A Study on Interdisciplinary Technical Projects as related to Outcome Based Education

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ABSTRACT –

There is an increasing demand for quality and up front work involving Interdisciplinary effort in every organization. As engineers, it is of prime importance to focus on developing skills that might help produce effective solutions requiring a multidisciplinary approach. This article aims at providing a broader perspective regarding the various aspects of why Interdisciplinary Technical Projects are a not so popular choice among students belonging to different engineering disciplines and what measures can be taken to promote the same. The students were made to fill a survey questionnaire to obtain valuable inputs using which appropriate inferences are drawn.

Keywords*: Interdisciplinary,multi disciplinary*

INTRODUCTION: Interdisciplinary work involves the combination of two or more different academic disciplines working together to achieve a common goal through creating new ideas and innovations. Technical projects provide a deeper insight on the subject knowledge and aides in better understanding [10] and play a main role in applying the concepts learned during the entire course work [1]. Interdisciplinary technical projects involve technical projects in different domains collaborating to achieve a common purpose through mutual understanding and effective team work. In the present scenario very few interdisciplinary technical projects are taken up [8]. The major problems that inter disciplinary project may face is explained in [3]. This development is affecting the academic progress of the students. Interdisciplinary technical projects help the students in expanding their knowledge base [4]. Taking a reference of 250 students and 40 faculties from various departments such as Mechanical Engineering, Electrical and Electronics Engineering, Electronics and Communication Engineering Computer Science Engineering as sample size for the survey, different attributes regarding the possibilities and outcomes of interdisciplinary projects are discussed. The survey concentrated on analyzing the reasons for unpopularity of interdisciplinary projects among faculty and students alike.

LITERATURE REVIEW: Education aims to provide knowledge and learning to improve skills and abilities of every student to achieve competency

and aid them with positive values.In order to achieve an outcome based education in engineering, an interdisciplinary approach in learning plays a vital role in realizing quality education. The scrutiny of previous studies governing interdisciplinary work has been helpful in guiding the subject of this paper. Parten and Micheal [1] talk about engaging engineering students in projects given by industry and research scientists. They have provided experimental evidence that students learn more in these projects because they are multi-disciplinary. The experiment is conducted on mechanical and electrical departments of engineering.

Cuijpers, Maarten, Hannes Guenter, and Katrin Hussinger[2] speak about inter-departmental innovation projects in industrial firms. They have analyzed the costs and benefits of inter-departmental collaboration and have found that Inter-departmental collaboration benefits process innovation outcomes but not the results of product innovation. The results of product innovation depend mainly on R&D strength of the firm.

Smythe, Errol [3] point out the problems that we face in doing inter-departmental projects. They have proposed a theoretical model of overcoming these hazards.

Cummings[4]scientifically illustrates that interdisciplinary projects has more chances of being successful if the people who are working know each other well and have had previous work experiences with each other. They use three mechanisms in their model i.e. .homophile, familiarity, proximity. We can extrapolate it and we can say that friends in inter departments can collaborate and do projects in our scenario.

Robertson [5] debates on making the approaches of interdisciplinary projects transparent. The authors are of the view that the approaches of interdisciplinary projects are opaque and making them transparent would boost inter-disciplinary projects.

Heberlein,Thomas.A[6] focuses on having inter-disciplinary projects mainly in natural sciences and social sciences. They have specified models of improving administrative institutional level activities to boost up the research

Bruhn, John G[7] discusses about the difference between inter-disciplinary projects and usual research projects. The authors discuss the culture of interdisciplinary projects; they provide examples of successful and unsuccessful interdisciplinary projects. The author gives a scientific analysis of the interdisciplinary projects

Bachnak, Ray, and Carl Steidley [8] talk about the new computer lab in Texas A&M University-Corpus Christi (A&M-CC). It talks about the interdisciplinary aspects of the lab.

Schachterle[9] speaks about implementing projects in the engineering coursework. The authors talk about the benefits of project based education and its benefits and how it provides students the practical knowledge that they would require

Bracken [10] indicates the language barriers and the problems that group members who are working in interdisciplinary projects may face. They have illustrated how difficult it would be to convey a research idea in interdisciplinary projects. The author has concluded that interdisciplinary projects must allocate time to the development of shared vocabularies and understandings .

Borrego, Maura, and Lynita K. [11] have analyzed important parallels between humanities based descriptions of interdisciplinary integration and implicit graduate learning outcomes hinted at by engineering and science faculty who more frequently work in teams.

METHODOLOGY:

The objective of the study is to identify the reasons and factors influencing the pros and cons of taking up Interdisciplinary Technical projects and provide suggestions to improve the same resulting in outcome based educations. This study is descriptive by nature which helps in describing the intricacies of interdisciplinary projects among engineering students. The tools of data collection were both primary and secondary data. The primary data was collected by conducting a survey among students and faculty of BMS College of Engineering, Bangalore. The secondary data was collected through internet and journals. Primary data was

collected by designing a structured questionnaire distributed among students of 3rd and 4th year of engineering of different streams and faculty members of different departments. The questionnaire consisted of 15 close ended questions, responses of which were collected in person and Google forms. Random sampling techniques were utilized in selecting the sample of 250 students and 50 faculty members of BMSCE.

The questionnaire was designed differently for experienced faculty and students belonging to the final and pre-final year. The first five questions in the student survey focused on the know how's of interdisciplinary technical projects among students following which the next few questions were framed to bring out the pros and cons of involving in an interdisciplinary project. The personal opinion of every individual vis-à-vis promoting interdisciplinary projects was considered. The faculty perspective was also taken into account to substantiate our study. The limitation of the study is a response bias that could lead to faulty results and time constraint in doing a wider study.

RESULTS AND DISCUSSIONS:

From the data obtained from the survey the following illustrations help in understanding the student and faculty opinions concerning the diverse aspect of Interdisciplinary approach in technical projects.

1.When asked about the medium of approach chosen by the students to expand their knowledge base regarding academics and technical work, about 45.75% students said they would browse web, 29.09% said they would approach faculty, 15.5% said they would discuss with peers and 10% said they would refer literature.

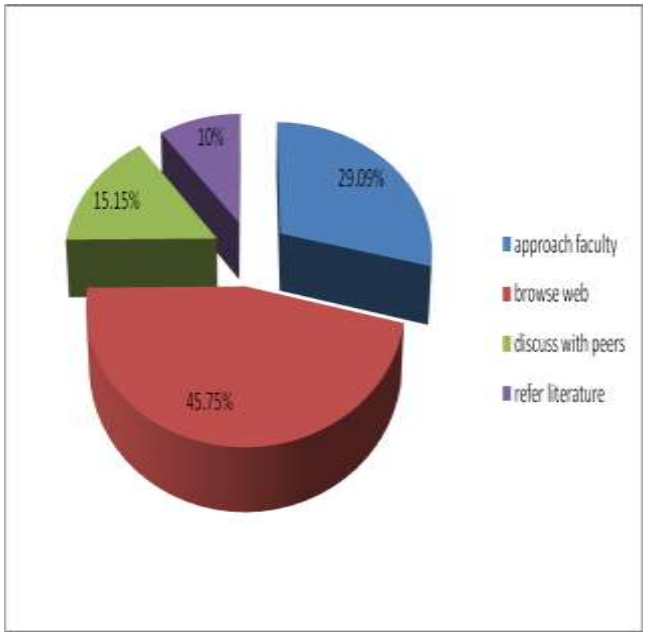

Figure 1

From the above it can be inferred that a majority of students refer the web for accessing information which could be a hindrance for faculty- student interaction between different departments that might provide an opportunity for interdisciplinary work.

2. When asked about the opinion of students regarding the year in which inter disciplinary projects should be implemented as part of the course work, 51.3% of students agreed upon 3rd year and 40.86% agreed upon 2nd year whereas the rest agreed upon 4th year.

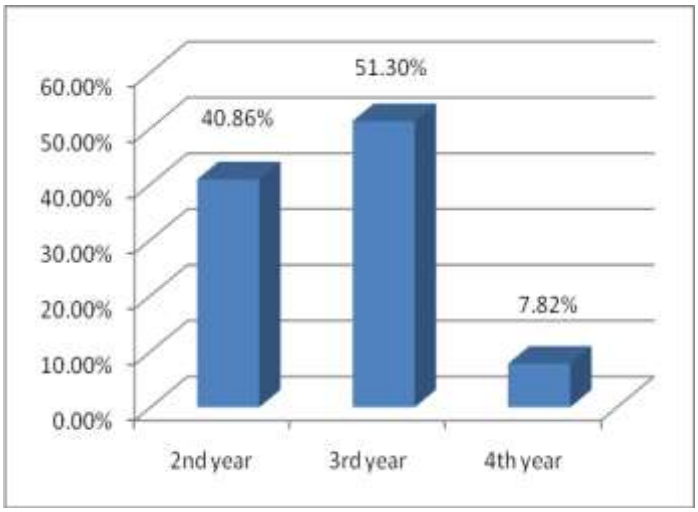

Figure 2

The above data indicates that the willingness of students to engage in Interdisciplinary technical projects if included as part of the course work.

3) When asked if students agree with the fact that Interdisciplinary technical projects will involve personal learning and growth, 53.38 % of students strongly agreed, 42.97% of students agreed and the remaining disagreed.

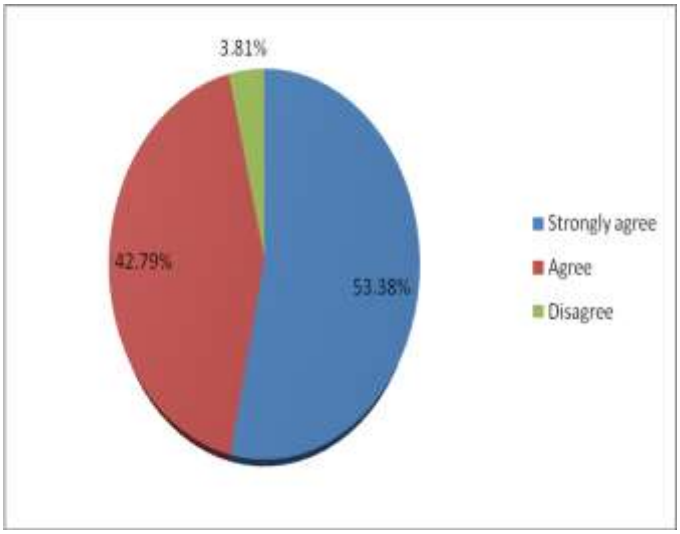

Figure 3

From the above data it is clear that the students believe interdisciplinary technical work would benefit their learning process.

4) When the faculty of different disciplines were asked if Interdisciplinary work should be encouraged more in the present scenario to enrich the quality of education, nearly 48.68% of them strongly agreed and agreed whereas only 2.63% chose to disagree.

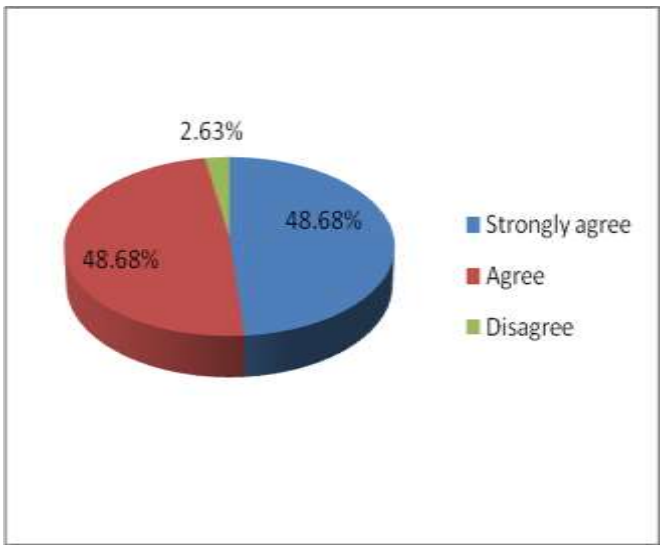

Figure 4

The above data signifies the importance of doing Interdisciplinary technical work from a faculty point Of view.

5) When the students and faculty were asked about the barriers that involve in doing interdisciplinary technical projects, the following table indicates the distribution of responses with respect to students And faculty

Factors	Student Percentage	Faculty Percentage
Lack of Interest and thinking	12	16.66
Fear of Compatibility	26.5	30.2
Sense of Failure	15.7	0
Procedures	29.6	33.4
Time	37	9
Improper guidance	6.8	18

Table 1

From the above table we can infer the various reasons why Interdisciplinary technical projects are not pursued in large numbers though it includes many benefits that Help in obtaining deeper subject knowledge.

CONCLUSION:

The study throws light on the student and faculty outlook on Interdisciplinary projects and Its advantages. The awareness of synergy in Interdisciplinary projects is very high among students And faculty. The impending reason for not making it a reality is identified as complicated procedures and lack Of interest among both the respondents. It is a common opinion among students that Interdisciplinary projects should be untaken ideally in the pre final year of engineering as the basic knowledge of subjects would Be known in the previous semesters.

The industry revolves around multidisciplinary concepts

of science and engineering, it is of ample importance bridge this need through involving and undertaking multidisciplinary projects as part of course work in the Curriculum. This can be encouraged by the following Suggestions obtained through the study:

- Industry exposure needs to be augmented
- Create awareness about the benefits of doing Interdisciplinary technical projects
- By including Integrated courses in every branch
- By making Interdisciplinary projects compulsory as part of course work
- By providing open ended projects to the students
- By sharing success stories of Interdisciplinary technical projects
- By providing students sufficient knowledge and learning time
- By creating a network or platform among faculty belonging to different disciplines to promote and encourage Interdisciplinary work

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REFERENCES

[1]Parten, Micheal, et al. "Program for multidi sciplinary engineering projects." fie. IEEE, 1996.

[2]Cuijpers, Maarten, Hannes Guenter, and Katrin Hussinger. "Costs and benefits of inter-departmental innovation collaboration." Research Policy 40.4 (2011): 565-575.

[3]Smythe, Errol. "Antecedents Of Interdepartmental Conflict in Cross-Functional Enterprise Integration Project Teams." PACIS 2000 Proceedings (2000): 68

[4] Cummings, Jonathon N., and Sara Kiesler. "Who works with whom? Collaborative tie strength in distributed interdisciplinary projects." Proceedings of the 3rd International e-Social Science Conference. 2007.

[5]Robertson, David W., Douglas K. Martin, and Peter A. Singer. "Interdisciplinary research: putting the methods under the microscope." BMC Medical Research Methodology 3.1 (2003): 20.

Heberlein, Thomas A. "Improving interdisciplinary research: integrating the social and natural sciences." Society & natural resources 1.1 (1988): 5-16.

Bruhn, John G. "Beyond discipline: Creating a culture for interdisciplinary research." Integrative Physiological and Behavioral Science 30.4 (1995): 331-341.

[8] Bachnak, Ray, and Carl Steidley. "An interdisciplinary laboratory for computer science and engineering technology." Journal of Computing Sciences in Colleges 17.5 (2002): 186-192

[9]Schachterle, Lance, and Ole Vinther. "Introduction: The role of projects in engineering education." European Journal of Engineering Education 21.2 (1996): 115-120

[10]Bracken, Louise J., and Elizabeth A. Oughton. "'What do you mean?'The importance of language in developing interdisciplinary research." Transactions of the Institute of British Geographers 31.3 (2006): 371-382

[11] Borrego, Maura, and Lynita K. Newswander. "Definitions of interdisciplinary research: Toward graduate-level interdisciplinary learning outcomes." The Review of Higher Education 34.1 (2010): 61-84.