A perspective of experiential learning approach followed in Dhirajlal Gandhi College of Technology

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***Abstract*— In the current scenario, curriculum design of Indian engineering education need to have high impact to change the lives of engineers and scientists to sustain in the professional field. Moreover engineers are in a position to meet the elevated demand in various sectors right from financial services to manufacturing techniques. In order to meet the above demand in this competitive world, it is essential to improve the engineering curriculum design which actually refers to the entire plan of a course and its desired learning outcomes. Effective improvement in the curriculum design of undergraduate engineering education can be done with the inclusion of various experiential learning methodologies. This paper deals with the inclusion of experiential learning in terms of guiding and training the students to design the equipments needed for the laboratory of optical communication and thereby enhancing the learning of theory course of Fiber optic communication. This methodology can be facilitated during the semester holidays for the students. This paper also describes about various experiential learning methodologies and high impact teaching skills required for engineering curriculum design.**

Keywords—curriculum, engineering education, experiential learning, optical communication

I. INTRODUCTION

Experiential learning involves participative, interactive and applied knowledge skill sets to learn any concepts. It encourages the students to contact with real world environment and exposure to processes that are highly changeable and indecisive. Basically experiential learning methodologies help the students to connect classroom learning with the technical practice by improving the conceptual understanding and broaden their career perceptions. Experiential learning for students provides an opportunity of gaining professional technical experience while doing the graduation. They will be capable of applying their knowledge what they have learnt through experiential learning during the real time situations in the industry.

Such experiential learning methodologies yield the below mentioned diverse set of experiences to the students.

1. Authentic classroom activities
2. Professional development and training activities
3. Simulation projects
4. Entrepreneurial projects
5. Student internships(summer & abroad)
6. Undergraduate research
7. Co-op experiences
8. Field placements

In order to improve the employability skills of Indian engineering graduates, Wipro has launched the concept of Mission10X scheme since 2007 by enhancing the quality of engineering education. The main objective of Mission10X was to develop a sustainable model to improve the quality of engineering education by the initiative in terms of empowering faculty members to use Mission10X learning approach in teaching methodology.

Curriculum is a tool through which the university can add what the students can learn through the program and add the educational instructional practices to facilitate effective learning. The design and implementation flow of the curriculum structure for all affiliated institutions under Anna University starts from the opinion of the top academic administrators of Anna University. The curriculum structure must be dynamic, nonlinear, subject to processes of continuing dynamic research and open to futuristic trends [1]. The curriculum is designed and framed by the identified team members formed from interdisciplinary sectors, integrates representatives from academic community like mentors, advisors and program coordinators of Anna University.

II. EXPERIENTIAL LEARNING CONCEPTS

Although several models of experiential learning methodologies exist in general, Kolb's model is one of the widely adopted methods [2]. In this method, the complete learning of any concept happens only when all the four elements of the model is incorporated in the learning cycle. The four elements are i) Concrete Experience, ii) Reflective Observations iii) Abstract conceptualization and iv) Active Experimentation. All these four elements of learning cycle

give rich learning experience to the students [3]. All these elements of learning cycle yields the students to gain concrete experience, reflect on observations, conceptualize the gained experiences and change the experimentation outcomes. Thus Kolb's learning cycle incorporates the knowledge grasping dimension and knowledge transformation dimension attitude for the students. This learning model affords an incomparable outline to plan teaching and learning activities in engineering education.

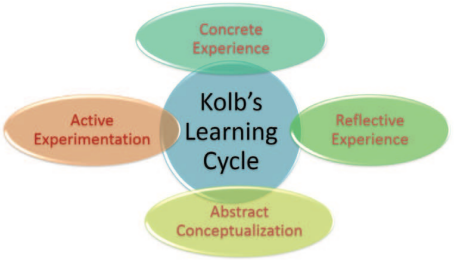

Fig 1. Kolb's learning model for Experiential learning methodology

In case of engineering education and curriculum design, it is of utmost importance for an engineering facilitator to utilize high impact pedagogical practices to give experiential learning based stimulus to the students and to bring the focus of the students under their control. It is also essential that the curriculum design and flow also should encourage learner centric learning approach instead of teacher centric learning approach. In Dhirajlal Gandhi College of Technology, an attempt is made to facilitate experiential learning approach for learning engineering concepts by following high impact teaching skills and making the students to design the kits needed for doing laboratory experiments in Fiber Optic communication course.

A. Various approaches of experiential learning

Various approaches of including experiential learning and instructional practices includes improving the problem solving capability of the students, improving case study discussions, implementing study group discussions, encouraging internships, encouraging students to write proposals for government research institutes and encouraging students to identify innovative ideas and implementing them.

B. Benefits by integrating experiential learning

Experiential learning programs are potential opportunities for the students to gain working experience from a company during their college career to understand real world scenario that what engineers do in the professional workplace. Benefits achieved by the employers includes, the students are young and enthusiastic budding talents, who provide excellent support for the innovation centers. At the time of hiring full time engineers, Employers prefer the list of the students who have already undergone internships and co-operative learning program from the company. Employers can evaluate the candidates before having them as full time workers. Internship programs and Co-operative programs raise awareness about the company among budding engineers.

C. Difficulties for inculding experiential learning

Limited resources and unpredictable business climates pose a problem of setting up co-operative concerns and internships. The challenge deals mainly with the selection of a suitable model to ensure a good fit for the co-op student, the academic institution and host organization. Other main aspect includes sufficient time requirements of comprehensive training and obtaining regular partnerships with companies/ Industries in order to enhance student training.

III. Design of Laboratory Equipment

Generally in most of the Engineering colleges, the devices and equipments necessary for conducting the lab experiments are almost purchased in the form of trainer kits. The laboratories included in the curriculum provide excellent support for learning the theoretical concepts. In Dhirajlal Gandhi College of Technology, we have established a centre for excellence named DRDP-Dhiraj Research Development Park, where we develop equipments and devices for laboratory purposes under the supervision of subject matter experts. The equipments for Optical Communication course of Final year ECE curriculum are designed along with the practice of the students under the guidance of professor. This experiential learning process can be facilitated during the semester holidays for the students. When students undergo the design process definitely experiences four different cycles of learning in the experiential learning methodology. The various equipments designed with the experiential learning environment of the students were Fiber optic LASER & LED source, LASER trainer kit module and fiber optic analog communication trainer module.

In order to intensively study the various theoretical concepts of fiber optic communication techniques such as measurement of fiber numerical aperture, measurement of attenuation characteristics, characteristics of LASER diode and setting up of fiber optic analog communication link, it is essential to learn and research about various components involved in the design of certain equipments.

Fig 2. Fiber optic LASER source 850/1310nm

The learner needs to undergo many various learning cycles of experiential learning methodology because while starting the process of designing circuits and equipments, the learner researches about diverse availability of the components required for the design. The students will choose the necessary components from various existing components with trial and error methods. Optical sources designed in the DRDP centre was LASER source and LED source modules and is shown in fig 2 and fig 3.

Fig 3. Fiber Optic LED source 850/1310nm

These two optical sources are designed in such a way that these sources are capable of generating light with two different wavelengths namely 850 nm and 1310 nm respectively. These sources are useful to pump light through the fiber cable to read the various characteristics of the cable such as acceptance angle, concept of total internal reflection, theory of Snell's law and measurement of Numerical aperture of the fiber. The device used for this purpose is shown in Fig.4.

Fig 4. LASER Trainer kit module

The terminology of Attenuation deals with the measurement of light propagation capacity through the fiber. It is the measurement of power coming out of the fiber being less than the power entering the fiber. While doing this experiment the students will be able to understand the concept of various losses and coupling loss associated with the fiber optic cable.

Formation of fiber optic analog communication module involves the use of optical direct intensity modulation technique, where optical light ray from the source is modulated directly by varying the current around the bios level in accordance with the message signal. Learner can also make use of any one of several modulation techniques available. On the other end demodulation is applied to retrieve the message signal using PIN detector module.

Fig.5 Fiber optic analog communication trainer module
Impedance measurement

The analog signal can be send using one of several modulation techniques. The simplest form of optical fiber link is direct intensity modulation, where optical output from the source is modulated simply by varying the current around the bias point in proportion to the message signal level. Thus information signal is transmitted directly in the end of the base band. More efficient method is to translate the baseband signal into an electrical sub carrier prior to intensity modulation or phase modulation techniques.

IV. Conclusion

The concept of experiential learning brings the practical implementation of classroom knowledge and professional practice together for the students during the graduation period. In order to focus the development of Indian engineering curriculum to be more effective and creative, it is essential to add experiential learning methodologies to implement the instructional practices. In can be concluded that the method of making the students to design the laboratory equipments necessary for learning the fundamental concepts and theoretical concepts provides the students with hands on experience and gives confidence relevant to design engineering. This allowed the students to undergo all the learning cycle experiences in Kolb's learning cycle.

V. References

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