Reforming Engineering Education

Milind Sohoni
CSE and CTARA, IIT Bombay
February 2015

Broad Comment

- Development Ouctomes and Engineering: Strong Connection.
- A more suitable, inter-disciplinary, region-specific, field-oriented training required.
- Closer interaction between state, industry and academia.
- National-level objective-type testing creating perverse incentives.
- CFI, both technical and social, should collaborate more and have a broader role in R&D for national needs.
- A broader and more inclusive definition Science, Technology and Society.

The state of Engineering

- Poor outcomes and disturbing trends in HDI such as drinking water, cooking energy, public transport.
- Poor macro-economic indicators: jobs, manufacturing and resource-use.
- Poor, narrow and shallow knowledge formation in key sectors.
- Disconnect between research and problems which require research.

Issue 1: Outcomes of Engineering Education

- Placements after education: an important attribute.
- Classification by sector, industry and role. Also domestic market and global market.
- Example of IIT Bombay and VNIT.
- Make in India vs. Make for India. Role of the state.

Recommendation

- Decide on attributes of reporting and mandate it.
- Important information for parents, students, policy-makers.
- Use this to base R&D funding and other decisions.

Issue 2: Accreditation

- Accreditation now to ABET curricula which may not be suitable.
- Use the broader definition of Washington Accord to define curricula as responsive to societal needs.

Recommendation

- Rigorous analysis of Engineering Body of Knowledge and priorities.
- Keep importance of regional and strategic needs in curricula design.
- Adopt these for accreditation.

Issue 3: GATE

- De facto measurement of engineering training.
- Largely reflects IIT and IISc practices and requirements for graduate work. Unsuitable for Industry and development needs.
- Largely impossible for non-IIT colleges. Possible cause of coaching.
- Multiple-choice format unsuitable for measuring engineeing training.

Recommendation

- Reduce GATE core requirement after consultation.
- Introduce other more nuanced evaluation processes.
- Publish reports and do research on GATE outcomes.

Issue 4: Inter-disciplinarity

- Core sectors-Rural and Urban engineering systems, small enterprises.
- Increasing need of inter-disciplinary training.
- State, market and civil society. Historical analysis, liberal scientific training.

Recommendation

- Develop course modules on structure of society and of technology.
- Make institutions truly multi-disciplinary. Closer collaboration between apex technical and social institutions.
- More avenues for students to work on real problems.
- Collaboration/internships with Collectors etc. and close relationship with regional problems.

Issue 5: TEQIP and World Bank

- Problems with TEQIP and its outcomes.
- Unclear where research in apex/regional institutions is headed.
- No rapport between World Bank projects and regional and national education and research institutions.

Recommendation

- Better design of TEQIP III.
- Closer alignment with national programs and World Bank projects such as Watershed or Urban Development.

Issue 6: JEE

- JEE defines Science Education and tests it by unsuitable instruments.
- Outcome of science education only for top 2%.
- Vast migration of students to institutions abroad.
- Disruption of State Curricula.
- Many many sociological problems.

Recommendation

- Phase out JEE. Replace by State Boards.
- Match science education to regional needs and student's world.

Issue 7: Role of CFIs

- Lack of clarity and accountability of IITs, IISc and IISERs.
- Poor relevance of research to national and regional needs.
- Poor connection between IITs/IISc with regional institutions.
- Poor collaboration with state agencies and industry.

Recommendation

- Vision revamp of CFIs. Enshrine accountability to developemnt outcomes.
- Innovative research/training collaboration between apex and regional institutions.
- Each CFI to pick key sectors such as Water, Railways, or Urban Systems.
- Closer collaboration at policy and implementation between state and CFIs.

Approach

- Long-term approach via broad discussion and not through mandate.
- Reform of AICTE as a think-tank.
- Collaboration with ICSSR and other institutions.
- Role of AICTE as a policy-agency coordinating between MHRD, DST, other ministries, industry and society.

Thanks