

Augmenting Pedagogical Practices Through Innovative Technological Interventions

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Abstract

The ubiquitous educational technologies due to technological growth and development has led to significant advancement in practices adapted by teachers globally to educate children. Students are 'learning by doing' and 'technology enhanced learning'. In such a scenario, laboratories become a core requirement, in particular in science education for skill training and better understanding of concepts. The present paper seeks to research and analyze comprehensively the various educational technologies available addressing the concern for the flexible use of teaching spaces along with ensuring a quality learning experience for Undergraduate students when on campus and off campus. Cost effective models have been proposed for both students on campus as well as for the under privileged section of students to provide quality education by reaching out to such needy children through participatory and interactive methods. Each model was accomplished by engaging students at every level of the project, i.e., designing, creation of digital content, controlling and monitoring and its management and evaluation assessment.

Keywords: *Educational Technologies, Technology Enhanced Learning, Student Centric Learning, Scientific Inquiry*

Introduction

The drastic changes in the education system has given rise to significant advancement in practices adopted by teachers for teaching and learning due to all-pervading educational technologies. The use of new and innovative education technologies and strategies entail a paradigm shift from simple chalk and talk methods to practical and hands-on based learning in classrooms. This

facilitates the faculty to integrate teaching learning and research more effectively achieving success at varying levels.

Exposing students to quality learning opportunities outside the walls of classroom provides opportunities to practice skills of enquiry, analysis and problem solving in everyday situations. The learning when moved out of the boundaries of the classroom becomes inherently student centric as students are able to actually practice in the real world what they have studied in the class rooms, thereby enhancing their learning potential. Learning beyond the walls of classroom offers students with high quality learning activities with opportunities to practice skills of enquiry, value analysis and clarification and problem solving in everyday situations. It is seen that such students have higher level of driving force, exhibit improved academic progress as they are able to retain information about the course material more lucidly.

Studentcentered learning involves learning and teaching that stresses upon student responsibility for various actions such as planning, learning, interacting with teachers and other students, researching, and assessing learning. As technological innovations open up many new ways of teaching and learning, the students' learning processes involve more eclectic ICT tools such as the web, laptops, online encyclopedias, electronic dictionaries and so on. Such technology enhanced learning provides increased opportunities and options to learners for flexible learning, thus they have greater control over their learning in terms of time, pace, place, content and mode of learning.

Diffusion of Educational Technologies in Student Learning

To address this problem, a comprehensive analysis of the various educational technologies available and the quality of technology-enhanced learning environments, in addition to the normal face-to-face lectures was done under the aegis of a student driven innovation project, 'Fostering Diffusion of Educational Technologies in Undergraduate Learning for the Students', funded by University of Delhi.

Through this paper, an attempt has been made to develop a flexible model that can effectively achieve this task and simultaneously adapt to its environment. In order to effectively implement this prognosis based on technological interventions into student learning, the research paper explores the existing solutions to this challenge, while presenting potential futuristic and innovative solutions to be implemented in diverse scenarios.

Innovative Prototype Models Designed and Developed at Maharaja Agrasen College for Quality Learning Experience

The requirements for these innovative solutions were studied and analysed for (i) individual learning space, (ii) curriculum-based laboratory work space, and (iii) quality learning space for underprivileged sections of society. Following innovative models were proposed and developed in the innovation research project MAC 205 'Fostering Diffusion of Educational Technologies in Undergraduate Learning for the Students, by the Students' funded by University of Delhi. Taking into account the flexible use of teaching spaces, the following prototypes were developed in order to ensure a quality learning experience for undergraduate students at Maharaja Agrasen College when on campus and off campus.

1. Watts-App: A green e-library for individual learning space

Concept: Guided by the vision of sustainability, 'Watts app' was yet another small step towards advancing green practices at MAC, by putting in place innovative offsetting measures through judicious and efficient use of material and energy resources to reduce our carbon footprint.

Innovation aspect: Through the prototype of 'Watts app', a green library was set up for the learning community of MAC by converting a stationary exercise bicycle into a source of electricity through the use of technology. The electrical energy generated through this project was proposed to be utilized for following meaningful applications in the college:

The watts generated by the students during the course of exercise shall be used not only to illuminate the exercise room but at the same time to charge the tablet coupled to the bicycle through which the student can surf the net and be connected with the world while exercising.

The green library comprising of a tablet coupled to the exercise machine serve as a bank of electronic knowledge and information which the student can access while exercising, keeping the student mentally agile and aware as well as physically fit.

The tablet at the cycle shall also display the power generation as it is occurring and the students can know exactly how many units of power they have

generated. Depending upon the amount of power generated by the students, they shall be issued vouchers as an incentive which they can redeem in the college cafeteria or the reprographic centre.

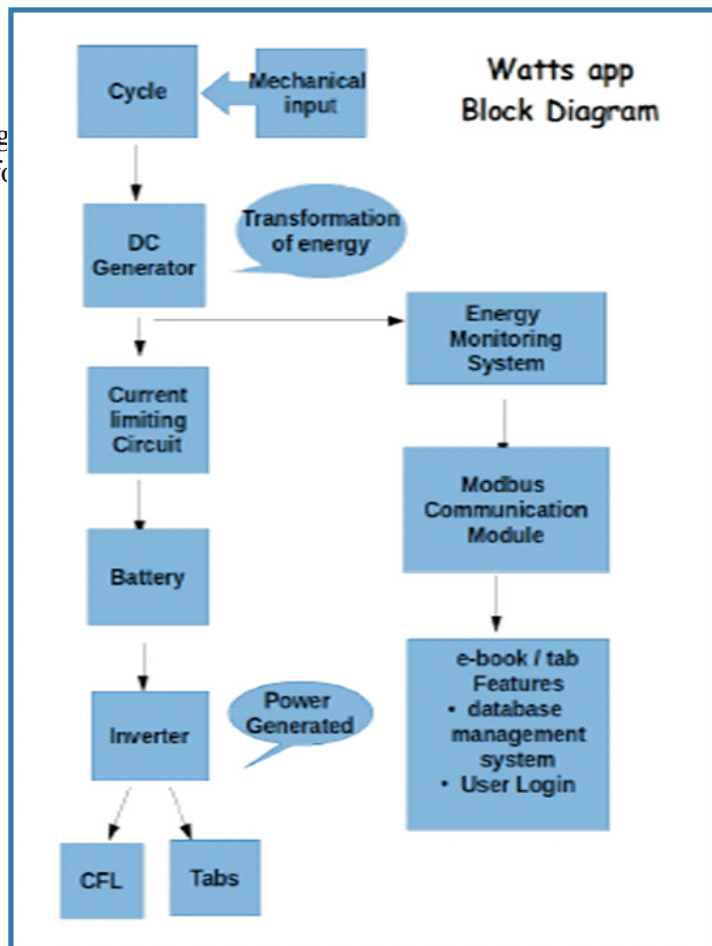
Figure 1



This innovative mitigation shall provide a platform

Figure 2

Block Diagram



learning community of Maharaja Agrasen College to engage in resource conservation by generating electricity through pedal power while staying both mentally and physically fit. The fraction of the energy generated by biking is probably pretty small, but using this concept, a lot of carbon-free energy could be generated in places like gyms, and college campuses, if all stationary bikes could be converted into electricity generators.

2. Innovative solution for curriculum-based laboratory workspace: Lab in the wall

Concept: The idea of 'Lab in the Wall' was conceptualized in line with Maharaja Agrasen College's commitment to the development of flexible and innovative teaching and learning milieu. The prototype of the model was designed to provide a student-centered learning panorama which leads to improved student learning experience using innovative approaches. 'Lab in the Wall' is an innovative model which was envisaged to provide opportunities for flexible learning through incorporating flexible delivery of learning experiences. This flexible learning initiative is an attempt to offer more choice to students in terms of when, where, and how they want to learn. The logistical flexibility in the 'Lab in the Wall' provides the choice of pace, place and mode of delivery to the diverse set of students in the institution. The concept of flexible pedagogy behind the innovative approach is aimed to facilitate significant advancement in student learning panorama with the use of proper technology.

Innovation Aspect: The 'Lab in the wall' concept provides integration of traditional face to face classroom teaching along with flexible learning to address the needs of diverse student environment.

Design: The prototype for the 'Lab in the Wall' has been designed for the students of B.Tech. Electronics and B.Sc. (H) Electronics. In the prototype, a replica of a laboratory complete with breadboard and all major measuring instruments like DSO, function generator, power supplies were fitted on a panel on a wall. A provision for hanging the wires, cutters, nippers, probes, etc. and a separate section for commonly required components like ICs, resistances, capacitances, diodes, transistors, etc. used for performing



Figure 3

experiments was also provided on the panel. A separate pocket in the panel served as a charging station of laptops for the students. The complete panel was designed on top of a waste segregation station which had a separate section for e-waste collection apart from biodegradable and non-biodegradable sections.

The aim of designing this panel at Maharaja Agrasen College was to provide the students of B.Tech Electronics flexibility in the manner in which they perform their practicals in the laboratory. The complete panel was put up in a corridor adjacent to the electronics lab, thus it provided the students the flexibility of performing practicals at their own pace and time cutting across bureaucratic hurdles and timetable limitations. The slow learners in the class who were not able to complete their experiments during the allotted classes could do so with the help of the 'Lab in the Wall'. It also provided the students a platform to do and try out new experiments beyond the curriculum promoting independent innovative and creative learning by giving greater control to them.

3. Quality learning space for underprivileged sections of society

This concept was mooted with a driving theme of sustainable literacy amongst the deprived and underprivileged sections of society as part of its corporate social responsibility. Due to shortage of resources and infrastructure and gaps in system, children from under privileged society are often at a disadvantage in school. The idea was conceived to bridge this gap by providing quality education by reaching out such needy children through participatory and interactive methods. As educators with expertise in this domain and with access to appropriate resources, we are well equipped to bridge this digital divide prevalent in the society as part of our corporate social responsibility. Under the project, prototype of a mobile learning space was set up with a vision to provide holistic education and support to the children of pavement and slum dwellers, and other disadvantaged families in the surrounding area of Maharaja Agrasen College. The innovative idea can serve as a vital tool to bridge the digital divide and also act as a catalyst in enhancing their employability profile.

The prototype comprises of a mobile custom built learning space which can be carried to the needy students so as to equip them with educational tools, thereby, overcoming the infrastructure and resources constraint. The customized design coalesce all the important components of learning needs and essentially comprises of IT section and Books section. The IT section

provides the underprivileged students with an exposure to devices such as laptop computers, projector, etc. thereby training them in IT skills. Books are the number one educational tool as a book provides a child with valuable vocabulary, expanding their 'word bank', stimulates children's imagination, develops social skills, offer the children a more wide knowledge and experience and enhance their curiosity for deeper subjects or abstract ideas. The section equipped with general reading books so as to expose the children to the wonderful world of books. The student members of the MAC 205 innovation project along with the MAC- NSS volunteers were engaged in driving the prototype to the nearby Dhallupura area of East Delhi under the 'reach and teach' scheme.

Students' involvement in designing these prototypes at every step right from idea to implementation helped in enhancing student's employability, by equipping them with skills that enable them to compete with the global workforce, exposure to industry-relevant experience, improved technical, employability skills, and entrepreneurship skills.

The prototype of products developed under the project won the award for best innovative idea and the project won a certificate of appreciation for best display under the theme social welfare at the academic and cultural festival 'Antardhvani 2015' of University of Delhi.

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