

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2015

Innovation and Creativity in Education

P.Sengottuvel¹, P.Karunakaran², D.Giridhar³, M.S. Devimani⁴

¹Professor, Department of Mechatronics, Bharath University, Chennai-600073. Tamilnadu, India

^{2,3}Associate Professor, Department of Mechatronics, Erode Sengunthar Engineering College, Erode, India

⁴Assistant Professor, Department of Mathematics, Erode Sengunthar Engineering College, Erode, India

ABSTRACT: The beginning of the twenty-first century is an exciting time for education in India. There is constant talk of the need to revise old ways of thinking and doing things and of the associated need for flexibility, creativity and innovation. Education policy is a prime instrument for the fostering of socioeconomic development. It is therefore not surprising that education policymakers, schools, principals, teachers and students are being swept along in a literal tide of newly launched policy directives. This paper poses questions about several ongoing and future challenges and dilemmas facing India's education system as it moves into the twenty-first century. It focuses on the ways in which schools are being urged to foster creativity and innovation to enhance national economic competitiveness in the global economy. It examines several key policies initiatives such as Thinking Schools, Learning Nation, and Master plan for Information Technology in Education, and revisions to university admission criteria. It's also discuss the move towers the mercerization of education, as manifested for instance in the push for intense interschool competition.

KEYWORDS: Education, innovation, creativity and engineering.

I. INTRODUCTION

The growth of the global economy has added urgency to calls to upgrade education and training as prime sources of national economic competitiveness. The Indian government can be said to have taken these calls seriously. The Ministry of Education recommended the education of each individual to their maximum potential and the development of creativity and flexible skills to maintain India's international competitiveness in the global economy. This paper seeks to stimulate and promote the discourse for transformation of understanding of objectives, required content and desirable processes of higher education, especially engineering and computing education. Educators, researchers, and visionary professionals are invited to contribute their articles.[1]

II. QUALITY, CREATIVITY AND INNOVATION

Engineering education is under attack for lack of quality, creativity and innovation as well as technical knowledge in the students passing out of the large number of colleges. Unfortunately many impediments and problems of engineering education, as it exists, have been clubbed together and the whole sector has been tarnished and whitewashed by one brush of non-performance. The poor output from universities and colleges can be divided into three or four categories for proper analysis of the reasons of deterioration.[2]

2.1. Admission and quality of students admitted

Schools are deficient in actual learning and there is a menace of Coaching Centers encouraging it and making money on the side.

2.2. Substandard colleges

Often producing poor quality graduates both Bachelors and Masters, thus providing poor quality teachers, the cycle is self defeating.[3]

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2015

2.3. Frozen and antiquated curricula and syllabi

Flexible curriculum is need of the hour. Affiliated colleges bundled into a Technical University are choking the education stream. Freedom of enquiry required for educating young minds is totally missing and in turn Research efforts suffer.[4]

2.4. Reforms necessary

Free colleges from the bondage to a Technical University. Colleges could be grouped in three categories excellent, good, and poor. Excellent colleges should offer Master's and Doctoral programs on their own. The 'Good' college should be confined to offering B Tech programs only but permitted to give their own degree. Other substandard colleges should be forced to wind up or offer Diploma courses.

We shall discuss and concentrate on points 3 and 4 above. The misfortune of the colleges is that they are allowed to start functioning commercially without proper facilities and they are tied to the apron strings of a state level Technical University. There is a dearth of trust and confidence in the capability of this college that they can impart good quality of education independently. This college is pushed under the umbrella of an omnibus system called a Technical University. Here the responsibility shifts from the "affiliated" college to the omnipresent but distant university. Managing few hundred colleges this University has to forget nice terms like Innovation and concentrate on day to day survival.[5] Innovations in curriculum, examinations and depth of questions asked, projects and laboratory exercises, searching assignments, peer learning and group teaching etc are out of question. Rote learning, 'describe and explain' type of questions is set in the examinations and the obvious effort is to pass the students. Unfortunately the standards even then are so bad that large number of students fail. The reform starts with fixing the category to which a college belongs. It may be time consuming but a criterion has to be worked out to separate them into excellent, good and poor class for three years initially. Hear will discuss how a 'good' college can be pushed into 'excellent' category and maybe a 'poor' college into 'good' class.

The objective of this effort would be produce graduates who are vibrant, smart, creative and innovative in their field. Now let us look broadly into what is required to be done to achieve this objective. This is not a unique solution but points out the direction which is likely to improve the situation.[6]

III. TEACHING LEARNING PROCESS

3.1. Admission

At the time of admission grading of the students is necessary in order to help the college in admitting better quality intake. A fixed level of performance in the HSC examinations followed by the position in the Competitive examination held specifically for admission should be used for admitting the student. In my view the result of Class 12 examination should be sufficient with an agreed formula for equating various Boards in the country.[7]

3.2. Revamp

Change the curricula and syllabi to make it current, forward looking, and dynamic. Provision must be made for slow learners and students coming from the deprived sections of the society. While going about it the following are essential:

3.3. Credits

The distribution of credits should preferably as follows. Core- 30 %, Electives-30 %, Science-20 %, HSS-20 % and extracurricular activities. The above distribution of 30 percent to Electives is an important step in this reform. These Electives are not confined to the material (sometimes advanced) not covered in the core. There is no end to knowledge and information all around in all fields but the core has to be kept minimum necessary allowing a flexible approach.[8] There are a lot of Options of having electives from the same area, from interdisciplinary area or from multidisciplinary area and a diversity should exist or rather be encouraged. Naturally the degree awarded would be in the core area.

3.4. Science courses

There is a lot of repetition in the topics covered in class XI and XII and the syllabus followed in Physics and Mathematics courses in the initial stages in Engineering. This is counterproductive since it does not allow newer topics to be introduced. The syllabi are practically the same of what we had in Allahabad University B Sc course in 1950-52. Not

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2015

that principles and subject material has changed but when do we teach subjects like Lasers, Nano technology, solid state and nuclear Physics to name a few.[9]

Similarly we go on teaching Mathematical theorems and how to solve a given Differential Equation, say, but never discuss why or how we come across the problem whose solution is the equation. A student never knows or understands which or how an actual problem leads to a particular equation.[10] Invariably the teacher of Mathematics in a college has no exposure to engineering and technology problems. Naturally his exposure of Mathematics to his students does not touch actual applications.

3.5. Humanities and Social Sciences

Exposure to Humanities and Social Sciences is an integral part of the mental makeup of an engineering graduate. The courses should be well designed to cover the whole gamut of a person's outlook of the society, duties and obligations to fellow human beings, and a positive and a happy outlook and perspective of life. We should not clutter them with 'n' number of Management related courses. Twenty percent of the curriculum allocation to HSS will mean about eight subjects in a program which effectively means one subject of HSS in every semester. A number of subjects of contemporary relevance can be taken up here and the mental horizon of the students widened. Some courses in this group could be compulsory or core and some others depending on the choice of the student.[11]

3.6. Labs and Projects

There should be heavy emphasis on Laboratory exercises since I firmly believe that a person actually learns about the subject in the Labs. Routine experimental setups, using set ups in green boxes, now popular, should be prohibited. Experiments should be challenging and the student must learn either to design or establish some principle of engineering through his own efforts working in a group.[12] The assignments have become a dull routine with the teachers and the students without making any efforts to enliven it. At least here the assignment has to be such that the students have to make an effort to look for the material from the Internet or the library, if desired, and present it in his own fashion. The cut and paste tricks should be punishable if a student resorts to that. [13]

Projects are an important component of creative teaching. Heavy emphasis on projects where the ingenuity of the student is tested and if properly encouraged they should be able to tackle research problems effectively and may take a research career later on. The projects could be individual or a group of two or three students. Effort on successful carrying out the Projects would lead to better Labs, Assignments and Seminars. Projects should be the backbone of good quality innovative and creative course work.[14]

If you look at the average engagement of a teacher in a good college is maximum of 6 hours of teaching in a week and the balance 10 hours in laboratory etc. If we assume that six hours of lecture would require about six hours of preparation he is technically busy for about twenty hours in a week of about forty hours. The argument that he has no time to check the assignments thoroughly and critically does not wash. It is a fact that if he is not active in research he has ample time to guide the students in the projects and assignments.[15]

3.7. Extra curricula activities

In order to develop a well rounded personality, Extra Curricular Activities must be encouraged so that the students participate in Social and Cultural as well as Sport and Games freely. Unfortunately a number of Engineering Colleges are being established and permitted to function without a provision of play grounds and student activity clubs. No encouragement of debates and quiz competitions is given by the administration so much so that all that is left of a cultural activity in a college is to hold one gala festival in a year. The main attraction of such festivals has shifted from students taking part in various activities to that of inviting well known artistes from outside to come and entertain them.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2015

IV. RESEARCH ACTIVITIES AND FACULTY

It goes without saying the obvious that educational standards can only improve if the faculty and the students are directly involved in Research either for a degree or for projects, preferably sponsored. Now the research standards are not up to the mark for various reasons. But on the face of it there are three reasons for poor performance in research.[16]

4.1. Insufficient financial support particularly for sponsored research

There has been almost a total lack of support to university kind of research by Indian industries. As long as the industries are not interested in the outcome of the research –whether theoretical or applied and experimental - they see no point in supporting it. If we continue buying and importing new technologies and equipment including manufacturing plants the need for research does not exist. The same is true for Government efforts also except the Defense industries where an embargo on exports to India exists in the foreign counties.

4.2 Insufficient or poor incentive for research graduates

Whether a person has Bachelors, Masters or Doctoral degree the industry almost does not differentiate in terms of emoluments, position of responsibility and promotions. Unfortunately this is also a fact that good students join industry after B Tech and students coming out of ordinary colleges join the Masters program to improve their qualification and employability. After all the filtering the students who join the Doctoral program are the ones who are reconciled to a teaching career. Though a large number of vacancies exist in the teaching profession but then actual salaries in most of the private colleges is far below that stated.

4.3. The career prospects are dismal in the teaching profession

Unlike all services like the Civil service, the Military or the Industry where once you get in your performance is monitored against your contemporaries serving along with you, in teaching your performance is measured against outsiders not even in your organization. For example for a promotion to the post of Infantry Major in the army your competitor is another Infantry Captain but not a Captain from E M division or a Deputy Secretary from Civil Services. As an Associate Professor you may have to compete with somebody coming from a completely different university set up. Every time there is a nationwide advertisement for a post to be filled in the university. I do not see any advertisement for the post of Joint Secretary or a Colonel in the army. Sometimes in the industry they do induct people at the senior position but after exhausting all local available talent. Engineering College is the only profession where you compete with outsiders at every level of promotion.[17]

4.4. Financial benefits

The Engineering colleges financed by the Government at least give the proper scales, the DA and other benefits to the faculty but the Private colleges seldom can afford to give the same emoluments to them. The main reason cited is that the fees that they can charge are limited and it is not enough to pay the teachers that are expected. Some Private colleges do manage to pay their teachers well but those are exceptions. Even if we do not take into account the high salaries and perks paid by the Industrial houses to their engineers and managers the actual benefits enjoyed by the people in Civil and Military services is also far more than what is doled out to a faculty member. It is part of their pay packets and service condition. The result is that teaching profession is least paying and attractive and only draws talent from the bottom of the barrel of eligible people.

V. FACULTY DEVELOPMENT ISSUES

In all services like Civil, Military or Industrial there is provision of upgrading one's skill and periodical training at the expense of the organization is almost mandatory. Neither before nor after joining is the teaching profession a person required to be trained. At one time the Government had started the QIP program for training the engineering college teachers to do research and acquire a Doctoral degree while being paid the full salary and an additional subsistence

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2015

allowance at the place of work. It benefitted a large number of teachers but slowly the initiative has petered off. Five day seminars in the name of Faculty Development that have become the fashion of the day are meaningless. In addition to the 3 years leave program for doing a Ph D all faculty members must be forced to go for training in an Industrial or a Research establishment for periods ranging from six months to a year fully supported by their parent college. It is no use saying the quality of education is poor without taking any concrete steps to set right the problem.

Pay the teachers a pittance in comparison to similarly trained people and then expect wonders from them. Since salaries are tied up and are according to the national scales the perquisites have to be scaled up. Why does an IAS / IPS officer not crib about the salaries because they have a large number of hidden benefits which the faculty members do not enjoy. Even if the starting salaries of teachers are similar to what these officers get the faculty get much poor compensation. Better facilities and perks based on performance are essential therefore to attract better people into teaching. Most of the Private Engineering Colleges, and they are in vast majority, treat their faculty shabbily. Barring a few the Management of these colleges are helpless because the fees they charge is not enough to pay proper salaries to the faculty.[6]

If we want quality of education we have to pay more to the faculty and therefore more fees from the students. We in our country suffer from over-regulation and over-control to the extent it becomes counterproductive. We have allowed a large number of Private engineering colleges to be opened and now we discover that thousands of seats are vacant in every state since there are no takers for them. Naturally these colleges are also suffering from shortage of qualified teachers and adequate facilities. Maybe opening new colleges is more lucrative in terms of return of investment - probably a lot of undeclared money is parked here - than pushing for improving the quality of education. Legislation closing these colleges is not possible in our democratic country but they can be declassified into the third category. It would be possible to work out a criterion for demotion of such college who do not meet the standards. The situation is so bad that some state government has requested the AICTE not to give permission for opening new college.

VI. FOREIGN UNIVERSITIES ROLE

India in its long history has been colonized by different kinds of people - some came as conqueror hungry for land and loot, others came for trade with us but became masters very quickly. The third kinds of conquerors aiming to colonize in another way are on us. These are aiming to make us subservient to them intellectually. Not that Indian students have not been going to foreign, mainly Western, countries for higher education it was not harming Indian universities in any major way. The subjects and specializations in India were also based on knowledge acquired from there. The performance of the Indian universities and colleges were not up to the mark and required reforms and tightening of standards to improve things.[4]

These foreign universities are not coming here for India's benefit but for their own ulterior motive. They are facing shortage of local American and European students particularly at higher levels of Postgraduate education and this is one way to attract talented students to their country. They also realize that in India there is a craze for foreign degrees coupled with a prospect of job there. We cannot object to a person's desire to obtain a higher degree and maybe a lucrative job outside India. This has been the scene for the last 50 years or so. The situation has changed now and we find that the foreign universities suddenly want to open campuses here for Masters Program and going up to a Ph.D. In my view the direct outcome would be as follows,

- a. The efforts to improve the quality of education in Indian institutions will suffer because the local institutions cannot compete with them in terms of resources at their command.
- b. There will be a tremendous unbalance in salaries and perks of the staff. The foreigners employed to teach here would have to be paid much higher emolument in addition to the protection of their dollar salaries. The local cost would have to be borne through enhanced fees from students making most of it unavailable to ordinary citizens.
- c. A better scheme would be to send the faculty members in sufficient numbers to these foreign universities for them to get trained. The benefits of such a scheme would be valid for generations of students trained by these faculty members.

In conclusion, it can be said the allowing the Foreign Universities to operate in India is serving their interests and not of Indian educational interests.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2015

VII. CONCLUSIONS

This paper has provided an overview of how creativity and innovation are conceptualized in the context of education and the emergence of a knowledge society. The existing research on creativity and innovation is broad, complex and addresses multi-faceted concepts. Creativity and innovation in education are not just an opportunity, but a necessity. This highlights an inclusive and democratic perspective of creativity, which sees all people as capable of being creative from early childhood. However, whether people develop their creativity depends on the kind of training they receive. Accordingly, creativity should be understood as a skill which may be developed through creative learning and innovative teaching. The fostering of such skill depends substantially on the development of curricula, where a balance among the different subject areas, between prescription and freedom and in agendas should be a priority. This paper provides a theoretical grounding and a working definition for creativity and innovation. It also explores the role and function of creativity and innovation in the educational domain and the factors which are likely to enable or inhibit creative learning and innovative teaching.

REFERENCES

1. Faruqui, M. N., Engineering & Computing Education: Reflections and Ideation, IIT, Kharagpur.
2. Sree Latha R., Vijayaraj R., Azhagiya Singam E.R., Chitra K., Subramanian V., "3D-QSAR and Docking Studies on the HEPT Derivatives of HIV-1 Reverse Transcriptase", Chemical Biology and Drug Design, ISSN : 1747-0285, 78(3) (2011) pp.418-426.
3. Ala-Mutka, K., Bacigalupo, M., Kluzer, S., Pascu, C., Punie, Y., & Redecker, C. (2008). Learning2.0: The Impact of Web2.0 Innovation on Education and Training in Europe: Report on a validation and policy options workshop organized by IPTS, Seville, pp.29-30, 2008.
4. Masthan K.M.K., Aravindha Babu N., Dash K.C., Elumalai M., "Advanced diagnostic aids in oral cancer", Asian Pacific Journal of Cancer Prevention, ISSN: 1513-7368, 13(8) (2012) pp.3573-3576.
5. Albert, R. S., and Runco, M. A., A History of Research on Creativity. In R. J. Sternberg (Ed.), Handbook of creativity Cambridge: Cambridge University press, pp. 16-31, 1999.
6. Tamilselvi N., Dhamocharan R., Krishnamoorthy P., Shivakumar, "Anatomical studies of Indigofera aspalathoides Vahl (Fabaceae)", Journal of Chemical and Pharmaceutical Research, ISSN : 0975 – 7384, 3(2) (2011) pp.738-746.
7. Almeida, L. S., Prieto Prieto, L., Ferrando, M., Oliveira, E., and Ferrandiz, C., Torrance Test of Creative Thinking: The question of its construct validity, Thinking Skills and Creativity, 3(1), 53–58, 2008.
8. Devi M., Jeyanthi Rebecca L., Sumathy S., "Bactericidal activity of the lactic acid bacteria Lactobacillus delbreukii", Journal of Chemical and Pharmaceutical Research, ISSN : 0975 – 7384, 5(2) (2013) pp.176-180.
9. Baek, Y. K., What hinders teachers in using computer and video games in the classroom? Exploring factors inhibiting the uptake of computer and video games, Cyberpsychology & Behavior, 11(6), pp. 665-671, 2008.
10. Reddy Seshadri V., Suchitra M.M., Reddy Y.M., Reddy Prabhakar E., "Beneficial and detrimental actions of free radicals: A review", Journal of Global Pharma Technology, ISSN : 0975-8542, 2(5) (2010) pp.3-11.
10. Cropley, A., and Cropley, D., Resolving the Paradoxes of Creativity: an Extended Phase Model, Cambridge Journal of Education, 38(3), 355-373, 2008.
11. Carroll J. A model of school learning, Teach Coll Rec 64:723–733, 1963.
12. Heilman, K. M., Nadeau, S. E., and Beversdorf, D. O., Creative Innovation: Possible Brain Mechanisms, Neurocase, 9(5), 369–379, 2003.
13. Loveless, A. M., Creative learning and new technology? a provocation paper, In J. Sefton-Green (Ed.), Creative Learning, pp. 61-72, 2008.
14. McNeir, G., Outcome-based education: Tools for restructuring, Oregon School Study Council Bulletin, 36(8), pp. 22, 1993.
15. Smith SR, Dollase R. Planning, implementing and evaluating a competency-based curriculum, Med Teach, 21(1): pp. 23–25, 1999.
16. Turvey, K., Towards deeper learning through creativity within online communities in primary education, Computers and Education, 46(3), pp. 309-321, 2006.
17. Wyse, D., and Torrance, H., The Development and Consequences of National Curriculum Assessment for Primary Education in England, Educational Research, 15(2), pp. 213-228, 2009.
18. B Karthik, TVUK Kumar, Noise Removal Using Mixtures of Projected Gaussian Scale Mixtures, World Applied Sciences Journal, 29(8), pp 1039-1045, 2014.
19. Vijayan T ,Cooperative Communication over Rayleigh Fading Channel,International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering , ISSN: 2278 – 8875 , pp 2702-2708,Vol. 2, Issue 6, June 2013.
20. E.Kanniga, Dr.M.Sundararajan , Design and Architecture of Bio Signal Amplifier for Signal Extractor Neuro feedback Interface Machine ,International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering ,ISSN: 2278 – 8875 , pp 792-780 ,Vol. 2, Issue 3, March 2013
21. S. RAJESWARII, S.JASMINE2, Industrial Manifold Control Systems Using High Speed Networks, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, ISSN: 2249-2615,pp 17-23, Volume2 issue-4 No1 July 2012
22. G.TAMIZHARASI & S.KATHIRESAN, Four Stroke Diesel Engine's Surface Ignition using Ethanol, International Journal of Computer



ISSN(Online) : 2319 - 8753
ISSN (Print) : 2347 - 6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 5, May 2015

Trends and Technology(IJCTT) , ISSN (Print) : 2320 – 3765 , pp 3639-3646 ,Vol. 2, Issue 8, August 2013.

23. Sridhar raja .D , Application of BCI in Mind controlled robotic movements in intelligent rehabilitation ,International Journal of Computer Trends and Technology (IJCTT), ISSN: 2278 – 8875 , pp 1231-1238,Vol. 2, Issue 4, April 2013.