

# **Restructuring Post-School Science Teaching Programmes**

**Brain Storming Session on the Science Academies' Initiative  
on Post-School Science Education – January 12, 2009  
at Indian National Science Academy, New Delhi**

## **A BRIEF REPORT**

Indian National Science Academy (New Delhi)  
Indian Academy of Sciences (Bangalore)  
The National Academy of Sciences, India (Allahabad)

**April 2009**

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## Foreword

The three National Science Academies of the country — Indian National Science Academy (INSA), New Delhi, Indian Academy of Sciences (IASc), Bangalore and The National Academy of Sciences, India (NASI), Allahabad — have been working together over the past few years in improving science education in the country. A Joint Science Education Panel has been conducting and organizing various programmes for the benefit of students and teachers in all parts of the country. Following a series of discussions and meetings spread over 2007–2008, in October 2008 the Panel prepared a document titled 'Restructuring Post-School Science Teaching Programmes – A Position Paper'. This was released by the three Academies as a combined initiative, and was widely circulated among individuals, agencies and institutions. This report was also published in 'Current Science' (25 November 2008 issue) and in 'Resonance' (December 2008 issue).

A special 'Brain Storming Session' to present this document and have extensive discussions on it was held at INSA, New Delhi, on 12 January 2009. This was attended by a large number of heads/representatives of agencies and institutions, including UGC, AICTE, MHRD, DST, ICMR, Office of the Principal Scientific Advisor to Prime Minister and Fellows of the Academies.

A complete Report on this 'Brain Storming Session' is available on the websites of the three Academies. We are pleased to present herewith a condensed version of the report for the consideration and benefit of all agencies involved in possible implementation.

**Based on the discussions at the brain-storming meeting, the Science Academies recommend the following for implementation**

**1. The following multiple options be available to students who have completed +2 level and wish to continue in Science stream:**

- I) 3 year B.Sc. → 2 year M.Sc. → Ph.D. (existing)
- II) 5-year Integrated M.Sc. programme, followed by Ph.D. (existing)

- III) 3 year B.Sc. followed by Integrated or dual-degree M.Sc.–Ph.D. programme (existing)
  - IV) A 4 year B.S. (Honours) programme followed by Ph.D. programme, without the need for a Master's degree (new, details given later)
  - V) Vocational courses to facilitate self-employment
2. Learning of Science (and all other disciplines) in all the above models must be pyramidal and not a vertical high-rise. The curriculum must provide a broad-based training of different disciplines of scientific enquiry with specialization introduced as the student advances in training.
  3. All courses should be semester-credit based.
  4. The 1st two semesters of the 6 semester (3 years) B.Sc. should provide for learning of all major science disciplines by all students with the next four providing core training in 2–3 disciplines; the last 2 semesters may provide for Honours in one or two disciplines.
  5. All semesters at B.Sc. and M.Sc. should provide 15–20% credits through courses in disciplines (in and outside Science faculty) other than their major/honours subjects, including communication skills.
  6. Courses in highly specialized subjects like Biotechnology, Bioinformatics, Computer Applications, Nanotechnology, Nanobiotechnology etc should not be allowed at School and undergraduate levels.
  7. All core courses must provide for 30–40% credits through laboratory/field work; several of the lab exercises must be based on open-ended experiments.
  8. Students at M.Sc. level must undertake a dissertation and prepare a research project proposal.
  9. After completion of the 6 semester B.Sc., provision be made for a 2 year B.Tech/B.E. programme
  10. A new 4 year B.S. Honours programme may be introduced following which the graduates can join Ph.D. programme:

- I) The B.S. (Hons.) programme would be credit based semester system available to those passing out of the +2 level in Science stream
- II) The first 4 semesters will cover all major science streams as core courses. Students will opt for a Major/Honours subject in the last four semesters. Each semester would have 15–20% credits for elective courses in other fields, including communication etc. The last semester should provide research experience
- III) On successful completion of the 4 year course, they would be eligible for seeking admission to Ph.D. programme, since it is expected that the 4 year period would prepare them better than the conventional 3 year B.Sc. + 2 year M.Sc. courses and any deficit in a specific area can be made up through courses during Ph.D.
- IV) The first two semesters of Ph.D. programme will have credit-based lectures as well as laboratory courses. Those not desiring to continue with Ph.D. may exit after successful completion of the course work with M.Sc. degree
- V) The 4 year B.S. (Hons.) programme be introduced only where a good research base is available.

11. Mobility within basic sciences and between basic and professional courses be facilitated, including for Ph.D.

12. A system for regulated transfer of credits from one major to another major within the institute and also between institutions may be evolved.

13. Vocational courses for those who complete +2 or 3 yr B.Sc., or 2 yr B. Tech. after 3 yr B.Sc. be strengthened so that those not interested in an academic career can take up self-employment or join appropriate industry

14. Laboratory training courses be initiated to provide for increasing need for laboratory technicians in educational/research institutions and in industry

15. All science teaching colleges and universities must have adequate laboratory facilities – this must be rigorously monitored and audited
16. Simple and exciting experiments, doable with minimal and inexpensive facilities, need to be designed and popularised
17. The existing faculty must have opportunities for continuous training in new concepts/techniques
18. Adequately trained and motivated new teachers be regularly appointed on existing vacancies
19. The Science Academies may assist the implementing agencies in preparing broad frameworks of syllabi at various levels.

We are particularly grateful to Prof. S. D. Thorat, Chairman, University Grants Commission, for having attended the meeting and for responding very encouragingly and supportively to our suggestions. The attached condensed report on proceedings of the brain-storming session also includes full text of Prof. Thorat's observations.

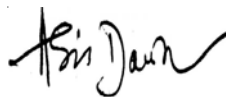
We are aware that the Science Academies are not major implementers or executors of policies and programmes, and can only aspire to act as catalysts and beacons that try to guide. We of course treat these roles with utmost seriousness. We assure all concerned implementing bodies and agencies that if they take up some or all of our recommendations for follow-up actions, the Fellowships of our Academies will be happy and willing to assist in any ways that are needed.



M. Vijayan  
President, INSA



D. Balasubramanian  
President, IASc



Asis Datta  
President, NASI

Date: April 2009

## **Science Academies recommend a broad-based education in sciences**

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A Position Paper entitled “Restructuring post-school science teaching programmes” was prepared by the Joint Education Panel of the Indian Academy of Sciences, (Bangalore), the Indian National Science Academy (New Delhi) and the National Academy of Sciences India (Allahabad). The Position Paper carried a variety of suggestions to improve the quality of teaching of sciences with a view to provide a holistic and integrative learning in science and technology. Presidents of the three Academies presented this document to the Fellowships of the Academies and to various governmental agencies, universities, research institutes, IITs, IISERs etc with the “hope that the suggestions will be seriously considered by the concerned agencies for their effective implementation”. The Position Paper was also published in *Current Science* (25 November 2008) and *Resonance* (December 2008) for a still wider awareness.

Following the wide circulation of the Position Paper, the three Academies jointly organized a brain-storming session on 12<sup>th</sup> January 2009 at the Indian National Science Academy auditorium to discuss the various suggestions in the above document and to consider specific steps required for their implementation.

The brain-storming session was attended by, besides a large number of Fellows of the three Academies, several heads/representatives of different agencies. These included Prof. S.D. Thorat (Chairman, UGC), Dr. T. Ramasami (Secretary, DST), Dr. Katoch (Director General, ICMR),

Dr. S.K. Sikka (from office of the PSA to Prime Minister), Prof. S. Ramdorai (Member, National Knowledge Commission), Prof. Prem Krishna (Vice-President, Indian Natl. Academy of Engineering), Prof. Yashpal, Prof. M.G. K. Menon and others.

Prof. N. Mukunda coordinated the meeting and welcomed the participants. Prof. M. Vijayan (President, Indian National Science Academy), Prof. D. Balasubramanian (President, Indian Academy of Sciences) and Prof. Ashok Misra (Ex-President, National Academy of Sciences of India) in their inaugural speeches highlighted the urgency of reforms in curricula of science teaching programmes at under- and post-graduate levels and also emphasized the need for a proactive role of science academies in sensitizing and advising the regulatory and implementing agencies about science education and policies. All the three Presidents expressed their happiness that the Academies are working in concert in this sphere of activity.

Prof. S. C. Lakhota presented highlights of the Academies' suggestions for restructuring post-school science education contained in the already widely circulated Position Paper. It was pointed out that the main emphasis of these recommendations was to:

1. Replace the existing highly compartmentalized B.Sc./M.Sc. courses with broad-based pyramidal and choice-based semester system at all existing under- and postgraduate programmes to foster concept-based interdisciplinary and integrative learning of the desired discipline of science.
2. Ensure adequate laboratory facilities at all colleges/universities and to have at least 30% of course work through actual laboratory work which should include some open-ended experiments to provide not only adequate laboratory training but also inculcate the spirit of enquiry.
3. Introduce, initially at select places, a new 4 year B.S. Honours degree following which the qualified graduates can directly join Ph.D.
4. Provide for easy switch-over between technical and basic science education.



Keeping in view the recommendations of the Academies' Education Panel, the following specific questions were presented for discussion at the brain-storming session:

- 1. Would broad-based pyramidal curricula dilute learning of specific discipline?**
- 2. Should B.Sc. degree be provided in narrow specialized disciplines?**
- 3. Is it desirable to introduce the proposed 4-year B.S. Honours course at select places?**
- 4. Should multiple options for Science courses be available to +2 students?**
- 5. Should there be mobility between basic science and professional courses?**
- 6. How are the suggestions to be actually implemented? – Are the universities/autonomous colleges free to adopt them or do they need UGC/AICTE mandate?**
- 7. Should the Academies undertake exercises to suggest broad frameworks for different curricula?**

Speaking immediately after the above, Prof. Thorat, Chairman of the University Grants Commission, whole-heartedly supported the Academies' recommendations and stated that the Position Paper of the Academies for restructuring the post-school science education was a well-analyzed and timely document. He assured that the Commission will provide all help in implementation of these proposals for which it would seek guidance of the Academies. Prof. D. Pental, Vice-Chancellor, Delhi University, speaking on implementation of the recommendations in the university/college sector highlighted the urgent need for drastic reforms and agreed that the Academies' recommendations provided a significant step in that direction. He was of the view that the multiple choices make it easy to implement the various recommendations keeping in view the local needs and capabilities. Prof. P. Rama Rao highlighted the dearth of qualified scientists and well-trained engineers and technocrats compared to the actual needs of the country and of

waning interest in original research. He strongly advocated the proposal for easy switch-over between basic science and technical education since this would facilitate new technical developments based on original research.

During the open discussion session, Prof. Yashpal emphasized that mere availability of more money for education would not make for better science but better facilities have to be matched by appropriate interdisciplinary curricula and stimulating teaching methods that evoke curiosity in Science. Dr. Sujatha Ramdorai noted that there are many points of convergence between the recommendations of the Science Academies and those of the National Knowledge Commission and thus the two should work together. Prof. Gnanam pointed out that the UGC Committee's recommendations also converge with those in the Position Paper. Prof. T. J. Pandian pointed out that Agriculture and Medicine should also be included in the proposals for post-school science education reforms and that the Academies should not only develop the curriculum for the various proposed reforms but also define the minimum eligibility for admissions. Prof. P.T. Manoharan mentioned that M.Phil. should be scrapped and the proposed 4-year B.S. (Hons.) course should be started only in universities with good research base. He mentioned that language is a major problem in most state universities since a majority of their students are not proficient in English and good reading material is not available in regional languages. Prof. Manoharan also suggested that similar reforms need to be introduced in disciplines other than Science. Prof. D.P. Roy of Homi Bhabha Centre, Mumbai, strongly felt that the existing 3 year B.Sc. programmes should continue since the European countries are switching over to the 3 year B.Sc. pattern.

Prof. M.G.K. Menon strongly defended the proposed broad-basing of Science education since the B.Sc. degree was "Bachelor of Science" and not Bachelor of a specific discipline in Science. He categorically stated that all the recommendations in the Academies' Position Paper should be accepted and the issue of governance need to be discussed with the concerned regulatory bodies. Dr. Sikka, speaking on behalf of the Principal Scientific Advisor to the Prime Minister, stated Dr. R. Chidambaram would be happy to implement the recommendations of the Academies and that the earlier recommendation made by Prof.

Mukunda Committee in 2004 that the research institutions should start under-graduate teaching needs to be followed widely. Dr. Soumitro Banerjee while supporting the Academies' recommendations cautioned about credits earned by students in unconnected courses since that would seriously dilute the learning of core courses. Dr. Ananthkrishnan, while agreeing to all the recommendations, suggested that some institutions should be mandated to train teachers. Likewise Prof. Rudraiah stated that the Academic Staff Colleges need to be revamped to ensure that the various courses offered by them help the participants really learn newer developments in the subjects and methods of better teaching, rather than conducting the refresher and orientation courses merely to fulfill the requirements for promotion etc. He stressed the need to regularly fill in the faculty positions as vacancies arise. Dr. Rajendra Prasad emphasized that B.Sc. degree must be the terminal degree for a majority. He suggested that Indian History, especially of Science, should be taught to all students. Prof. D. V. S. Jain agreed that all the suggestions are good and need to be implemented, although he raised concern about the feasibility of semester system with many colleges in the country being "run" without adequate faculty or even without regular water or electricity supply. These aspects also need urgent attention for remedial steps. Prof. Jain further suggested that the rules and regulations governing different state universities need to be changed to free them of the political controls and that the examination system at all levels needs to be transparent so that the examinees have opportunity to see their evaluated answer books.

Prof. Prem Krishna (Vice-President of Indian National Academy of Engineering) lamented the sub-standard quality of education due to poor infrastructure and inadequately qualified faculty in most of the engineering colleges in the country. He welcomed the proposals that would facilitate mobility between basic sciences and technology and proposed that the Science Academies and the INAE should work together. Prof. Yadav (UDCT, Mumbai) emphasized the need for industrial training in all engineering/technology courses. He also suggested that the academic institutions should have six-days of working per week and that the retirement age in state and central universities should not be different. Earlier, Prof. Ashok Misra, while welcoming participants on behalf of the National Academy of Sciences India, also strongly argued

in favour of the proposed 4 year B.S. (Honours) and of easy switch over between science and technology streams. R.H. Sawkar (Secretary, Geological Society of India, Bangalore) emphasized the need for increase in Earth Sciences in curriculum in first two years of the 4 year course.

In view of limited time, some participants gave written comments. R. Nagarajan desired that international recognition of the various proposed courses be examined. H.Y. Mohan Ram agreed that B.Sc. in narrow disciplines is detrimental. He also suggested that teachers need motivation and learning the philosophy of teaching. G.K. Mehta opined that the state universities need greater autonomy and that Ph.D. should be awarded only by universities. S. Sriramachari agreed with the need for trans-disciplinary learning. T J Pandian suggested inclusion of Agriculture, Engineering, Medical Academies in efforts to revitalize education. He also emphasized the need for good text books relevant to our conditions. S. Ananthakrishnan indicated the need for better laboratory practices at UG and PG levels and for motivating UG students from rural areas through 4 week bridge courses before they join PG courses. Soumitro Banerjee supported the need for broad-basing of science education.

Dr. Ramasami (Secretary, DST) while summing up the discussion agreed for implementation of the Academies' suggestions but cautioned that we must remain conscious of the difference between ideal and real world. The multiple education programmes available after the school education would help segregate those who wish to be scientists/teachers at colleges and universities from those who wish to go in for other jobs. He emphasized the need to significantly improve the quality of Ph.D. in Science.

Prof. Vijayan, in his concluding remarks agreed that the problems facing higher education are formidable but it is the right time to take the first steps. He expressed satisfaction that the Science Academies are working with synergy and with clear understanding that the Academies need to play advisory roles and work in concert with the implementing agencies.

**Transcript of Lecture by Prof. S. D. Thorat, Chairman, UGC at the brain-storming session on 'Restructuring Post-School Science Education' held at INSA auditorium on January 12, 2009**

Distinguished participants and friends,

I am delighted and happy to be here. Because of several preoccupations I did not go through the document. But colleagues recognized the importance of the document and insisted that I should come. I must share with you how immensely I have benefited with this presentation. It was a brilliant and necessary and timely presentation. I really congratulate and appreciate the effort undertaken by the Academies and other persons associated with this Committee for coming with a proposal for reform and restructuring the curriculum of degree and post graduate programmes in sciences and related disciplines.

Let me share couple of things with you: why should I say it is timely and why do I value it, why it is most important. When I took over sometime in February, as the UGC Chairman, it was coinciding with the formulation of 11<sup>th</sup> five year plan. Review and preparation of approach and strategy for higher education was a major agenda of the UGC. This includes sciences, social sciences and many other disciplines. When we began to prepare documents and look for literature I was a little surprised that there was nothing substantial available around on the basis of which one could really get an insight of higher education system. I think probably 1964/65 Kothari Commission report was the last comprehensive document on the status of higher education in this country. Thereafter we had several committees but those committees addressed the issues in isolation. The UGC in the month of March and April - when I joined - had sponsored seven to eight such reports on higher education. It varies from access to quality to relevant curriculum and education offered. It deals with privatization of higher education, deals with curriculum to certain extent. Those studies have brought out a good deal of the status of higher education. In fact they have been put together now and a big volume has been brought out on higher education related to India with quality of finance. Sometimes later we will have a get-together, some of you will be a part of it. But I am telling

you this for a simple reason: status of higher education and the concern for higher education's needs was neglected for the past 20-25 years. Fortunately we have Hon'ble Prime minister Dr Manmohan Singh who was the chairman of the UGC. We appreciate this. Because of his concern and because of his understanding he could appreciate the problem that has been faced by the higher education and so does our Hon'ble minister Shri Arjun Singhji who is dedicated to higher education for several years. And that brought the due recognitions. What I am going to share with you is that when we tried to locate the problems of higher education, issues of higher education came like a flood to us, to those who are in the framing of the policy. Not only one issue but a number of issues. We recognize that access to higher education measured in terms of the enrolment was only close to 10 to 11 per cent; if we include certificate of diploma, our enrolment will not be more than 30 to 40 per cent compared to world average of 33 per cent, 37 per cent in countries like China, 55 to 80 per cent in other developed countries. Although in absolute numbers we have so many scientists and also social scientists but in ratio it is only 11 per cent. The first problem that we recognized was that of access to higher education: after a student completes plus two, there are very few who continue. We are talking of a number with a given enrolment ratio, but if you increase it upto 30 per cent or 40 per cent imagine what will be the number that goes to higher education. The first issue was how to make access easy. Second, we improve their access but also bring all those sections which are lagging in the past, to higher education. Because we realize that the concentration of certain sections of society for promotion of science or social science and technology will not help. In fact, one of the greatest achievements of higher education in my view is that it is the state universities which are the catchment areas of talent from rural areas, small towns, medium towns. The state universities really promote the galaxy of scientists in this country. So it was recognized we will have to increase the canvas of our catchment area and bring in as many people as possible. Therefore the emphasis on inclusiveness. But one of the most important problems is the quality of higher education. Everybody talks about quality. There is no data, somebody picks up the head of the elephant, somebody picks up the tail of the elephant, somebody picks up the leg of the elephant, that's the quality. When we

tried to look at it in the UGC, then we at least try to collect some data. There is a National Assessment and Accreditation Council which assesses the universities and colleges. For 140 universities and some of the other institutions, 3200 colleges, we got those voluminous data by a professor from Jamia Millia Islamia. Then they classified them into A, B and C. Govardhan Mehta and his team has revised that methodology. We discovered only 10 per cent of the universities fall into A category, another 40 per cent into B, remaining are C. But more than that, what we discovered are the causes, the causes are as you have pointed out in your presentation, the physical infrastructure in the colleges and universities is not satisfactory. More than physical infrastructure, the human resources, particularly the faculty was a problem. All those A class colleges and the universities had good physical infrastructure, had permanent teachers, had more PhD and Mphil; and all those with C and some of D had bulk of temporary teachers and part time teachers due to outsourcing. Therefore we understand why the quality was a problem. Excellence is another story. I believe that the excellence emerges from the college, if you have good infrastructure and good faculty; then you become innovative and creative and create knowledge in different areas. But we also discussed not only physical infrastructure, not only quality but the way we need to teach we discovered the bulk of the universities continue with the annual examinations, assessing the students with giving marks, conducting only one examination. But there were others who are doing better, they had a semester system, they have a credit system and more internal assessments and the students give the feedback on teachers. Coming to the expectation of the student and therefore the academic practices, curriculum and how it is being taught and in what structure. I think this was brought to the notice of the policymakers and authorities. I am very happy to share with you that we got this issue on the agenda of the Ministry, Planning Commission. I just want to link what you are doing here very quickly so that we recognize a couple of things and take steps. We recognize our enrolment and access to higher education has to increase from at least 10 per cent to 15 per cent in this Plan and taking it to 22 per cent in the next Plan. A number of studies show minimum 20 to 25 per cent of the available human resources must go into higher education even for a sustainable economy. To be able to get 15 per cent what we require was more

universities, more colleges and increase in the intake capacity of the existing universities. Otherwise you will not be able to provide the access. If you have more access and more boys and girls going to the colleges and the universities, then there is a possibility of creating talent. To get human resources and what to teach them and how to teach them is a secondary issue. I am happy to say that there has been a 9 fold increase in finance allocation to higher education. The government took initiative to increase 2 per cent cess and it has never happened in the history of higher education that at one go we have so many new institutions coming up. Thirty central universities, several IIMs, IITs, Polytechnics, ITIs, several model colleges under the programme of skill development. But also increase in the grant to the universities and the colleges several times, increase three to four times their intake capacity, so that more students could be accommodated. And there comes the question of infrastructure, and faculty. The first thing was recognized and we have been able to do that. As a result of that the allocation to the higher education has increased from 7 or 8 per cent to 19 per cent. Allocation to education as a proportion to GDP has increased from .37 to close to .7 per cent. Its a big jump. That is the first initiative that has been taken, Of course, there have been many other initiatives which I would like to share with you for inclusiveness, there are several decisions taken by the UGC and the Plan. But there are two issues that are more important and I request you when you go for discussion please discuss them also as far as quality is concerned. Particularly in science, infrastructure, faculty and academic structure, what to teach and how to teach: these are three issues which are very important and to some extent UGC has tried to address them. I think lot more needs to be done and we are in the process of creating that and this has come very very timely. As far as the physical infrastructure is concerned, I must say that before I appeared on the scene in the UGC, there was already prior recognition through the MM Sharma Committee, that science is lacking: there is a disincentive in terms of students going to science, and that recognition was there in the very elementary stages. But when this MM Sharma Committee was converted into a task force of the UGC with the agenda of doing something to science education, I am extremely happy that they are working hard. For the last three years I have seen them regularly every month; they develop certain major steps which in my view will



lead to promotion of science education in this country in the medium term. First thing that they did, as you rightly suggested here, is to increase the infrastructural capabilities, giving a grant to the state universities and also state departments, the autonomous colleges, now will be given to some central universities. This assistance 2 lakh to 20-25 lakhs has come as a surprise to the colleges like a windfall. I think there is a happy feeling among the colleges and I get a feedback from Prof Rama Rao and others that colleges are happy and are utilizing these funds quite effectively. Second, creating infrastructure is not enough; you should have students and to be able to have students at the M Phil and Ph D level you cannot ask them to be self financed. They are a human resource to the country. And rightly therefore, the empowered committee instituted fellowship programme to all departments, with ten fellowships to each department, leave it to the department to select the student based on their earlier experience of guiding PhDs. 3200 fellowships have already been sanctioned and approved in the sciences through the empowered committee. Then to hold on to the PhDs who are going to foreign countries, they developed what is called the DS Kothari Fellowships, about 500 fellowships. And to do it on fast track we outsourced this work to Pune University, Prof. Gadre has developed a software for online submission of application, online declaration of the result. 250 post doctoral fellowships have already been declared. Then recharging of faculty. The concept that has been given to the committee is that we want to recharge the faculty, they developed a scheme which is a modified form of earlier scheme, that 1000 post doctoral persons will be selected and placed at the doorsteps of different departments to be able to get them absorbed in future as faculty. I think, friends, this is a major initiative and has really addressed some of the issues that had been raised. This is not adequate but is a beginning. At the other level, when I joined and discovered that there are 25 central universities, there are students who are admitted through the proper screening and examination, Viva voce examination but there are 3 to 4 percent of the students who get fellowships and others who do not. We expect them to pursue the programme on their own finances. I took courage with a lot of reservation that all those who do not get regular fellowships will get a fellowship of 5,000 for Ph Ds and 3500 for M Phils to every student admitted in the central universities. As on today, in all 25 central

universities every student has a fellowship either NET or in non-NET through the empowered committee. I am told that these have brought thousands of students to go to Ph D, and the dropout rate has gone down and we will have many of them now who will be completing either M Phil or Ph D. Some of them might disappear to foreign countries, some of them might join private sector but I am quite sure that bulk of them will go to the education sector. But this is not good enough, we require more to be done. I will address one question to you, please discuss that we are not doing good enough at the undergraduate and master level fellowship programme. Masters is also expensive. You are proposing 4 year programme which is a wonderful idea but please give a thought to the financial assistance at the UG and PG programmes, why we are not doing as much as we are supposed to. I just want to tell you one or two more points and then I will stop. Exactly the issues you have addressed. what to teach and how to teach. As far as how to teach is concerned we are very concerned. About a year ago, I issued a letter to all the universities to follow semester system, credit and grading system, the internal assessment of teachers by students and change the whole thing. It was a short letter. I thought we should have a more detail, We appointed a committee with Prof Gnanam, with Pental and Anant Director of IIT, Chennai to develop the academic practices and the structures, They submitted the report approved by the Commission. I think all that you have suggested here as a part of the semester system, credit system, internal evaluation are dealt with by this committee and we will be sending it very soon to the universities.

As far as mobility of students is concerned, on a very selective basis, I am so impressed that I like this suggestion. In fact, I am going to take this report and put it up immediately for discussion in the UGC now. This has come in very timely. We can prepare a scheme of mobility of the students. Why not a student in Delhi University or other college do two courses in JNU and come back and get the credits transferred? Why not a student in Bhagalpur university come to Delhi university, do two semesters in Delhi University, get the credit and go back? If he doesn't get an admission at JNU at least he can do it. We will develop that scheme on a selective basis. I think you have captured rightly as a major suggestion, as a major policy that there should be mobility of

students, students should be allowed to take courses and get the credit transferred on a larger scale.

So I think the academic issue we have agreed, please do discuss in greater detail. If there is any add-on to the committee we will certainly add to this and we will send to universities. It is an ongoing process. I will only make a point here: please address the issue of language and text book. In ordinary colleges teaching is being moved from English to regional languages. Not only the undergraduate courses but even some of post graduate courses are being taught in regional languages. There are no text books, there are reasonably good text books at UG level but not at the PG level. Therefore same UG books are being used by the PG students, teachers who do not read English books cannot translate into regional languages. I think we will have to address that: how do we make latest material available at the disposal of the student and even at the disposal of the teacher; if possible we will have to have a separate organization to prepare text books, to collect materials and give it to the students. Please discuss that issue.

For the first issue, what is to be taught, the curriculum division set up a committee. I am happy Prof Yash Pal is here, we set up the committee under his chairmanship. I know he is busy in another committee. But we are soon going to have a talk, this committee will start functioning and it will take a review of the curriculum in the country. Science group has done lot of work and I am going to take a similar exercise for social sciences and humanities and all that will come from the part of Prof Yash Pal committee. Within 6 months or so we will have something in front of us. These are some of the points that I wanted to share with you, that both on the curriculum front and what to teach and how to teach, that is, academic reform: UGC has taken considerable amount of lead. But I think UGC indeed needs support. I am so happy that this document which has come is a very concrete proposal and we will take it. To the extent UGC has power we will implement and we will not lag behind. Because as I said earlier, once we recognize that higher education has problems and we should address them, these problems are coming like a flood and we are trying to address them. The problem of public private partnership, problems of globalization and cross country

education, quality of deemed universities and private universities: number of issues are staring at higher education. There are committees, each of these will come with policies; but I am extremely happy that this initiative has been taken by you and no other society is better than you to tell us, the policy maker, what to teach and how to teach. UGC will support and get many of you involved in that exercise which is being headed by Prof Yash Pal.

These are some of the issues I wanted to share with you.

Once again with great appreciation and congratulation for your effort, you will have my support, we will carry it now to the UGC and see what we can do.

Thank you.