ROLE OF RESEARCH IN THE ENGINEERING EDUCATION

Mrs. S.V. Devika[12], Dr. K. Sarat Kumar[3], Dr. K. CH. SriKavya[4], Ms. Swetha A.Patil[5]

[1] Associate Professor of ECE, Hyderabad Institute of Technology and Management, Hyderabad.
[2] Research Scholar, Department of ECE, KL University, Vijayawada.
[3,4] Professor of ECE, KL University, Vijayawada.
[5] Department of ECE, Poojya Doddappa Appa College of engineering, Gulbarga.

Abstract: The importance of research in Engineering Education has grown to levels of sophistication. Undergraduate research is a pedagogical tool that helps channelize the energy and enthusiasm of students into conceptual-based education, thereby igniting their minds to explore with curiosity of the world around them. The word "research" emits a groan from those who simply have no idea as to where to begin literally. This is a common response from most of us, especially in case of an engineering student. The fact is many of us procrastinate when it comes to doing research because we just don't know how to do it. Although there is no quick fix when it comes to doing research, there are some practical approaches that make doing research a lot easier.

The main objective to write this paper is to investigate students' perception/attitude towards research. What are the techno factors that influence the cognizance.This paper focuses on the fundamentals of getting started with research, the students' perception towards the research in their engineering education, the importance of its role in engineering education, the support of the students by the institution and as well as government carries out research activities in engineering education and the aspects to enhance engineering education without boundaries.

Key Words: Research, Engineer, Engineering education, pedagogy, conceptual based education.

1 Introduction:

India was lagging behind in terms of encouraging its engineering students towards research, when compared to countries like China and the US

- M.M. Pallam Raju, Union Minister for Human Resource Development, India. Article in The Hindu 2015

1.1 What/why is Research?

The first thing that comes to mind about engineering education research is to know the depth, to make basics strong, student centric knowledge based learning. The question expected when we confer about research is: why research? What is expected out of it? Whether it is straight forward / higher level / ill defined problem solving. Is it critical/multidisciplinary thinking / creative form of learning? Why/ how this has happened /happening?

3 major instruments in the research area are:
➢ Survey
➢ Questionnaire
➢ Interview & observation

Research in the field of medicine is more empirical in the engineering field. Engineering education still follows the chalk & talk rule, which is being less effective in contrast to olden days of lecturing. This is very stagnant, and the rate of improvement seen is very less.

1.2 Role of Teacher/Trainer in implementing Research in Engineering Education:

To develop research based Teaching as well as learning in the classroom, the responsibility of the faculty increases. In the traditional teaching method, the teacher teaches the curriculum using chalk and board and will not go beyond that. But this type of teachers' centered teaching is not sufficient to enter into the research domain. Different teaching pedagogies are implemented in the classroom to make students deeply think the subject which in turn makes them think about the real time applications, latest technologies on the subject concerned. They will have motivation to do something in that subject which leads to research.

1.3 Student Perception on Research in Undergraduate studies:

The question expected when we confer about research are: why research? What is expected out of it? Whether it is straight forward / higher level / ill defined problem solving. Is it critical/multidisciplinary thinking / creative form of learning / Why/ how this has happened/happening?

1.4 Why/Where Research is lacking?

(1) Students are much focused on curriculum & not much prioritization on project/activity based learning.
(2) Not being provided with sufficient guidance
(3) Lack of networking(no knowledge about the scholarship schemes provided by the Government/various investors)
(4) No much encouragement from faculty
(5) Outdated methods are still in practice
(6) Lack of observation
(7) Financial issues and so on

JEET

1.5 Sample Questionnaire for survey done among the students:

1) When you hear the word research what is the first thing you get into your mind?
2) Do you think research is necessary in the engineering curriculum?
3) How do you think research helps in building your skills?
4) Up to what extent a research can clear your doubts in a particular area rather than simply studying it?
5) How research helps in new innovations?
6) What is the need for research?
7) Do you think research is meant only for PhD's?
8) How do you think research is helping in the improvement of technology?
9) Do you know there are different funding agencies which supports students to carry out research work in engineering education?

A survey was conducted for approximately 100 students in The Hyderabad Institute of Technology and Management, Hyderabad to create awareness and to know the students perception towards Research in Engineering Education.
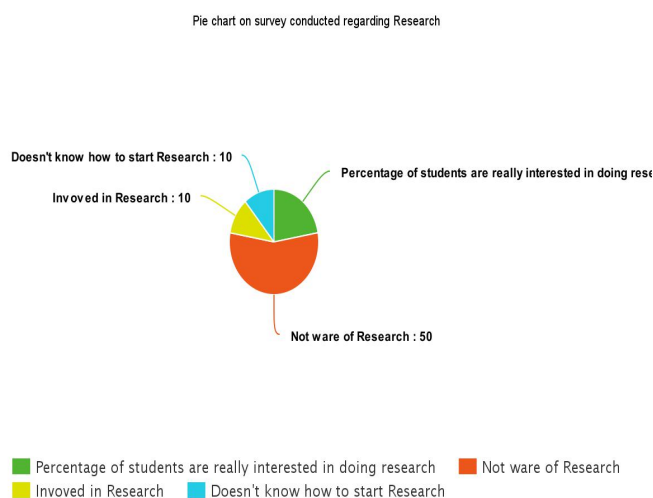

Pie chart on survey conducted regarding Research

Doesn't know how to start Research : 10
Invoved in Research : 10
Percentage of students are really interested in doing rese
Not ware of Research : 50

■ Percentage of students are really interested in doing research   ■ Not ware of Research
■ Invoved in Research   ■ Doesn't know how to start Research

meta-chart.com

Fig1. Pie chart representation of Survey done on 19ᵗʰ August 2016 at HITAM campus

2. How to start Research?

2.1 LLP model to start research: A LLP model is proposed for the beginners to start their research work. It states that Labs for research, Literature Survey and Paper publication or presentation. It would be helpful for the engineering students initially to start their work starting from first year of their engineering.

2.1.1 Labs: The initial research of the students should be started with the laboratories in their engineering education. They have scope to do innovative experiments in the labs apart from the curriculum. The work done for those innovative experiments will lead to their research in the future. Students can visit research labs like RCI, DRDL, ISRO, etc.. to enhance the practical knowledge and to progress in to research.

2.1.2 Literature survey: The literature in general education, technical education, psychological education, and various other fields of education is getting repleted. Alas, less impact is observed in mainstream engineering education. A Literature survey in their respective areas of the students will help them to know the level of work going on in the present and also future scope as well.

2.1.3 Paper publications: Publication of their work in the internal journals and conferences will give sound knowledge to the student to move forward in their respective area. The starting step for publishing paper is to do literature survey again. The survey on the topic should go deeply to learn about the pros and cons of the area that leads to **.**The work of the authors should be presented in the form of publication of papers characterized by exceptionally high quality research.

2.2 Curriculum to be changed: Many of the Universities have involved subjects related to the society in engineerings study like Environmental Science, Gender Sensitization etc. Similarly Research Methodology should also be included in the curriculum which can help students to get awareness on how to start research.

3. Awareness to the students to take forward their Research activities:

3.1 Support from the government of India:

Some of the Engineering graduates are really interested in research, but will not come forward due to their financial conditions. They are not aware of the support given by the government to carry out research and development activities in their education. Government of India came forward with many schemes to uplift engineering graduates. Funding agencies like DST, AICTE, UGC, DSIR, ISRO etc. Kudos to the Government of India for providing various funding schemes to the students to complete their graduation in a given specific time.

The below mentioned are few such government schemes.

1) **Department of Scientific and Industrial Research (DSIR):** Government of India is supporting student entrepreneurs and also supporting students by giving funds to their projects with innovative ideas. Under DSIR there are many schemes like TePP (techno Preneur Promotion

program), Micro Technopreneurship Support (TS) where the support from 50,000 to 10 Lakhs is given.

2) University Grants Commission (UGC): To promote excellence in research in higher education by supporting research programs of the University and College teachers in various disciplines. Traditionally, universities have been the centers of research. Although, the Government has a network of science and technology laboratories for research and development, the major base of researchers in science and technology remains with the universities. Therefore, university and college teachers need to be supported to meet this requirement.

Major Research Project in Sciences, including Engineering & Technology, Medical, Pharmacy Agriculture etc. - Rs. 12 lacs. Major Research Project in Humanities, Social Science, Languages, Literature, Arts, Law and allied disciplines will get the support of Rs. 10 lacs. And the Minor Research Project with Rs. 1 lakh. The Commission will provide financial support for the items like Equipment, Books and Journals, Research Personnel (Research Associate or Project Associate or Project Fellow), Hiring Technical Services, Contingency, Chemicals and Consumables, Travel and Field work and any special requirements. However, assistance towards research personnel will not be provided in Minor Research Project.

3) Information Technology Researh Academy (ITRA): IT Research Academy (ITRA) is a National Programme initiated by Ministry of Electronics and Information Technology (MeitY), Ministry of Communications and Information Technology (MCIT), Government of India, aimed at building a national resource for advancing the quality and quantity of R&D in Information and Communications Technologies and Electronics (IT) and its applications at a steadily growing number of academic and research institutions, while strengthening academic culture of IT based problem solving and societal development.

There are many more schemes in the Government of India which gives support to the students to carry out research activities in their under graduation and post graduation studies.

3.2 Process of Improving Research in the Engineering filed with the support of the Institution:
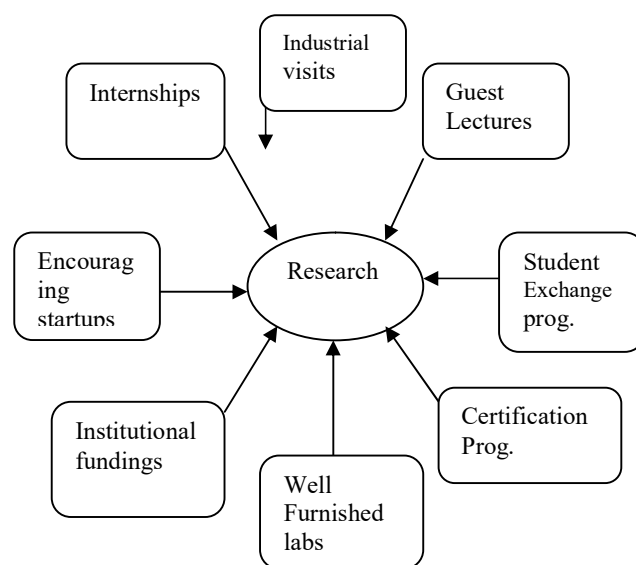
Fig.1 Parameters which help students to improve Research activities in Engineering Education

i) Industrial Visits: Industrial visit has its own importance in a career of a student who is pursuing a professional degree. It is considered as a part of college curriculum, mainly seen in engineering courses. Objectives of industrial visit is to provide students an insight regarding the internal working of companies. We know, theoretical knowledge is not enough for making a good professional career. With an aim to go beyond academics, industrial visit provides student a practical perspective on the world of work. It provides students with an opportunity to learn practically through interaction, working methods and employment practices. It gives them exposure to current work practices as opposed to possibly theoretical knowledge being taught at college. Industrial visits provide an excellent opportunity to interact with industries and know more about industrial environment. Industrial visits should be arranged by the institutions which makes students think of it and creates a path towards research activities.

ii) Guest Lectures/Seminars: Institutions should frequently arrange guest lectures and seminars for motivating students to start research work in their interested area. Presentations by the eminent personalities will create an impact on the students to start involving themselves in the research activities.

iii) Internships: Undergraduate students should create opportunities for doing internships in the industries to develop their technical skills in the respective areas. Internships give basic knowledge of research to the students. They would have the opportunity to see the physical research labs and the experiments in their course. Institutes should encourage students to internships, even during college hours.

iv) Encouraging startups: Undergraduate students should be involved in the entrepreneurship training programs organized by the institution with the help of industry interactions. Incubation centers should be established by the colleges to make students involve actively in the research and produce innovative projects.

v) Institutional fundings and well furnished labs: Undergraduate colleges should support students by giving a part of financial assistance for completing their research work. That motivates other students to involve more. And laboratories play a great role in starting research work. So, Labs to be well established in the college.

vi) Certification Programs: Certification programs to be organized in the engineering colleges to make students aware of the availability of the latest tools in their respective branches.

4. Outcomes of Research:

For transformation in the engineering education, the Institute should play a major role by making students to involve in research and development activities. Students should involve and actively participate in all the activities to gain the knowledge and to work towards their research. Students will get awareness like, how to start research in their respective area? How to get support from the institution as well as government to carry out research activities?

The below list are the outcomes of introducing research in the engineering colleges: 1) It promotes active learning in class room (2) Research based learning will put students in student-centric learning such as projects and problem based learning (3) Networking (4) Observation skills are identified have high priority especially during identifying a problem (5) Students opportunity to choose their stream after appropriate research (5) Student initiated research is relied upon for the student to progress through the project as well as for their own learning (6) Leading to new innovation and therefore putting a step forward to the technology

5. Conclusion:

Research importance is very less in the undergraduate programs. Awareness to be created among engineering students about research and the role of research in their education. Perusing a research/ working on a research project will be a challenging & rewarding experience, this opportunity enables to pursue an in depth original study about a topic of interest, it leads to expansion of knowledge, improving communication skills, amplify the way we mediate & also nourishment & exercise for the mind. It is a mirror process. Students turning up in the direction of research will be benefited in their careers to become a successful individual in the nation. This paper concludes about the awareness and research importance for an engineering student. An awareness is created among the students about the support from funding agencies to become a successful entrepreneur.

6. Acknowledgements:

References:

[1] Creswell, John W. *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications, 2013.

[2] Case, Jennifer M., and Gregory Light. "Emerging methodologies in engineering education research." *Journal of Engineering Education* 100.1 (2011): 186.

[3] Borrego, M., & Bernhard, J. (2011). The emergence of engineering education research as an internationally connected field of inquiry. Journal of Engineering Education, 100(1), 14–47

[4] Streveler, Ruth A., and Karl A. Smith. "Conducting rigorous research in engineering education." *Journal of Engineering Education* 95.2 (2006): 103-105.

[5] Jackson, Susan E., and Randall S. Schuler. "A meta-analysis and conceptual critique of research on role ambiguity and role conflict in work settings." *Organizational behavior and human decision processes* 36.1 (1985): 16-78.

[6] Van Sell, Mary, Arthur P. Brief, and Randall S. Schuler. "Role conflict and role ambiguity: Integration of the literature and directions for future research."*Human relations* 34.1 (1981): 43-71.

[7] Pintrich, Paul R. *The role of goal orientation in self-regulated learning*. Academic Press, 2000.

[8] Smith, Karl A., et al. "Pedagogies of engagement: Classroom-based practices." *Journal of engineering education* 94.1 (2005): 87-101.

[9] Case, Jennifer M., and Gregory Light. "Emerging methodologies in engineering education research." *Journal of Engineering Education* 100.1 (2011): 186.

[10] Zydney, Andrew L., et al. "Impact of undergraduate research experience in engineering." *Journal of Engineering Education* 91.2 (2002): 151-157.

[11] Borrego, Maura, and Jonte Bernhard. "The emergence of engineering education research as an internationally connected field of inquiry." *Journal of Engineering Education* 100.1 (2011): 14-47.