

# **Transforming Undergraduate Education in Engineering, and Technology**

## **Project-based learning: Educational Leadership**

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### **Abstract**

Vidya Jyothi Institute of Technology is one of the promising institutes of Anurag Group of Colleges in Hyderabad. The faculty is encouraged to introduce active learning techniques for the learner centric teaching. The Project based learning has been introduced from the first year onwards. By dividing the students into small groups, the students are encouraged to solve certain problems that they come across. The faculty has been trained in new teaching techniques and in every program Project Based Learning has been introduced to measure the outcome. **Project Based Learning** is a teaching method, in which students gain knowledge and skills by working for an extended period of time to investigate and respond to a complex question, problem, or challenge. Recent observations on engineering graduates from various institutions in India indicate the need to look into the teaching and learning methodologies at Engineering institutions. In this presentation, the authors evaluated the implementation of a Project Based Learning (PBL) incorporating the development of students' soft skills as well as technical or professional competences. The research question addressed here is the suitability of PBL in achieving the desired learning outcomes i.e. practical knowledge of engineering and soft skills or personal competences. Hence, our objectives are two-fold; (i) to evaluate the effectiveness, and (ii) to identify potential improvement. As a result, we reviewed and carried out the necessary revision of our programs to ensure that Outcome Based Education (OBE) is implemented. The experience of teachers in our college, confirms that PBL is an effective and enjoyable way to learn and develop concept learning competencies required for success in college and career. The feedback of the students encourage us to introduce many more active learning strategies.

### **Introduction**

The AGI became one of the consortium members in IUCEE. The VJIT successfully adopted the IUCEE mantra "I'm teaching. Are they learning?" The expedition began when Prof Krishna Vedula, Executive Director, IUCEE visited our college on Jan 1<sup>st</sup>, 2014. He addressed the faculty on Outcomes based education for the accreditation process. He encouraged the faculty to register themselves in "lensoo.org" and the principal of the VJIT motivated the faculty to write the articles for the first International conference : ICTEE (International Conference on Transformations in Engineering Education) at DRB V Reddy College of Engineering, Hubli.

The Heads of all the departments of Vidya Jyothi Institute of Technology, attended the first International Conference on Transformations in Engineering Education held at DR BV Bhooma Reddy College of Engineering, Hubli, India during Jan 15-17, 2014. The conference has

introduced many aspects with regard to transformations that are to be introduced in our college. After returning from Hubli, the information has been shared and action plan was decided. The faculty concentrated on our action plan to introduce the changes in teaching process.

According to the Action Plan designed, the first activity is to introduce the faculty the IUCEE concept of Engineering Education. Hence, it has been decided to organize an orientation program for the faculty to create awareness on IUCEE. In that program, the faculty has been introduced the four pillars of education such as:

1. Learner Centric Approach
2. Research Excellence
3. Out comes Based quality supported by accreditation and
4. Innovation and entrepreneurship

Generally, the teachers at engineering level take lot of interest in giving more information to the students while giving least importance to involve the students in learning. The students do not have the clarity at the end of the day. They are ready to take all the notes but depend on guides for giving the end exams. Hence, the teacher and the taught must answer two questions at the beginning and the end of the class that “what and why” The teacher should know “what has been taught and why it should be taught and its importance. Similarly the students must also learn what is learnt by them and why should they learn and its importance. The teacher, by the end of the class can analyze whether learning is happened or not. The Learner-centric teaching always encourages the students’ participation in the learning process.

The second pillar of engineering education is to introduce research in regular academic curriculum. The engineering students do the mini and major projects in their third and final years respectively but they are done mechanically. We, at the VJIT, introduced the research from the first year onwards. We selected three students based on their interest in doing research namely Mr. B Santhosh Pawan, Mr. A Ajay and Mr. Eshwar and sent them to attend the first international conference for Students SPEED (Student Platform for Engineering Education Development). They have been selected as the best action planners . Later they have been selected Mr Ajay as President, Mr Santhosh Pawan as In charge VJIT –SPEED, and Mr Eashwar as the Treasurer. These three students shared their conference experiences with the students of VJIT the momentum started. The college decided to introduce Research from First year onwards. The students are asked to attend the webinars given by IUCEE team. We introduced the three tracks to the students to entertain—Technical Track, Community-Based projects and Entrepreneurship Track respectively. The Registration Process started and 310 students have registered for the program. We even introduced EPICS (Engineering Projects in Community Service) in which 110 students have joined. The students were asked to identify the problem that exists in and around them to give an engineering solution. The students in all the four tracks divided into teams and projects were given to them to work on. The students decided to attend the problems of the college before going out to help the community. The team leaders were

asked to prepare the list of problems and divided them accordingly and gave the tasks. Every Friday, we meet the students to know about the status of the task given to them. The Technical Track students started to attend the problems in Library. Slowly they started automating the facilities that they want by not wasting their time. The following are some of the tasks identified and worked on are:

Automating the Library

Rain Harvesting in VJIT

Trash Vaporization (Generating Electricity from the waste)

VJIT Radio (up to 1km Radius)

Foot Power Generation of Electricity (in progress)

Tesla Turbine (to generate Electricity)

Generating Electricity from e-waste.

Auto-Tank

VJIT Mobile App

Solar mobile Charger

Prof Krishna Vedula, Executive Director, had an exclusive meeting with our SPEED members and appreciated the work that they have been doing on July 14, 2014.

Prof Siva Krishnan delivered a talk on the importance of “Project-Based Learning” and interacted with our SPEED and EPICS teams on July 15, 2014

Dr William Oakes from Purdue University visited our college on August 2, 2014. He spent some time exclusively with SPEED and EPIC teams and appreciated the work of our students. In the Interactive Session and shared many things with the students. He motivated the students to attend to the community based problems to give an engineering solution.

### **Achievements:**

- Mr Sharfuddin of SPEED designed and created a website and blog for VJIT-SPEED – EPICS
- Mr. Santhosh Pawan organizes Webinars for the Speedsters.
- Peer tutoring is very active in every class.
- Mr Ajay has been selected as a facilitator and has been invited to conduct the SPEED Regional Workshop in SR Engineering College, Warangal.

- Organized a Three Day Regional Workshop on “21<sup>st</sup> Century Grand Challenges of Engineers”. 146 students from various engineering colleges participated actively. Student facilitators appointed by the IUCEE-SPEED motivated the students to present solution to the three grand challenges on “Water Resources, Energy sources and Urban Infrastructural Development”. Students took active part in finding solutions for these grand challenges. The best action plans have been awarded with Certificate of Appreciation.
- Mr Ajay and Mr Santhosh Pawan have been selected as Registration Officer and social media officer respectively for the forth coming 2<sup>nd</sup> International Conference for SPEED to be held in BMS college at Bengaluru during Jan 5-7, 2015.

The short span of 10 months improved the students and their learning outcomes are praiseworthy. They have learnt so many soft skills like time management and team management, organizational behavior, presentation skills, decision making, creative thinking,, communication skills, etc. Students’ participation is very good because PBL is an effective and enjoyable way to learn.

#### **For Faculty:**

21st Century Skills Professional Development supports teachers as they integrate 21st century skills, tools and teaching strategies into their classroom practice.

Dr Sandhya Kode from IIIT delivered a lecture on “Active Learning Techniques to be used by the teachers in the class room” on June 24, 2014

An orientation programme was organized on **Outcome Based Teaching and Learning (OBTL)** by Dr VSV Laxmi Ramana in the month of June

The teachers too showed interest in these activities. The College arranged series of workshops for the faculty on **Active Learning Techniques and Project Based Learning on July 14-15, 2014**. Prof Siva Krishnan, Purdue University conducted the workshop. Faculty has been enlightened and encouraged to introduce team based projects to learn.

Prof Neeraj Buch from Michigan University conducted another workshop for the faculty on **“Active Learning Techniques for STEM Discipline on Aug 6-7, 2014**.

The IUCEE webinars and workshops introduced the benefits of the Active Learning techniques and learner centric teaching. The Initiatives involved the teaching fraternity to explore new horizons in their classrooms in turn. It has become a “...multi-dimensional program to improve and enrich learning for undergraduate students.” Active learning strategies have been a big part of the ensuing conversation. Following are some web resources that will be useful for faculty interested in finding out more about how to incorporate active learning activities into their

teaching. Following are some web resources that will be useful for faculty interested in finding out more about how to incorporate active learning activities into their teaching. The teachers are encouraged to give webinars.

The following sites have helped our faculty to introduce certain active learning techniques in their classes:

Team Based Learning Collaborative: <http://www.teambasedlearning.org>

The Team-Based Learning Collaborative (TBLC) is a consortium of university educators dedicated to supporting faculty from a variety of disciplines who wish to implement team-based learning. The website has specific guidelines, and step by step instructions created by faculty for faculty.

Technology Enhanced Active Learning (TEAL) <http://web.mit.edu/edtech/casestudies/teal.html>

TEAL is an initiative to transform university education from a string of passive lectures in introductory courses into an intense, active, personalized and highly collaborative adventure. The central concepts are flexible modes of learning that better stimulate discovery and improve understanding of conceptual material.

Physics Education Group Tutorials:

<http://www.phys.washington.edu/groups/peg/curric.html>

*Physics by Inquiry* is a set of lab-based modules designed for K-12 teachers and for college students whose science background is weak. *Tutorials in Introductory Physics* is intended for use by small groups of students working collaboratively.

### ***Conclusion:***

A learning environment that promotes the development of creativity, innovativeness and capability for self-directed lifelong learning in students will have a strong flavor of constructivist learning, rather than one of teacher-dominated declarative learning. Students will be active agents in the construction of their own knowledge, rather than passive recipients of that knowledge from teachers. The fostering of creativity and self-directed learning occurs when students are given tasks or problems that challenge them to ‘think outside the box’ and to ‘own the problem. Constructing such learning tasks also challenges the creativity of curriculum developers and teachers. Though the time involved during this journey may be short, the involvement and dedication of the faculty is worth praising. We need to improve a lot and learn many more techniques to assess our outcome. It can be concluded that collaborative learning fosters the development of critical thinking through discussion, clarification of ideas, and evaluation of others' ideas.