



BMS COLLEGE OF ENGINEERING, BENGALURU-19

Autonomous Institute, Affiliated to VTU

Best Practice-1

1. Title of the Practice

Imagine, Innovate and Implement.

2. Objectives of the Practice

Centre for Innovation, Incubation and entrepreneurship (CIIE) is established to facilitate Innovation through Research and collaboration for translating domain expertise into products or technologies. The Centre aims at fostering entrepreneurial spirit, promote start-ups by providing appropriate incubation facilities, offer consultancy services and improve industry institute interaction. It envisages creating products and technologies that address the societal needs and also nurture the innovative minds. Create an ecosystem for innovation and entrepreneurship through incubation support, facilitation of technology transfer for commercialization by multidisciplinary approach. To provide the opportunity for students to use their learning to solve complex engineering challenges, through projects.

3. The Context

Promote culture of entrepreneurship through various activities - Entrepreneurship Awareness Camps (EAC), Entrepreneurship Development Programmes (EDPs), education, training, Summit, FDP, MDP, Discussion Forums) that facilitate creativity and innovation.

Transform prototypes and proof of concepts into Product/Technology/Service across the campus. Become a hub for entrepreneurial activities across the state. Build strong network of Mentors/Advisors across the verticals. Provide necessary infrastructure support to incubate to progress in their ideas. Facilitate interaction between industry, institution and funding agencies to transform concept to commercialization

Leverage schemes of the Government bodies towards promoting entrepreneurship.

Foster and sensitize family business through education, awareness and mentoring and also encourage social entrepreneurship.

Assessment of General Enterprise Tendency (GET)* of Students and Faculties, initiate Motivational Talk. Conduct Design Thinking, unmet need analysis, Design Innovation Rapid Prototype, Enterprise Development and Business Modelling, Market Research Tools Workshops. Create awareness about IPR & Technology from Reimbursement strategy

4. The Practice

The Practice and its uniqueness in the context of **Imagine, Innovate and Implement** at BMSCE is truly reflected by the several Innovating setup that are performing in the campus.

Centre for **Innovation in Medical Electronics (CIME)** has been set up with the objective of creating a FORUM FOR INDUSTRY, INSTITUTION AND HOSPITALS to WORK TOGETHER for DEVELOPING AFFORDABLE INNOVATIVE HEALTHCARE DEVICES and Encouraging Faculty/Student RESEARCH DRIVEN ENTREPRENEURSHIP.

- The projects getting incubated at CIME are expected to mature into a viable Business Enterprise at the end of the Incubation period.



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- The final outcome will also depend on the type/stage of Project taken up for Incubation

PROPEL LAB on 3D PRINTING

To become a centre of excellence in the field of additive manufacturing & new product development. To help students, researchers, Start-Ups & Industries in bringing ideas into real world objects. Areas of applications:

- Automotive Industries
- Architecture Industries
- Aerospace Industries
- Electrical & Electronics Industries
- Medical Industries
- Manufacturing Industries

Product Innovation centre:

Product Innovation Lab was jointly established in BMSCE with Dassault Systems, France and 3D PLM India aiming at training highly skilled industry ready engineers and entrepreneurs to the society.

Training the in-house faculties for the hands-on in the latest software-3D Experience for the research work and subsequent product development. It will provide relevant guidance and required experience in training the research scholars and students who are carrying out their projects. It covers a wide area of field of study like Mechatronics, CAD/CAD, CAE, Systems Engineering, and Product Life Cycle Management.

Aerospace Propel lab

To Create Awareness about the Exciting Fields of Aviation and aerospace. To provide the opportunity for students to use their learning to solve complex engineering challenges, through projects and competitions.

Teams of Aero BMSCE

- Design Team
- Analysis Team
- Manufacturing Team
- Safety and Testing Team
- Finance and Management Team

Propel Lab-Robotics and Embedded Systems

To create a platform to connect people interested in Robotics and Embedded Systems and Develop products for societal usage

Major Areas of Research:

- Internet of Things(IoT)
- Machine learning
- Robotics

BMSCE STARTUP Cell

Start-up cell has organized motivational talk on "Tired of telling yourself your billion dollar idea? Meet the people who believe in it" and "Medical Device Innovation to Commercialization in Industry & Academia". Owing to the prevalent situation of unmet needs, the participants were introduced to the clinical / designer / engineer equation in India. Responsibilities of individuals in addressing the issues.

5. Evidence of Success

Provide evidence of success such as performance against targets and benchmarks, review results. What do these results indicate? Describe in about 200 words.



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- *CIME*
 - *Development of Digital X-Ray Machine - Prototype ready*
 - *Development of Oral Cancer Screening Device - Ready for marketing*
 - *Balance Assessment tool - Over 98 installations*
 - *Cardio-Connect Emergency Response Platform - Field testing*
 - *Device for Intrapartum Materno Foetal Care - Prototype ready*
 - *Smart Eye Kiosk for Community (SEK-C) - Prototype shipped to Singapore*
- *3D Printer lab*
 - *Built Delta based 3D printer, I Bot, Tooth Scanner, bi-stable chair, 3d quad copter, Casing unit for watch*
- *Product Innovation Lab*
 - *SLA Printer*
 - *Hyper loop Transportation System*
 - *Self-Balancing Robot*
 - *Structural Analysis of Hydraulic Valve*
- *AEROSPACE*
 - *Secured 23rd rank, SAE Aero Design East 2012, Atlanta, USA.*
 - *Secured 18th rank, SAE Aero Design West 2013, Los Angles, USA.*
 - *Secured 15thrank, SAE Aero Design West 2014, Texas, USA.*
 - *Secured 14thrank, SAE Aero Design West 2015, Los Angles, USA.*
 - *Secured 13th rank, SAE Aero Design West 2016, Van Nuys, USA.*
 - *Secured 15th rank, SAE Aero Design East 2017, California, USA.*
- *Robotics and Embedded Systems*
 - *Sustainable irrigation*
 - *Ubiquitous lab*
 - *Generic IoT platform*
 - *R.O. Water plant monitoring*
 - *Autonomous Robot Development Open Source Platform*

6. Problems Encountered and Resources Required

Any Innovation to take the product shape, there is need for Involvement of multiple departments. The product is usually a multidisciplinary effort. The facilities and expertise in BMSCE is now at different department. The culmination of an effort to bring these innovating centres and facilities under single umbrella happened with formation of Centre for Innovation Incubation and Entrepreneurship (CIIE).

CIIE is hosted in the new Platinum Jubilee academic block. It is housed in the Ground floor of the building. The total area is 50,000 sqft. There are 20 incubation cells and many discussion rooms, Board rooms, think lab, seminar halls and auditoriums. The other facilities. It also has access to the large library area of 50,000 sqft housed in the first floor of the new academic block.

It is therefore envisaged that the whole institution will get together to Imagine, Innovate and implement to find solution for the societal needs.



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Best Practice-2

1. Title of the Practice:

Effective Implementation of Outcomes Based Education

2. Objectives of the Practice:

Since 2014, India is recognized as a signatory of the Washington Accord, and students graduating from accredited programs of Tier-I Institutions (Autonomous Institutions) shall have global recognition. Since, our institution has academic autonomy, focused efforts were in place towards ensuring graduating engineers from all programs demonstrate expected skill and competency leading to their global recognition. This task towards global recognition of our graduates became easy, as the expected global attributes were embedded through the Program Outcomes (POs), defined by the National Board of Accreditation (NBA). Hence, all activities on campus (academic, activities beyond curriculum, co-curricular and extra-curricular) were focused on developing the POs leading to an effective implementation of Outcomes Based Education (OBE), as it would then lead to global recognition of our graduates.

3. The Context

The academic heads of the college realized the need to embrace OBE in the true sense, as it was a shift from an input based education system towards a student-centric/student learning education system. Accordingly, there was a need to define, develop, implement and measure student learning through the attainment of various outcomes: Course Outcomes (COs), Program Outcomes (POs) and Program Specific Outcomes (PSOs). The campus has a large number of student forums, both technical and non-technical which helps in the overall development of the students, especially the student outcomes related to skills and attitude (beyond the engineering knowledge). However, the contribution and development of the student skills through these components was not measured. With a shift in the parameters for teaching-learning, and with a need to implement OBE, every association of the student both regular academics through curriculum and activities beyond curriculum was defined and measured. The campus witnessed the introduction of the annual state level technical symposium (Phase-shift) leading to further development and measurement of the student competencies beyond curriculum.

4. The Practice

India was a provisional member of the Washington Accord, and in the process of attempting to become a signatory. This process required the need to embrace OBE in the true sense. Accordingly, at the National Level, the parameters for accreditation were redefined, and were aligned to meet the minimum expected global standards. It is to be recalled that among the initial accreditation visits conducted by NBA, there included a team of International observers, to oversee the accreditation processes. In this context, our Institution had the opportunity to represent a sample institution in the Private Engineering College category. It is with pride we would like to mention that the first accreditation visit for five of our Undergraduate engineering programs in the Tier-I format (to assess effective implementation of OBE), had International observers, with two of the five UG programs getting full accreditation. Hence, since



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2013 the institution has embarked on the journey of effective implementation of OBE.

This initiative by the Institution lead to innovations in the class room by teachers in the delivery methods, innovation by faculty in assessment tools and hence, contributing to the overall development of the student learning, with conscious efforts in developing the expected program outcomes defined by NBA, and hence ensuring our graduates have global recognition. This improved competency of the students resulted in enhanced student performance both when on campus and after graduation as our alumni.

We would like to add that this journey of embracing OBE was a collective effort by all stakeholders, both direct and indirect. The initial learning was from the series of training programs conducted by NBA. This was then followed by series of brain storming sessions to comprehend and implement the processes of OBE. The academic leaders were able to perform with unconditional with support from management.

To conclude, there were no constraints or hurdles in this path of adopting OBE. In addition, all academic leaders have willingly shared this journey and learning experience in various platforms, to help other institution of higher education to grow and contribute to the progress of the nation. Few are listed below:

- Conducted various Faculty development programs in the domain of OBE (one of the FDP was supported by NAAC)
- Uploaded the OBE content on the college website
- Delivered several invited talks on OBE
- Delivered webinars on OBE
- Published papers in the domain of OBE in National and International forums (WOSA by NBA, MITE by IEEE, ICTIEE by IUCEE, WEEF, ASEE etc)
- Published book on OBE (by Dr K Mallikharjuna Babu)
- Recognized Master trainer for OBE by NBA (Dr R V Ranganath)
- Recognized as evaluators by NBA
- Delivered a series of two day workshops in the North-East region of the Nation through the TEQIP initiative
- Recognized as a mentor for the University in Bareilly towards their accreditation through implementation of OBE, by TEQIP

5. Evidence of Success

Focused efforts by faculty in truly embracing OBE, happened through small innovations in the teaching learning process, innovations in assessment tools and ensuring that every student has the expected knowledge, skills and attitude. Faculty contribution towards successful implementation of OBE reflected in enhanced student performance. Few parameters that are considered as evidence towards successful implementation of OBE through faculty contribution are:

- Enhanced quality of projects
- Enhanced number of student publications
- Enhanced professional body activities (both quality and quantity)



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- Enhanced number of awards secured by students in National and International technical competitions/professional body activities
- Improved performance in cultural contests held in-campus and outside campus
- Improved performance in sports both individual and team events held at State, National and International levels
- Improved performance in National and International competitive examinations (GATE/CAT/GRE/TOEFL etc)
- Enhanced on-campus placements
- Enhanced off-campus placements
- Continuous improvement in the average and highest pay package offered
- Marginal improvement in number of successful entrepreneurs

The above evidence of improvement in student performance can be attributed purely to faculty contribution in effective implementation of OBE.

This effective implementation of OBE, leading to improved student performance through faculty contribution eventually resulted in all the Under Graduate programs getting accredited by NBA in the Tier-I Format. In addition most of the PG programs are accredited.

7. Problems Encountered and Resources Required

The academic leaders of the institution realized the need to comprehend and implement OBE during 2013. Accordingly faculty in large numbers were deputed to training programs conducted by NBA on OBE. This initiative resulted in faculty understanding the true essence of OBE, and the need to consciously plan and develop the POs defined by NBA, together with a need to compute the attainment of various outcomes.

During the process all faculty realized that through conventional fixed duration closed book examinations, one can address only the first five POs, and to effectively address the higher POs (PO6 through PO12), there is a need to go beyond conventional assessment tools. Accordingly, through approval by the Academic Council, every course faculty was empowered to define and implement a flexible assessment tool also known as the alternate assessment tool (subject to a maximum of 40% of the internal evaluation component). This modification resulted in faculty including assessments like: course seminar, assignments, term paper, open ended experiments, mini-projects, concept videos, partial reproduction of research work, oral presentation of research work, group activities, etc. This small modification in the assessment pattern contributed significantly to the effective implementation and development OBE. Hence, there was no need for any additional resource either in infrastructure or financial towards achieving the set aim of implementing OBE.