the way superstitious people can be so easily hoodwinked. "Superstition and blind faith make people vulnerable to the scams of anyone looking to make easy money," he believes, recounting an instance where a conman once did just that in his village. The man held out a fistful of turmeric powder that "miraculously" changed colour, to the great awe of his gullible audience. Girish was quick to point out that mixing turmeric with washing soda produces exactly that effect. "This is what happens when you don't understand science," he chided his neighbours. "Science makes people aware."

Although Girish intends to become an engineer who makes software for mobile phones, he was not always interested in science. "I used to find the subject hard to understand before I started to visit the Agastya Science Centre," he says, "but now science and technology are my favourite subjects".

Girish S

Age: 14 years

Student of: Standard 10, Government High School, Hebbal, Bangalore

A Firefly

for his robot model and his initiative to dispel superstitions

Yes to Why

Going to Where the Learning is

AWARENESS

Jyoti Gooli

Age: 18 years

Student of: First year, BSc, SVM College, Bijapur

A Firefly

for funding her education by tutoring her peers

Jyothi's first introduction occurred when her Standard 10 science teacher suggested she visit the Agastya Science Centre for a fresh, new understanding of the subject. Jyoti has participated in numerous fairs and competitions since, including Agastya's Mega Science Fair where she was introduced to over 200 new models. Her conduct was so exemplary that she was awarded a scholarship of Rs 1,500 to buy her Standard 10 books.

Jyothi was one of the first to participate in Operation Vasantha, an Agastya initiative where students teach children living in slums. In addition to math, science and English, Jyothi also teaches her students yoga, which she has taught herself from books. The experience gave her the confidence to communicate with anyone, she reports. She has now taught close to 100 students from her own home. The Rs 600 she earns goes towards financing her education.

Jyothi would have liked to pursue a degree in engineering but as her family could not afford the expense, she opted for science after Pre-University. She intends to be a working woman, a social worker who does something in the area of science, perhaps. A weaver herself, she would like to invent a loom that eases the drudgery of weaving, for instance. She wants to meet Indian and international scientists and join Agastya after completing her degree. "Money is less important than learning," she says. "We must always go where the learning is".

Passiveness to Exploring

Rising, Shining

AWARENESS

Mahesh is a student in Hubli, whose father is a government school teacher and mother a housewife. Science did not particularly interest Mahesh two years ago. This changed when Agastya organised a summer camp in his village Annigeri. Mahesh learnt about reflection and transmission, and went on to present on the topic at the INSPIRE competition in Dharwad in 2012. His project was selected for the state level competition in Kumta.

Mahesh is now working on an automatic alarm, which he proposes to enter for Agastya's Jignyasa competition. "Human beings are lazy, they wake up late and continue to snooze even after the alarm goes off," he says, adding that he too is a late riser. His idea involves an alarm connected to a key, which in turn is connected to the cap of a bottle full of water on a window sill. The ringing alarm activates the unwinding of the key and causes the water to spill on the sleeping person's face! He is in the process of discussing his idea with his instructor at Agastya.

"Keep your heart clean, don't worry about superficialities, be kind, be good to your friends and if you can't afford an education, come to Agastya because they teach everything free", says the young man, who would like to take Agastya to an international platform so that children everywhere can learn to make low cost models. Mahesh would also like to see corruption eradicated and dreams of developing a laser that converts seawater to drinking water. Given a chance, he says he would wire public offices with cameras to curb the scourge of corruption.

Mahesh Hombalamatti

Age: 15 years

Student of: Standard 9, Ningamma S. Hugar, Annigeri, Hubli

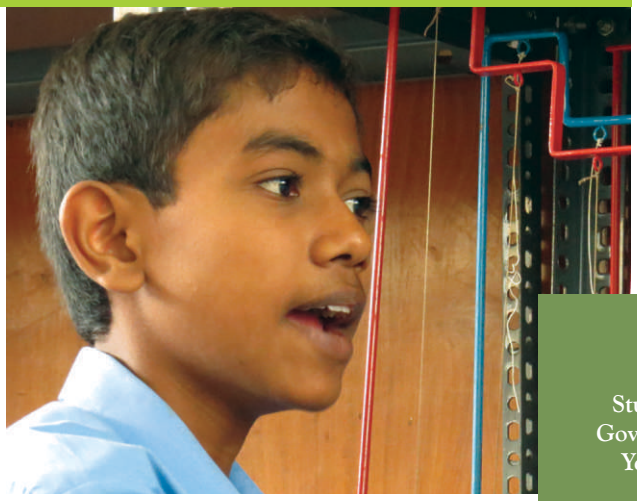
A Firefly

for his pioneering water bottle alarm idea

Fear to Confidence

The Shape of Things to Come

AWARENESS



Naveen R

Age: 14 years
Student of: Standard 9, Government High School, Yelahanka, Bangalore

A Firefly

for building an electric arc furnace to melt and reshape small bits of metal

Naveen is always enthusiastic about coming to Agastya because he is a scientist in the making. "The instructors here inspire me," he says. Naveen has always been interested in math and science even though he did find the latter difficult sometimes. Here at Agastya, he gets to learn not only these but music as well. The selection process was an easy one – "which is heavier, a kilo of cotton or a kilo of ragi," the children were asked. He had the answer instantly. "There were a few more questions like that. It was a pleasure to be part of it," he recalls. Now, Naveen and a group of about 30 students from his school come to the Agastya Science Centre in a special bus a few times a month. The first time around, there were icebreaking games. Now, the place is like a second home – he knows everyone and everyone is friendly.

The happiest day of his life was when he was awarded ninth place at a state level math competition. "I was in Standard 6 – I'll never forget the moment," he says. His teacher encouraged him all the way but he was unable to participate again because the schedule always clashed with his school exams.

Naveen's claim to model fame is an electric arc furnace he made with his friend Manoj. His grandfather used to work in a metal melting factory. "Not everyone can go and see how metal is melted, so we thought we'd demonstrate it for them," he explains. Capable of melting and reshaping small bits of silver and aluminum, the boys' model has garnered much admiration among their peers. Naveen now looks forward to entering it into a competition.

The teen is quite clear about what he wants to do in the future – begin with mechanical engineering and save enough to then switch to agriculture, where as a scientist, he will devise solutions that will help farmers thrive. Naveen's father is a plumber and his mother works in a garment factory. His family is extremely supportive of all his endeavours and urges him "never to forget that (he) can win".

Textbook to Hands On

Abuzz with Innovation

Rajesh had always loved science but had no one to encourage or nurture his interest at home. When he was in Standard 8, his project on vermi-compost was selected for a state fair on natural fertilisers. His teacher sent him to Agastya for help. Walking into the Agastya Science Centre felt to him like coming home. Rajesh marveled at the models and could not wait to make his own.

In the years since he has been at Agastya, Rajesh has worked on models that belie his years. These include, for example, earthquake and tsunami indicators for disaster management – an underwater speaker sets a buzzer on land off when an earthquake causes the frequency of the waves to increase. His tsunami alert comprises a stick placed in water, connected to a bulb wired to light up when the water rises above the danger line. Rajesh also studied soil moisture detection and colostrum with his friend Om Shiva.

Always bright – Rajesh used to score in the eighties before and now scores over 90 per cent in science – he is thrilled to be part of an environment buzzing with ideas and opportunities. He has participated in the state level Doddabella Ballapur science competition and the Intel IRIS national science fair in Chandigarh. The hydraulic pressure kit he created with his friend Om Shiva for Agastya's Jignyasa competition in 2012 won a Rs 10,000 cash prize. The kit, comprising a collection of syringes, demonstrated the working of a vacuum cleaner, explains how electricity is generated from canal water and detects the moisture content of soil.

When he grows up, Rajesh wants to become a science teacher, one who uses experiments to teach his students. He has already opened his own bank account and is saving money for his higher education.

AWARENESS

Rajesh Balagi

Age: 16 years
Student of: Standard 10, Bijapur

A Firefly

for his model for warning about upcoming earthquakes or tsunamis

Passiveness to Exploring

Untrivial Pursuits

AWARENESS

Soumya Biradar
Age: 15 years
Student of: Standard 9, Government High School, Muddebihal, Bijapur

A Firefly
for publishing a book on general knowledge

Only 15, Soumya is already a published author. She wrote *Gnyana Mritha*, a general knowledge book, after participating in a television quiz programme. It took her four months to write and was double-checked by her science teacher and the Kannada poet Ashok Anchali. "The world is moving so fast," she says, "we need general knowledge to survive". The book was distributed to about a dozen schools and half a dozen book stores, earning her Rs 5,000 in sales.

Soumya is currently awaiting the results of the INSPIRE awards, which she was introduced to at Agastya. Her entry was a model of a solar water heater that she worked on under the guidance of an instructor at Agastya. She used solar panelling to cover a cylinder filled with copper tubes and connected it to a water tank. When the panelling heats up the copper tubes and the water inside them, the resulting decrease in water density causes the hot water to rise and be dispensed from the cylinder.

Soumya has big dreams and ambitions. She wants to take care of her mother, who is the village tailor. She hopes to write another book, this one on the life history of Kannada poets. She wants to take competitive exams so that she can get a good job that lets her pursue her desire to help people, build orphanages and old age homes, and serve the poor. The government has several programmes, she says, but they do not always reach those in need. Soumya sees her calling in helping the poor access the support they need to climb out of poverty and deprivation.

Yes
to
Why

Experiments with Green Thumbs

AWARENESS

Soundarya used to be a shy, quiet girl who sat at the back of the class and made no effort to participate even when she knew the answers. Her mother used to scold her for her timidity. And science used to be plain boring. But that was all before her introduction to Agastya. Today, she is a new girl, a confident Young Instructor Leader (YIL), sure of herself, singing, dancing, making speeches and helping her classmates with science.

Recently chosen to take part in the IRIS competition, Soundarya's project on the effects of human behaviour on plant growth was inspired by her mother's belief that plants must be treated well because they are living creatures. She planted six coriander and bean saplings each on the roof of the Agastya Science Centre, then picked two to treat well, two to ill-treat and another two to treat neutrally. The first two plants were constantly told they were useful, beautiful, the best in the world. She played melodious music and held lightly coloured paper next to them. The second pair was repeatedly told they were "bad, useless and served no purpose". She played harsh, screeching sounds and tsumani videos and held dark papers close to them. The pair that were meant to grow naturally were left alone.

The experiment extended over a month and a half. The plants that were complimented and spoken to kindly thrived; their leaf growth was good and they looked better than the other plants. The plants that were spoken to unkindly were less lush and had a few dry leaves. The plants that had not been interacted with verbally did not show a significant deviation from the norm.

Soundarya has learnt so much during her time at Agastya that she now wants to become a teacher herself. Listening to the teacher and paying attention is critical for learning, she believes. Queried about her advice to other children who are timid like she used to be, she suggests, "stand up and imagine you are alone or close your eyes and imagine you are alone, *then* say what you have to with confidence. Do this often enough and all your nervousness will disappear".

Soundarya Dhondusa
Age: 13 years
Student of: Standard 8, Lamington Girls' High School, Hubli

A Firefly
because of her project on how human behavior affects plants

Fear to Confidence

Modelling a Path through School

AWARENESS

Sunil Badiger

Age: 17 years

Studying for: a diploma in Mechanical Engineering in Bijapur

A Firefly

for making science models for schools to earn money for his college education

Model making has been Sunil's passion since his first exposure to Agastya in 2008. Then in Standard 7, Sunil has since won numerous prizes at the state and taluka levels for math, science and even drawing.

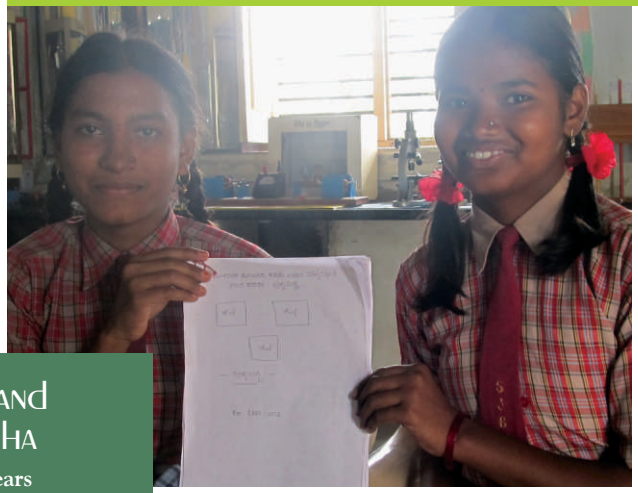
With help and support from Agastya's Science Centre teachers, Sunil has constructed models which include a hydraulic pressure model of an earthmover that received an award at a Mega Science Fair. He has since built a rocket, hydraulic pressure robot and a periscope, using materials bought at a second-hand shop. His family, friends and neighbours look forward to his models, cheering him on with every new one. So impressive are they that Sunil is now commissioned by schools for models that they can demonstrate at their science classes. He recently earned Rs 10,000 for a mini solar-powered village complete with a mechanical device to draw water, a solar energy kit and a four-foot high windmill. He used the money to pay his college fees – his choice of subject obvious after the grounding he received from the Agastya Science Centre. Sunil hopes to earn at least Rs. 15,000 next year so that he can continue supporting his elderly mother and siblings. Alongside, he also takes up metalworking projects where he carves intricate metal frames and deities for clients on festive occasions to pay his fees.

His father is a carpenter and his mother is a homemaker. Sunil lives with his mother in a small house given by the Municipal Corporation and life is hard, particularly for his ailing mother. Sunil dreams of having her treated in a good hospital and building a home for her so that she no longer has to work or worry.

Passiveness to Exploring

Getting Sweet on Science

AWARENESS



Geetha and Sangeetha have seen the Agastya Mobile Van with its exciting science experiments about a dozen times. They make sure to visit the Agastya Science Centre as often as they can, even though it is a long way by bicycle. Geetha's father is a baker and Sangeetha's father sells soap.

Awarded a certificate at the INSPIRE awards conducted by the Government of India for their model of an iron crane to transport heavy materials, the girls are currently researching methods to prepare *huli nuchu* on a low budget. A popular sweet treat made from jowar and lemon, this is traditionally prepared for the Manigoli Chaatra festival in honour of Lord Basavannappa. Its preparation is long, tedious and not inexpensive, but much to the delight of children all over Manigoli, it lasts for days without refrigeration. The girls decided to research why.

Mr Chandrakanth from Agastya took them to Hitnalli Agricultural Farm where they met Mr Aswatham and Dr Prema Patil. Dr Prema offered to take them to the Ana Lab in Solapur but since the timing clashed with their school schedule, they discussed and studied the nutritional content of the dish and intended to present their findings at the IRIS competition.

Both hope to become doctors when they grow up. But, they say, they will inject the professions with their own twist of creativity by using "household ideas and objects to heal the sick and change the world".

Geetha and Sangeetha

Ages: **15 years**

Residents of: **Manigoli village, Bijapur**

Fireflies

for researching the preservation of a popular sweet

Passiveness to Exploring

Cycling for Water

CREATIVITY

Aijaz Ahmed

Age: 17 years
Student of: Second Year Diploma, Electronics and Communication, Bijapur

A Firefly

for using a cycle and dynamo motor to pump water

Aijaz's love of science started in Standard 6 when he saw an experiment on the production of electricity at Agastya's Science Centre. Instantly captivated, he has since developed a strong interest in physics. He now finds the subject easy to understand, especially because "one follows the laws of physics in life". Aijaz's father owns an aquarium business and his mother is a homemaker. He is the youngest of three children.

One day, when his friend Shahid challenged him to empty a bucket without using either his hands or a container, Aijaz asked for a few hours to prepare. He went home and picked up a dynamo motor and bicycle. He removed the cycle tube and connected it to the motor with a rope in such a way that when he peddled, the tube rotated and activated the motor in the process. He put a suction pump in the bucket with the water. Peddling the bicycle started up the motor and caused the water to flow out of the bucket through the suction pump. Setting up the whole apparatus took him close to two and a half hours but he won the challenge and a soft drink for his pains.

Aijaz enjoys conducting experiments, learning new concepts and playing with the models at the Agastya Science Centre. He always hoped to become an engineer and fulfill his big dream of inventing something with motors and fuel. Today Aijaz is pursuing his second year Diploma in Electronics and Communications. He considers Agastya a part of his family and credits the Agastya teachers for supporting and encouraging his interest in science.

Passiveness to Exploring

Road Alert

CREATIVITY

On a sunny morning in November, a plastic rocket fashioned from two disposable bottles shoots off the roof of the Agastya Science Centre in Bangalore with a loud bang. It is never seen again. Kausalya, one of its 'inventors', stands by beaming as her audience of children and instructors alike cheer with approval.

Kausalya began coming to the Agastya Science Centre three years ago. She says she has "never seen anything like it, anywhere". Like all her friends, it was the models that intrigued her most in the beginning. Things she had learnt at school began making more sense. "At Agastya, we *see* it. It's very interesting when you *see* and learn. That's the difference between school and here," she says.

Kausalya has also learnt about road safety. One of her first models, constructed with a friend, was of a road hump to prevent accidents. "Driving in the mountains can be dangerous. Our model demonstrates how a car approaching a blind turn can activate a switch set in a road hump at the curve, and set off an alarm to alert a driver coming the opposite way," she explains. Her schoolmates and principal were very impressed. "This is something that would help the community," Kausalya continues, "and the alarms have deliberately been kept visible to draw public attention to the need for alertness and safety".

The young woman's family is proud of her accomplishments. Her parents are happy to buy materials for her models and thoroughly approve of her desire to become an engineer. Kausalya dreams of creating things and supporting her parents so that they never have to work again. She has learnt many wonderful things at Agastya, she says – the importance of conserving water, how to help a person across the road, why it's good to work as a team – "Teamwork is very important. Together, we can create many things," she declares.

Kausalya Ashok

Age: 16 years

Student of: Standard 9, Feather Light School, Bangalore

A Firefly

for building a warning system for drivers on hairpin bends

Looking to Observing

ANYTHING IS POSSIBLE

PASSION AND FREEDOM OF SPIRIT

SELF
ILLUMINATION

THE
MAGIC OF
BELIEVING

Cementing the Parent-child Bond

CREATIVITY

Kavya Gangai

Age: 14 years

Student of: Standard 8, Sri Sadguru Sivanand Girls' High School, Hubli

A Firefly

for her initiative to get children to write to their parents about their ambitions

When Kavya was in Standard 5, she realised that children's dreams for their future are not always the same as their parents' aspirations for them. As a result, many children are afraid to share their dreams with their parents. Seeing this as problematic on many levels, Kavya undertook a project on this for the Design for Change, a global competition introduced to her by Agastya. She enlisted the help of two friends to speak to hundreds of Standard 8, 9 and 10 students in five government schools. The girls identified those with serious ambitions and urged those whose aspirations clashed with their parents dreams for them to write to their parents. Kavya's schoolteacher helped them mail the letters.

Kavya, who recently took an exam for the Gifted Children Programme (a partnership between Agastya and the Government of India), has also competed for an INSPIRE award, conducted by the Government of India. Her project 'Nisarga Nivasa' focussed on eco-friendly home construction, which she modelled using a windmill connected to a rainwater harvesting tank to generate hydroelectricity, a *gobar* gas pit connected to a stove for cooking and streetlamps powered by a turbine. With guidance from Agastya's teachers at the Science Centre, her efforts won her a district level certificate.

"To move forward you need self-confidence. Ask more questions," says the teenager, whose dream is of a clean, green country and of herself as a District Commissioner. She would also like to cultivate a plantation where people can learn about plants. And she wishes she could learn to make all the science models in the world.

Looking to Observing

Sharing the thunder

CREATIVITY

Megha and Vijayalakshmi have a talent for making low cost models from everyday objects and scrap. Megha's father works in the silk industry; Vijayalakshmi's father is a security guard. Both their mothers are homemakers.

At a workshop conducted by Agastya at their school, they used cardboard, scissors and gum to make a rocket. The two friends subsequently participated in two science quizzes at school and won first prize both times.

The duo's signature invention, a Thunder Maker, was inspired by an instrument in the movie Paramatma that produced a sound like thunder. The girls got thinking about the science behind the instrument and experimented with scrap to develop their own version of the contraption. They finally used a discarded PVC pipe, a plastic box from the corner store, some iron nails and a spring from a cycle repair shop to assemble their model with a little guidance from their instructors at Agastya. They cut the bottom out of the box and inserted the pipe into it. They then slid the spring into the pipe so that when the spring is shaken, the air particles inside the pipe vibrate to sound like thunder. The Thunder Maker has inspired their classmates to also take up model making.

Megha and Vijayalakshmi

Ages: 15 years

Students of: Standard 9, Jananagar High School, Bijapur

A Firefly

because of their invention of a Thunder Maker, made from scrap

Making interesting, low cost models is not all the girls do. A week before their Standard 8 final exams, they conducted a model making class for teachers at government schools. In doing so, they took a step towards increasing access to learning that is fun, engaging and meaningful for other children like themselves. Agastya's teaching methodology at the Science Centre had a huge impact on the two girls' venture into teaching their peers.

Yes to Why

A Multi-facetted Award Winner

CREATIVITY

Om Shiva Galagali

Age: 16 years

Student of: First PUC, Bijapur

A Firefly

for his many award-winning projects

Om Shiva travels over 30 kilometres to school every day. He learnt about the Agastya Science Centre from his science teacher and at last count, had visited the Centre about 50 times.

Always on the lookout for ways to apply science to improve the quality of life, Om Shiva has made a model on wind-powered electricity and another to detect the moisture level of soil. This, he believes would be very useful to farmers like his father, who use it to measure the percentage of moisture in his field and assess how much more is required. Another time, he connected a dynamo to a bicycle wheel and an LED bulb. Rotating the wheel generates enough electricity to light a bulb and charge a mobile phone.

Om's other activities include experiments with colostrum and an electricity generation project that utilises canal water to create a waterfall that feeds into a turbine connected to a dynamo. He made a model of this for farmers, suggesting the use of solar panels as an add-on.

Among the many awards he has received are the science quizmaster of Bijapur at the Deshpande Foundation competition and the young scientist state level award in 2012. In 2011, he received a special mention at the state level children's science conference. He was awarded a certificate of excellence at the Bijapur district level, and won first prize at Agastya's Jignyasa competition in 2011, jointly with his friend Rajesh.

Om dreams of working at the Indian Institute of Science. His family is happy to play the role of audience whenever he needs to practice a presentation. They have no doubt their dreams for their boy will all come true. Om Shiva continues to visit the Agastya Science Centre to stay updated even though he is currently pursuing his PUC.

Fear to Confidence

Turning up the Heat

CREATIVITY

Prashant Biradar

Age: 15 years

Student of: Standard 9, Government High School, Bijapur

A Firefly

for creating a box with naturally available material to dry grain indoors

Prashant has always loved science but had no equipment to experiment with. Along came the Agastya Mobile Van and for the past two years, he has been able to let his imagination and creativity run riot.

When Prashant was in Standard 8 he participated in the Karnataka Rajya Vigna Parishad's state level Makala Vidyan Samavish or Children's Science Congress. Having observed that his clothes took a long time to dry during the rains, he concluded that grain would dry even more slowly, perhaps not at all, causing major losses to farmers. He discussed the observation with his science teacher in school, who advised him to develop the idea with his instructor at the Agastya Science Centre. The model he eventually constructed demonstrated how painting a surface black helps store solar energy. Prashant took a kilogram of raw wheat, soaked it in water and laid it out under a tray painted black. On the other side he laid out wheat that he left uncovered to demonstrate that the grain covered with the black tray dried faster because black retains heat. The experiment won a prize and was selected at the state level for another competition in Madikeri. Here, he improvised further, using a black box with three compartments, each holding wet articles of food and clothing.

Next on his agenda is a prototype for a gadget to promote better sanitation. Prashant proposes to place a mechanism with a sensor over the street garbage bin. At the opposite end would be a solar powered laser beaming on it. The laser would cut off when the bin filled up, triggering an alarm to alert the residents to call the Corporation to collect the garbage. This idea was applauded by the Agastya instructors, who are committed to helping Prashant make his prototype.

Prashant's father runs a bakery and his mother is a homemaker. Someday, Prashant would like to become a pilot and see how people live around the world. "We humans, who weigh 60-70 kilos, are too heavy to fly but planes, which are much heavier, can fly. How come?" he queries. And if, while he is at it, he becomes a very rich man, he will make sure no one is ever unemployed again.

Yes to Why

A Helping Hand

CREATIVITY

Srinivas V
Age: 14 years
Student of: Standard 9, Government High School, Hebbal, Bangalore

A Firefly
for creating a vegetable chopper

Srinivas had participated in the Government of India's INSPIRE competition before but it was only after he visited the Agastya Science Centre two years ago that he won an award. His model of a vegetable cutter was inspired by his experience of helping his mother chop vegetables in the kitchen. Fed up with cutting himself on more than one occasion, he thought about designing a vegetable chopper where his fingers are not in close contact with the blades, like he had seen vendors selling in the market.

Srinivas's vegetable chopper is made up of two plastic boxes, placed one over the other. A rotating blade, embedded into the upper box, cuts vegetables placed in it and deposits the pieces into the lower compartment. The gadget has worked well for his mother as well as a neighbour in a hurry to get her chores done and leave home. Srinivas recently saw an advertisement on TV that has got him thinking about promoting it in the market.

Of the many models at the Agastya Science Centre, the parallel connection model is the first he learnt about and remains his favourite. This was the model he presented to students of seven government schools at an Agastya Science Fair. Srinivas has also attended a Science Fair at Shikshakarasadana in Bangalore. Now that he has more than a basic understanding of model making, he tries to build on the concepts he learns at Agastya by making models at home. This, he finds, also helps him in his studies.

Srinivas's father is a daily wage worker and his mother works in a photo frame shop. "Not knowing things is a real disadvantage," Srinivas says. He sees himself studying hard for success and dreams of becoming a doctor, a film director or an architect building the most amazing buildings because as he now knows "science can make it possible".

Looking to Observing

Spreading His Wings

CREATIVITY

Sushil was at the school where his mother teaches when the Agastya Mobile Van happened to visit. Stepping forward for a closer look, Sushil learned about solar and lunar eclipses and planetary mass all in one day. Smitten, he has since spent as many evenings as he could at the Agastya Science Centre and at last count, had visited about 75 times in the past four years.

Sushil has studied all the physics and biology experiments at the Centre over the years. He has made a model of a bus and a space shuttle, and tried to make a working helicopter model with fans, batteries, card sheets and thermacol lying around at home. The latter posed a huge challenge. He tinkered with it for a long time, altering the design, the position of the fans and the size of the blades to get it to work, to no avail. Several attempts later, he decided to cut his losses and work on a model of electricity generation instead.

Sushil says the exposure he has received at Agastya has been invaluable for many reasons. His rapid-fire answers in class amaze his teachers who can scarcely believe this is the same boy they admonished so frequently in the past. Sushil attributes his improved performance to Agastya's Summer and Winter Camps. He now reproduces models at school, has won prizes at quiz and math competitions, and was awarded a first class at the taluka level for his participation in the 12th International Science Talent Examination in 2010.

Sushil's dream is to become a fighter pilot. Driven by deep love and gratitude towards his mother, the boy is determined to give her a good life. Her happiness he says, is what matters most; it gives him wings and helps him fly.

Sushil Somaling
Age: 13 years
Student of: Standard 8, Bijapur

A Firefly
for using old fans to create a helicopter

Fear
to
Confidence

A Multi-purpose Wonder

CURIOSITY

Adam Maniyar

Age: 20 years

Student of: BBA, A.S. Patil College of Commerce, Bijapur

A Firefly

for inventing an eco-friendly horizontal wind turbine

Adam was only in Standard 7 when, with the help of the Agastya instructors, he invented his economical, energy saving, eco-friendly horizontal wind turbine. This multi-purpose wonder consists of four springs attached horizontally to the blades of a fan. The first spring is connected to a belt and another fan that produces *gobar* gas. Another spring activates a grass-cutting system. The turbine also produces electricity and pumps water. This innovation, he believes, would be invaluable to farmers, sparing them the nuisance of power cuts and electricity bills.

Adam has also invented an animal repellent using a small plastic bottle into which he inserted a gas lighter through a hole at the bottom. The bottle is sealed with a rubber cork. When the lighter is ignited, the cork shoots out 20-30 metres, effectively scaring away small forest animals.

In August 2011, the District Education Board selected Adam to receive the Young Scientist award at a grand ceremony at the Bijapur stadium. But Adam has no recollection of how much he won – he donated the prize money to people in need.

Today, the youth who says he lacked discipline and self-confidence only a few years ago, can see just what a long way he has come. Back then, he recalls, he built models but lacked the confidence to present and explain them. He is quick to credit his Agastya instructors' guidance at every step of the way: "Agastya motivates and helps young people to grow in confidence. It lays a brilliant foundation for students," he says.

Adam recently acquired a diploma in journalism and is now studying business administration. He continues to visit Agastya despite being pressed for time. "Agastya is my platform and my home," he says. "I could never leave."

Textbook to Hands On

Insect Busting, Euphorically

CURIOSITY

Akshay has always been interested in science but describes himself as a "very, very weak student" who "did bad in studies". That has clearly changed since he began visiting the Agastya Science Centre three years ago – Akshay recently scored an aggregate of 90 per cent, with 92 per cent in science. For a boy who used to score 50-60 per cent, it was a particularly thrilling achievement.

When Akshay was in Standard 10, he became curious about the *Euphorbia tirucally* plant, known to attract houseflies and other insects. Parts of this plant are left to hang from the front doors of houses in his village.

Why this plant, Akshay wondered. Therein lay the germ of his experiment. His instructor at Agastya helped him collect three varieties of *Euphorbia tirucally* commonly found in his village, extract the sap, which he noticed hardened very fast, and spray it on insects. They then crushed the leaves and flowers and sprayed the extract obtained thus on insects. Finally, they experimented with cutting up and boiling portions of the plant prior to squeezing out the liquid. Akshay discovered that the last method produced a bio-insecticide as effective as commercially available mosquito repellent. His project was awarded fourth place at a state level exhibition conducted by the Bala Vikas Academy of the Government of Karnataka's education department.

Akshay is now pursuing a diploma in mechanical engineering. He would have preferred to study biology but believes that engineering offers better employment prospects, an important concern because his family is poor and debt-ridden. Now convinced of his own potential, he has little doubt that hard work and determination will help him help his family.

Akshay Tigadi

Age: 17 years

Studying for: a Diploma in mechanical engineering, KHK College, Hubli

A Firefly

for using a common weed to repel insects

Passiveness to Exploring

Tiny Drops to a Sea Change

CURIOSITY

Deepa Karadi

Age: 14 years

Student of: Standard 8, Sajjan High School, Illekal, Bijapur

A Firefly

for her inventions to conserve water

Since her exposure to Agastya, Deepa loves science because she believes that "science leads to new inventions". Most of her models relate to water conservation. One of these, on rainwater harvesting and groundwater recharging, is of a house with a tank that collects rainwater, sparing the owners the expense of electricity. Another, on water purification, was presented at Agastya's model making competition Jignyasa in Hubli. Here, she dug a pit, filled it with stones, sand and charcoal, and demonstrated how it purifies water passing through it. Deepa's association with the Agastya Science Centre has given her the confidence to present her models in public, and has enabled her to discuss the importance of rainwater harvesting with about 20 people in her neighbourhood.

Another of Deepa's innovations is a mosquito repellent made from neem, curry leaves and cowdung. Shaped like a cylindrical incense stick, the combination of neem and cowdung causes it to smoke away mosquitoes for that much longer. She is clearly thrilled to have developed something of so much practical use.

Deepa would love to travel the length and breadth of India, exploring the monuments and the myriad cultures. She dreams of better education and facilities for everyone. Bad habits are the root of many problems, she believes, and they must be eradicated. "Have courage and confidence, there is nothing to fear," she says to other girls like herself.

Looking to Observing

Firing Creativity

When the Agastya Mobile Van first arrived at Dhanush's school two years ago, it was with the promise that the students would see in real life what they had only ever learnt in books. That got Dhanush "very keen". He now makes sure to visit the Agastya Science Centre every other Thursday. "I get to do a lot here. There is a lot you can do if you are creative," he says.

Dhanush's father is an electrician and his mother is a housewife. During the summer vacations after Standard 8, Dhanush and his brother (who is studying computer engineering) decided to build a model of a petrol stove like the one they had seen at a science exhibition. They connected two bottles – one holding water and the other petrol – to a stove and designed their innovation so that petrol vapour passed through a pipe to the bottle with water. The water vapour helps cool the petrol and causes the stove to light. The construction was easy, Dhanush recalls – it only took a day. It was the conceptualising that took close to two weeks.

This Young Instructor Leader (YIL) is no stranger to awards and appreciation. In Standard 7, after learning about adulteration in the food processing industry, he went on to win first prize at the INSPIRE awards conducted by the Government of India by explaining how merchants cheat consumers with a cardamom fragrance spray instead of using the real thing. Winning the award was the happiest moment of his life, he recalls. Speaking up in public and explaining things to absolute strangers is a skill Dhanush says he has acquired at Agastya. "I couldn't speak, my hands would shiver," he says. "But my Agastya instructors helped me develop the confidence to speak in public".

When he grows up, Dhanush would like to "build big houses" like his uncle and "learn the many practical things that go into science" to find an alternative to petrol, because as everyone knows, "it is going to get over very soon". And as he loves pets, he intends to do this while also raising a houseful of cats.

CURIOSITY

Dhanush C

Age: 14 years

Student of: Standard 9, Government High School, Indian Institute of Science, Bangalore

A Firefly

for making a stove using water and petrol

Looking to Observing

Through the Gate of Creativity

CURIOSITY

Jay Prakash

Age: 13 years

Student of: Standard 8, GKHPS, SR Nagar, Bangalore

A Firefly

for building a low cost solar panel

Jay Prakash's father is a weaver and his mother is a homemaker. A year ago, Jay's parents decided to fit a solar panel into their home. The boy's curiosity was piqued. He watched the process closely and asked a lot of questions that no one seemed to have the answers to.

Over to Agastya. With his friend Akash and a little guidance from his instructors at the Agastya Science Centre, Jay used a sheet of glass, four light bulbs, a water drum and black paint to build a low cost solar panel. Now, the family has hot water to bathe with whenever the sun is out.

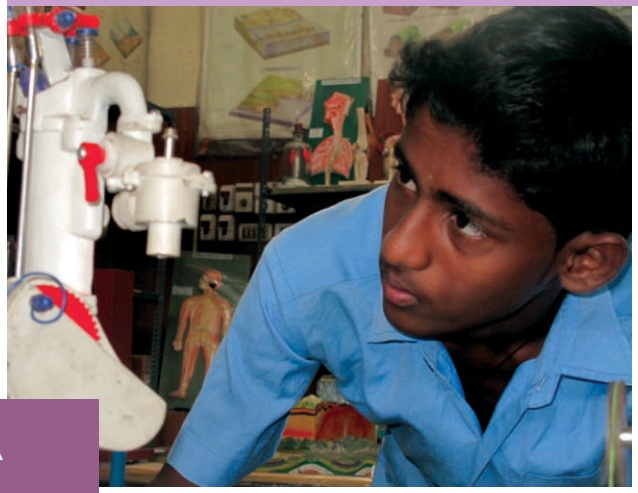
Not content with one innovation, Jay is constantly on the lookout for new ideas. The Agastya instructors have been instrumental in encouraging him to experiment. The boy's most recent model sought to measure how much current a revolving gate would generate. Such gates are used everywhere, he says, and he was curious to experiment with them. Using two magnets, a wire and a meter, Jay discovered that his hunch was right – such a gadget would indeed generate power, just as the meter indicated. Both the solar panel and the power gate models sit in the Agastya Science Centre, where their inventor loses no opportunity to demonstrate them to adults and children alike.

When he grows up, Jay thinks he might perhaps be an engineer. For now, he is happy simply inventing things.

Textbook to Hands On

Making Every Drop Count

CURIOSITY



Unlike many of his peers, Manjunath comes independently to the Agastya Science Centre and has been doing so thrice a month for the past three years. Apart from being continually fascinated by the science models, he has learnt to conduct research and also write stories about "everyday life". Among his stories is *Grandmother's Kitchen*, based on a true life event in which he saved his home from being burgled. Manjunath's father is a contractor and his mother is a housewife.

Manjunath recently teamed up with a friend on a rainwater harvesting project. The model was displayed at the Anveshna science competition in Bangalore. Fitting a drain into the roof, the boys channelled the rainwater into a drum covered with a cloth to filter out solid impurities. The water collected in this manner was then used for household chores. Now, inspired by a Discovery channel programme he saw a month ago, Manjunath is working on building a motor for a water pump. He is in the process of taking apart and researching two motors, one from a car and the other from a scooter, for his innovation. If the project is successful, he intends to take the model to the Science Centre.

Manjunath thinks he has grown in many ways since his first exposure to Agastya, both in the things he has learnt as well as in confidence. He has begun to understand the importance of community service and cleanliness, for instance. When a sewage pipe in his neighbourhood burst, he approached the BBMP to have it fixed. This would not even have occurred to him in the past, he says.

Manjunath's parents, meanwhile, are delighted with the change in their son, who dreams of becoming an electronic engineer and conducting research. They approve of him thoroughly and have promised to support him all the way.

Manjunath A

Age: 15 years

Student of: Standard 9, Government High School, Yelahanka, Bangalore

A Firefly

for his project on rain water harvesting

Yes to Why

Ink on Paper

CURIOSITY

Netravati Ganji
Age: 18 years
Student of: Second PUC, KLES Saunshi College, Dharwad

A Firefly
for making ink from a ubiquitous wild plant

"There is science in everything," says Netravati, whose exposure to Agastya began when the Agastya Mobile Van first visited her school where she was in Standard 6. Although she had no interest in science at the time, Netravati began visiting the Agastya Science Centre every day when it was set up in her village. She enjoyed handling the models and liked that the teachers were friendly and helpful.

When Netravati was in Standard 9, she attended a workshop at the Science Centre in Hubli, where she heard about the national science competition IRIS. Deciding to compete, she approached her Agastya instructor with her observation that the seeds of the *Basala alba* plant that children play with leave a purple stain on clothing. From this was born her project on natural ink.

Netravati and a friend collected *Basala alba* seeds and extracted the juice. Preserving the liquid posed a challenge. Upon the advice of their teacher, they added vinegar and distilled water to the concentrate and boiled it until they were left with a thick residue. To compare the durability of their natural ink with that of commercially available ink, they filled a pen with each type of ink and wrote until the pens ran dry. They also conducted a blotting test using three kinds of paper and a viscosity test that revealed that their ink flowed more slowly than store bought ink. Netravati's natural ink blots less and can be used to write four pages more than the same amount of store bought ink.

Netravati carries a little bit of Agastya everywhere she goes. She explains things she has learnt to her younger siblings and continues to participate in competitions such as DC Dynamo, where she makes and explains her low cost models.

Yes to Why

Just Saying No

CURIOSITY

The easy availability of alcohol in her neighbourhood always bothered Renuka. So when the 'Can the Child Do It' project came up at the Agastya Science Centre, she decided to take action against the wine shops in her village of Annigeri. Renuka's stand is simple – she proposes that shops open only in the evening. This way, people would not be tempted to stay home drinking rather than go to work in the morning. Behind her passion lies the conviction that it is invariably women who experience the violence and hardships that result from alcohol abuse. She believes that rather than approaching the Municipality individually, the community must be mobilised to act in unison. If she does not succeed this time, she says, she will bring about the change by becoming an IAS officer – she will opt to be placed in a rural area without amenities so that she can really make a difference.

Last year, Renuka created a power card system as her entry to Agastya's Jignyasa science fair. The system incorporates the use of recharge cards for household electricity in much the same way as cards are used to recharge currency on mobile phones. She demonstrated this using a multi-component model that rotates while it is charged and sounds an alarm when currency runs low. The idea emerged when her parents went out of town without her; the electricity bill came home and she found herself without the money to pay it.

Renuka Badiger
Age: 15 years
Student of: Standard 9, Ningamma High School, Hubli

A Firefly
for taking action against wine shops in her village

At Agastya, children have the opportunity to learn a lot more than just science, Renuka says. "You learn about social and community involvement by planting trees, helping the poor and making people literate," she adds. She recently participated in a quiz competition where she won first prize. Her parents were thrilled at their daughter's success and hope she remains a winner always.

Looking to Observing

The Buzz with Oranges and Lemons

CURIOSITY

Santhosh Banakar

Age: 17 years

Studying for: a Diploma in Electrical and Electronics, SJS High School, Hubli

A Firefly

for using orange peels as a mosquito repellent

Santhosh's first exposure to Agastya was when he was in Standard 5. He had once seen an engineering student's model of a fan that switched itself on using solar energy when the temperature crossed a certain point. Assisted by his Agastya instructor, he took the concept further by incorporating a sensor to switch on and off the fan as the temperature increases or decreases. Santhosh thinks the innovation, selected for the INSPIRE awards organised by the Government of India, would be especially useful for bed-ridden patients in hospitals.

Inspiration for projects may crop up quite unexpectedly. He was once sipping juice at a local shop when he noticed there were fewer mosquitoes near a pile of orange peels than elsewhere. Natesh, an instructor at Agastya, encouraged him to research his observation for the national IRIS competition. Thus began a string of experiments that involved cutting, boiling, powdering and extracting the oil from citrus peels. Santhosh went on to discover that his fresh peel oil repels mosquitoes for up to seven hours and that lemon peel oil is even more effective. He now hopes to monetise his safe, eco-friendly mosquito repellent.

In Standard 6, Santhosh studied the effects of bio-fertiliser versus chemical fertilisers on people. The project, which took him to Nagaland, involved a survey that showed that an increasing number of farmers were resorting to chemicals, thereby increasing consumers' risk of illness.

Santhosh's family does not share his enthusiasm for science and experimentation. His mother wants Santhosh to contribute to the household income now that his father has passed away, instead of using his prize money to finance his education. "Everyone has hardships," he says gravely. "We have to be able to look past problems and work towards success."

Yes to Why

Harnessing the Power of the Sun

Akash's association with Agastya still feels to him like a dream come true. Akash's father works in a hotel and his mother is a housewife. When the owner of the home his family rents installed a solar water heater on the roof of the house, he told his Agastya instructors about it immediately. They suggested he collaborate with his friend Jay Prakash and together they built Agastya's first solar water heater model.

The boys used four light bulbs, a glass panel and a drum. When placed in the sun, the panel heats water placed in the drum. Akash also learned to explain the working of his model to visitors at a science competition organised by Agastya.

Akash is now working on an experiment to electromagnetise an iron nail and is also building a model of a generator from a bicycle. Apart from that, he is very interested in mobile repair. He has observed mobile technicians at work and hopes to make big machines and improve mobile technology. Becoming a scientist has been his lifelong ambition. Making a movie with Amitabh Bachchan alongside would be pretty cool too, he laughs.

LEADERSHIP

Akash Sharma

Ages: 14 years

Student of: Standard 8, Government Higher Primary School, SR Nagar, Bangalore

A Firefly

for building Agastya's first solar water heater model

Passiveness to Exploring

Exploring a Wonderful World

LEADERSHIP

Chandini M

Age: 13 years

Student of: Standard 9, Government High School, Bangalore

A Firefly

for building a low cost pulley for women in the village to draw water with

"The most amazing moment of my life was when I presented my AC DC dynamo model. It was the first time I received appreciation for anything," says Chandini, her eyes welling up at the memory of the Agastya Science Fair sponsored by Hewlett Packard (HP).

Chandini loves working on models. She had been reading about dynamos when she was selected for Agastya's Young Instructor Leader (YIL) training in Standard 8 and happened to mention to her Agastya instructor that she was keen on making one. She thought it would be difficult but got around it with her instructor's assistance. "Models help you get on the inside and really learn (a concept). It's a wonderful world," she says. In 2012, Chandini attended a science competition as a YIL, which she loves being. "Everyone who comes here starts thinking about innovating something and now everyone wants to become a YIL as well," she says. Her own innovation is a periscope made from low cost materials from the local hardware store. The idea came to her as her brother and she stood waving to their father who was reversing the car out of their compound one morning. Worried that he might crash into something, she wondered what it would be like if he had a gadget that allowed him a good rear view. Chandini has also made an inexpensive pulley that makes drawing water from a well less exhausting. She demonstrated this at the HP fair, explaining the mechanism to visiting students, teachers and even scientists, and was awarded a certificate for her performance.

When she grows up, she would like to become a scientist or a police officer. A lady sub-inspector delivered a very inspiring talk at her school once. Now, Chandini would like to work for social justice too. "The syllabus is difficult," she says, looking unperturbed.

Fear to Confidence

The Radio Star

LEADERSHIP

Idayath has been an active presence at the Agastya Science Centre since he was in Standard 8. His life took a new turn when Agastya conducted a workshop with Radio Active, a community radio station. Here, Idayath met people who offered him the opportunity to train as an RJ at the station. He is now also learning to edit with Audacity. His show, *Active Job*, an employment related programme, was on air for two months. His eyes light up as he recalls the people he interviewed, the calls he received, the fan base he built and the response his Facebook page has garnered. Now that his programme is no longer on air, Idayath is not resting on his laurels. After participating in Agastya's weeklong waste management workshop where he learnt about the classification, segregation and disposal of waste, he took his friends from the radio station to the waste management facility at Nayandahalli. The boys subsequently conducted a workshop on hygiene for the staff there. As a result, the workers now use protective gear while handling the refuse.

Idayath dreams of discussing political controversies as a news anchor on a popular television channel. His guardians do not believe he will amount to much but like his role models Sir M. Visvesvaraya and President Kalam "who went so far despite not being rich," he is driven by determination. This Children's Day, he has been invited to anchor a programme on a popular Kannada TV channel. He has also been approached to act in a TV series but has not responded for fear of "disturbing school".

"I haven't got the words to describe how much Agastya means to me. Everyone here is my friend," he concludes, with palpable emotion. And then, with very little prodding, he bursts into a song he has composed himself. Throwing his head back, he sings about the fragrance of a humble jasmine that touches everything around it. Idayath lives with his aunt, a housewife and his uncle, a fruit seller.

Syedh Idayath

Age: 16 years

Student of: Standard 10, BBMP Boys' High School, Bangalore

A Firefly

for becoming an RJ in a radio station

Fear to Confidence

Crusading Against Child Marriage

LEADERSHIP

Karishma Bagwan
Age: 16 years
Student of: Standard 10, G.G. High School, Jamkandi, Bijapur

A Firefly
for intervening against child marriage

Karishma currently bears her family name but intends to switch to Kalpana Chawla, after the brilliant and intrepid astronaut, some day.

Always an exceptional student, scoring well over 90 per cent in math and science, Karishma was first exposed to Agastya when she was in Standard 9. She confesses to learning mostly by rote before, with very little real understanding. At Agastya, she began to grasp concepts. One day, after she explained a math problem at school, her classmates told her she would make a fantastic teacher. She has been helping them with math and science ever since.

Karishma's pet cause is education and her pet peeve, child marriage. Accompanied by her Agastya instructor, Karishma spoke about the importance of education and the ills of child labour in an effort to raise awareness about schemes and incentives for education. She told her audience in five schools about government scholarships and programmes for students who attend and do well at school. The initiative won her a certificate and books at Design for Change, a global competition introduced to her by Agastya.

Her brush with child marriage had a less happy outcome that still leaves her bristling. Her neighbour proposed to give her young daughter away in marriage. Karishma did all she could to reason with the woman but to no avail. Although her failure to prevent the marriage was a bitter pill to swallow, Karishma remains resolute. "With confidence, you can achieve anything," she maintains.

Fear to Confidence

The Young Mentor

LEADERSHIP

Of the many skills Kavitha has acquired in the three years since she came into contact with Agastya, it is of her teaching ability that she is most proud. During her training as a Young Instructor Leader (YIL), her instructors there encouraged her to teach her peers at the Agastya Science Centre. Kavitha taught close to 50 children from Standard 6 to 8 about light and light dispersion in a prism, reflection, refraction, distribution of light, retention of light in the ozone layer and the depletion of the ozone layer. She smiles as she recalls that her students say she is a good teacher.

Over the years, Kavita has begun teaching other subjects as well. She borrows science and social science models from Agastya because she feels they help her students grasp the concepts better. Her teachers are so impressed by her presentation ability that that they invariably chose her to make presentations on various topics to her class.

Kavitha's ambition in life is to eradicate crime, corruption and terrorism as a police officer. Her parents are happy to support her. In the meantime, she reads about the universe and dreams about what it would be like to travel and live on a completely different planet.

Kavitha Hadapad

Age: 15 years

Student of: Standard 10

Adikavipampa Higher Secondary School, Hubli

A Firefly

for teaching her peers science

Yes to Why

Melting Moments

LEADERSHIP

Manoj M

Age: 14 years

Student of: Standard 9, Government High School, Bangalore

A Firefly

for his working models of furnaces hot enough to melt aluminum foil

A frog jumped into a well with 30 steps. How long will he take to get out of the well if he jumps three steps up and two steps down a day? Manoj was quick to calculate the answer to this and other questions posed at the Agastya selection process two years ago. Now a Young Instructor Leader (YIL), he recently made a working model of an electric arc furnace. Using a clay pot, carbon rods obtained from battery cells sliced apart with a large knife, wire and salt water, Manoj can generate heat over 4,000 degrees centigrade.

The idea was born from a class discussion on the properties and uses of metals during which he learnt that iron is melted in large arc furnaces. Back at Agastya, Manoj and his friend Naveen approached their instructor Maltesh with the desire to make a model of an arc furnace. Maltesh Sir was encouraging but cautioned them about the need for protective gloves because they would be exposed to ultraviolet rays. After a little trial and error, the boys were thrilled to find their model worked. They could easily melt aluminium foil and chocolate wrap! The model won fourth prize at a fair held at the Rotary Club and has also been displayed at a school science exhibition, where both boys took turns explaining it.

Manoj's mother is a High Court advocate and his brother is a software engineer at IBM.

Manoj's mother and brother are very happy that he is constructively occupied after school. Manoj for his part could not be happier. He loves making models and plans to come to Agastya even as an adult. "I want to take up science after Standard 10 and then become a member of the Agastya Foundation. I would like to work at the Science Centre," he says. Eventually, he intends to become a scientist like his role model Albert Einstein and invent something "that can be useful to the nation".

Yes to Why

Reinventing the Traditional

Megha became acquainted with Agastya when the Agastya Mobile Van visited her school a year ago. Now a Young Instructor Leader (YIL), she has visited the Agastya Science Centre several times and is particularly fascinated by the dynamo model. Handling the models and conducting experiments got her thinking about making her own innovation.

One day, after observing how much the women in her village struggle with operating the hand pumps, she decided to develop a more ergonomic design that would cast less of a strain on the user's back and limbs. Megha and three of her friends experimented with PVC pipe, string and a pulley system that causes the water to travel through the pipe when the string is pulled. As it does not require the user to bend, water is drawn with much less effort than with a traditional hand pump. To her pride, the model, constructed with the help of her teachers at school as well as her instructors at Agastya, was presented at the Agastya Science Fair held in Electronics City. Megha lives with her aunt in Bangalore. The rest of her family lives in the village. Her father is a farmer and her mother, a housewife.

Megha has always been interested in science but that is not all she learns at Agastya. She is learning computers, which her school does not teach and is also learning to take pictures, write a script and shoot a movie. Both are activities that she enjoys so much that she is torn between choosing to become a software engineer or a film star. For now, she is happy to imagine becoming an engineer who acts in her spare time.

LEADERSHIP

Megha K.S

Age: 14 years

Student of: Standard 9, Government High School, Hebbal, Bangalore

A Firefly

for creating a hand pump using easily available material

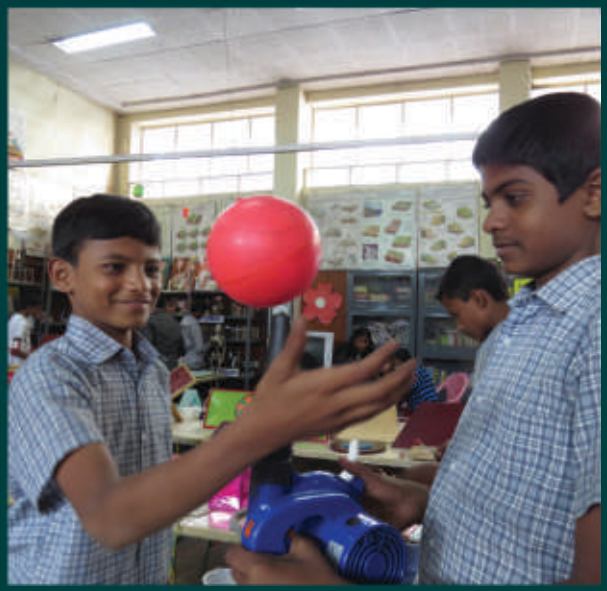
Passiveness to Exploring

PASSION AND FREEDOM OF SPIRIT

ANYTHING IS POSSIBLE

THE
MAGIC OF
BELIEVING

SELF
ILLUMINATION



Shining a Light

LEADERSHIP

Muskan Ingalagi

Age: 14 years
Student of: Standard 8, RMSA Kundgol, Dharwad district

A Firefly
for tutoring children forced to drop out of school

"Don't throw away your old and damaged electronic goods! Give them to us, we're building a laboratory in our school!" The children's voices echoed through young Muskan's village as her friends and she travelled in a hired vehicle with a mike to collect equipment. Their efforts resulted in the accumulation of six television sets, a laptop, radio, watches, batteries, cells, wires and 12 bulbs. These were then cleaned, dismantled and assembled into models of all sorts for their school laboratory.

Muskan, who was a Young Instructor Leader (YIL) at Agastya and has participated in several competitions such as Prayoga, is convinced "there is nothing like Agastya" because it "nurtures you like a mother nurtures her child". She described how she neither knew nor cared in the least about anything science-related until she began visiting Agastya.

Inspired by the way Agastya reaches out to thousands of children, Muskan now tutors children who have had to drop out of school to work in the fields. Everything she learns, she shares with them. She teaches an average of 10 students from six to seven every evening. If a child fails to show up, she sends another student to fetch them and demands to know why the child did not come. She has already taught 20 children. To her enormous pride, she has persuaded the parents of six of them – four boys and two girls – to re-enroll them in school and refuses to give up working on the ones whose children are still out of school.

Muskan's father is a daily wage labourer and her mother is a housewife. Muskan dreams of becoming a scientist and using science as a base for everything she goes on to innovate.

Passiveness to Exploring

A Whole New World

LEADERSHIP

Pavithra has come a long way since her first exposure to Agastya five years ago. Neither of her parents was particularly keen at first. The turning point came when Agastya invited her parents to her demonstration on using agricultural waste to make paper as part of her project for the national Intel IRIS competition. She made the model at the Agastya Science Centre and to her parents' pride and joy, presented it before the entire school. That got her parents interested in seeing the Science Centre. They are most supportive now.

The IRIS competition in Mumbai presented another big opportunity for Pavithra. Although she was thrilled at the prospect of participating, she was quite certain that her parents would never allow her to travel to the big city. Enter Chaya and Natesh, her instructors at Agastya. They persuaded her parents to see this for the fantastic opportunity it presented and off went Pavithra to Mumbai for the time of her life, making friends and sharing ideas with students from across the country.

Grinning, Pavithra recalls how much she disliked science before. The environment and the teachers at Agastya were different. She was encouraged to see, touch and share her thoughts. She found herself outgrowing her shyness and her fear of asking. She became more involved. Her grades shot up. She loves it because there is always something new to learn. And learning that she has nothing to fear has been among the biggest lessons yet.

Pavithra Sarvandi

Age: 16 years
Student of: First PUC, Bijapur

A Firefly

whose agricultural waste to paper project widened her horizons

Fear to Confidence

Finding Happiness Everywhere

LEADERSHIP

Pramod Melmari

Age: 12 years

Student of: Standard 7, Nigamma S. Hugari Primary School, Annigeri, Hubli

A Firefly

because of his adult education project he initiated in his village

Until a few years ago, Pramod found science boring. He neither understood the subject nor saw the point of it. Why should he care about Newton's laws, he wondered. Anyone could make a law. At the Agastya Science Centre in Hubli, set up in partnership with the Deshpande Foundation, Pramod began to understand. The models helped, he says, as did the teaching methods and the willingness of the instructors to answer questions. Making laws is not the point, they explained. Laws must be backed with proof. Science matters because it is offers proof. And it is everywhere in our lives.

Communicating in fluent English with a trace of a British accent acquired from language tapes his father plays at home, Pramod's views belie his years. He once asked his Agastya instructor how Annigeri could possibly become a taluka when it has such a large illiterate population. The instructor suggested he write the question down and discuss it with his science teacher and school principal. What followed is the child's Akshara Lokadahchinnar Chitta Anaksharasta programme, an extraordinary initiative to promote adult literacy.

Pramod and three of his friends went door to door inviting people to what they described as "a project everyone would benefit from". When their audience gathered, Pramod climbed on a stage they had rigged themselves and began to speak about the problems of illiteracy. He told the gathering that his friends and he would teach elementary reading and writing, first in Kannada, and then in English. Those who want to learn more are encouraged to use their children's books.

Pramod's initiative has been commended highly by his school and his neighbourhood. "I want to do more projects like this," he says, lighting up as he launches on a description of his next idea, waste management on his street. He dreams of meeting President Abdul Kalam and studying stones and rocks. "Happiness can be found everywhere," says the little boy with big dreams, "in work, in nature, even in cooking!"

Yes to Why

Winning All the Way

LEADERSHIP

The first time Pranesh saw a science model was in the Agastya Mobile Van three years ago. The experience has had a "huge impact" on his life, he says, going on to describe the numerous awards and accolades he has won over the years. The list includes first place at an international math competition, second place at a science quiz in Bijapur and at a taluka level competition for his model on the greenhouse effect, among others.

"People toss bottles and other waste on to the road. This is what I use to make my models," he explains. His model depicting the manner in which static energy converts to kinetic energy was awarded a cash prize at Agastya's Jignyasa science competition. He has also won a cash prize at a national level science competition. Pranesh uses his models to help those who have never had the opportunity to go to school to grasp science concepts. "There is a shop that sells expensive models here. My models are low cost and I use them to teach others," he says, adding that "the journey is one of discovery. Like Madam Curie, you set out to find something but may end up discovering something quite different instead".

Pranesh's father is the headmaster of a government school and his mother is a homemaker. His role model is Mr Santhosh Hegde, the former Lokayuktha. He would like to become an IAS officer and fly in a helicopter, while he is at it. His father had wanted to become a civil servant too but his family could not afford it. Now Pranesh hopes to accomplish his father's dream and be remembered for weeding out corruption, particularly as it pertains to food adulteration.

Pranesh Kannolli

Age: 16 years

Student of: Standard 10, Government Boys' High School, Bijapur

A Firefly

for his award-winning low cost models

Passiveness to Exploring

The Neighbourhood Go-to Girl

LEADERSHIP

Subhashini Kadamur
Age: 12 years
Student of: HPS, Vishwarnagar, Hubli

A Firefly
for her Call to Clean project

Subhashini's years belie her talent and creativity. As one of three students chosen by Agastya to compete for the Government of India's INSPIRE awards from her school, this Young Instructor Leader (YIL) explained Faraday's Law with a model that harnesses wind energy for drip irrigation and solar lighting. Explaining the model, she says wind energy sets the windmill in motion causing the magnets in the motor to move, thereby creating an electrical current through induction that causes an attached lamp to glow.

In September 2013, Subhashini's Call to Clean project for the national Design for Change competition she was introduced to at Agastya, received widespread recognition. Inspiration for her project struck as she and a friend picked their way through the littered streets on the way to school. They discussed the problem with their teacher Nagarathna, who advised them to find and call the Hubli Dharward Municipal Corporation's toll free number. Having done this, they pasted the number on the overflowing dustbins. The dustbins were emptied by the Municipality a few days later. Other residents now contribute to the cleanliness of the neighbourhood, calling the number whenever a dustbin fills up. Subhashini proudly reports that her area Madhavanagar is far more clean than it has been in a very long time. Her next project is to fix the flooding that keeps occuring at her school. She proposes to do this by taking up a collection for money that will fund the filling of cracks in the boundary wall.

Not one for all work and no play, Subhashini also wants to defeat the reigning champions at kabadi and hockey. As for the future, she is torn between becoming a doctor and a lawyer – her parents would rather she opted for medicine but becoming a lawyer means she could wear a blazer! Subhashini's father is a barber and her mother is a housewife. Either way, her advice to other girls is something she practices in her own life – "Strive to achieve something, come forward!"

Fear to Confidence

Making Music from Nothing at All

PROBLEM SOLVING

Having seen the Agastya Mobile Van about 15 times in three years, Akash is a boy obsessed with electronics. At the Agastya Science Centre, he made a model of a heat switch whose sensor turned a light on if an animal entered the house. Another time, he worked with a team to make a robot.

Akash's father is an auto driver and his mother is a tailor. One of Akash's favourite things to do during the school holidays is go to the electronics store with his friend Siddharth to observe the technicians at work and use scrap found by the roadside to create his own inventions. A remote controlled toy car found in a gutter might long since have stopped running but its parts would do just fine for one he made himself. Another time, he came upon a rusty, damaged iPod. His own music came from a mobile phone but a friend had fragments of the same gadget. Despite never having seen a whole, functional iPod before, Akash examined the chip and pieced the missing parts together in his mind. The boys began saving up to buy a soldering machine from Siddharth's father, at whose shop Akash had learned to solder. The tinkering continued relentlessly until one day, a light came on. A speaker from another find, a battered old television set, was connected next – and the 'iPod' played.

Experimenting, learning, taking apart and putting together are far from all he does. Akash also teaches. At Agastya's model making competition Jignyasa, he explained and answered questions about the working of a flour-grinding machine they had built at the Agastya Science Centre. He has also conducted a class on the production of sound for 70 Standard 5 students. He says he was not nervous but did take an older boy that everyone was scared of, just in case.

Akash Hanumatsa
Age: 13 years
Student of: Standard 7, Government Primary School, Nekarnagar, Hubli

A Firefly
for creating an iPod using electronic scrap

Yes to Why

Driving Change

PROBLEM SOLVING

Harsha Hiremath

Age: 15 years

Student of: Standard 10, PB High School, Jamkandi, Bijapur

A Firefly

for generating electricity from a moving vehicle

Harsha, who has been visiting the Agastya Science Centre for two years, is a girl of many talents. Her writing skills took her to a state level essay writing competition in Bangalore, where she wrote about the dowry system. Passionate about environmental conservation, she has persuaded her uncle and neighbours to switch from chemicals to bio-fertilisers. Now, her uncle has a compost pit where he recycles agricultural waste. "If we take care of the environment, it takes care of us," she says earnestly.

Harsha is very interested in making low cost models. One of her creations, developed with the help of Agastya instructors, was an embryo system fashioned from coconut shells into which she stuffed cotton wool shaped and coloured to look like a baby. She made nine of these to depict each stage of a baby's development in the womb. She has also made a model of twins. She presented the models both at school as well as at an exhibition organised by Agastya in her village, much to the pride of her grandmother and uncle, with whom she has lived since she was orphaned. Harsha has also participated in Agastya's Jignyasa competition, making a model to demonstrate how electricity may be generated from vehicles using air by fixing a fan to a vehicle and connecting it to a battery. The fan was set in motion by the moving vehicle, thereby generating electricity that was stored in the battery. Harsha says the energy stored this way may be used to run the air conditioner and other parts of a vehicle.

"Technology has advanced so much that we can now instruct robots to work for us, leaving us free to use our minds to the maximum," she says. She hopes to serve the country and shape young minds as a sociology lecturer when she grows up.

Yes to Why

Not a Drop to Waste

PROBLEM SOLVING

Madhusudan was selected for Agastya's Young Instructor Leader (YIL) programme two years ago on the basis of his logical thinking and memory skills and his excellent performance in math and science. His big new discovery at Agastya was the world of stories through the storytelling workshop, at which the children were shown pictures on a laptop and instructed to write about them. The staff then told the children stories. Riveted, Madhusudan soon began writing his own stories. He has written four stories so far, one of them about summer at his grandmother's house. His grandmother is his favourite storyteller. He has also been learning music and can now sing scales and Kannada *kirtan*.

Madhusudan was learning about natural resources and their management at school when it occurred to him to make a rainwater harvesting model. He discussed the idea with his instructor at Agastya and assembled it using thermacol, glue, plastic bottles, plastic straws and wooden twigs. "Rainwater wasted is water down the drain," he explains. Although he has not participated in a fair or exhibition yet, Madhusudan has learnt to explain his model with immense confidence. He is buzzing with ideas for more innovations. All he needs is "technical support", he says. And he is "sure that Agastya will give" him that.

Madhusudan's father is a helper at a hotel and his mother is a tailor. When he grows up, Madhusudan wants to be a researcher. Convinced that the best way to conduct research is with computers, he is currently learning computer basics at school. He hopes to pursue a professional course eventually. His sister has completed a computer course recently so he already knows where he is headed.

Madhusudan G

***Age*: 14 years**

***Student of*: Standard 9, Government High School, Yelahanka, Bangalore**

A Firefly

for his storytelling skills and his inventions on rainwater harvesting

Passiveness to Exploring

Extraordinary Gifts

PROBLEM SOLVING

Santhosh Kudalagi

Age: 13 years

Student of: Standard 7, Adarsh Vidyalaya Khalaghatagi, Dharwad district

A Firefly

for reciting the national anthem in sign language and for creating a water purifier

Attending the Agastya Summer Camp was a life changing experience for Santhosh, who loves science models and is a big fan of scientists. Now, he not only has access to all the models he wants but was also persuaded to test for Agastya's Gifted Children Programme sponsored by the Government of India. As challenging as the exam is, with tests for mental and creative ability, it was a cakewalk for Santhosh – the boy who has recited the national anthem in sign language to large audiences walked away with the first prize.

Among Santhosh's models is a water purifier that won second prize in a competition. He made it using three pots with a hole, wadded over with cotton, at the bottom of each. The first pot held charcoal, the second, sand, and the third, stones. When topped up with dirty water, the charcoal, sand and stones absorb and filter out the dirt to provide clean water. Thoroughly impressed, his friends and teachers were convinced from the start that he would win. As Santhosh says, he "felt very love".

Santhosh has another extraordinary talent – he can recite his times tables in reverse order and backwards simultaneously. When the local MLA's private assistant, who happens to be Santhosh's neighbour mentioned this to the MLA, the boy was invited to recite his tables before the MLA, his assistants and several others. So impressed was the MLA by his unusual abilities that he offered Santhosh a cash award of Rs 10,000. About 50 people accompanied him from the MLA's office to his grandmother's house, and handed her the sum with much fanfare towards his further education. Santhosh's father has passed away and he is being raised by his aunt.

Textbook to Hands On

A Model Teacher

PROBLEM SOLVING

Orphaned at age 10, Shubham, who lives with his grandparents, looks upon Agastya as his second home. His instructors there have always encouraged him to become an engineer or a scientist and knowing that he lacks the means, "took care" of his fees from Standard 8 to 10.

The first time Shubham participated in Agastya's Jignyasa science competition was when he was in Standard 9. His model, demonstrating how garbage may be used to generate electricity did not win but the experience spurred him to try harder. In Standard 10, he demonstrated the use of the *balantis* fruit as a stain remover for clothes. Shubham collected, peeled and soaked the fruit, filtered the sap and sun-dried the residue to remove odour. His organic fabric stain remover won second prize – Rs 6,000! – at the competition, which he used to pay his fees.

No longer eligible to participate in the competition himself since he finished school, Shubham now mentors other children in science. In 2012, his student Vineeth won third prize for a project on the sustainable use of natural resources. This year, he is helping Pramod, another boy from his village, to make a model of the carbon cycle.

Shubham chose to pursue a diploma so that he can get a good job. Always a star student, he continues to excel, earning a first class in his first semester and distinction in his second and third semesters. He hopes to take the CET exam and continue financing his engineering studies with the *dakshina* he is offered for performing *pujas* in the tradition of his priestly family. Participating in the ISEF international competition in the USA remains a cherished dream for the young man who is also determined to give something back as a volunteer staff member at Agastya for the way it "supports and inspires students and acts as a springboard to higher things".

Shubham Pawar

Age: 18 years

***Student of*:** Second year student of Diploma in Computer Science and Engineering, CBC Rural Polytechnic College, Bijapur

A Firefly

for mentoring other youngsters in science

Textbook to Hands On

Of Wire Stethoscope and Breathing Balloons

PROBLEM SOLVING

Shwetha Kudari

Age: 14 years
Student of: Standard 9, SGRC High School, Noolvi, Hubli

A Firefly

because she taught the respiratory system using balloons and string

Shwetha is a girl on a mission. She was selected for Agastya's Young Instructor Leader programme (YIL) when she and her team made a bridge from the bundle of straw left to them to use as they deemed fit. Shwetha had read about the difficulties of travelling and transporting goods across rivers. The answer, she believes, lies in building bridges.

The YIL, who regularly teaches her peers, says that teaching science helps her to understand her favourite subject even better. She recalls making a balancing doll to explain the centre of gravity. Another time she taught the respiratory system with a model built from two balloons and a string connected to a third balloon at the lower end. Pressing the lower balloon causes the air to be released from the upper balloons, just as it would in the human diaphragm and lungs.

With parents who support and encourage her, Shwetha is an old hand at fairs, exhibitions and competitions. She has participated in a quiz, fancy dress and Agastya's Jignyasa competition in 2012. She demonstrated low cost model making techniques on items such as a stethoscope made from wire, at a science exhibition in Dharwad and won first prize in a map drawing competition at her school.

Making models takes up most of her spare time. Shwetha has begun to enjoy science so much that she has decided to pursue the subject in high school with computer courses alongside so that she can become a software engineer.

Yes to Why

Restoring the World to Health

PROBLEM SOLVING

Never one to sit around, Swapna has always liked fixing things, especially during the school holidays. A year ago, when a friend told her she could do this and more at Agastya, the teenager signed up immediately.

"I always had a lot of ideas but didn't know what to do about them. Agastya gives life to my ideas," she says, recounting how, when she happened to mention that she had made a cardboard rocket, her instructor urged her to try her hand at a working model. She has also learnt about hygiene, sanitation and the importance of conserving resources. Now, she closes taps left open and protests when garbage is dumped or water is left to stagnate in the vicinity. "We learn why we should and shouldn't do certain things," she says.

Swapna's father paints houses and her mother is a housewife. Swapna's three siblings all want to become engineers but she is determined to become a nurse. Her mother has had pneumonia twice and she herself had it once. Although seeing her mother struggling to breathe was a nerve-wracking experience, she considers herself fortunate that her family can afford healthcare. "There are so many people who live in slums. They cannot afford to go to hospital and people treat them badly," she says. As a nurse, she would be able to take care of her mother, her neighbours "if there was an emergency next door," and anyone who could not afford to pay for care. "It is a noble profession," she says. "And if it turns out that I don't enjoy it all that much, maybe I will switch to engineering".

Swapna A
Age: 16 years
Student of: Standard 9, Featherlight Government High School, Bangalore

A Firefly
because of her initiatives to save water and against indiscriminate garbage dumping

Textbook to Hands On

Shedding Light on Superstition

PROBLEM SOLVING

Triveni D

Age: 14 years

Student of: Standard 9, Government High School, Hebbal, Bangalore

A Firefly

because of her model that depicts the lateral shift of light

Triveni, recently selected as a Young Instructor Leader (YIL) by Agastya, likes recounting the story of her selection. "They asked us general knowledge questions and looked at how active we were. I was selected because I'm very interested in science and could answer all the questions," she says. Triveni's father is a driver and her mother is a homemaker.

Triveni's latest model depicts the lateral shift of light. She made it using a prism and coloured sticks and was thrilled to be selected to exhibit it at the HP science fair supported by Agastya, where she explained its workings to the visitors. She has begun teaching her classmates science and has also been taken to explain her model in other schools.

Like her friend Jay Prakash, Triveni too has been active in dispelling myths and superstition in her community. "There is a lot of superstition out there. People think it's magic but there's nothing magical about a combination of lead nitrate, potassium and iodine changing colour when it is mixed together with water," she says.

Triveni is fascinated by computers, particularly laptops, and wants to become a software engineer. Her school does not offer computer science but she is unfazed. "I want to get good marks in Standard 10 and study computers and have my own laptop," she says. She has informed her father that she intends to study, find a job, work and earn well before anything else. "I won't marry until I am well settled in a good job. I want to support my family," she concludes.

Yes to Why

Rennaissance Girl

Vajreshwari has been coming to Agastya since she was in Standard 5. "I used to be quite silly before I came to the Agastya Science Centre. I didn't know anything about science, models or practicals. I couldn't speak English. I speak better English now. I really like science, and watch programmes on Discovery channel. That's how I learnt about Stephen Hawking", she smiles.

Hawking is clearly Vajreshwari's role model. She quotes him as saying that one's thought processes are in one's own hands. Considering her grades have leaped from B to A+, it is clear that she has internalised this. It is not just her grades that have shot through the roof, though. Vajreshwari is now a prize-winning debater and is keen to participate in more science competitions. At a science exhibition in Annigerri, she presented a project on acids and bases using litmus paper. With all these myriad interests, Vajreshwari still finds time to dance, sing, paint and win awards for these as well. She likes listening to Justin Bieber, Christina Aguilera, Shakira, Akon and Britney Spears.

Vajreshwari's father is a clerk in a warehouse and her mother is a housewife. The future is clearly rife with infinite potential. Vajreshwari definitely wants to join the Design for Change programme and bring about change in her village by having the local Public Works Department (PWD) unclog the sewers, for a start. She wants to conduct research on atoms, black holes and outer space and she intends to travel the world, because as she says, "if we don't travel and understand our own world, how will we learn about other worlds?"

PROBLEM SOLVING

Vajreshwari Narayanapur

***Age*: 14 years**

***Student of*: Standard 9, Ningamma S. Hugar High School, Annigerri Hubli**

A Firefly

for being a prize-winning debater

Yes to Why

TEACHERS

Learning to Teach

Mr Shashidhar

teaches math and science at New High School, Hubli.

"Students from Standard 8 to 10 go twice a month to the Agastya Science Centre in Hubli so that they can understand science better. Agastya also conducts numerous other events and competitions, such as science fairs, speech competitions and the Young Instructor Leader (YIL) programme. My students have a better grasp of some concepts than I do because of their exposure to the models at the Science Centre.

Before, I used to teach right out of the textbook but now I begin with examples from the children's daily life before progressing to more specific topics. Now that they are using models, my students can write pages on a concept. Developing a better understanding of the subject has increased their confidence. Now they are capable of choosing a concept, collecting material for a model on it, taking notes and teaching it to the class. They are also far more confident about speaking on stage and many are now giving speeches and anchoring programmes at school. Attendance at school has also increased, with the maximum number of students showing up on the day that they are scheduled to visit the Science Centre.

The government should help Agastya expand its reach and create more initiatives just like this."

"The teaching of teachers trained (in the Agastya methodology) has improved. They implement their learning in the classroom with teaching aids and low cost models. After being exposed to Agastya, a science teacher in KGS Selawadi collected parts and made his own overhead projector. This training, experimentation and experience has given the teachers the ability to do such things."

- **Basavaraj S. Mayachary,** Block Education Officer, Navalgund Taluka, Hubli

Experiencing the Truth

Mr Ravindra Zalaki

teaches science at Government High School, Station Road, Bijapur

"Mainstream schools use the lecture method to teach but at the Agastya Science Centre, children learn hands on to construct and use models. They also get to participate in state and district level debates and competitions.

Science is about experiencing the truth. Agastya increases students' creativity, self-confidence, leadership and willingness to speak up in public. The programme has become very popular among the students. After every visit to the Science Centre, the students get together and discuss the subject. I don't know if they do the same for other subjects. One student, Akshay Burapura, was so motivated by the instructors that he scored over 80 per cent in his SSLC board exams, topped the six government schools in Bijapur and won a scholarship.

I have visited the Science Centre four times since the programme began running at my school three years ago. I try to replicate their teaching methodology in my classroom. I made sure to go just before the INSPIRE awards as well, because my students were participating."

"Before Agastya came, we had schools with science equipment but the teachers were not trained to organise or use the material. We tried to provide labs but couldn't. When Agastya came, we started one block with a Science Centre. The objective was to go to the schools and demonstrate curriculum-based experiments."

- **Muragendra Sindhur,** Block Education Officer, Bijapur

Encouraging Aspiration

Ms N.M. Mirza

teaches science at Government Urdu High School (TTI Campus), Bijapur

"Government schools often lack the funds to do better for their students but ours benefit from the Agastya Science Centre. They gain a lot from this. They develop curiosity and a huge interest in science. This is not often the case with children who are not exposed to Agastya. It inspires us teachers as well, by offering more information, particularly on model making.

We used to have a student whose academic performance was very poor. His despairing parents were all set to pull him out of school and put him to work. Once he was exposed to Agastya, his interest in studies grew; he began conducting experiments and making models. He is now in college, doing well for himself.

We notice a definite improvement in the academic performance of at least half the students who are exposed to Agastya. Their comprehension and self-confidence improves, they become less shy, ask more questions and learn to express themselves far better. All, not just a select few children, should be able to visit the Science Centre. Other schools see our students doing well in science and making presentations at science exhibitions, and aspire to be like us."

"Agastya instructors bring chemicals and do experiments that we cannot do here with our limited resources. Our science teachers have less practice (at such methods)."

- Ms Shakuntala Notre, Headmistress, Ramalingeshwar

Like Watching Television

Ms Jadhav

teaches science at MTS Number 4, Kamalapur, Hubli.

"I have had about 10 exposures to the Agastya Science Centre and Mobile Van and it's clear to me that children learn better through experimentation than through theoretical learning. I have now begun to use a combination of the lecture method, models and charts to teach. Some concepts, such as gravity and air pressure are best learnt with experiments and models. For the children, it's like watching television, with it all going on right in front of them rather than their having to mentally visualise anything.

My role is to make sure my students reach the Science Centre on time. The staff there also help me with any difficulties I may have in communicating science concepts to my students. It makes me happy to see the children conducting experiments and learning something new all the time. I used to carry materials like test tubes to school so that the children could see exactly what they looked like, but I don't do that anymore. The children can see them at the Science Centre. The children who have been there keep asking when they can go back. At Agastya, there is a model for everything and the staff always have answers for the children."

"Our children had never been exposed to models and practical activities before the Agastya Science Centre. Now they remember everything they have been taught. They teach the children very well and that too in Urdu."

- Ms N.H. Mulla, Headmistress, Government Urdu Higher Boys Primary School, No. 8, Azad Colony, Keshwapur, Hubli

Glossary of Terms

Agastya:	Agastya International Foundation
BEO:	Block Education Officer
YI:	Young Instructor
YIL:	Young Instructor Leader
Jignyasa:	A state level science model making competition
Intel IRIS:	Initiative for Research and Innovation in Science
Mobile Van:	A van equipped with low cost science models that facilitates access to science education for schools in remote areas
Science Centre:	A resource hub equipped with scientific models
Summer/Winter Camps:	Camps conducted at the Agastya Science Centre during the school holidays to encourage remedial learning and experimentation
HP Science Fair:	Science fair sponsored by Hewlett Packard

Agastya International Foundation

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