

## Competency based Training and Development for Engineering Students

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### ABSTRACT

Advances in the Information Technology have introduced fundamental changes in Business Structures and Work Processes. These changes demand the development of new educational approaches to develop Engineering Students Curriculum and new pedagogical systems so that the Organisational performances as well as the GDP of the nation can be improved. In this paper an effort is made to provide for an approach for tailor made teaching-learning environment based on the teachers competency and training and development for all levels of Industrial-Engineers. This approach also integrates with the other components of 'Uniform Curriculum in Industrial Engineering Education System'. This paper also explores the possibility of teachers 'Competency Training and Development to embed the uniformity in teaching-learning in Industrial-Engineering Education for the 21st century budding engineers who are the key personnel for the organisational performances as well as the improvement of GDP of the Nation in their respective fields of work.

**Key Words:** learning organisation, organizational performance, pedagogical systems, sustainability

### I. INTRODUCTION

The 21st century teacher competencies that relate to the professional skills of critical thinking, problem solving, creativity, innovation, collaboration, ICT literacy, adaptability, self direction, social skills, cultural skills, accountability, negotiating, networking, sustaining both short- and long-term working relationships across cultures and functions which can be considered as sustainability, and task skills of designing group technology-based projects, and keeping current skills in ways of thinking, learning, and dealing with change, copious amounts

of data, and new technologies, etc. are to be developed so that the students who graduate as industrial engineers can do better for the organizational performance.

Change in the pedagogy methods apart from the existing predominant lecturing methodology, case study based methods, students active learning systems, studio teaching, data based teaching, interactive computer assisted learning, problem based learning, teaching with models (conceptual, statistical & mathematical), etc. are to be imparted.

Instructional best practices that foster group work, decision-making, project-based learning, and appropriate technology, aimed at motives, traits, self-concept, knowledge, skills, etc. are to be aimed in such a way that students get the on-the-job industrial trainings shooting up the organizational performance much before reaching the floor i.e. methodology of learning organisation should be imbibed much earlier in the career.

To create an outstanding industrial engineering teachers, it is essential to impart qualitative, innovative, creative, value driven training and development

programmes/workshops/seminars. That is the reason why competency based training and development is a must to add up to a Holistic Learning/Teaching Approach. Teachers should always take a step ahead by improving their personality with the fresh aspects and capacities encouraging their capability with courage, underlining the need and the importance of computer aided information technology.

There could be difficulties in inputting the effective operations on the scale required but Simultaneously there could be a risk that difficulties might increase rather than diminishing in the near future.

The alarming situation today is that due to shortage of qualified teacher most of the engg. Colleges are getting closed .The crucial reason for this could be the total lack industrially learned teachers trained to undertake the work. Due to the vast changes in the development of STEM

S = Science  
T = Technology  
E = Engineering  
M= Mathematics

Experts all over the world suggest intense and immense research in the field of Training And Development to provide practical & useful information to the future budding industrial engineers.

\*It is clear indication from the industrial feedback that students must possess a-k competencies.

\*\*Training programmes should transform the graduate industrial engineer trainee to professional industrial engineer trainee through supervised & controlled on the job training facilities.

As good learning depends on good teaching (Briggs 1999).Now there is a need that Universities have to support students to acquire new knowledge on industrial engineering and high order cognitive skills to enable them to adapt to new contexts and pursue learning, whatever the conditions (Prosser & Trigwell 1999).Industrial Engineering Education now a days is passing through vast changes with the ongoing diversification and innovation in the fields of STEM. It is proved fact that the teacher in the current scenario has to become a LIFE-LONG learner to develop their facilitator skills and advisory skills. At the same time the teachers of today should learn new technologies to harness internet, software and presentation skills.

As for faculty development Rege Collet (2002) has greatly distinguished the three basic faculty development strategies:

A programme of courses and workshops offering industrial engineering teachers opportunities to improve themselves.

An Industrial Engineering teacher training programme leading to a formal certification.

Continued education of teachers as lifelong learners in a learning community.

### 1.1 INDUSTRIAL ENGINEERING TEACHER COMPETENCIES

Basing the papers referred in the end of this article, it was decided to take up some of the engineering teacher's competencies for the analysis purposes.

Criticalthinking,problem solving,creativity,innovation,communication,collaboration,information literacy, media literacy ICT literacy,flexibility,adaptability,initiative,self – direction, social skills ,cultural skills ,productivity,accountability,leadership & responsibility.[1]

### 1.2 INDUSTRIAL ENGINEERING STUDENT SKILLS

Criticalthinking, problem creativity,innovation,communication,collaboration,information literacy, media literacy ICT literacy,flexibility,adaptability,initiative,self – direction, social skills ,cultural skills ,productivity,accountability,problem solving ,leadership & responsibility

## II. TRAINING AND DEVELOPMENT FOR INDUSTRIAL ENGINEERING TEACHERS

Components involve in the methodology are – student skills [3] teacher competencies [2], curriculum.

“A good learning depends upon good teaching”(Biggs 1999).But this is an older saying now a days as compared to the scenario existing in the present world since education now a days is not restricted to the high class society only. That is the reason why trained and developed teachers are required to the curriculums. So teaching cannot be taken by the people with a natural teaching aptitude or with the required achievements only. Universities have to support students to acquire new knowledge and higher order cognitive skills to enable them to adapt to new contexts and pursue learning, whatever the conditions. More over the traditional method of transferring the knowledge from an experienced

person to the layman will fail for the prevailing conditions of TEACHING and LEARNING .Several authors stress the importance of institutional recognition of the quality and the value of teaching in higher education by academic leaders at all levels (knight & Trawler).

The Industrial Engineering training and the development programmes should be made upon the following:-

1. A programme of courses /workshops/seminars offering teachers opportunities to improve themselves.
- 2.A teacher training programme leading to a formal certification.
3. Continued education of teachers as lifelong learners in a learning community.

Aim of T & D should always be on student centered learning, individual supervision and coaching,ICT in higher education, assessment of learning results, teaching in English,theatre skills and research skills .

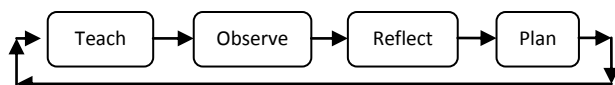


Fig.1 Model for Lifelong Learners

**Table-1** Teaching is to Observation, Observation is to Reflection, Reflection is to Planning & Planning is to Teaching again...

Teaching	Observe	Reflect	Plan
Teaching – learning. This is what happens here.	Observations & registrations are made. What do I do? Teaching form? Choice of activities? Choice of evaluation –culture plan?	Deep thoughts, based on observations & notes. How was it? Was that the right choice of teaching & evaluation methods? Were the activities appropriate	New plans are made. Changes & experiments are planned. Description of new approaches is made.

		? could it be done later from now?	
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### III. DISCUSSION

Keeping in view, the global aspects ,business policies, converging industrial needs, increased sensitivity to the shareholders value,competition,new models of sustainability, communication channels, IT services & It enabled services ,values based management ,increased operational efficiency, importance of human beings .Although the differences between teaching and learning is disappearing now a days .It is considered that an Industrial Engineering teacher need not have to answer all the questions that are asked to him but he should be in a position to say atleast for the existence of the data.Didactic competencies are towards the concept of LIFELONG LEARNING as this will take you practice/teach as you preach.

Moreover the concepts of TEACHING & LEARNING are disappearing now a days .

Teachers are supposed to go for a systematic learning approach. University teachers no longer are required to answer all the questions from the students but they can facilitate their learning and this could only be possible if they themselves are the learners.

These could some of the areas on which the training could be implemented.

Contextual Competency, Conceptual Competency, Content Related Competency, Educational Transaction, Educational Activities, Preparation of Educational Aids. Evaluation Competency. Management Competency. Parent Related Competency. Community Rapport Competency. Micro - teaching. Action Research. Information Technology Training. blueprint Preparation. Innovation Programs, Question making workshops, Provide on going training and support, Host and preserve materials within faculties’ ,Supply system monitoring, back-up and recovery. Review and Summative evaluation report, at the end of program.

Developmental activities could be based on the following aspects:

Classroom Management. ,Session Plan / Work Plan., Challenges in Communication, Presentation Skills, .

Conflict Management ,Time Management, Discipline Management., Student Psychology., Use of IT as a Special Aid.,Class room Management., Creative Teaching.,Public Speaking., Interpersonal ,Relationship.,Shaping Attitude., Qualities of Good Teacher. ,Leadership Development. ,Role & Behavior before students., Sharing of Success Stories of good Teachers., How to inculcate healthy humor in Student

Examining critical issues associated with the Management of Problems & overcoming the constraints of implementation. Emotional Intelligence.

The mapping for the competencies of Industrial Engineers as Teachers and the Budding Engineers as students could be mapped by the following proforma :

**Table-1 Mapping – 2 or 3 skills/competencies/ with respect to curriculum**

Teacher 's competencies		Curriculum	Student's Competencies	
1	Critical thinking		1	Confident Person
2	Problem solving		2	Self Directed Learner
3	Creativity		3	Active Contributor
4	Innovation		4	Concerned Citizen
5	Comm.		5	Information Skills
6	Collaboration		6	Communication Skills
7	Information Literacy		7	Civil Literacy
8	Media literacy		8	Global Awareness
9	ICT literacy		9	Cross Cultural skills
10	Flexibility		10	Self Mgt.
11	adaptability		11	Social Awareness
12	Initiative		12	Relationship Management
13	Self-direction		13	Responsible Decision Making
14	Cultural skills		14	Managing Ambiguity
15	Productivity		15	Agency & Responsibility
16	Accountability		16	Finding And

				Sustaining Community
17	Leadership		17	Managing Emotion
18	responsibility		18	Managing Technological Change

There should be a perfect curriculum design so that the contents mentioned in the Teacher's Competencies should be mapped on to the Student's Competencies so as to result in a perfect curriculum.[10][11]

[Argument - strategies for training and development (evaluation/feedback/training) could be the hindering factors responsible for the transformation of this kind but proper research in the so called fields has to be taken up so that there won't be any kind of argumentative factors for the same .]

**IV. CONCLUSIONS:**

1. Both the students and the teachers their duties for the future generation .
2. There should be an effective partnership between the university communities and the school communities.
3. STEP i.e. social ,technological,political and economical systems should reflect the objectives, missions & goals in the organization of the systems .
4. The core professional competencies and the exit profiles should be based on the guiding principles of development.
5. With the ICT enabled Teaching – Learning facilities industrial engineering teachers and the students should be in a new position to take up the new roles for the development of the mankind.
6. The competency based approach for both the teachers of Industrial Engineering and the Budding Industrial Engineers can affect the traditional roles of both and can develop a competent society.
7. The competency based approach can give rise to a concept which could be called as competent teacher for a competent student.
8. Continuing Education programmes could very well supplement to all the factors of the (g)mentioned above.

- i. A lot of work can be taken in this work and optimisation has to be done basing upon the affordability, accessibility and availability of the various concepts of Science, Engineering, Technology And
- ii. Medical as a whole taking into truths of organizational learning and learning organisations
- iii. Works in the future can be taken up with the comparisons in the past, present and future scenarios of the Industries as there could be lots of forecastings which could be done in the Investors markets.

The curriculum could not be developed as the technological exploration is still going on and might be put forth in the next issues to come.

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