

Employability Skill Matrix for Engineering Graduates of Tier-II Institutes

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Abstract: Employability is a sustainable effort to be inculcated in all students gradually. A study reveals that student's interests in studies and extra efforts are maximum in first and second year of admission. Employers are also specifically interested to test basic concepts and application oriented key skills to be demonstrated by students during recruitment. The gap between university specified examination and employability assessment can be met by using Blooms Taxonomy Levels. Identified 11 employability skills that are predominantly important for any industry/employer needs to be inculcated in a time bound way by identifying chain of similar subject domains or mapping through prerequisite subjects. Subject specific employability skill matrix development procedure is presented in this research work.

Keywords: Employability, Skills, Blooms Taxonomy

1. Introduction

Engineering is basically a problem solving skills. To employ this ability in students of engineering graduates it requires lots of additional efforts by institution. Tier-II institutions in India are particularly facing problems of lowering intake quality in advent of growing institutions of IITs, NITs and Tier-I institutions in India. However, Outcome Based Education (OBE) is giving opportunity to Tier-II institutions to think, adopt and "Think Global, Act Local" approach. Due to lowering intake quality of students, it is hard to expect leadership, self development of students in their own benefit. In normal perception, it is found that only 15% of students are qualifying for leadership abilities and sustainability thereon.

Tier-II institutions, therefore cannot just reply on creating environment for them and expect dissemination to happen automatically but expect faculty to adopt this growing learning requirement and make changes in dissemination of learning skills.

Engineers contribute to the development of technological and infrastructural sustainable development of country, matching with lifestyle satisfaction of the residents. Engineers will have to therefore always be ready and deliver, in new work environment to cope up with dynamism of needs. This requires profound and constant knowledge of related domain expertise. Employers expect to recruit engineering graduates capable of working in such scenarios with appropriate employability skills.

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Employability skills can be viewed as a small set of skills that are reduced from a large set of specific attribute [1].

Most of the employability efforts are been developed when students are in Final Year or Third Year. However, these efforts have to be consistently met, from first day of admission till last day of graduating.

In this research paper, a skill matrix is developed for engineering graduates to meet requirement of developing skills, consistently.

2. Literature Review

Various literatures are available in research domain, addressing employability skills development issues in engineering graduates.

However, tier-ii institutions requirement are specific and few relevant studies are highlighted in following section

Dipawalee S Mishra (2016) recommends need of continuous up gradation of need based curriculum through stakeholders' participation.

G. Gowasalya and Dr. M. Ashok Kumar (2015) specified individual centric approach and focus towards continuous learning and recommend faculty to practice employability skill during teaching and learning session.

M.M.G.V. Shayamalee and et al (2014), examines important attributes required by fresh civil engineering graduates and recommends knowledge, attitude, management, technical and administrative skills, norms and standards are amongst key requirement and spells needs of attainment through faculty efforts.

SA Meshram and et al (2015), advocated need of energetic and vibrant team for enriching and enhancing the employability in engineering institutes in order to inculcate employability skills in students [2].

3. Employability Skills

Engineering Graduates in Tier-II suffer less contact hour's deficit, as compared with IITs and NITs, due to non-residential campus [2] requiring a time

bound efforts in developing various skill sets required. Following 11 key skills are required to be developed in engineering graduates



Fig1: Employability Skills in Engineering Students

Table 1 gives detailed attribute and time line for fig1

Table 1 describes possible activities to be taken up by faculty to inculcate respective employability skills in students. The assessment of learning outcomes must be mapped with Blooms Taxonomy for leverage of improvement in students.

The major issue of carrying employability skill development activities are

- 1) Whether students will get time to do all such activities due to their hectic academic schedule
- 2) If Faculty are trying to inculcate these, will the students face academic loss due to less concentration on their syllabus
- 3) Students are already loaded heavily. Even if this is all inculcated, will the university result affect?

Integration of employability skills with University specified curriculum is a debatable issue. However, University guidelines are minimum to be followed and University has never restricted faculty members to go beyond syllabus for improving employability key skills and minimizing curriculum gaps.

To understand this analogy, a Case Study of Manufacturing Processes related subjects' domain is taken in Production Engineering, UG course.

Employability of Production Engineering Sandwich

Table 1

Sr. No	Employability Skills	Attribute in Employability Skills	Recommended Activities	Attainable Program Outcome	Blooms Level			
					FE	SE	TE	BE
1.	UG course can be Communication	Read and Interpret technical reports correctly	Technical Communication Reports such as Profit and Loss Statement, Technical Graphs, Technical Pie Chart	PO10	B3	B4	B5	B6
		Generate Technical Reports on own	Technical Concept in 100 words, One Sentence Summary after viewing video, Creating blogs	PO10	B4	B5	B6	B6
2.	Team Work	Being good at working with people	Calculation of manpower, tasks to be carried out in group, Men Management, Work Allocation, Correct Job Allocation	PO09	B2	B4	B5	B6
3.	Individual Work	Effective Function, Ability to work in Diverse Team	Achieving high delivery and not just capacity, Multitasking and Reach of Functions, Fitting in organization structure	PO09	B3	B5	B6	B6
4.	Initiative	Creative Thinking, Identifying Improvements required	Thinking differently about usage, applications, materials required, Doing same work differently, Out of box thinking	PO8	B1	B2	B4	B6
5.	Enterprise	Looking at broader perspective of problem	Looking the problem from others socks, Analyzing the causes/symptoms in its own perspective	PO12	B2	B3	B4	B6
6.	Planning	Things to work out what is required to get job done, Finalizing Timelines and Deadlines	Developing a Time Table, Breaking down the work into elements, Loss incurred if deadlines are not met, Penalty calculations, Possibilities of emergencies	PO11	B3	B4	B5	B6
7.	Organizing	Generation of Resources, Allocation of work	Helping for resource by mapping capacity with efficiency and effectiveness	PO5	B2	B4	B5	B6
8.	Self Management	Working without supervision and effective delegation of work	Fixation of Responsibilities, Getting work experience, Internship	PO8	B2	B3	B4	B6
9.	Learning	Burning desire to understand new things, Able to pick them quickly, Ability to take on new tasks, Accepting changes quickly	Issues related with Sustainability, Research into learning skills and learner types, Volunteering new ideas, suggestion schemes	PO7	B3	B4	B5	B6
10.	Technology	Use of IT tools, Innovative and Invented Products	Impact of Technology management solutions	PO5	B2	B3	B5	B6
11.	Application	Usage in daily life	Why, How, When Principal	PO6	B3	B4	B5	B6

formalized with appropriate level of Blooms Taxonomy requirement is as per table 2.

Table 2: Employability Questions

Sr. No.	Employability	Minimum Targeted Blooms Taxonomy Level
1)	GATE	B5
2)	Off Campus Placement	B5
3)	On Campus Placement	B5
4)	Entrepreneurship	B6
5)	Business (Chain Marketing)	B5

The chain of subjects related to Manufacturing Processes course in Production Engineering, UG in Savitribai Phule Pune University are as per following

Table 3: Blooms Level of University Question Paper

Sr. No.	Year	Subjects	Major Topics	Average Attainable Blooms Level
1)	FE	Basic Mechanical Engineering	Conventional Machining	B2
2)	SE	Manufacturing Processes	Casting, Welding, Forming, Machining	B3
3)	SE	Manufacturing Engineering and Metrology Practices	Jigs, Fixtures, CNC, Press Tools etc	B4
4)	TE file	Manufacturing Technology (Self Study)	Non-Conventional Machining Processes	B5
5)	BE	Advanced Production Technology	Hard Part Machining	B3

blooms level gap mentioned between table 2 and table 3, either indirect attainment practices like guest lectures, industrial visits etc or left to students for attainment.

4. Are the students interested in employability?

A survey of studies is conducted to find out willingness of solving employability related questions as indicated in table 2, beyond working hours.

Fig 2, indicates surveys of employability related questions

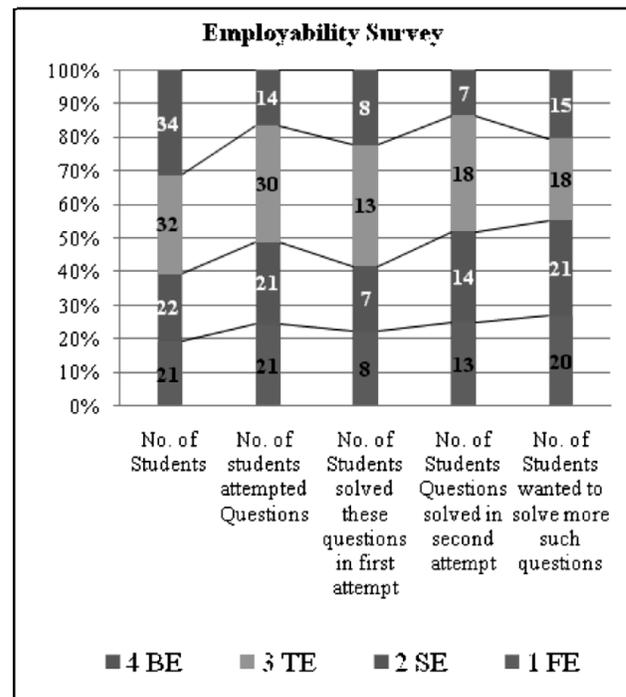


Fig 2: Employability Survey Analysis

Fig2, shows trends, which can be summarized as follows

- 1) Students interested to solve employability related questions apart from university examination question is very high nearing 100%
- 2) Students of FE and SE, shown greater interest and enthusiasm, while TE and BE are demonstrating less interests in such activities.

The decreasing trends in TE and BE are less due to generation of backlogs in examination. Students having backlogs in university examination are feeling out of such activity zone and are less active in such efforts.

An important conclusion can be drawn that, employability efforts should therefore begin from First Year and gradually enhanced blooms level as recommended in Table 1.

However, a channelized effort is required to be put by faculty to inculcate these employability skills in students.

Tier-II Institutions are mainly concerned with teaching subjects rather than development of students, due to restrictions of curriculum. The contact hours of Tier-II are mainly dedicated to subjects rather than employability skills. It will therefore be important to inculcate these employability skills through technical subject specific contributions in every subject. To achieve this, integration of table 2 and table 3 is useful to produce 11 employability skills in a time bound manner through subject specific contributions.

Table 4, can be prepared for the chain of subject specific domains from FE to BE with Blooms Taxonomy level.

higher order thinking skills (HOTs).

In tier-ii institutions, these gaps between LOTs to HOTs are either met indirectly or left to students. However, this approach will never ensure active learning outcomes to be attained by every student.

Therefore, a blooms taxonomy based employability skill matrix is designed and presented in this paper to enhance from First Year (FE) to Final Year (BE) assigned with every employability skills out of 11 specified in table 1.

These skills are strongly recommended to be attained through each subject specific skills.

Table 4 Technical Assessment based on Blooms Level for attainment of employability assessment skills

Sr. No	Employability Skill	Class	Blooms Level	Assessment Question/Activity
1	Communication (Read)	FE	B3	From lathe machine manual, Use Speed, Feed lever positions for turning C45 job
		SE	B4	From lathe machine manual, Examine speed, feed lever setting for getting different surface finish
		TE	B5	Judge selection of EDM machine as compared to Lathe machine for drilling a 1 mm hone in a Job of L/D ratio 1.5 from machine manual.
		BE	B6	Investigate EDM machine capability of performing hard part machining process from machine manual.
2	Communication (Write)	FE	B4	Examine user manuals of conventional and non-conventional machine
		SE	B5	Evaluate use of levers in lathe machine and Support their usage
		TE	B6	Formulate use of electrolyte selection guide
		BE	B6	Design a color coding method for visual communication for safety aspects in machine tools

In the similar ways, other assessment questions/activities can be planned to inculcate subject specific remaining 10 employability skills.

5. Conclusion

In outcome based education, employability is important aspect to help students achieve their career dreams. The skills required to make the students employable and acceptable in field to demonstrate their technical knowledge earned during the four year studies of engineering. The curriculum based learning is majorly designed to impart lower order thinking skills (LOTs) whereas employability skills require

Faculties can devise employability skill matrix demonstrated in Table 1 and Table 4 for each subject contributing to employability skill requirements to be developed in each student.

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