CHAPTER 5
SUMMARY AND CONCLUSIONS

This chapter consists of the following sections:

- Prologue
- Recommendations – Macro level imperatives
- Recommendations – Micro level imperatives
- Limitations of the research
- Green pastures for future research
- Data incidental to the research
CHAPTER 5 - SUMMARY AND CONCLUSIONS

5.1 Prologue

The research predicts that there is a correlation between the learning style of the students and the teaching methodology adopted by the faculty in Indian Engineering campuses. The new psychometric tool developed to measure learnability of Indian Engineering students has been statistically proved to be reliable and valid. Further, a research survey was conducted to understand the workplace benefits from recruits with high learnability. 309 managers from the top 66 IT organization operating out of India participated in the survey. The results of the survey is depicted in Figure 5-1.

![Work Place Benefits from Recruits with High Learnability](image)

Figure 5-1 Workplace benefits from recruits with high learnability

As can be seen the workplace benefits from recruits with high learnability are aplenty. A comparison of the top three benefits that accrue from learnability indicates that the output of an individual significantly increases if they have high learnability. In a people
intensive business like IT this can be a huge lever for organizations to remain competitive globally. Since our research indicates that academic scores and learnability do not have a one on one correspondence, recruiters can use the ALI as part of their battery of tests while recruiting fresh engineering graduates. This is apart from their enforcement of academic scores as entry criteria.

5.2 Recommendations – Macro Level Imperatives

Since we have defined Learning Outcome to include the parameter of learnability, we make those recommendations that directly touch the learnability factor.

Learnability Synthesis

At a macro level, it is important that we understand the need for recruits with high learnability and how vital it is for the Corporate world and engineering academia to focus on the same. Figure 5-2 provides a summary of the stakeholders and the role that they can play towards learnability as a competency.
Corporate Derive the Benefit Expect
Academia Novel Teaching Methodologies Evangelise
Students Understand the need Enhance
Governing Bodies Redefine Learning Enrich

Figure 5-2 The four waves of learnability

Corporate - Expectations

IT organizations should initiate the process of “Rekindling Learnability” in the recruits.

Figure 5-3 provides an approach that can be adopted by IT organizations to make this happen:
The above DNA changing framework has been created based on personal interactions with subject matter experts in the field, several managers and top management of several organizations.

The entry point for a fresh recruit in the IT organization is the Training Unit. The training Unit is responsible for transforming a fresh graduate into an IT professional. The training-learning processes adopted here should stimulate the learnability of the recruit.

Post completion of the training program, the recruit moves into the businesses where he is assigned certain roles and responsibilities which are taken care of by the staffing team.
The nature of work assigned to an individual also plays a major role in enhancing their learnability – challenging assignments ensure that they are always on their toes learning and applying their learning to the assigned work. While performing in their role, they are supervised by their supervisors or mentors who can encourage and motivate the recruits to learn. Hence mentoring by the supervisor/mentor also plays a vital role in grooming the learnability. Learnability is not a new skill to be acquired but a skill that needs rekindling - the challenge therefore is also to ensure adequate HR processes to maintain the motivation level of the recruits. This can be through a flat hierarchy, appropriate reward systems, fast track progression norms etc. Once this happens “learnability” gets enculturized in the workforce.

**Academia - Evangelize**

The academia can use innovative teaching methodologies to enculturate the students to the concept of learning outcomes other than academic scores. Some of the methodologies which have been found to be effective are recommended below:

**Teachers' Portfolio**

Teachers' portfolio is a means to document, reflect upon and improve the teaching and students' learning. The process of developing the teachers' portfolio will help them to develop and articulate their core values of teaching and learning and support the practice of these values with evidence. It establishes the teachers' commitment to their personal development in teaching and to enhanced student learning.
A typical teaching portfolio includes (Mary Jae Paul, 2004):

- Philosophy of education—basic ideas about how learning takes place
- Statement of teaching responsibilities
- Outline of learning goals
- Discussion of relation between goals, teaching strategies, assessments and more broadly the philosophy of teaching and learnability
- Documentation and analysis of student learning outcomes and
- A renewal plan based on information gained during the process of compiling the portfolio

The teachers' portfolio will capture the complexity, depth and richness of teachers' and students' learning. With the growth and the need for continuous improvement, engineering colleges need to adopt a more proactive and faculty-driven approach for improving teaching and learning thereby equipping the students for recruitment for Corporate enterprises. Hence the need for teaching portfolio.

Evaluation of teachers' portfolio is essential. The parameters which can be used to carry out the same are given below (John Olson, 2005):

- Explanation of teaching responsibilities
- Explication of teaching philosophy
- Summary of student evaluations
- Summary of classroom observations
- Explanation of involvement with curriculum development
- Summary of efforts to improve teaching
The construction root route of the teachers' portfolio can profitably be based on 4MAT Cycle of Learning. The cycle represents graphically the teacher behaviors appropriate to each stage/style of learning. It provides a framework for planning and constructing the portfolio: The cycle is given in Figure 5-4:

![4MAT Cycle of Learning Diagram](http://volcano.und.nodak.edu/vwdoc/msh/llc/is/4mat.html)
The cycle has the following components:

- Concrete experience: Integrating the experience with the self-connect the concepts to be learned with students frame of reference/scheme by creating a connecting experience and asking them to reflect and analyze experience
- Reflective observation: Concept formulation--present concepts to be learned and check understanding by presenting concepts in an accessible form and integrating effective activity for analysis of concepts (through questions)
- Abstract conceptualization: Practice and presentation--allow students to integrate and show understanding by practicing concepts by practicing defined givens and practice in applying concepts and adding something of oneself
- Active experimentation: Integrating application of knowledge and experience--apply knowledge gained to anew setting by analyzing application of knowledge for relevance and doing it ad applying it to new more complex experience

**Pedagogical Tools**

The appropriate mix of pedagogy is quite helpful in developing teacher's portfolio. It is plainly clear that learning is a complex process and students learn in various ways. The teacher who acknowledges and actively responds to these truths will facilitate learning success for more learners. The list of pedagogical tools with our observations is given below:

Recent research studies (according to our personal interactions with the senior professors in the engineering colleges) indicate the following ways in which the students learn:

- By learning 10%
- By seeing 20%
- By discussing 40%
- By doing 90%

In a nutshell, the students learn in all four different ways:

- Lecture method (listening)
- Audio-visual (seeing)
- Case studies, drilled down exercises, Internet exercises with compelling discussions, role playing and stimulation (discussions)
- Project work (doing)

What is important is to ensure Integrated Learning Experience (ILE). This concept, in our opinion, leads to 'passion for learning'. The ILE leads the learner thorough: build awareness, teach, provide an opportunity to practice and prepare for Corporate life and finally sustain, sustain and sustain more of learnability. Figure 5-5 exhibits this concept:

![Figure 5-5 Integrated learning experience](image-url)

Source: Personal Enquiry Notes
"Action Learning" is the end product of this ILE. "Action Learning" as developed by Professor Reg Revans of Cambridge University is based on the concept of:

\[ L = P + Q \]

This means that Learnability (L) is determined by:

- Programmed knowledge (P) (the things that students have been taught through experience) Plus
- Questioning skills (Q), the ability/willingness to challenge this programmed knowledge using the stimulus of real problem problems (Nirmal, V, 2001)

Table 5-1 Prominent pedagogical tools

<table>
<thead>
<tr>
<th>Pedagogical Tools</th>
<th>Discussion</th>
<th>Suggestion to suit engineering students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture Method</td>
<td>One instructor can handle a large class in addition to covering a great deal of ground in his/her way. Lectures are useful in introducing and opening up a subject. They are suitable when adequate text books are not readily available.</td>
<td>Making the subject matter interesting and presented in an attractive manner using audio-visual aids. Lectures can be transformed into a live experience by reducing the time from sixty minutes to thirty minutes of well planned task, period of questioning etc.</td>
</tr>
<tr>
<td>Participative Learning</td>
<td>Learning is not a solo endeavor, nor is it necessarily a competition to see who is best within a classroom.</td>
<td>Instructors should encourage students asking questions. Students</td>
</tr>
<tr>
<td>Pedagogical Tools</td>
<td>Discussion</td>
<td>Suggestion to suit engineering students</td>
</tr>
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<td>----------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Discussion</td>
<td>This method is nothing more than a lecture except it is modified; students are permitted to ask for explanations. The success of this method depends on the age of the students, Size of the class and Personality temperaments of the instructors</td>
<td>should also put sensitive, legitimate and relevant questions to the instructors.</td>
</tr>
<tr>
<td>Mutal Lectures</td>
<td>Students either individually or in syndicate of two or four are given topics to prepare and then one of them will be asked to give a short lecture followed by others Of course more time would be required than for a straight lecture</td>
<td>Using this method though time consuming can result in the development of character qualities such as leadership initiatives.</td>
</tr>
<tr>
<td>Project Method</td>
<td>This method lays emphasis on the purpose of learning and claims that the students should know clearly what they do in relation to what they ought to do. The Teachers' Role Is to provide a situation. Students learn from what they practice.</td>
<td>This method can be implemented based on the subject being taught. IT is very rewarding as it ensures team work, knowledge, understanding, discussion, analysis, synthesis, experiment and evaluation</td>
</tr>
<tr>
<td>Role Plays</td>
<td>Develops supervisory skills, see</td>
<td>This method is time</td>
</tr>
<tr>
<td>Pedagogical Tools</td>
<td>Discussion</td>
<td>Suggestion to suit engineering students</td>
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</tr>
<tr>
<td><strong>Case Method</strong></td>
<td>Real cases are presented to the students who are asked to analyze the case, identify the problem and offer solutions (s). If there is a basketful of solutions, optimization through pay-off matrices should be resorted to. It is a powerful vehicle of instruction. Any case study is a mish, mash of what, why, who, when, where and how.</td>
<td>It facilitates a student in a training program to operate in a situation which is more or less similar to the one he/she is accustomed to. It is a more precise simulation of the process that takes place in an organization. Out of the various pedagogical tools, CSM gives an opportunity to go through the stages in decision-making evaluation for the purpose of establishing those particulars of the case.</td>
</tr>
<tr>
<td><strong>Simulation Method</strong></td>
<td>It is used extensively in technical training It is largely computer-based, but it can be non-computer</td>
<td>It provides a realistic picture of both knowledge and skill.</td>
</tr>
</tbody>
</table>
Pedagogical Tools | Discussion | Suggestion to suit engineering students
--- | --- | ---
 | based. | Simulations make sense only if the students learn something. So, they should be made with a definite learning objective and not to let learning just 'happen'.

In our opinion, it is wrong to assume that the case study method is relevant only in law, medicine and management domains. It is equally applicable to engineering faculty. The utility of case study lies in the fact that it can be used to project the variants of work it.

Table 5-2 highlights this fact:

<table>
<thead>
<tr>
<th>Method</th>
<th>Discerning the problem</th>
<th>Gaining information</th>
<th>Solving the problem</th>
<th>Criticising the solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case-Study-Method</td>
<td>Priority: Concealed problems have to be analysed</td>
<td>Information is provided</td>
<td>Solution variants are found out and the decision is made</td>
<td>Solution is compared to the decision in reality</td>
</tr>
<tr>
<td>Case-Problem-Method</td>
<td>Problems are explicitly stated</td>
<td>Information is provided</td>
<td>Priority: Solution variants are found out and the decision is made</td>
<td>Solution is compared to the decision in reality</td>
</tr>
<tr>
<td>Case-Incident-Method</td>
<td>The case is described fragmentarily</td>
<td>Priority: Information has to be obtained independently</td>
<td>Solution variants are found out. The case is solved.</td>
<td></td>
</tr>
<tr>
<td>Stated-Problem-Method</td>
<td>Problems are provided</td>
<td>Information is provided</td>
<td>Solutions are provided. Alternative solutions are looked for.</td>
<td>Priority: Provided solutions are criticised</td>
</tr>
</tbody>
</table>

Table 5-2 Variants of the work with case studies
Source: Kaiser et al, 2007
Summer Projects

The summer internship is the engineering college students' maiden exposure to a live company situation. Their first opportunity to relate theory to practice; real responsibilities, real issues minus real pressures of a real job. This is an ideal learning ground for those engineering students who are simply brimming over with enthusiasm, confidence and revolutionary ideas. Once back to the Institute after internship, the students prove to be valuable brand ambassadors for the companies in which they have undergone internship and help to reinforce its status as an employer of choice. The students need to know how the summer projects are assigned by the companies. The decision criteria are:

- Skills and knowledge of the students
- Potentiality of a permanent hire
- Criticality of the projects
- Learning potential for students
- Practical applications of concepts
- Value inputs for the companies
- Relevance in the current context

How do students choose the summer projects?

- Desired specialization area
- Overall CV of the project
- Chances of getting a final offer
- Learning value of the project
- Stipend and monetary benefits
- Reputation of the company
- Locational preferences

What are the prerequisites for the success of the summer projects?

- Greater awareness of the organizational issues through live projects in the first year of the curriculum will enhance the value of summer training for students as well as for the companies
- Frequent interaction with the Guide, Campus Mentor and others in the organization


- Interns should look for a challenging project, which gives them a sense of achievement (not merely to fulfill the mandatory requirements of the University), and they should take the internship as an opportunity to network with people in and outside the organization
- The summer internship program should kick off with a one-day induction program in the college itself.
- Perhaps, it would make a difference if engineering colleges repackage the summer internships as an ‘experiential learning phase’ where the focus should shift diametrically from simply executing a pre-defined assignment to developing the students’ potential. Seems to be a very tough job!
- The current situation is students are merely assigned guides for their internships without reporting either by the students or the guides! This issue needs to be thought over
Observations from personal interactions with the faculty of engineering colleges

The following observations emerged from our personal interactions with the faculty of engineering colleges:

- There is no neat, stock type mathematical formula for the employment of a particular method of instruction, though some benchmarks are available.
- Instructors can choose any of these methods depending on his/her needs.
- Instructors may be a little staggered by the ever increasing number of innovations in the methods of instruction. Let us not be depressed by the avalanche of published material on theories of learning, CBT, Skills Analysis, Systems Analysis in Training Programs, Assessment of Needs, and Evaluation Techniques etc. There is a scope for innovation. Change is always changeable.

In considering the method of instruction, it is quite useful to examine the following interrelated factors:

- Methods of instruction
- Methods of learning
- Means of assessment

We should also recognize that each method of instruction or mode of learning is effective within certain limits and each has its own strengths and limitations. It is to be realized that the method of instruction enhances not only the effect of learning process of students but also quite significantly enhances the learning process of instructors. According to a compilation by Smeaton, G, 2004 use of advanced technology is indispensable in adopting
pedagogical tools. The idea is to ensure that the students should become techno-savvy. The instructional strategies based on learning styles organized by Paulsen are quite helpful. He has grouped the instructional strategies into four segments: (a) One-alone Online Resources Paradigm, here the student is a self directed learner, often only interacting with online resources. This requires minimum interactivity on the part of teachers: online data bases, online journals, online interest groups and interviews (b) one-to-one: this includes individual and individualized instruction and learning and they rely heavily on the personal relationship between the student and the teacher; it involves learning contracts, apprenticeships and correspondence studies (c) One-to-many (The Bulletin Board Paradigm), here students are exposed to one or more experts in a given subject area. It includes lectures, symposia, skits (d) Many-to-many technique (the Conferencing Paradigm). This includes discussion groups, debates, simulations, case studies, role plays, brainstorming and group projects. The factors affecting the choice of an appropriate teaching method must be recognized; they are shown in the following chart:
The application of some prominent learning principles in teaching methods is equally important, as shown in Figure 5-7:

![Figure 5-7 Application of some principles of learning in teaching methods](image-url)
Management of Learning Processes

Learnability needs an effective management of learning process. Figure 5-8 portrays the essential ingredients of this process:

Students – Enhance

IT organizations need recruits with high learnability. Knowledge constitutes 'Power' in the IT industry. Each individual should ensure that they are always on top of the learning curve irrespective of their work pressures if they are to be successful. Recruits with high learnability can transform the India IT scenario. As we have seen the workplace benefits from such recruits are aplenty. Currently, India is known to be the best of the knowledge hubs for “Outsourcing” while all the research and IT organizations need recruits with
high learnability. Knowledge constitutes 'Power' (sapient authority) in the IT industry. Each individual should ensure that they are always on top of the learning curve irrespective of their work pressures if they are to be successful. Recruits with high learnability can transform the Indian IT scenario. As we have seen the workplace benefits from such recruits are aplenty. Currently, India is known to be the best of the knowledge hubs for “outsourcing” while all the research and development work happens in other countries. It is only recruits with high learnability who can transform this scenario and make India the preferred destination for Research and Development work. This will change the landscape of Indian economy thus benefiting society at large. Students need to unshackle from their existing mind-sets that constrain their learning processes to pre-defined conventional methods employed by the academia. Students should nourish creative thinking through their natural styles of learning.

**Governing Bodies – Enrich**

The NBA can redefine the Learning Outcome of Engineering education to include competency based outcome. Since the workplace benefits of recruits with high Learnability are immense, this can be added as one of the parameters in the learning outcome. We recommend following a process-oriented approach to enable the students to acquire key competencies for life long learning. The pedagogic model developed by the Institute of Technical Education (ITE), Singapore is quite helpful in this regard. The ITE Pedagogic Model is a framework that enables teachers in engineering colleges to use a systematic approach to take on a facilitative role in teaching and learning. The model is shown in Figure 5-9.
Process-oriented approach to acquire key competencies for life-long learning

Conducive physical environment

The following are the key concepts of the model in terms of competencies which, in our view, have a direct bearing on the learning outcome, specifically learnability (Leong, P et al, 2000):

- Technical competency comprising the technical skills and knowledge pertaining to the respective training occupation and the development of specialized knowledge.
- Methodological competency i.e. the ability to learn and work independently with capabilities to plan, solve problems and make decisions with the regard to the acquisition of technical knowledge and skills.
- Social competency of being able to work well with others with abilities to cooperate, share responsibilities and communicate effectively.

To apply this model effectively, the NBA can come out with measures to ensure that the teachers of engineering colleges provide a realistic problem or a challenging task in the
form of a case study or simulation of a work environment. The presence of such a learning context is highly significant for enhancing competency based learning outcome.

5.3 Recommendations-Micro-level imperatives

Our personal interactions with the senior faculty members of the engineering colleges surveyed gives out the following micro-level imperatives for the faculty members to enhance the learnability of the students and prepare them for the job market. It is reiterated that learning is not a solo endeavor, it is a joint endeavor and this is ignored by the faculty in most of the engineering colleges. The faculty should work to:

1. Encourage contacts between students and the faculty
2. Develop reciprocity and cooperation among students
3. Use active learning techniques
4. Give prompt feedback
5. Emphasize time on task
6. Communicate high expectations
7. Respect diverse talents and ways of learning
8. Employ technology to create a variety of learning opportunities

The following are the specific recommendations:

1. Our personal interactions with the senior faculty of engineering colleges surveyed indicate junior-level faculty members (including the newly appointed faculty) have problems to gain practical classroom experience before they start teaching vigorously. The concept of micro-teaching is quite helpful in this context. Micro
teaching is organized practice teaching. The goal is to give instructors confidence, support and feedback by letting them try out among colleagues a short slice of what they plan to do with their students. Ideally, micro teaching sessions take place before the sessions are scheduled and are videotaped for review individually with an experienced teaching consultant. Micro teaching is a quick, efficient, proven way to help instructors get off to a strong start.

2. Indian accreditation system continues to follow the traditional resource-based approach. The Indian accreditation agency, universities and engineering institutes are strongly encouraged to undertake serious requirement analysis for curriculum design by involving all stakeholders.

3. Faculty’s unfamiliarity and inexperience with real life engineering projects as well as research on learning also need urgent attention.

4. NBA has identified the teaching learning process as the most important parameter amongst eight parameters. A much deserved large-scale awareness, attention and research on this parameter can be taken up.

5. Engineering faculty can be exposed to the vast research and literature in SOTL (Scholarship of Teaching and Learning).

6. Changes in engineering learning experiences involving curricula, pedagogies, and support services should be based on research on learning.

7. We also recommend the colleges contemplate 'learning materials project' to develop the learning materials for the faculty and the students, in collaboration with the Indian Society of Technical Education, New Delhi.
8. It is wrong to assume that only the academia need to own the responsibility of cultivating learnability among students. Corporate enterprises have an equal or higher responsibility in creating a conducive environment for every graduating engineer to augment his/her learnability. This should be a component, inter alia, of Corporate Social Responsibility. Subsequently Corporate can place higher expectations on their performance which will result in substantial gains to the industry.

9. The focus of our research investigation is on individual learning (Learnability of engineering college students). However, the individual learning must be aligned/fine tuned with the organizational/institutional learning.

10. It is important for the engineering colleges to conduct 'learning behavior' surveys periodically to capture the 'potholes' in learning which can be considered while designing the curriculum and teachers' styles. The survey of this type constitutes 'corrective mechanism' to the Learnability. The importance of the data generated from Learning Behavior Surveys is that they provide insights into the students' learning as they experience it themselves. These surveys allow instructors to gain a better understanding of what contributes to that learning, as well as what does not. They can then use these results in an iterative process to maintain those aspects of the intervention that are a factor in student learning, and strengthen it or eliminate those that are not. It is here the concept of 'Learnability Audit' is helpful. This concept of learnability audit can be patterned on the basis of 'Knowledge Management Audit'.
11. The learning style inventory is substantially useful to the Learnability. The inventory is highly individualistic and each engineering college can effectively build the learning style suited to it. The colleges can obtain the data base for this task from Richard Felder Learning Style Model (appendix 3).

12. We also recommend the deployment of experiential learning in the engineering colleges. Some prominent experiential learning activities are: (a) attribution style analysis; (b) ABCDE Analysis; (c) warring voices; (d) wall-vaulting and (e) Soul boosters. These experiential learning activities are effective boosters for learnability. Some very significant techniques of facilitating experiential learning are: (a) funneling; (b) front loading; (c) framing; and (d) indirect front loading.

13. Outbound learning is essential for engineering students to grasp the intricate learning landscapes.

14. A system of 'informal learning' needs to be blended with 'the system of 'formal learning system, since the Learnability is faster in an informal setting.

15. A System of 'blended learning' is recommended to reinforce the Learnability. The blended learning concept greatly hinges on self-directed learning.

16. The focus of our research investigation is on individual learning (Learnability of engineering college students). However, the individual learning must be aligned/fine tuned with the organizational/institutional learning.

17. Our personal interactions with the faculty of the engineering colleges indicate that mentoring is not provided for the junior faculty. Mentoring is the most individualized aspect of assisting new faculty acclimates. Mentor-protégé relationship addresses the specific and unique needs of each new faculty member.
The senior faculty who serve as mentors respond directly to the needs and interests of the new faculty with whom they are paired. Mentors are available not only to answer specific questions but to assist and support new faculty in becoming experienced and contributing members of the engineering colleges' community. The most important tasks of a good mentor are to help the new faculty member acclimate to the college environment by sharing teaching, social and governance experiences. A good relationship with a supportive, active mentor contributes significantly to a new faculty member’s career development and satisfaction. The accessibility, networking and independence are the qualities of a good mentor. The mechanism of mentoring includes pairing the mentors, learning contract and clarifying the roles. The Peer Matching Survey Questionnaire is indispensable. A typical Peer Matching Survey Questionnaire is enclosed in the chapter on Appendices.

a. Mentor and Mentee (Protégé) Expectations: A mentor should:

   i. Impart organizational skills
   ii. Listen and question
   iii. Show how to use the system to accomplish goals
   iv. Build confidence
   v. Provide support and counsel
   vi. Act as a role model
   vii. Give constructive feedback
   viii. Foster creativity
   ix. Offer career service
x. Assist with self-evaluation

xi. Provide networking opportunities

xii. Act as a companion, ally and co-learner

b. A Mentee (Protégé) should:

i. Be willing to accept constructive criticism

ii. Communicate

iii. Act professionally

iv. Exhibit flexibility

v. Demonstrate initiative

vi. Notify mentor or problems or concerns

vii. Maintain confidentiality

viii. Express appreciation for their mentor's efforts

ix. Plan for personal well-being

x. Be open to new ideas

xi. Respect their mentor's time

xii. Act on the information provided by the mentor

xiii. Pass on the gift of mentoring

18. It is of utmost importance to impart the knowledge of 'networking' to the students of engineering colleges. Networking as a concept is based on shared learning through mutual support, exchange and advice. This concept can be piloted through 'placement cells' of engineering colleges.

19. It is found during our survey that many of the engineering colleges admit students from different parts of the country as well as from different countries. These
students are heterogeneous and their learnability is presumably varies considerably largely due the cultural differences. The model developed by Marchesani L & Adams M is helpful for the instructors to consider how their own identify not just that of their students, has implications for the classroom dynamics. The model serves as a useful framework for designing courses and inclusive class room environment in respect of culturally diversified students. The model is given in Figure 5-10:

![Diagram: Four Dynamics of Diversity]

To sum up, it is our belief and conviction that Learnability is a sine qua non for employability of engineering students in the Corporate sector. Learning excellence as a result of incremental increase in Learnability can be a key driver of 'Corporate fit' (matching the employability in accordance with the learnability requirements of the Corporate sector). Devoid of learnability, the whole fabric of employability of
engineering students gets stuck in the mud. Lack of appropriate learnability in accordance with the learnability requirements of the Corporate enterprises would alienate the engineering students from the employability in the Corporate sector. Every engineering student can become 'Michelangelo' in learning domain, provided his/her Learnability increases by leaps and bounds. We sought to project in our research investigation the need, significance, mechanism, and process of increasing the Learnability. It is reiterated that Learnability propels, catapults, triggers, drives, reinforces, sensitizes, energizes and rejuvenates the employability. The whole gamut of Corporate recruitment gets streamlined with this gateway of learnability. Employability without learnability becomes will-'o'-the-wisp... Our analysis calls for, nothing more nothing less than, enhancing the learnability with a concomitant benefit on employability in the IT Sector.

5.4 Limitations of the Research

Our research investigation is beset with the following constraints:

- Time and resource constraints
- At the micro level, the scope of our research investigation is restricted to IT organizations
- Bias/prejudice creeping into the responses of the respondents. However we took care to obviate it through meticulous cross checking of data
- Limited sample size, but it is adequate enough to make valid projections
- The ALI has been developed taking into consideration Indian Engineering student context
Students have been chosen from third year of engineering since their recruitment happens during the same period.

Since the focus is on engineering recruits the research in respect of non engineering recruits is left out

5.5 Green Pastures for future Research

Based on our research findings and our personal interactions with the experts in the field, the following areas for future research have emerged. These areas constitute the 'green pastures' for future research. They are outside the ambit of our research investigation. Perhaps the line of thinking on which our research investigation is based may give scope for future research in these areas:

- Since the IT and ITES sector is supplied with talent from the Science stream institutions too, it would be worth while to investigate the application of ALI for Science graduates
- Understanding the impact of learning style and teaching methodology on the learning outcome of Science graduates.
- A comparison of Learning Style in IT and Non IT students.
- The Learnability of a new recruit as measured by ALI can be recorded. Post this the growth path of a recruit who scores high on learnability versus the growth path of a recruit who scores low on learnability can be studied. This will further authenticate the need for ALI
- The data emerging from the analysis of senior management views on teaching methodology adopted by their institute indicates that the focus of the senior
management in the academia is less on teaching and learning paradigms. A research work can profitably be carried out on

- The gaps between the management philosophy and the implementation of the same by the faculty
- Reasons for the gaps
- Solutions that can reduce the gaps

The research results will enhance the quality of engineering education.

5.6 Data Incidental to the Research

(*unused data not directly concerned with our research investigation*)

1. What should be the appropriate relationship between Learnability and Learning Style is a question to be answered. Data was captured from 32 faculty members from the below campuses.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>College Name</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bangalore Institute of Technology</td>
<td>Bangalore</td>
</tr>
<tr>
<td>2</td>
<td>BNM Institute of Technology</td>
<td>Bangalore</td>
</tr>
<tr>
<td>3</td>
<td>Muffakham Jah College of Engineering &amp; Technology</td>
<td>Hyderabad</td>
</tr>
<tr>
<td>4</td>
<td>RMK Engineering College</td>
<td>Tiruvallur</td>
</tr>
<tr>
<td>5</td>
<td>Vasavi College of Engineering</td>
<td>Hyderabad</td>
</tr>
<tr>
<td>6</td>
<td>Velammal Engineering College</td>
<td>Chennai</td>
</tr>
</tbody>
</table>

Data analysis indicated the below results
2. An analysis of data from 33 Science graduates on their learning styles is shown below.

Figure 5-12 Learning style of Science students

The participants belonged to the below colleges.
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of the College</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bhaktavatsalam Memorial College for Women</td>
<td>Chennai</td>
</tr>
<tr>
<td>2</td>
<td>Vivekananda College of Engineering &amp; Technology</td>
<td>Puttur</td>
</tr>
<tr>
<td>3</td>
<td>Birla College Kalyan</td>
<td>Thane</td>
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<tr>
<td>4</td>
<td>Bishop Heber College</td>
<td>Trichy</td>
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<tr>
<td>5</td>
<td>CAT Degree College</td>
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<td>6</td>
<td>College of Applied Science</td>
<td>Vadakkencherry</td>
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<td>7</td>
<td>Dewan Bahadur Padma Rao Mudaliar Degree College</td>
<td>Hyderabad</td>
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<tr>
<td>8</td>
<td>M.S.P.Mandal's Deogiri College</td>
<td>Aurangabad</td>
</tr>
<tr>
<td>9</td>
<td>Government City College</td>
<td>Hyderabad</td>
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<tr>
<td>10</td>
<td>Jagarlamudi Kuppuswamy Chowdary College</td>
<td>Guntur</td>
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<tr>
<td>11</td>
<td>Jagruti Degree &amp; PG College</td>
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<td>12</td>
<td>Justice Basheer Ahmed Sayeed College for Women</td>
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<td>Loyola College</td>
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<td>14</td>
<td>M N R Degree College</td>
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<td>15</td>
<td>Magunta Subbarami Reddy Degree College</td>
<td>Chittoor</td>
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<td>16</td>
<td>Modern College of Engineering</td>
<td>Pune</td>
</tr>
<tr>
<td>17</td>
<td>NRK &amp; KSR Gupta Degree College</td>
<td>Guntur</td>
</tr>
<tr>
<td>18</td>
<td>P B Siddhartha College of Arts &amp; Science</td>
<td>Vijayawada</td>
</tr>
<tr>
<td>19</td>
<td>Prof. Ramkrishna More Arts,Commerce &amp; Science College</td>
<td>Pune</td>
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<td>20</td>
<td>PSG College of Arts &amp; Science</td>
<td>Coimbatore</td>
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<td>Pydah College of Women</td>
<td>Visakhapatnam</td>
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<td>Mysore</td>
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<td>24</td>
<td>Sikkim Manipal University</td>
<td>Bangalore</td>
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<tr>
<td>25</td>
<td>Spaces Degree College</td>
<td>Godavari</td>
</tr>
<tr>
<td>Sl. No</td>
<td>Name of the College</td>
<td>City</td>
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<tr>
<td>26</td>
<td>Sphoorthy Degree College</td>
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<td>27</td>
<td>Sri Sathya Sai University</td>
<td>Anantapur</td>
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<td>28</td>
<td>St Ann's Degree College for Women</td>
<td>Hyderabad</td>
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<td>29</td>
<td>St.Joseph’s College</td>
<td>Bangalore</td>
</tr>
<tr>
<td>30</td>
<td>Wesley Degree College for Women</td>
<td>Secunderabad</td>
</tr>
</tbody>
</table>

Does this imply that the teaching methodology in Science Domain (Non-engineering) is different? This is an area to be investigated.

The future researchers can obtain any information/clarifications from the researcher on this aspect. She can be reached at annapoorna.gopal@wipro.com