

INNOVATION IN TEACHING –LEARNING IN APPLIED SCIENCES

Mr. Udoshi Basavaraj¹ & Dr.Rajani Jairam²

¹Asst. Professor, Department of Electronics & Communication Engineering, PES Institute of Technology, Bangalore South Campus, Electronic City, Bangalore-560 100

²Dean (student welfare) Jain University, Bangalore-560004

E-mail: rajanijairam@gmail.com udoshi.basavaraj@rediffmail.com

Abstract

Teaching is an art and an aptitude. It provides an opportunity to update the knowledge base and communicate the same very effectively to the primary stake holder. The skill of a teacher lies in his ability to deliver the right information to the most befitting recipient.

Currently, the scenario demands learner centric teaching methods. The teacher of today faces varied challenges. Open sources like internet have made ready availability of information, this has demanded more from a teacher who can no more adapt the convection method of teaching. This concept is more essential for domains which have continuous up gradation and enhancement of knowledge. Innovation brings about a marked difference in knowledge sharing and enhancement of skills.

The paper examines the role of innovative teaching learning practices in the domain of Engineering and Technology. Thrust is given to Applied Sciences where frontier and cutting edge research is initiated, sustained and enhanced.

Sources and references would be drawn from published and unpublished works on innovations in teaching-learning and applied sciences. Research papers on emerging trends in the field of applied sciences would also be consulted to add weightage to the paper.

Keywords: Teacher, Learner, Innovation, Applied Engineering & Domain Expertise.

Introduction

Innovation refers to designing, changing or creating more efficient and effective processes, products, methodologies that usually become best practices.

Innovation is not just thinking 'outside the box but realizing there is no box'. It is the convergence and coming up in a different way or adding values to products, services, systems or processes. From management concepts and practices, the heart of an enterprise is innovation and it is the effort to create purposeful focussed change in economic, social or service potential. The human capacity to invent and create is universal. This is a living world of continuation, creation and infinite variation. Scientists keep discovering and rediscovering. Each creation is an embodiment of an innovation that was successful. More often than not science is a resistant to change. Within an organization recognising and utilizing the potentials of different people is an opportunity to change. Change

being the order of the day, it is highly imperative to introduce innovations in all spheres of life. Therefore, even in Teaching-Learning process, innovation becomes the key for quality enhancement. Scientific domain adapts innovative technology very easily if the change is for betterment and positivity. Hence institutes of repute have adapted to innovation in teaching-learning process, innovation in technological advancement and innovations in creating human assets. The paper examines the changing modalities in teaching-learning processes of higher educational institutions in the field of Science and technology.

Case Study

The most adaptable and understandable way of innovation is to analyse a model through case study approach. Practical and real time study unfolds the earthy problems and result oriented solutions to these problems which are simple, complex and complicated in nature. Given below is one such study which conveniently blends a student in the innovative world of knowledge and analysis.

The darling of the Innovative Learning Environment case studies is the Jenaplan School in Germany. It's one of the few schools embodying all the principles fluidly. The school has about 450 students that range from three to twenty years old. Students aren't broken up into grade levels, instead they learn in mixed-age groups as well as in groups of roughly the same age. Learning is directed by students, often project-based, evaluated primarily through writing and projects, self-assessments and peer-assessment. The schedule is periodic, focusing on a topic like application oriented for three to four weeks and crossing into multiple disciplines. The teacher is seen as an active mentor and coordinator and the school has active parental involvement.

The Jenaplan School has won awards for its model and in the eyes of the Innovative Learning Environment researchers is doing an excellent job at preparing students to be adaptive and nimble thinkers in a knowledge-based world.

Critical Thinking in Innovative Teaching-Learning

Cognition and learning form the core of critical thinking. Adapt, analyse, apply and appreciate are the four A's of innovation. Application of theoretical knowledge in practical sphere becomes the most important engagement to introduce any innovative principle in the routine process of teaching-learning to make it more effective, efficate, efficient and empowering. After all, the ultimate result one would expect out of it to create human capital, globally relevant, adaptable to change, holistic and intellectually viable.

In educational terms, development of critical thinking is really a curricular issue. Looking beyond an individual course to the deep, recurrent problems of critical thinking in a field of science and technology and devising a curriculum that cumulatively teaches students how to identify and approach problems on hand. That is how memory trained to be an ally. This insight implies that courses designed in isolation are likely to be ineffective, compared to thoughtfully sequenced courses as a part of a larger curriculum. Learning sequences in a series of thoughtful and well-designed courses will yield the most effective learning.

The techniques, students might use to learn material, those most deployed re-reading, highlighting texts, and the like are decisively least effective. Those that most effective – self-administered testing, practicing to understand any concept

through critical thinking, creating short notes, making block diagram representation of tough derivations, converting concepts more into easily understandable formats. Students don't use techniques on their own; teachers should help them to do so. Skilful teachers have to take that into account as they engage precisely in the task of trying to get something from within their own minds into persons. Teachers have to take the deficiencies in their students learning skills into account and point them toward effective practices.

The Innovative Art of Teaching

Science is a domain which demands both experimental and empirical approach. As the teaching-learning uses multitudes of practical methodologies, it is easier for a faculty to drive home the points to the students in a more demonstrative manner. Models, miniatures, experiments, lab orientation enable a student to understand the concepts in a better way as visual approach enhances the retention power in the minds of students. If teaching is an art, innovation in teaching is a tougher art and being an innovative teacher is the toughest art.

The conventions of discipline make education desolating and in this internet era students attributes are no longer natural as they experience it. To prepare a student to write an intense research paper on a single work one needs to be 'astonished by what he has innovated'. It would be an idea of experimentation, innovation or collaboration. Teaching strategically and innovatively gives the necessary aperture and avenue for challenge that the world of world of teaching demands as also in the allied domain of research and rest of contemporary life.

Educating and creating interest in research is testing and needs to be duly supported for assessment. Faculty members ought to be pertinent, productive, performance oriented and practical.

Teachers' obligations extend beyond the domain of mere teaching. It refers to making students aware of their potential being and enabling students to doing what interests them. Conditions change and people change therefore wisdom received in unreflective orthodoxy leads to innovation, incubation and ideation in the prescribed domain of teaching-learning.

Student Centric Approaches

Teaching-Learning process should be more oriented to make the campus a learner-centric campus with newer and newer strategy development and deployment. Applied sciences are more students friendly as they have the following features:

- **Potentiality for experiment based teaching:** The concepts of Science could be explained more effectively by conducting experiments and concepts application knowledge could be brought to the learners notice.
- **Practical and result oriented approaches:** Topics presented to students could be practically proved with high precision and accuracy; this encourages learner's interest on applied science.
- **Knowledge updation through domain innovations:** As naturally applied science attracts learner's attention due to its wondering products and applications. Therefore a teacher can easily guide student and can enforce his interest towards science by mentioning domain innovations.
- **Case study analysis:** Teaching-Learning process in applied science is made more accurate through case studies. Students are encouraged to involve more in knowledge based understanding by comparing trends of different industries design. Here a questionnaire could be prepared to compare

designs and implement ideas of manufacturers of particular product; this could be given as case study for students to enhance their domain knowledge and logical thinking.

- **Laboratory orientation:** Effectiveness of practical subjects could be improved in students grasping by designing laboratory session. This will help students to understand the concept more effectively and clearly.
- **Project and model making:** To testify learner's applicative based mind, students can be asked to construct small projects and could be projected in the form of models. This technique of teaching-learning will yield better result.
- **Student seminars and workshop on latest development in the field:** students can be asked to make presentations on emerging technologies and current trends of technical development. This method of learning will encourage student community to update their knowledge base.

Bridging the Gap between Industry and Academia

This is a very challenging task needs to be executed by education institutions. It is becoming very tough for education institutions to meet requirements of technical industries (private companies) in the form of technically sound graduates. It is disheartening to say that, there is no match between syllabus designed by university and technical industries demands. Learning should be made more effective by making students inclined towards application based knowledge Updation and making them to realize needs of technical growth. This gap which exists between industry and academia could be effectively connected through following practices;

- Students are encouraged for industrial visits and should be asked to make report on it. Later experience of such visits should be presented in the class room
- An expert from technical field or industry exposure is invited and needs of industry is brought to students notice. Hence student's contribution for further growth of field is made as mandatory.
- Syllabus should be designed in such way that it should be more relevant and appropriate to current trend of technology.
- An industry expert can be considered as member of syllabus designing committee
- Teacher should be sent to industries to know how the knowledge of an employee is utilised for the design and construction of machines and whose implementation. So that, he can encourages his student's interests towards industry requirements.
- Industries should provide platform for students to take projects and guide them to enhance their practical knowledge.
- Industry and academia together can design syllabus in collective manner such that learner could get maximum knowledge benefit out of it.

Enhancing Employability

Students are made more relevant to job market and industries best option for recruitment through the following practices;

- Innovation in classroom teaching
- Using modern teaching aids
- Institution of technology
- Use of modern equipments
- Industrial and technical visits

- Interaction with experts
- Visits to process and manufacturing units
- Attending conferences and presenting papers
- On the job training
- Earn while you learn
- Summer internships

Conclusion

Every educator wants to create an environment that will foster student's love of learning. Teachers need to develop self-directed learners, students with adaptive expertise. Adaptive expertise tries to push beyond the idea of mastery. Students need to equip to question and apply learning in new situations. Innovative teaching-learning environments reflect the various experiences and prior knowledge that each student brings to class.

If both the industry and academia works together by joining hands, then students will get maximum exposure to learn, innovate, design, implement and re-invent and finally can become great asset in nation building. This can be more effectively implemented by thoughtful teachers who consider teaching as noble profession and have passion towards innovation in teaching.

Learning can't be meaningful if students don't understand why the knowledge will be useful to them, how it can be applied in life. Understanding the connections between subjects and ideas is essential for the ability to transfer skills and adapt.

Reference

- Tapscott, D. (1998). *Growing Up Digital: The Rise of the Net Generation*, New York: McGraw-Hill.
- Teo, R. & Wong, A. (2000). Does Problem Based Learning Create A Better Student: A Reflection? Paper presented at the 2nd Asia Pacific Conference on Problem -Based Learning: Education Across Disciplines, December 4-7, 2000, Singapore.
- Vaughan, T. (1998). *Multimedia: Making it Work* (4th Ed.), Berkeley, CA: Osborne/McGraw-Hill
- BPP (2000), *Success in your Research and Analysis Project*. Carol JM. Creativity and Rational.
- Svenja and others *Teaching Practices and Pedagogical Innovations - OCED Publication-2012-UK*.
- Jack Hassand and other 'The Art of Teaching Science - Inquiry and Innovation' Amazon Worldwide.
- 101 Ideas for Innovative Teachers Commissioned by Microsoft Hungary.