Problems of school science education in India

Subramaniam[1] has brought into focus the symbiotic relationship between school education and the university system. He deplores the minor role played by Indian universities in the promotion of science education: 'experience from around the world indicates that the quality of education depends critically on having well prepared and motivated teachers. The role of the universities in school education is generally thought to be the preparation of school teachers. However, universities and research institutions in India have typically played a minor role in teacher preparation, which has taken place largely outside the university.'

The Justice Verma commission report concludes: 'the isolation of teacher education from mainstream university education has indeed taken deep root and is endemic to the entire education sector.'[2] The Committee also observed that bulk of trained teachers who undertook TET (teacher eligibility test) failed to qualify despite having a professional degree in teaching. This reflects two aspects: the poor quality of both teacher education programme and general education being provided in Indian institutions.

During 1975, I undertook a survey of Punjab schools to determine the reasons for high rate of failure in the science stream[3]. One of the reasons was the poor quality of science teachers who were not qualified to teach science at high-school level. There were very few teacher training colleges in Punjab and the stress was on pedagogy rather than the subject content in teacher training. This situation has changed and teacher education has expanded massively over the last few decades, most of this expansion (almost 90%) being in the private sector without any regulatory body to control and maintain the quality of training.

In Germany, my research collaborator, Rajinder Singh, who is a high-school teacher himself with a Ph D degree in the history of science informed me that most of the science teachers are trained in universities. There are no private colleges as in India. Teacher training programmes have both pedagogy and subject content, followed by a rigorous training of two years in school-level teaching and stringent examination system of evaluation. Some of the school teachers hold doctorate degrees in science or science education.

I agree with the observations of Subramaniam[1]: 'The separation of teacher education from the university has served to widen the separation of pedagogy from subject matter.' As a consequence, our teacher training programmes suffer from the malady of poor quality of teacher orientation in science subjects.

Subramaniam[1] has also pointed out discrepancies and suggested some remedial measures: 'The rapid growth of a separate professional stream of education in isolation from the university, is prone to commercialization with its attendant loss of quality and integrity. Second, organic links with university-based knowledge disciplines are vital to introducing innovation in teacher education, as in other professional streams. There is a third important reason why isolation from universities is particularly debilitating for teacher education.'

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2. Verma, J. S., Report of the High-Powered Commission on Teacher Education constituted by the Hon'able Supreme Court of India, MHRD, GoI, 2012, vol. 1, pp. 1–98.
3. Virk, H. S., *School Science*, National Council of Educational Research and Training, New Delhi, 1976, 1–5.

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Shanti Swarup Bhatnagar prize: an inspiration for international recognitions – III

Our earlier studies[1,2] showed that Shanti Swarup Bhatnagar (SSB) prize winners have been recognized as Fellows of the Royal Society (FRS), Foreign Associates of the US National Academy of Sciences (NAS) and Fellows of the World Academy of Sciences (TWAS) for their outstanding scientific achievements[1,2]. Here we look at the SSB prize recipients awarded with TWAS prize which is ranked among the highest scientific accolades bestowed on outstanding scientists in developing countries. These are awarded annually in agricultural sciences, biology, chemistry, earth sciences,

Table 1. Geographical distribution of recipients of the World Academy of Sciences (TWAS) prize (1985–2016)

Awardees	No. of countries	Name of countries
24	18	Bangladesh, Costa Rica, Ethiopia, Ghana, Iran, Jordan, Korea, Malaysia, the Philippines, Sultanate of Oman, Uruguay, Venezuela, Colombia, Egypt, Lebanon, Nigeria, Turkey, Uzbekistan
27	4	South Africa, Pakistan, Chile, Taiwan
37	2	Mexico, Argentina
38	1	Brazil
50	1	China
62	1	India
238	27	

Table 2. Indian recipients of TWAS prize from 1985 to 2016

Awardee	Year of SSB prize	Year of TWAS prize	Discipline
Ennackal Chandy George Sudarshan	–	1985	Physics
Mysore Ananthamurthy Viswamitra	–	1986	Biology
Mudumbai Seshachalu Narasimhan	1975	1987	Mathematics
Govind Swarup	1972	1988	Physics
Sukh Dev	1964	1988	Chemistry
Tiruppattur Venkatachalamurti Ramakrishnan	1982	1990	Physics
Madabusi Santanam Raghunathan	1977	1991	Mathematics
Narendra Kumar	1985	1992	Physics
Manapurathu Verghese George	1973	1992	Chemistry
Animesh Chakravorty	1975	1993	Chemistry
Girish Saran Agarwal	1982	1994	Physics
Padmanabhan Balaram	1986	1994	Chemistry
Ramanath Cowsik	1984	1995	Physics
Dorairajan Balasubramanian	1981	1995	Medical Sciences
Kalyanapuram Rangachari Parthasarathy	1976	1996	Mathematics
Asis Datta	1980	1996	Biology
Bhola Nath Dhawan	–	1996	Medical Sciences
Ashoke Sen	1994	1997	Physics
Balajapalli Sriram Shastry	–	1998	Physics
Biman Bagchi	1991	1998	Chemistry
Darshan Ranganathan	–	1999	Chemistry
Raghavendra Gadagkar	1993	1999	Biology
Ajay Kumar Sood	1990	2000	Physics
Gautam Radhakrishna Desiraju	–	2000	Chemistry
Sundararaman Ramanan	1979	2001	Mathematics
Avadhesha Surolia	1987	2001	Biology
Deepak Dhar	1991	2002	Physics
Eluvathingal Devassy Jemmis	1994	2003	Chemistry
Kaigala Venkata Subbarao	–	2003	Earth Sciences
Shiv Kumar Sarin	1996	2004	Medical Sciences
Spenta Rustom Wadia	–	2004	Physics
Krishnarajanagar Nagappa Ganesh	1998	2005	Chemistry
Raman Parimala	1987	2005	Mathematics
Rengaswamy Ramesh	1998	2006	Earth Sciences
Dipankar Das Sarma	1994	2006	Physics
Kankan Bhattacharyya	1997	2007	Chemistry
Shrikrishna Gopalrao Dani	1990	2007	Mathematics
Ashutosh Sharma	2002	2008	Engineering Sciences
Vasudevan Srinivas	2003	2008	Mathematics
Predhiman Krishan Kaw	1986	2008	Physics
Partha Pratim Majumder	–	2009	Biology
Swapan Kumar Ghosh	–	2009	Chemistry
Satyajit Mayor	2003	2010	Biology
Santanu Bhattacharya	2003	2010	Chemistry
Anil Kumar Gupta	–	2010	Earth Sciences
Vivek Borkar	1992	2010	Engineering Sciences
Manindra Agrawal	2003	2010	Mathematics
Zeyaur Rahman Khan	–	2011	Agricultural Sciences
Valakunja Nagaraja	1999	2011	Biology
Sreedharan Krishnakumari Satheesh	2009	2011	Earth Sciences
Thanu Padmanabhan	1996	2011	Physics
Swapan Kumar Pati	2010	2012	Chemistry
Kalyanmoy Deb	2005	2012	Engineering Sciences
Ayyappanpillai Ajayaghosh	2007	2013	Chemistry
Indranil Manna	–	2013	Engineering Sciences
Rajesh Gopakumar	2009	2013	Physics
Viswanathan Kumaran	2000	2014	Engineering Sciences
Jagdish Ladha	–	2015	Agricultural Sciences
Upadrasta Ramamurty	2011	2015	Engineering Sciences
Sandip Parimal Trivedi	2005	2015	Physics
Amitabha Chattopadhyay	2001	2016	Biology
Shiraz Minwalla	2011	2016	Physics

Table 3. Time taken by the SSB awardees to get the TWAS prize

Time taken (years)	Number of SSB awardees conferred with TWAS prize	% share
0–5	7	14.5
6–10	18	37.5
11–15	12	25
16–20	8	17
21–25	3	6

engineering, mathematics, medical sciences and physics. Each TWAS prize carries a cash award of USD 15,000 and a plaque[3].

The latest list shows that there are 338 TWAS prize-winners from 27 countries[4]. Table 1 shows geographical distribution of TWAS prize-winners during the period 1985–2016. India dominates the number of recipients (62) followed by China (50) and Brazil (38). Thirty-seven scientists belonging to Mexico and Argentina, 27 belonging to South Africa, Pakistan, Chile and Taiwan and, 24 scientists belonging to 18 countries – Bangladesh, Costa Rica, Ethiopia, Ghana, Iran, Jordan, Korea, Malaysia, the Philippines, Sultanate of Oman, Uruguay, Venezuela, Colombia, Egypt, Lebanon, Nigeria, Turkey and Uzbekistan have been conferred with the prestigious TWAS prize.

Table 2 presents Indian recipients of the TWAS prize from 1985 to 2016. Of these, 48 are recipients of the SSB prize as well. Table 3 provides a snapshot of the time taken by SSB awardees to win the TWAS prize. The result is in line with our previous studies[1,2] that winners of SSB prize are more likely to get international recognitions.

1. Singh, I. and Luthra, R., *Curr. Sci.*, 2014, **107**(2), 163–166.
2. Singh, I. and Luthra, R., *Curr. Sci.*, 2015, **109**(2), 661–663.
3. http://twas.org
4. https://en.wikipedia.org/wiki/TWAS_Prize

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Rediscovering universities: bring back academic respectability

P. J. Lavakare[1] in his commentary on rediscovering our universities has made certain points that are partially agreeable. The focus of the note is essentially on science and technology-based subjects; it has completely ignored language and literature, history, political science, sociology and other related subjects.

Lavakare[1] wants the Academies of Science in our country to have close association with colleges and universities, and through such association and involvement wants to do away with the caste system in education. Science has grown to become an extremely specialized field today. While CSIR laboratories and institutes of higher learning promote the depth of knowledge, traditional universities promote the expanse of knowledge. It would have been better if the depth and expanse could be combined together to create a new recipe. Successive governments, and the Department of Science and Technology have been interested in showcasing advancement in science and technology; the universities have got a raw deal. Most of the affiliated colleges across the country have not received much (and desired) academic attention.

India is a vast country with extraordinary diversity; but there has been no planning of education based on resource availability at a particular geographical location in the country. The university laboratories need upgradation, and should attract talented students. Researchers should stick to the field of research for all-round development of the country and get all administrative and financial support. I agree with Lavakare[1] that there is a need to infuse 'life' in the universities in the country today. In the prevailing situation, a more synergetic relationship among the CSIR laboratories, universities and colleges should be established. Science needs to move from laboratory bench to the meadows and factories and unless that happens, the real strength of science in a big country like India cannot be harnessed. It is a fact that CSIR laboratories have received huge grants over the years. Now it is time that they transfer the knowledge created, through universities and affiliated colleges, to the less fortunate ones of the country. The major problem in India is that true centres of knowledge creation have been too few, although there are colleges and universities all over the country. The rediscovery of the institutions calls for proactive action from the top and also from the bottom. The gifted institutions must shake hands with the emaciated ones; this will bring forth a cultural change. That is the only way to rediscover our universities and affiliated colleges.

Lavakare[1] has proposed phase-wise abolition of the affiliation system. I do not know whether it will do good to the affiliated colleges. These colleges need mentoring by the universities. Rules and regulations related to registration, examination, reviewing of answer scripts, publication of results, etc. made by the universities need to be adhered to by the colleges. It has been my experience that when colleges are given partial responsibility of conducting, say, examinations, they back-track citing certain operational problems. These operational problems/difficulties stem from the student community, which puts pressure on the college administration to relax rules, enhance marks, admit students beyond their capacity, and when their demands are not met, the students often resort to violence, etc. The principals of the affiliated colleges are in direct contact with the students and often it becomes difficult for them to ignore requests. Sometimes, local politics creeps in making the system ineffective. Under these conditions, the principals use/consider the universities as sacrosanct institutions where rules are made and which cannot