

# More Talented Students in Maths and Science

## Introduction

As India seeks to establish itself as a knowledge superpower, it is essential for it to build on its science and technology base. Pure sciences has a critical role to play in this – a strong foundation in science helps in building excellence in technology, propelling economic growth and prosperity, and consequently raising living standards. While India has had a rich heritage in abstract thinking and scientific discoveries, of late the progress in this field has been on the decline. It is increasingly felt that with the popularity of arts, commerce and professional courses, and more lucrative opportunities in related professions, there has been a decline in students studying pure mathematics and science. In order to create a critical base of scientific professionals in the country it is necessary that immediate steps be taken to attract more quality students in mathematics and science.

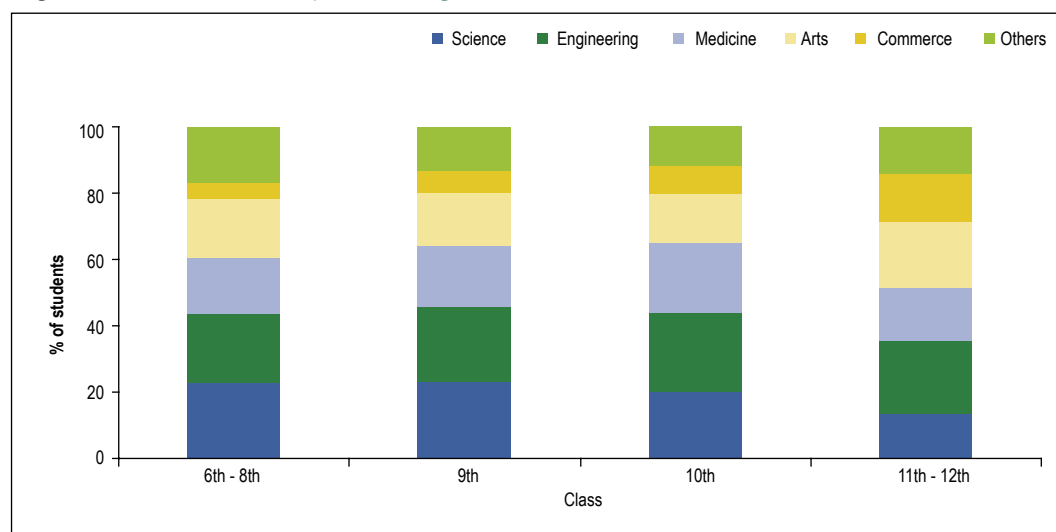
## Current Scenario

**School level:** While science dominates as the most preferred subject at the middle school level (class 6-8), it

becomes less popular at the higher secondary level (class 11-12). In a science survey conducted by the NCAER, 22 per cent of the class 6-8 students said they would like to study pure science in the future. Yet, at the level of class 11 and 12, only 13.4 per cent of the surveyed students wanted to study pure sciences at the graduate/postgraduate level. This percentage is lower than the figure for other disciplines – engineering, medicine, arts and commerce.

Further, the number of students opting for science after the secondary school stage has dropped from 32 per cent in the early 1950s to 19.7 per cent in recent years. More significantly, while in the 1950s, the brightest students entered science, the current science students often take it as a last resort. This indicates that young students, particularly the brighter ones, are drifting away from science. For instance, as reported by Homi Bhabha Centre for Science Education (HBCSE), very few students selected for Olympiads in Physics, Chemistry or Biology went on to opt for higher education in basic sciences. The choice of the National Talent Search awardees also reflects this trend in recent years. Of the 750 awardees, only about 100

Figure 21: Preferred subject for higher education by level of students (2004)



Source: India Science Report, National Council of Applied Economic Research

opted for science and only 15 to 20 of the awardees pursued science to the post-graduation level.

Further analysis of the reasons behind why students take science or choose not to take science at higher secondary level reveals that passion for science is the primary decision factor. Not surprisingly, 'better job opportunities' is the second most important reason for taking up science at higher secondary level. Peer pressure, the changing socio-economic situation, and market mechanisms have resulted in the drift of students away from basic sciences to professional courses which lure the student pool with high salaries. (See Tables 13 and 14)

**Table 13: Reasons for taking admission in science**

Reason	Percentage of science students (Class 11 & 12)
Interested in science subjects	66.6
Better job opportunities	20.4
Parents' desire	3.3
Interested in doing research in science	1.8
Influenced by the work of scientists	1.3
Quality of science teachers is very good	0.8
Influence of peer group	0.7
Intend to go abroad	0.2
Others	4.8

Source: India Science Report, National Council of Applied Economic Research

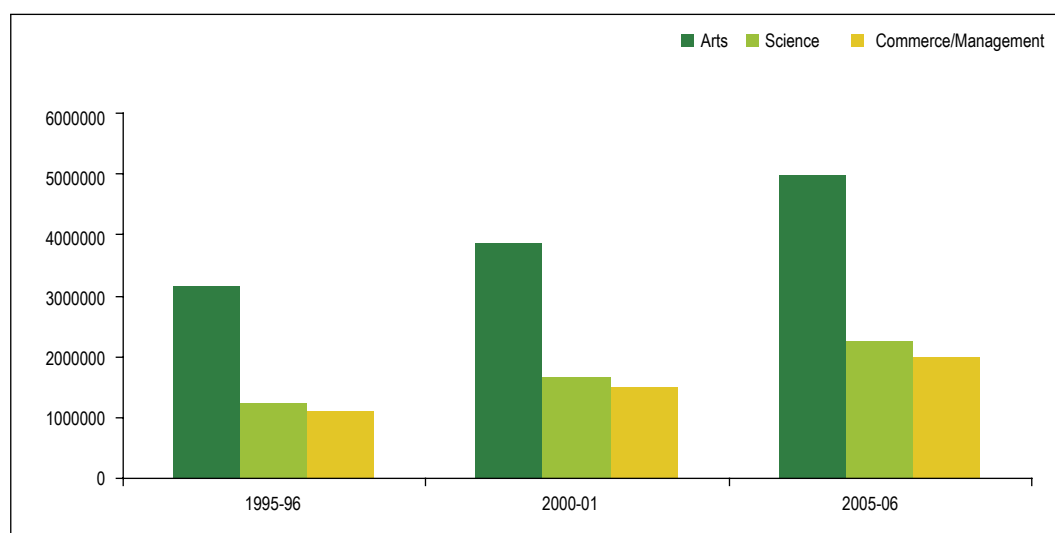
**Table 14: Reasons for not taking admission in science**

Reason	Percentage of non-science students (Class 11 & 12)
Not interested in science subjects	44.5
Difficult subject	20.4
Higher studies are costly	9.9
Interested in commerce	5.4
Like art subjects	4.8
No future opportunities	2.1
No science college nearby	2
Difficult to get through competitive examination	1.1
Poor quality of teaching at school	1.1
Others	8.9

Source: India Science Report, National Council of Applied Economic Research

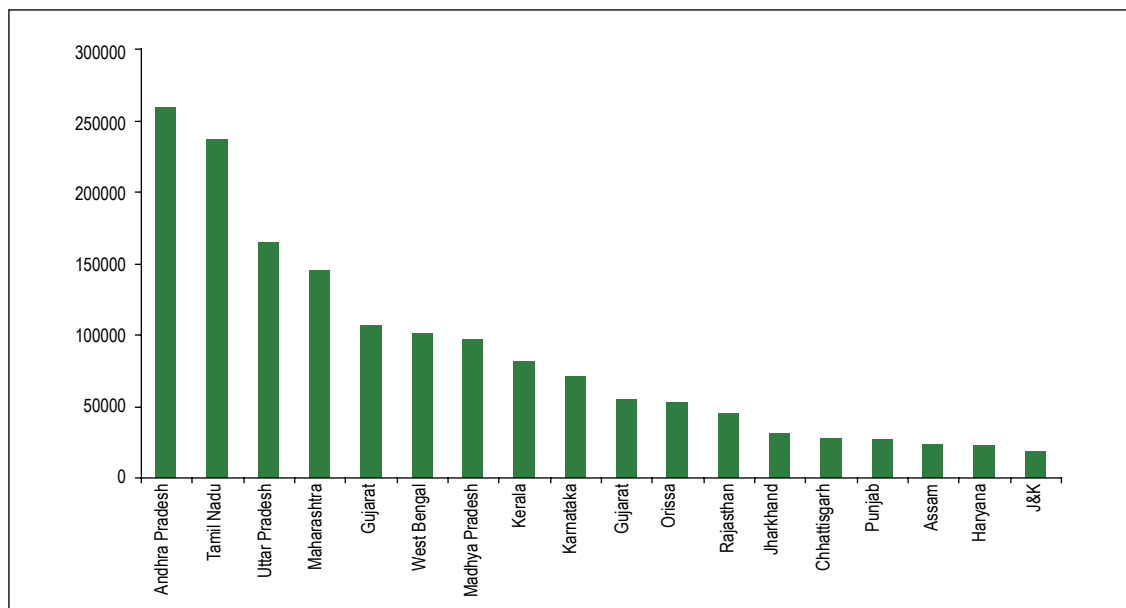
**Higher education:** Approximately 2.25 million students were enrolled in science in 2005-06 (UGC) – accounting for 19 per cent of the total enrolment in higher education. The number in absolute terms is not small. The stock situation in 2004 was also good. About a fourth of those qualified to the level of graduate and above had a background of science education. There are 8.74 million graduates in all (22.3 per cent of total graduates), 1.8 million postgraduates (19.4 per cent of total post graduates), and 0.1 million doctorates (one-third of total doctorates) in science. However enrolments in pure science and mathematics have not grown as much as in professional fields. Even the number of students from India going abroad to

**Figure 22: Gross enrolment in higher education**



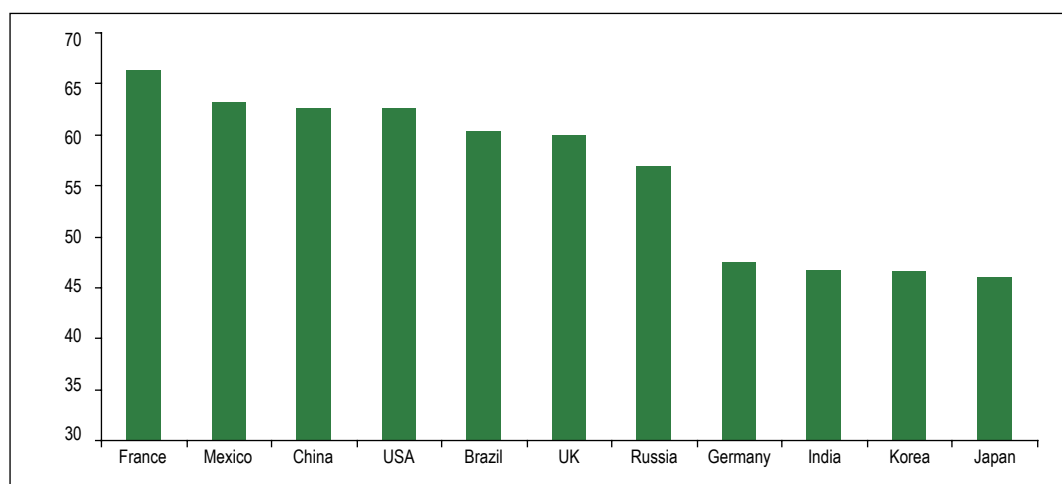
Source: UGC

**Figure 23: State-wise enrolment in science (2000-01)**



Source: University Development in India, 1995-95 to 2000-01, UGC

**Figure 24: Science and engineering doctoral degrees as a percentage of all doctoral degrees in selected countries**



Source: NSF, Science and Engineering Indicators 2004, Appendix table 2-36

pursue maths and science has fallen. According to MHRD figures, there has been an absolute decrease of 33 per cent in the number of students going abroad in the science stream (between 1991 and 1998) while the numbers in banking, technology, commerce and management have increased considerably. This could be a result of shift in student interest to pursue courses which have better career options than science.

There is also a striking regional imbalance in enrolment in science with Andhra Pradesh and Tamil Nadu having much larger students taking up science than in the other states.

**Research:** While research in all areas requires attention, the condition of science is particularly dismal. The

absolute number of science graduates is not small but the number of doctorates in science stream leaves much to be desired. According to 2005-06 UGC figures, science doctoral students formed only 1.1 per cent of the graduate enrolment in science. While most advanced countries have more than 60 per cent of total doctoral degrees in science and engineering fields, India has only 46 per cent doctorates in science and engineering (See Figure 24).

The declining interest in science and mathematics needs to be addressed comprehensively. Issues relating to pedagogy, evaluation, curriculum, careers, and infrastructure need to be tackled effectively. Large scale science popularisation programs could also re-establish the passion science once generated.