Chandigarh

Proposal for Involving International Experts in Curriculum Development

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Research Proposal

Involving International Experts in Curriculum Development

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Curricular Development in Nano-Science & Nano-Technology through International Expertise

1.1 Introduction

In the 21st century, the emerging field of nanoscience and nanotechnology is becoming more popular day by day. Nanotechnology deals with manipulating and controlling individual atoms and molecules to design & create new materials in form of nanomachines, or nanodevices for application in all aspects of our modern day lives. Developing nanotechnology programs will be the backbone for providing next generation trained workforce[1,2]. Engineers and scientists should possess the interdisplinary knowledge of mathematics, science, and engineering in order to design, analyze and fabricate nanodevices and nanosystems, which are radically different when compared with traditional technological systems and teaching also[3,4]. However, recent advances and fast growing developments in nanotechnology in developed countries provide challenges to academia in educating and training a new generation of skilled engineers and competent manpower of developing countries. Strategies for developing curriculum in nanotechnology are very essential to recognize the role of the teacher as a curriculum planner and developer to meet the challenges and demands of the years to come[5,6].A successful curriculum development and its execution plays a vital role in providing the direction of young generation on the desired way for the achievement of national objectives and fulfilling required social needs with change of time[7,8]. Curriculum development process also undergoes transformation due to newer developments in education and its evaluation keeps it valid, reliable and following in the right direction.

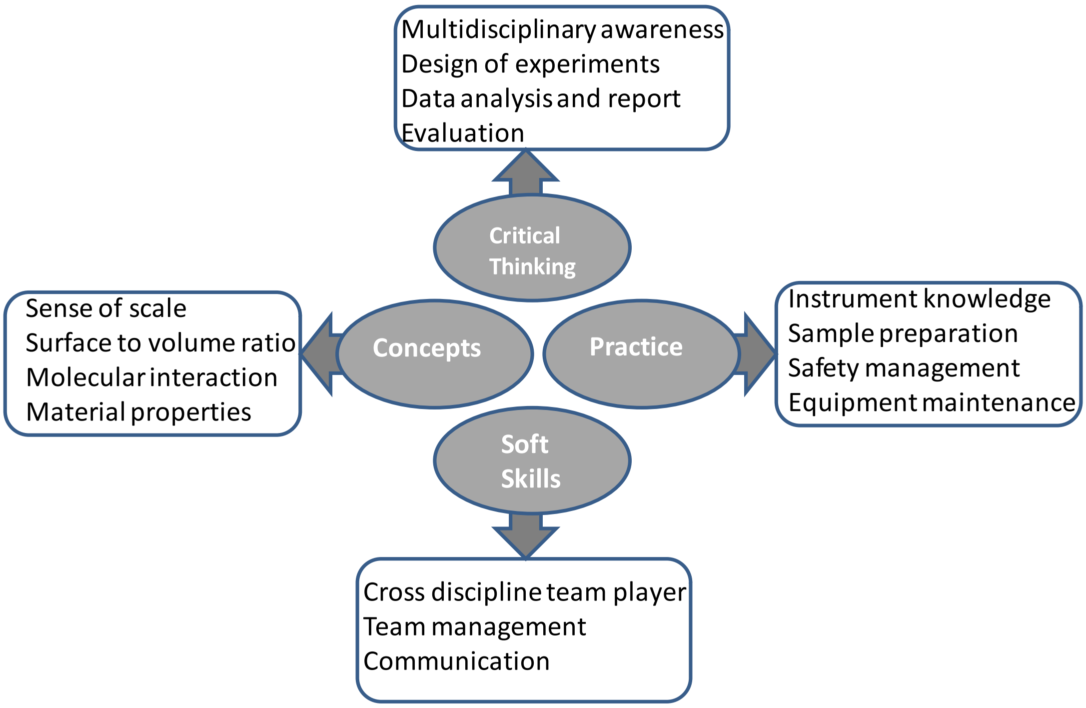
1.2 Objective

Curriculum development is intended to orient student/teachers to the principles, processes, and procedures of curriculum design and development. All the participants will be informed about the objectives, selection of curriculum content, its scope and outcomes, teaching strategies, and design of instructional materials. Various other factors that affect the process of curriculum development and implementation will be the part of the proposal. This programme will provide an opportunity gives student/ teachers to develop an in-depth understanding of the central idea of curriculum in nanotechnology. Furthermore, it will enable student/teachers to plan and develop curricula to meet the needs of their students. A variety of teaching and learning approaches adopted in present developedcountries will be discussed through lecture, group discussion, group work, peer learning, informational posters, and question-and-answer sessions. Discussion and reflection will help in understanding its elements, aims, and objectives; and the entire curriculum development process with following objectives

- Advanced and practical courses.
- Hands-on laboratory/projects
- Metaphysical courses.
- Developing learning objectives and course modules to fit with industrial needs
- Guest lecturers from abroad, experts form industry as resource personals
- To create collaborative research opportunities for undergraduates and masters students
- Internships -applied research and learning towards practice
- Knowledge from international expertise and professional organizations.

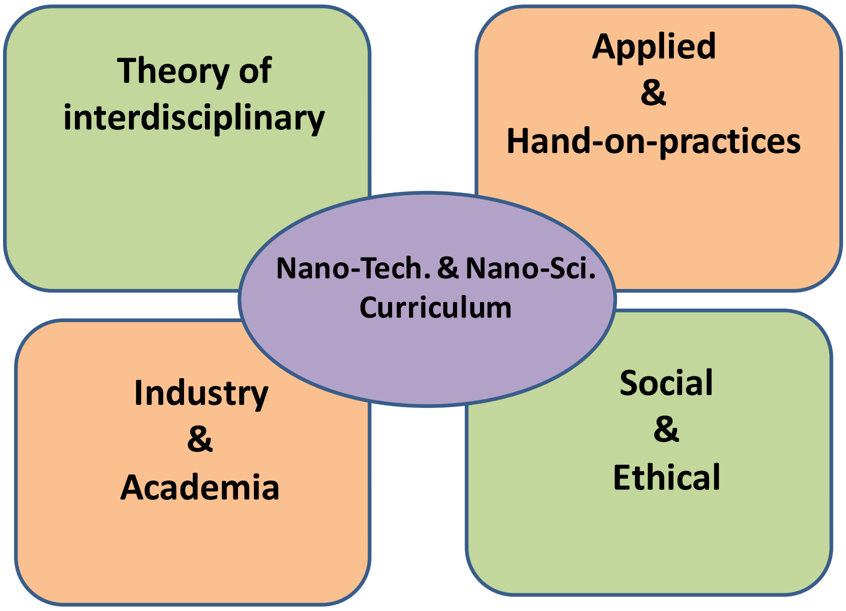
1.3 Curricular development plan

The key focus will be createa perfect, foundation and rationale to developing nanotechnology curriculum with help of international expertise. Information must be taught in an applied engineering/technology format to integrate engineering principles with "hands-on" experiences. Curriculum must also be meaningfully combined with theory and hands-on exposure to techniques and various tools that image at the nano-scale.



Scheme 1: Model of skill development through curricula plan.

In any curriculum, as student's progress, they gain conceptual depth and instrumentation experience. Upper level students are often involved in product characterization or measurements involving nanoparticles or materials. Various aspects include design of experiments, statistical measurement, quality control, data analysis, teamwork and interaction and report writing.



Scheme 2: Focused areas to be covered in curriculadevelopment plan.

One of the most beneficial partnerships required for the successful implementation of any educational curriculum, is the bond between industry and the educational collaboration. Industry can provide practical demonstrations and examples of how nanoscale concepts are being used to create applied products. Industries will equally benefited by these partnerships by creating a pool of technical sound manpower which industry will be needed. Industry involvement helps guide the curriculum and content created for the courses to insure that graduates can gate better job opportunities.

1.4 Strategies and implementation

Curricula on nanotechnology can be developed by creating bothknowledge-centered and learning-centered approach.Entire curricula should be well organizedthat encouragecreative thinking, critical thinking and life-long learningpriority. Due to its interdisciplinary nature, a broad understanding of basic sciences, engineering sciences and nanotechnology is essential. Introductory nanotechnologycourses should be taught more from the perspectives ofconcept development and qualitative analysis with basic theoretical approach. All effort will be made toconvey the big picture with different learning exercisesto achieve course objectives. Every effort should be made to integrate concepts related to nanotechnology into all design curricula. Interactive learning sessions both inside andoutside the classroom will be key focus. Entire course will be more learners centric so that large number of participationscan join. More opportunities will be createdto work directlywith established nanotechnology research centers and industries (local,regional, national, international) to gain hands-onexperience. The quality enhancement of the curriculum will be done by inviting guest speakers from industry and research centers. The new approach will impart the improvements inthe traditional teaching disciplines regarding the advances innanotechnology at present and in the future.

1.5 Conclusions

There are new challengesfor academia to incorporate nanotechnological advances into basic science innovations, engineering developmentsto establish a correlation. It is only possible via adopting regular revised curricula and relevant courses. Attempts tointroduce nanotechnology have been only partiallysuccessful due to the absence of coherent strategy anddiverse views about nanotechnology means. It is necessary to educateengineering and science students with an ability to design,analyze and synthesize nanosystems. Nanotechnologyeducation should be integrated into mainstreamundergraduate engineering curricula as soon as possible. Government, industryand university bodies are going to play an important in educating next generation youths in nanotechnology.

1.6 Proposed list of expertise from abroad to be participate in the curriculum development

1 Prof. Rahul Raveendran Nair, TheUniversity of Manchester, UK

2 Prof. Michael Gradzielski, Technical University, Berlin, German

3 Prof. Robert I. MacCuspie, Florida Polytechnic University, Florida, USA

4 Prof. Dominick E. Fazarro, University of Texas, Tyler, USA

5 Prof. Deb Newberry, Dakota County Technical College, Minnesota, USA

6 Prof. Takuzo Aida, The University of Tokyo, Japan

1.7 Proposed budget:

Budget items	Amount requested in Rs.		
	1^{st} Year	2^{nd} Year	3^{rd} Year
(a) Staff	-	-	-
(b) i. TA &DA for foreign experts (6 persons in 1.5 year) ii. Honorarium iii. Contingency	Rs. 9,00,000/- Rs.1 2,00,000/- Rs.5,00,000/-		-
(d) Total	Rs.2 5,00,000/-		
Grand Total	Rs.2 5,00,000/-+ 20% HRA + Overhead Charges		

1.8 References

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