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# Innovations in Teaching and Learning: Top Down or Bottom Up?

KEYWORDS: Top-down, Bottom-up, Enhance equity in participation, Centre for Excellence


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**ABSTRACT** *The honorable prime minister announced that 2010-20 is the decade of innovation for India. Today's physics demands judicious blend of its philosophical and applied aspects, new technologies and especially social computing, provide new opportunities for education and training, as they enhance learning, teaching and facilitate collaboration, innovation and creativity for individuals and organizations. The benefits of deploying social computing and ICT for learning depend on the learning approach used, emphasizing the role and the skills of the teacher and the need for supportive settings for both learners and teachers. Tremendous e-resources available on the internet can be utilized to enhance the effectiveness of teaching-learning by integrating them with lectures. The explosive growth of digital technology has made revolutionary impact on science in general and on physics teaching in particular. Various innovative experiments have been carried out in the field of physics education the world over during last 50 years after the inception of international commission on physics education. The purpose of this paper is to present a glimpse of existing, emerging and certainly the technologies of future in classroom teaching and learning process.*

## INTRODUCTION

You'll see a top-down vision of innovation in colleges - expensive stuff that delivers information, lots of flashy equipment like display systems, interactive whiteboards, etc. They might give the illusion of modern, but in fact they're just glitzy versions of the old standby - teaching as telling. In fact, the best innovation in instructional practice is coming from the bottom up - from teachers who find effective ways to harness the creative energy of their students. These teachers don't simply deliver information to students, they craft lessons where students can research, collaborate and reflect on what they're learning. They harness a flood of new platforms that enable students "see" information in new ways and support a more self-directed style of learning. Unlike the expensive wares being hawked by the convention vendors, No one at the top seems to notice that teachers who want to network have already created their own "bottom-up" support systems via the social web. New technologies and especially social computing, provide new opportunities for education and training, as they enhance learning, teaching and facilitate collaboration, innovation and creativity for individuals and organizations. The benefits of deploying social computing and ICT for learning depend on the learning approach used, emphasizing the role and the skills of the teacher and the need for supportive settings for both learners and teachers [1].

Showcase excellence and innovation in teaching that facilitates student learning and positively impacts student academic success. We are excited about showcasing and celebrating creativity and knowledge of faculty who consistently find ways to harness the creative energy of their students online and in the classroom. Share "best practices" to enhance teaching and learning

1. As a leading science institution by deploying educational technology within the classroom and within the curriculum.
2. Student access to technology-mediated curricular components via replacement/upgrade of the campus wireless network and smart classrooms.
3. Smart Classroom Project, technologies to facilitate teaching and learning [2].

**Collaborating with Groups the Groups tool for student collaboration**

With a discussion of the benefits of collaboration in learning, users learn to establish and support groups the impact of ICT use on students is highly dependent on teaching approaches and better skills result when student-centered guidance, group work, quizzes, seminars and inquiry projects are used [3]. Social computing tools and approaches can enhance learning outcomes:

- Supporting different senses with multimedia visualizations and representations, both in materials developed by teachers and by providing new opportunities for creativity for the students.
- Supporting collaboration with new online production, commenting and networking tools, improving both overall and individual performance.
- Supporting differentiation and diversity by supplying teachers with a wide variety of didactical and methodological tools that can be fitted to the respective learning objectives.
- Encouraging experimentation. Innovations in the process of learning and teaching emerge from different actors, both learners and teachers. Policies should aim to empower educational actors and institutions in their local contexts to develop innovative approaches to learning with added value in their environment.
- Co-development of tools for learning and teaching. Many innovations result from end-users adapting and developing tools for themselves. Involving learners and teachers in learning tool development processes could create innovative tools, which take into account both learner and teacher perspectives, and support personalization and scaffolding in new ways., design for All and co-development approaches are crucial for improving the usability of technological innovations, especially for learners with disabilities or special needs.
- Research on ICT impacts on learning. More research is needed for finding evidence on how technology can enhance learning. Together, tool developers and educational researchers should study and develop models for

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embedding new tools such as computer-based assessment in teaching and learning approaches. This would provide institutions and teachers with proven practical models that support the take up of innovative tools [4].

**ENHANCE EQUITY IN PARTICIPATION**

Although ICT access, supply and skills in general have been considerably improved in India, these factors are still limiting take up in educational settings, especially in rural areas and for disadvantaged user groups. Furthermore, in some areas, educational institutions are lacking broadband connections and up-to-date equipment. In addition to basic ICT skills, advanced digital competence is important for preparing people to use participative communities and collaborative content for work, leisure and learning [5].

**CENTRE FOR EXCELLENCE IN INNOVATIVE PHYSICS TEACHING**

Physics endeavors to understand the underlying laws governing our universe. It expands the frontiers of knowledge about space, technology, medicine and provides grounding for all of the sciences. The Centre will focus on curriculum innovation, the development of personal and professional skills, widening access, the use of modern technology to promote effective teaching and learning and the positioning of physics in the broader scientific context. The focus on innovative learning will include a rich program of e-learning, a strong element of problem-based learning and a substantial improvement in problem solving and employability skills. Innovative teaching in the Department of Physics is based on more than 50 years of developments addressing the problems of student engagement, access, retention and the cultivation of core skills. These innovations in teaching and excellence in research have been recognized by the Quality Assurance Agency.

**Enriching the Learning Experience**

In Andhra Loyola College, the learning environment will be based around problem-based learning (PBL) and will integrate theory, computing and practical work with class and tutorial activities in a learning community. A restructured state -of-the-art laboratory will be designed as a dedicated PBL facility and will provide a unique space for teaching and group and individual study. In addition there will be a highly innovative 'Sectored PBL Laboratory' in which students from different years will share facilities in laboratory sectors devoted to particular topics such as optics and thermodynamics, modern physics, electricity magnetism, electronics, mechanics waves and oscillations. This will also address a well-known weakness in the student experience of traditional practical work by using elements of e-learning to provide pre- and post-laboratory contexts for experiments [6].

**Inspiring Others**

Promoting interest in physics by placing it in proper context among other sciences and in a more general culture will be a key component of the CETL in collaboration with the Centre for Interdisciplinary Science. As the degree of experience and expertise in evaluated physics education increases and physics e-learning develops a future mission of this CETL will be to generate a high level of interchange between all partners and others who wish to join in these efforts. This will lead to an even higher level of interchange with a CETL-centred network of research-based teaching expertise and online physics teaching resources - enabling college leavers and lifelong learners to find elements of physics teaching designed to capture their interest and develop their skills wherever they are. This may provide a model for other university-level science education initiatives beyond the domain of physics [7].

**The Centre for Effective Learning in physics will achieve its goals by**

1. Using best practices in educational research to design better ways of teaching science and its concepts.
2. Increasing the number of science students and supporting the learning of science students locally.
3. Providing a significant new resource base for science teaching nationally.

The department of Chemistry and Physics maintains an effective program by organizing and attending conferences on the teaching and learning of science, obtaining grants that promote effective teaching, and establishing collaborations with other universities in an effort to improve instruction. Examples of instrumentation used in the teaching of Chemistry and Physics in our Department Data analysis in the physics laboratory can be done using calculators, readymade packages or programming languages. Spreadsheet programs are powerful programming and graphical analysis tools providing middle course between the readymade packages and the programming languages Microsoft EXCEL can be used as a powerful tool for analyzing and plotting data in an introductory physics laboratory. EXCEL enables data analysis in an easy manner requiring no prior knowledge of computer programming. Virtual experiment, simulation used for studies and analysis of electronic circuits, projectiles, waves and oscillations in physics laboratory. A virtual experiment simulates real lab experiment [8]. The experiment can measure various parameters and study different characteristics on computer. Data collected in virtual experiment are similar to those acquired in real physics laboratory. Students see innovative instructional approaches throughout their academic career. In addition to research based instructional materials, the programs regularly use modern pedagogical techniques such as interactive lectures using personal response systems and group problem solving. The science departments have a number of laboratory areas where students participate in classes and conduct experiments. Many of these laboratories are equipped with modern pedagogical equipment such as, Computer data acquisition systems, IR, OA, AAS, POLARISING MICROSCOPE, HIGH TEMPARATURE GLASS FURNACE and UIM, Brookfield Viscometer. Students use modern equipment in their courses and have opportunities to conduct research with faculty members to learn firsthand about science methods and experimentation.

**CONCLUSIONS**

If we are to cope with the challenges of rapidly changing society and make use of new opportunities offered by social computing and ICT, plans has to be realized by giving educators, teachers and students access to necessary equipments. The most important competence building in this field is the development of pedagogical methods that can happen only when long-term competence programmes can work along with real life experiences where educators, teachers and students are using social computing and ICT in their daily work and learning experiences. On line activities used are limited but should be given special emphasis on the use and integration of online resources.

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