Maths Missionary – P. K. Srinivasan

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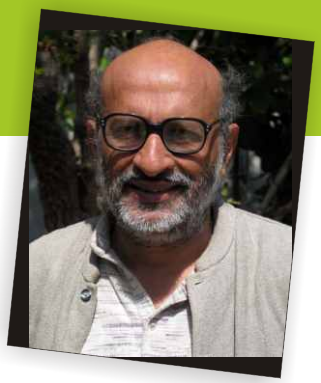


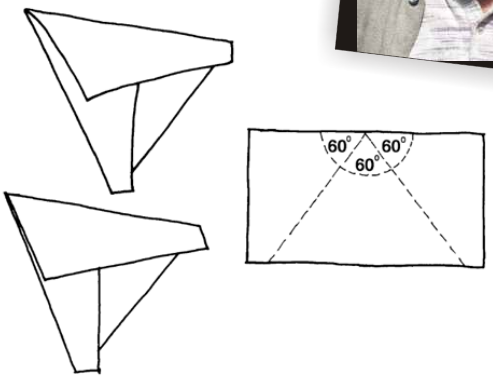
Skills are Taught
Concepts are Caught
-PKS

"From the near to the far, from the concrete to the abstract," is a sound pedagogic approach for learning Math. Before children can understand a thing, they need experience: seeing, touching, hearing, tasting, smelling; choosing, arranging, putting things together, taking things apart. They need to experiment with real things. This is how it's done in Hungary – a small country which has produced some of the world's greatest mathematicians. See this amazing free downloadable video from Teacher TV (http://www.teachers.tv/video/17878).

The greatest proponent in India of learning Math through activities was P. K. Srinivasan (PKS). As a one man Math missionary he did more than anyone else to imbue children with the love for this most beautiful subject Mathematics – the queen of all sciences.

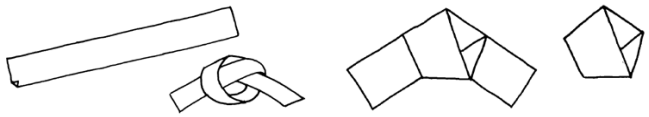
This article is both a tribute as well as a recapitulation of some of PKS's work.

PKS breathed Math. He dreamt Math. More than anything else he rubbed this infectious enthusiasm on everyone who crossed his path. I first met him in 1986 in a workshop organized by the NCERT at the Sri Aurobindo Ashram in Pondicherry. Those were pre-xerox days so PKS summoned a ream of cyclostyling paper, scissors, glue, old newspapers and one lone stapler. PKS gave each teacher one sheet of paper and asked them to fold an angle of sixty degrees? The teachers were at sea! Schooled into drawing angles only with a protractor they didn't know any other way of doing it. After 15-minutes of struggle the teachers gave up. Then PKS folded one straight edge (180-degrees) into 3 equal parts and produced an exact 60-degree angle! The teachers were amazed. It was almost like a revelation – all so elegant and beautiful. He showed them half a dozen different ways of folding 60-degrees. For instance, fold a strip into three equal parts and then into a triangle. All angles of this equilateral triangle would certainly be 60-degrees.



The whole day, teachers folded geometric shapes – a rhombus, a hexagon, an octagon etc. But how do you fold a pentagon? Paper folding by its very nature is binary. As you keep folding and doubling paper you generate 2, 4, 8, 16, 32, 64 ... layers. Weren't these all binary numbers? But how does one fold a pentagon? It is tricky but easy. In 1883, an Indian mathematician T. Sunder Row (Rao anglicized to Row) had shown this in his book Some Geometric Exercises in Paper Folding (still in print by Dover and perhaps the world's first ever book on Origami and Mathematics). How? Cut a long 3-cm wide strip from an A-4 size paper and simply tie a knot! Flatten the knot the trim the long ends to get a regular pentagon. How many times have we tied knots and noticed this?

> *"Mathematics should be visualised as the vehicle to train a child to think, reason, analyse and to articulate logically. Apart from being a specific subject, it should be treated as a concomitant to any subject involving analysis and reasoning". There's not a word about measurement, quantification and numbers!*



In that workshop the teachers folded over 80 shapes, some 2-D and others 3-D. All the 2-D shapes were stuck in an improvised file made by stapling a newspaper! They even folded a protractor with a dozen angles from a square of paper. The teachers were overjoyed. Perhaps they learned more practical geometry in those 2-days than they had done in their 2-year BEd course!

This brings us to the moot point – how out of sync is school Math with the real world. Early Mathematics evolved from the work of the tailor and the tinker – all practical crafts people. Mathematics has deep roots in practice. The very vocabulary of Mathematics is replete with associations of its pragmatic past. Consider for instance, the word "straight line". It comes from the Latin word "Stretched Linen". As any farmer wanting to grow potatoes would simply stretch a string to help him sow his crop in a straight line. Any mason would simply stretch a piece of string to help him lay bricks in a straight line. So, over time "Stretched Linen" became "Straight Line". The "digits" 1 to 10, which we use so commonly come from the Latin word for fingers – the ten little fingers of our hands.

Today school Mathematics is totally cut off from real life. The entire curriculum seems to be overlaid by the mumbo-jumbo of professional mathematicians. In the process the entire beauty and joy of Mathematics has got buried. The horrendous way Mathematics is taught in schools gives children a life time's distaste for this wonderful subject. If children are to appreciate the beauty of Mathematics, it is imperative for children to get a "feel" for Mathematics through practical work.

PKS struggled to infuse life in Mathematics. He cried, he wept and pleaded with one and all that Mathematics was all around them. And when no one listened he wrote a series of 60 odd articles for the Hindu which have become classic. He demonstrated that there was Mathematics in coins, in broomsticks, in matchboxes, in the square copy, in bus tickets, in the calendar in every ordinary thing around us. After considerable struggle these articles were collated by the NCERT into a book "Resource Material for Mathematics Club Activities". This splendid book – perhaps the greatest Maths activity book ever to be produced in India can be downloaded for free (http://gyanpedia.in/tft/Resources/books/pkshindu.pdf). After being out of print for almost a decade the book has just been reprinted by the NCERT.

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PKS was not always so lucky. In the seventies he wrote two amazing books Number fun with the Calendar and Romping in Numberland. He ran from pillar to post, from one publisher to another without any success. Publishers wanted him to write a high-school Math guide which was directly linked to the school mass market. PKS refused. Often his biggest enemies were his fellow teachers. They hated his popularity with students. Some of them even connived and had him beaten up!

But his students loved him. Some of them never forgot the inspiring way PKS taught them Mathematics. In the mid-eighties, fifteen years after these two books 'Number fun with the Calendar and Romping in Numberland' were written they were published by PKS's ex-student who had made good money in an ice cream business in Chennai! This certainly was a good way of paying *gurudakshina.* These books can be downloaded http://gyanpedia.in/fromtft/Resources/books/calendar.pdf and http://gyanpedia.in/tft/Resources/books/rompinginnumberlandeng.pdf). Alas, despite the plethora of government organizations and private do-gooders there are still no takers for good books in our country!

PKS shared his passions liberally. In the early nineties he sent me a xerox copy of the masterpiece 1001 uses of the 100 squares – by Leah Mildred Beardsley. This landmark book showed possibilities of doing amazingly creative Math activities by using just a square copy – used by children to do their arithmetic sums and available even in far flung villages. This book was a revelation. It can be downloaded from
http://gyanpedia.in/tft/Resources/books/squaresall.pdf

All his life PKS shunned commercial gains. He generously gave his book "Manual for Mathematics Teaching Aids in the Primary School" to the NCERT for free, without any royalties. This gem is out of print for years and needs to be translated into all Indian languages. He was always clad in a white kurta and dhoti spun out of khadi – rough and homespun cotton which symbolized Gandhiji's concept of Swadeshi. He always sported a Gandhi cap as well. His passion for Mathematics was visible as one approached his house in Chennai. The compound gate, walls and grills were laden with equations, identities and proofs-by-sight. This legendary Math teacher passed away in 2005 at theage of 81.

The greatest tribute to PKS will be to translate all his popular books into all languages; to digitize and upload them for the children of the world. There can be no better tribute to this Pied Piper of Math.

Arvind Gupta works at the IUCAA's Children's Science Centre in Pune and shares his passion for books and toys through his popular website http://arvindguptatoys.com. The books referred in the article can be accessed from the mentioned. He can be contacted at arvindguptatoys@gmail.com