

Effectiveness of ‘Project Based learning - Internship’ for Third Year Civil Engineering students

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Abstract: This Paper aims at investigating the effectiveness of Project based learning (PBL) Field Internship program as a PILOT study conducted with the third year civil engineering undergraduate students. The analysis of the study was based on the data collected by different tools which measured the role of PBL based Field Internship program in imparting the civil engineering field knowledge and contributing in preparing the program participants as career ready individuals. The outcomes presented were resulted from the qualitative and quantitative analysis of the collected data for the conducted PBL based internship program (PILOT) study with a sample of students. The designed curriculum topics and the related field activities are briefly included in the first part of the paper. The learning outcomes in the improvement in technical competence or gained field knowledge were assessed by comparing mean achievement scores of administered pre-test and post-test of the participants. The descriptive analysis of program participants feedback and evaluation forms, group project reports and presentations per designed rubric identifies the development or improvement in the soft skills (technical writing, team work, decision making, time management, etc.) of this PBL based Internship program (PILOT) participants. The empirical results obtained from this conducted PBL based Internship program (PILOT) were relevant in order to ensure the sustainability with the sample in identifying the shortcomings or challenges that may have appeared for the author’s proposed main study.

Keywords: Civil engineering education, Industry ready, Internship, Project based learning, Pilot study, Technical Graduates

I. INTRODUCTION

Higher technical education curriculum played a huge role in integrating students and fresh graduates in the industry. Technical institutes generate fresh graduates by imparting theoretical knowledge and related practical aspects of it. These institutes contribute to economic and social development by nurturing the young generation in the technical field but as per AICTE (All India Council of Technical Education) employability data technical institutes still lacks to keep up with industry demand. Industry has a serious concern that fresh graduates are not career ready which leads to 60% of unemployed fresh graduates. Industry experts shared that fresh civil engineering undergraduates are under-employable and lacks in civil engineering field knowledge and construction site experiences. The offered professional course work, related practicals and small classroom group projects are developed per technical institute’s or affiliation’s guidelines, which

restricts the students exposure to the outside scenarios. The opportunity can be created for undergraduate students to work or consult with construction site field supervisors, engineers even working on small classroom projects. The information gap from classroom knowledge to the civil engineering field activities knowledge can be bridged by proposing a PBL based Internship program to conduct curriculum related field activities. In this paper Author had presented the curriculum, implementation and the outcomes of the conducted PBL based Internship (PILOT) program which incorporates PBL field group activities for the third year civil engineering undergraduate students. The objective of this study was to engage and enrich the students with PBL group field activities and other attributes of professional onsite scenarios during attending Internship program. This preliminary study of conducting (PILOT) PBL based internship program gave the researcher an insight of the main study which will be conducted later with the similar sample of students.

II. THEORY & CURRICULUM

The student chooses a certain professional education depending on the inclination and interest in the particular area. In order to expect and visualise the attained professional education to a flourishing profession depends upon number of factors. In this recent world of rapid development, it becomes quite essential to educate the students about the actual field scenarios related to their profession along with imparting theoretical and related practical knowledge of professional core courses.

Author had approached different institutes, interacted with faculty and students and identified that the imparting practical knowledge is done in a controlled way in the form of laboratory practicals and classroom projects. Students stayed unaware of the implications of learned professional civil engineering core courses in the field and unable to reflect or connect the theoretical knowledge in the field scenarios.

Students acquired the basic technical theoretical competencies during the first three years of their undergraduate professional course curriculum and the attained theoretical knowledge can be more refined by incorporating into the PBL based internship program's designed group project activities. Author's PBL based curriculum was developed to provide a complete overview of civil engineering activities from proposing a project (selecting a site), to actual construction or development of it. The topics were chosen in a way to give the students an understanding about the development related activities such as site survey, soil testing & foundation design, excavation activities, foundation and building construction and also included other aspects such as precast construction and construction management practices.

The topics which were proposed for field activities curriculum are listed below:

- Site survey and Ground investigation
- Construction Site Excavation activities
- Soil testing reports and Foundation design
- RCC Foundation and Building construction
- Precast construction
- Construction Management practices.

The PBL based Internship curriculum was designed on the Project based Learning pedagogy of student-centred educational approach and it resembles with the professional behaviour of engineering discipline. The selected and designed field group project activities of the PBL based Internship program (PILOT) curriculum's fundamental theories and techniques were same as of PBL pedagogy.

Author had developed, proposed and implemented a curriculum for PBL based Internship in the form of PILOT

for the duration of 40 hours. The designed PBL based Internship program had designed group field activities which were conducted and assigned to the different groups of this program's participants. This PBL based Internship program curriculum (PILOT) included reviewing background theoretical material related to particular group field work activities, group presentations, group discussions and expert lectures related to field or site activities.

Topic	PBL based Internship program group activities	Duration
Site Survey and Ground Investigation	Sketch a site plan, mark the particulars of site topography and ground investigation on provided worksheet.	5 hours
Construction Site Excavation activities	Study and Identify the safety regulations on the excavation site, excavation equipment and its efficiency and measuring earthwork quantities.	4 hours
Soil testing reports and Foundation design	Study the analysis of geotechnical report for design purposes investigate about the foundation design drawings and coordinate construction activities in relate to construction design drawings.	6 hours
RCC Foundation and Building construction	Students to identify the material procurement procedures, BBS, form work monitor concrete mixing, pouring activity and identify challenges in foundation construction practices, challenges in building construction.	7 hours
Precast construction	Study and Identify the construction procedures , advantages and disadvantages of use of Precast Structures in construction practices.	4 hours
Construction Management practices.	Identify the procedures for preparation, filing of tender documents and construction management skills and identify construction management program softwares and skills required in construction management practices.	4 hours
Program participants worked in the assigned groups while preparing brief daily reports, group project report and presentations of this implemented PBL based Internship program.		

The briefed PBL based Internship program's designed project activities for each section of curriculum are as below.

Students had observed, conducted and inquired for the above scheduled assigned project activities for PBL internship program in their respective groups as per designed curriculum and collected the information needed for the daily group reports, final group project reports and presentations.

III. RRL - REVIEW OF RELATED LITERATURE OF PROJECT BASED LEARNING & INTERNSHIP IN CIVIL ENGINEERING

Researcher reviewed the instructional principles of Constructionism as per Papert (1991) (14) which are viewed as the reconstruction of knowledge and learning by connecting it with the real life projects. Constructionist theory involves and emphasise on student centred learning by incorporating PBL in the courses to make connections between theory and real world scenarios which can benefit the professional career of students. The reviewed studies conducted for different subjects' mathematics, science at different education levels such as Middle school, High school and Higher education at Diploma, Bachelors, and Masters Level and in Pre service teachers' education level using experimental, descriptive and other statistical methods for data analysis. (Dole, 2017) (10) (11), Markham (2003) (17), Edmunds (2017) (12), Bilgin(2015)(4), chinowsky(2006) (6), Gulbahar (2014) (13). The results were positive and incline towards benefits of using PBL methodology in teaching practice. Most of the reviewed studies emphasise on incorporating PBL approach in the curriculum of courses at school and college level. Mergendoller John R., Maxwell, Nan L., Bellisimo, Lee) (2006) (21).

Lee (2010) (18), Turns (2010) (20), found PBL found to be more affective in instructional approach for students with average verbal ability and develop the preference for group work, and problem-solving efficacy. Gavin, Kenneth (2011-2012) (18) had conducted a Case study of a Project based Learning Course in Civil Engineering design. The semester end survey clearly demonstrated student satisfaction with the PBL process with the improvement in technical competence. Participants also recognised that the key skills such as group work, time management, team work, problem solving, self-assessing and communication skills were enhanced .

Reviewed literature revealed positive impacts of PBL on conducted studies and author believed that PBL based internship program may provided the similar benefits of developing soft skills along with enhancing field knowledge of the program participants. Hence the author proposed to employ PBL approach to develop, design and implement internship program to conduct with third year civil engineering undergraduate students.

The inability or gap of linking and non-reflectiveness of academic theory to civil engineering professional practice had initiated in author's mind to identify what aspects of the technical education or curriculum are missing that job industry is in the shortage of technical skilled individuals. Author recognised that field Internship Program has not been made mandatory in all engineering institutes. Even the institutes which did offer Internship program in the curriculum did not count towards program's credibility or been allotted no credits in the curriculum. Even the credited In-

ternship programs or field activities program had no assessment and evaluation structure developed to investigate the improvement and development in the field knowledge and skills in the students after the implementation of the program. Hence, author felt for a need to incorporate the Project Based learning in the form of internship (PILOT) program to engage undergraduate students in groups for assigned field work activities to identify the improvement in technical competence or knowledge and development in soft skills such as technical writing, team work, presentations and decision making, etc.

IV. STUDY METHODOLOGY

The main goal of this study is to measure the effectiveness of Project based learning by incorporating a PBL based Internship program for a sample of civil engineering students. The pilot study represents the "mini-version" of a larger scale study, which involves the testing of a research tool (Polit et al., 2001; Teijlingen & Hundley, 2001). The PBL based Internship program was conducted with the third year students of bachelors in civil engineering course. The PBL based Internship program's curriculum was conducted for 40 hours, including reviewing project related theory monitoring and conducting designed group project activities and field expert lectures, preparing daily group reports and final project reports and presentations.

The PILOT study or field trial has immense importance because it provides the researcher the vision and feasibility for one's research for main study. It offers to measure the appropriateness of designed methodology and tools for the main study and provides evidence for the usability of research related data collection tools. Therefore, it is highly recommended to conduct a PILOT study before performing main research studies in order to timely identify the possible errors or modifications needed for unbiased data collection and related results.

The objectives of this study are:

- To identify the improvement in technical competence with the proposed PBL field activities program for the participants.
- To identify the development of soft skills with the proposed PBL field activities program for the participants.

Objective of this PBL based internship program (PILOT) is to study the improvement in technical competence which was measured by comparing the mean achievement scores of researcher administered Pre-test and Post-test. The retention of gained field knowledge or improvement in technical competence was measured by comparing the mean achievement scores of post test and delayed post-test which was conducted after the time gap of three months from implemented PBL based internship program(PILOT)

The development in soft skills for the program participants was measured from the analysis of submitted internship reports and delivered presentations. The feedback from

students for Student evaluation/feedback forms revealed the development and improvement in the soft skills

Author would like to identify if Project based learning/designed field activities program for students had enhanced the knowledge and understanding of civil engineering onsite activities and promoted development in the other soft skills like communication, team work, decision making, etc.

Implementation of PBL based Internship program began with author contacting and approaching the technical institute's faculty and briefing the objectives of the proposed PBL based internship program. The PBL based internship program was proposed to implement with third year civil engineering undergraduate students as had acquired the technical competencies of most of the core professional courses of civil engineering.

After conducting the pre-test, interactions and class observations with faculty and students, the group of the participants were formed based on the previous semester attained percentage, faculty suggestions and author's class observation. Each group has 5-6 students and group leader is chosen and appointed by the team members for each group.

The PBL based internship program field activities for different topics were conducted for 40 hours including reviewing background theory related to curriculum topics, group project activities, field expert lecture and discussions. Students were instructed to review the provided related background theory of scheduled group project activities and the assigned topics for the construction project site were discussed with each group by the author. Study participants observed, inquired and monitored with the site engineers or supervisors for the assigned project activities of PBL based internship program. The work responsibilities were divided in the group members, two participants did investigations and take notes, two of group members take pictures and videos while rest keep track of time simultaneously. All group members work collaboratively and prepare the daily group report to be submitted same day. After conducting of group project activity, the students shared with author about the gained field knowledge and discussed queries for the assigned group project activities conducted as a part of PBL based Internship program with the Site engineers and supervisors.

The main research tools for this experimental study were pre-test, post-test and delayed post-test. The qualitative analysis was conducted for the Group Internship/project reports, delivered presentations and student filled self-evaluation/feedback form after the implementation of PBL based Internship program.

The designed PBL based internship (PILOT) program curriculum and tools of data collection were reviewed and validated by the field and education experts. Pre-test was administered before the implementation of the program followed by post-test was conducted after the implementation of the program and a delayed post-test was

administered after a gap of three months from the implementation of the PILOT program. Along with the daily reports for assigned group project activities, participants had submitted group project reports and project presentations after the implementation of PBL based internship program.

The quantitative tests aims on evaluating the students for the knowledge for the civil engineering construction field activities and construction site preparedness before and after the implementation of the PBL based Internship (PILOT) program and delayed post test measured the gained field knowledge retained by students after the time span of three months of PBL based internship (PILOT) program implementation. The pre-test and post-test questions were divided according to the different sections of designed curriculum relating to civil engineering construction site activities. The questions were clearly formulated and aimed to evaluate the gained field knowledge after the implementation of PBL based internship program. The achievement test has similar short answer and multiple choice questions for pre-test and post-test. The answers for the achievement test were collected in the physical form and duration of each test was 2 hours maximum. The author designed rubric assesses and evaluates the students performance for the submitted group project reports and presentations on the basis of content, organisation, delivery and guided format. Student self-evaluation/feedback was collected on Linear scale and the open end questions captured the feedback and opinion of PBL based Internship program participants about the implemented program.

The independent and dependent variables for this PBL based Internship program were Proposed Curriculum and mean scores of the conducted achievement tests.

Author assumed the null hypothesis for this pilot study that there would be no significant difference between the mean scores of Pre-test, Post-test and hence no significant level improvement in the technical competence level or gaining field knowledge in the PBL based internship program participants.

There will be no significant development in soft skills (technical writing, team work, decision making, presentation) in the PILOT program participants.

V. DATA ANALYSIS

This section depicted the results of conducted PBL based Internship program and how the data had been analysed to identify for the improvement in the technical competence or gained field knowledge and development and improvement in soft skills of the PBL program participants.

The improvement in technical competence which was measured by comparing the mean achievement scores of researcher administered Pre-test and Post-test. The retention of gained field knowledge or improvement in technical competence was measured by comparing the mean

achievement scores of post test and delayed post-test which was conducted after the time gap of three months from implemented PBL based internship program(PILOT)

The development in soft skills for the program participants was measured from the analysis of submitted internship reports and delivered presentations. The feedback from students for Student evaluation/feedback forms revealed the development and improvement in the soft skills

Development in soft skills (technical writing, team work, decision making, presentation) was analysed on the basis of rubric designed for the content, organisation, delivery and guided format, to assess and measure PBL based Internship program participants performance for project report writing and presentation skills. Student feedback/self-evaluation forms filled after the implementation of PILOT study gave

Quantitative Analysis I

The table 1 below shows the scores obtained by the sample of 30 students for the pre-test and post-test conducted before and after the completion of PBL based Internship program.

Summary statistics for Pre-test and Post-test data							
N	Trial	Mean	Standard deviation	Coefficient of correlation	Standard error of mean	Standard error of difference	Normal Distribution 'z or t' values
30	Pre test	26.23	11.65	0.88	2.13	1.48	9.53
30	Post test	40.12	16.04		2.93		
Degree of freedom (df) = 29							

Table 1 - Summary statistics for Pre-test and Post-test data

For df = 29 the significance at 5% and 1% levels, the critical z values are 2.05, 2.76 respectively from t tables. Our computed value of z is 9.53 is much greater than the t-table critical values 2.05, 2.76, hence it can be taken to be quite significant at 0.01 and 0.05 level. Consequently it can be said that by incorporating this PBL PILOT program there exists a significant improvement in the gained the field knowledge and technical competence of the program participants.

The mean achievement scores of researcher administered achievement tests (pre-test and post-test) were compared and the calculated t or z value when compared with critical t or z value indicated the significant gain in the field knowledge or improvement in technical competence of PBL internship program participants. Hence the assumed null hypothesis for no significant level of gain in technical competence has been declined.

The table 2 below shows the scores obtained by the sample of 30 students for the post-test and delayed post-test administered after the time span of three months from the implemented PBL based internship Program.

Summary statistics for Post-test and Delayed Post-test data							
N	Trial	Mean	Standard deviation	Coefficient of correlation	Standard error of mean	Standard error of difference	Z or t
30	Post test	40.12	16.04	0.79	2.93	1.79	1.08
30	Delayed Post test1	38.40	13.53		2.47		
Degree of freedom (df) = 29							

Table 2 - Summary statistics for post test and delayed Post-test data

For $df = 29$ the significance at 5% and 1% levels, the critical z values are 2.05, 2.76

respectively from t tables. Our computed value of z for post test and delayed post test is 1.08 is much less than the t-table critical values 2.05, 2.76, hence it can be taken as not significant at 0.01 and 0.05 level. Consequently it can be said that the participants had retained the gained field knowledge even after the time span of three months after the implementation of program.

Fig 1 Bar Graph source of mean achievement scores of administered tests for the PBL based internship program.

Fig 1 shows the mean achievement scores of the pre-test, post-test, delayed post-test. The mean achievement score value of pre-test is 26.23, post-test 40.12, delayed post-test 38.4. Comparing pre-test, post-test and delayed post-test scores it showed the improvement in technical competence or in gained field knowledge of the program participants in post-test mean score as compare to pre-test mean score. The mean score value of the delayed post-test comparing with pre-test and post-test revealed that students had retained the gained field knowledge attained during attending internship program after the time span of three months of administered Internship program. Hence the PBL based Internship program participants retained the significant improvement level in technical competence.

Qualitative Analysis I

Table 3 below shows the analysis of developed soft skills based on group project presentation by team members as per the designed rubric.

Rubric for Oral Presentation of Project Report.				
	Below Expectation	Needs improvement	Satisfactory	Exceeds Expectation
Organisation, Content & Delivery	10%	23%	47%	20%

Table 3 - Rubric for group presentation for the conducted PBL PILOT program

As Per table 3 rubric analysis, 20% of the students had done extremely well by properly sequencing the topics and presenting it in a required flow. 47% performed satisfactorily, 23% of students had organised the content well but needed some improvement in delivering the content and interactions with the audience. 10% of team members appeared uncomfortable and anxious during group project presentations.

Table 4 below shows the analysis of developed soft skills based on group project reports submitted by team members per the designed rubric.

Rubric for Project Report writing.				
	Poor	Fair	Very good	Excellent
Content and Organisation	0%	20%	43%	37%
Guided Format	0%	33%	30%	37%
Language	43%	6%	50%	0%

Table 4 - Rubric for writing group project report for the conducted PBL PILOT program

As per Table 4 rubric analysis, the language section was performed well by 50% of the participants while 43% of participants students perform poor. For putting the content appropriate and organised, 37% performed excellent, 43% performed very good and 20% did fairly well. 37% students were excellent, 30% were very good while 33% were fairly well in report format per the guided format

Qualitative Analysis II

Table 5 below illustrates the feedback responses received from the program participants in clarifying their career plans and goals for the incorporated PBL PILOT program for conducting different group project activities on the construction sites The participants were asked to select the given options from not at all, somewhat, moderately, great extent, high

How much Field experience directly affected in clarifying your career plans and goals ?					
	Not at all	Somewhat	Moderately	Great Extent	High
	0%	0%	33.3%	57%	10%

Table 5 - Impact of field experience in clarifying career plans and goals

Internship experience affected career goals.

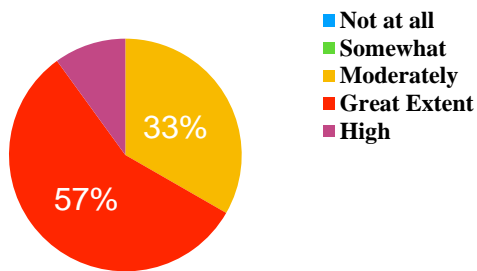


Fig. 2 Pie chart source depicting the responses for the impact of attended field experience on clarifying student’s career plans and goals.

As per Figure 2 it showed the participants response in clarifying career plans and goals while conducting group project activities. 57% responded to great extent, 10% chooses high and remaining 33% respond as moderate impact. Considering the aforementioned results one could state that participants had explored the different verticals of civil engineering while conducting different group project activities in the field and which helped in identifying a directional vision to proceed further in their professional career.

The table 6 below illustrates the feedback responses received for how the learning during the field experience was different from the traditional classroom learning.

What have you learned through your field experience that is not traditionally learned in the classroom?				
Construction site challenges	Material procurement & Mix proportions	Problem solving & decision making	None of the above	
20%	33%	30%	17%	

Field learning not traditionally learned in classroom

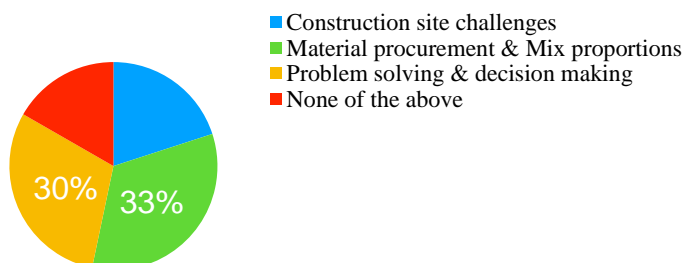


Fig. 3 - Pie chart source depicting learning during field experience that was different from traditional classroom learning.

As per Figure 3 it showed participants responses for what they had learned through field experience which is not traditionally learned in the classroom. According to their responses, 20% responded that learning about site challenges and 30% of them responded that problem solving and decision making skills can only be enhanced during experiencing challenges in the field.

33% responded as material procurement and mix proportions can be only understandable better at construction sites. 17% of students did not respond the question. Considering the students responses one could state that students felt there is a need to experience field work scenarios along with classroom learning to prepare themselves to be employable graduates.

The table 7 below illustrates the participants feedback responses on best aspects of construction site experience and suggestions for future students about going for such programs.

What do you consider to be the best aspects of your Construction onsite experience? What concerns would you express to future students about going for internship?				
	Construction management Practices. Must Go for field experience.	Foundation Construction, Excavation activities, soil testing Techniques and soils report. Very Good experience	Soft Skills, Report writing and presentations. Must attend internships.	None of the above
	30%	10%	30%	30%

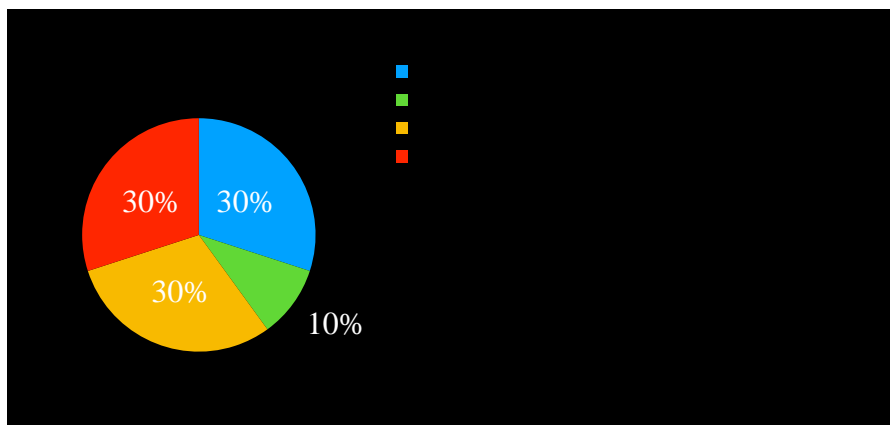


Fig. 4 Pie chart Source depicting the best aspects of field experience program and their suggestion to future students for attending such program

As per Figure 4 it showed participants responses to the best aspects of field experience and their suggestion to future students for attending such program. 30% of students found out the best aspect of field experience is learning about construction management practices and recommended the future students to must go for field experience programs. while 30% of them respond that learning soft skills preparing project reports and presentations, team work, communication skills etc. and recommended to must attend internships. 10% of the students respond that soil testing procedures, excavation and foundation construction was best aspect of field activities and rated as very good experience and recommend for future students to go for it. 10% of students did not respond.

Table 8 below reveals how participants had rated their performance for the listed attained skills after attending and completing designed pilot program.

Students Rating from 1-5 in percentage for learned Skills		(1 as minimum and 5 as maximum)				
		1	2	3	4	5
Team work skills	Effort	3%	0%	17%	57%	23%
	Openness	0%	7%	20%	40%	33%
Technical Competence skills	Understanding	0%	0%	20%	56%	24%
	Confidence	0%	7%	13%	53%	27%
Communication written and oral	Clarity	4%	0%	26%	35%	35%

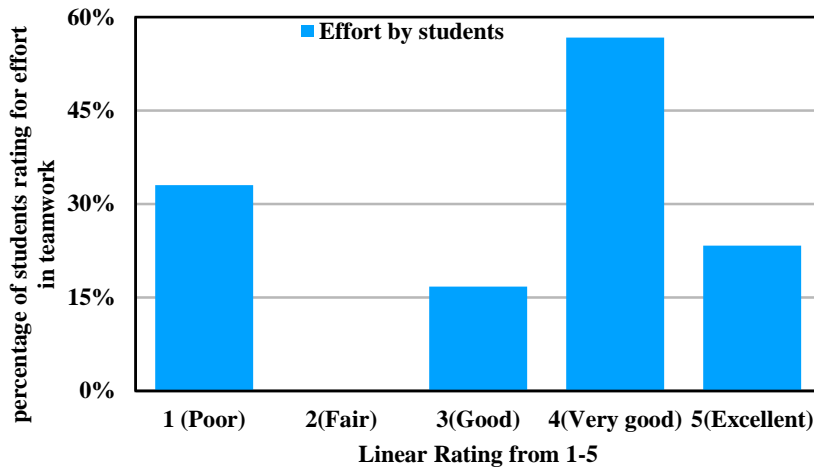
Students Rating from 1-5 in percentage for learned Skills		(1 as minimum and 5 as maximum)				
skills	Organisation	0%	3%	27%	37%	33%

The different categories of Skills are depicted category wise in below bar graphs:

1. Team Work Skills

A) Effort

Fig 5 Bar Graph source of student rating for effort as working in assigned group for Teamwork Skills



B) Openness

Figure 5 shows how did respondents rated for effort by team members in doing fair share of work while working with the assigned group. As per the rated responses 23% of students rated excellent (5), 57% rated very good (4), 17% rated good (3) and 3% students rated the as poor (1). It showed that most of the students reported fair effort done by team members to share and distribute the work responsibilities in a team.

Fig. 6 Bar Graph source of student rating for openness as working in assigned group for Teamwork Skills

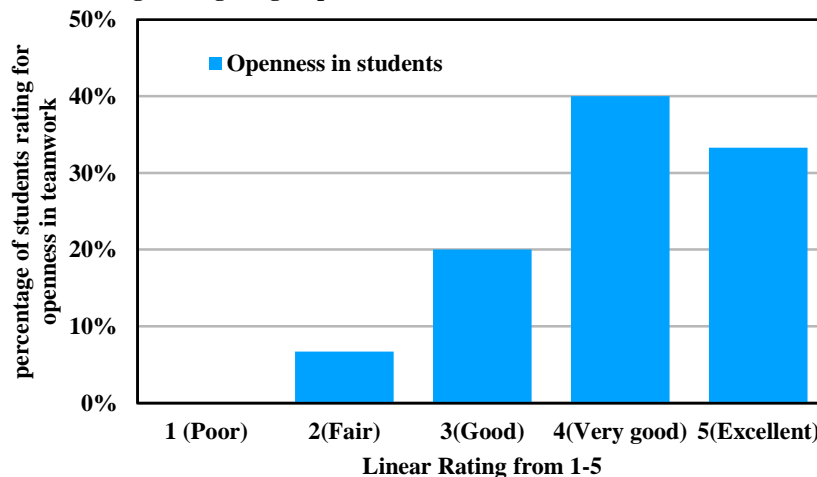


Figure 6 shows how did respondents rated for openness in working with assigned group. As per the rated responses 33% of students rated excellent (5), 40% rated very good (4), 20% rated good (3) and 7% students rated the as fair.(2). It showed that most of students reported their openness in the progressive working with diverse perspectives in the assigned group.

2) Technical Competence skills:

A) Understanding Skills

B) Confidence

Fig. 7 Bar Graph Source of student rating for understanding level in Technical Competence Skills

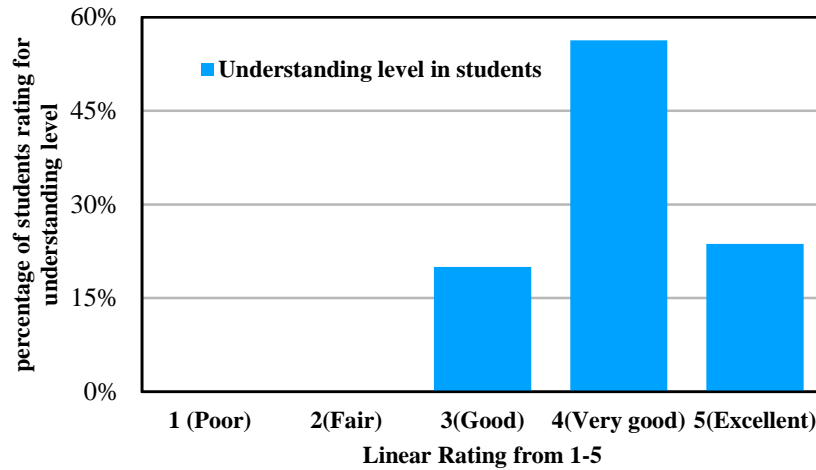


Figure 7 shows how did respondents understanding level developed for learned field knowledge and professionalism skills for the improved technical competence. As per the rated responses 27% of students rated excellent (5), 54% rated very good (4), 19% rated good (3). It showed that most of students reported developed understanding in gained field knowledge and professional skills.

Fig. 8 Bar Graph source of student rating for confidence level in learned field knowledge and professionalism skills for Technical competence

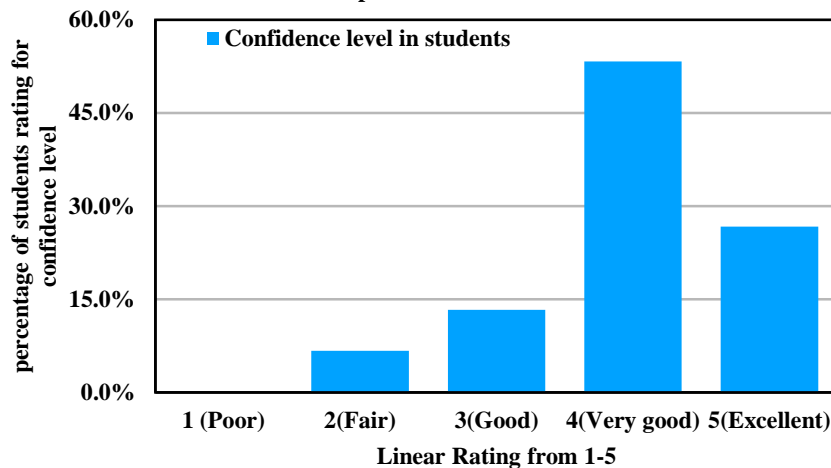


Figure 8 shows how did respondents confidence level developed for learned field knowledge and professionalism skills for technical competence. As per the rated responses 27% of students rated excellent (5), 53% rated very good (4), 13% rated good (3) and 7% students rated the as fair.(2). It shows that most of students reported developed confidence level in gained field knowledge and professional skills.

3. Communication Skills - Written and Oral

A. Clarity

B. Organisation

Fig 9 Bar Graph source for student feedback in clarity of expressing for written and oral communication skills

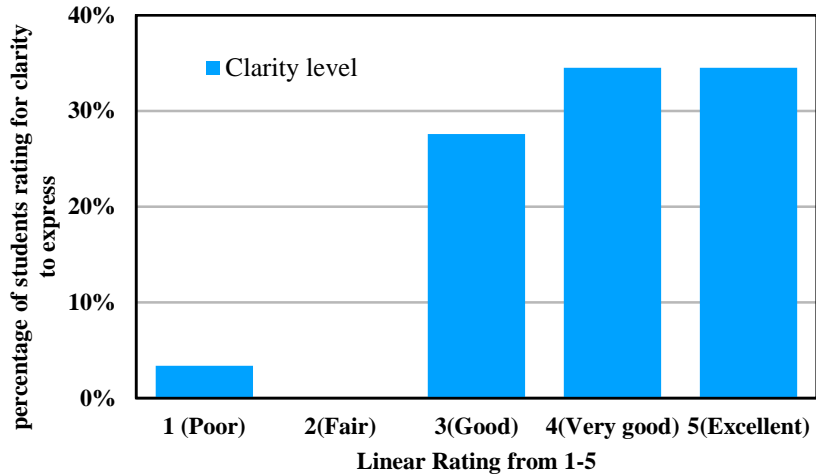


Figure 9 shows how did respondents developed improvement in clarity of understanding and expressing for communication written and oral skills. As per the rated responses 35% of students rated excellent (5), 35% rated very good (4), 26% rated good (3) and Less than 4% students rated the improvement as poor (1). It shows that significant improvement in communication skills of respondents.

Fig. 10 Bar Graph source of student feedback rating for logical and reasonable organisation in written and oral communication skills

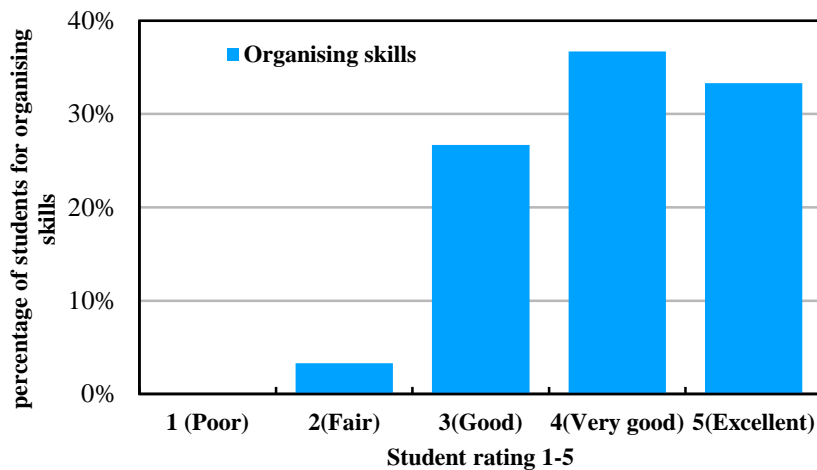


Figure 10 shows how did respondents developed improvement in logical and reasonable approach of putting the appropriate content and organise it for presenting meaningful work. As per the rated responses 33% of students rated excellent (5), 37% rated very good (4), 27% rated good (3) and 3% students rated the improvement as poor (1). It shows that significant improvement in soft skills of the respondents.

Author's observations during implementation, student ratings and feedback for the implemented PBL based Internship program revealed the improvement in technical competence or field knowledge and development in soft skills. Student evaluation/feedback form revealed that the students worked as a team, distribute fair share of work in a group member, interact and communicate among each other and with the field supervisors. Students reported in feedback form about significant improvement in clarity and organising technical writing, presentation skills and enhances understanding and confidence level while communication with team members and internship site supervisors. Hence, the above qualitative analysis revealed the development and improvement in soft skills of PBL based internship program participants and the assumed null

hypothesis of no development in soft skills of PBL based Internship program participants can be denied.

VI. FINDINGS AND RECOMMENDATIONS

The author conducted a PBL based internship program (PILOT) by formulating a structured group project construction field activities for third year civil engineering undergraduate students. The PBL based internship curriculum focussed on bridging the gap between the theoretical learning and practical implementation of the classroom learning by imparting the field knowledge or construction site preparedness and soft skill refinement. Construction site preparedness includes technical competence skills (Civil engineering site knowledge, Problem solving skills) and soft skills (Team work skills,

written and oral communication skills, decision making skills) for the fresh graduates.

By conducting this PBL based internship program as per designed curriculum researcher had found out the significant difference in the mean achievement scores of author administered pre-test and post-test and the quantitative analysis of the results revealed that the significant improvement in the gain of technical field and construction site knowledge in participants after the Implementation of PBL based Internship program. The delayed post test results revealed the high degree retention of gained field knowledge attained during attending Internship program even after the time span of three months from the implementation of PBL based Internship program. The feedback questionnaire of closed ended questions at linear scale and open ended feedback questions revealed that the students identified the conducted construction site group field practicum during PBL based Internship program improves their set skills of team work, technical writing, decision making and confidence. The results obtained from the author designed rubric details of the project report writing and presentation of students revealed their clarity in organising and presenting the appropriate project relevant material.

The significant difference in administrative tests scores supported that the students had gained field knowledge or improved technical competence skills and can reflect the classroom learning while conducting construction site field practicum. Program participants field work learnings and reflections together as a team in their respective groups contributed in developing and improving team work, decision making, communication skills and the approach of putting together logical, reasonable and organised content for internship program reports and presentations contributed in enhancing technical writing and presenting skills. Hence, with the knowledge and skills improvements witnessed in the participants and the positive response from the program participants, author recommended on incorporating and implementing internship programs at undergraduate level students for improving field knowledge and soft skills in students by preparing them from fresh graduates to career ready graduates.

VI. CONCLUSION

The curriculum of higher technical education contributes immensely in imparting the theoretical and related practical aspect to the students. The technical graduates contributed in the socio economic development of the country and per AICTE (2) reports the technical institutes lacked to keep up with the industry demands. Industry revealed that fresh technical graduates are unskilled and lacks in field knowledge and industry needed skills of team work, time management, decision making, communication skills , etc. To bridge the gap from unskilled to skilled individuals the author attempted to conduct a PBL based internship

program (PILOT) by formulating a structured group project construction field activities for third year civil engineering undergraduate students. The PBL based internship curriculum focussed on the issue of imparting field knowledge or construction site preparedness, skill refinement and its evaluation and assessment.

The results of mean achievement scores of author administered achievement pre-test, post-test and delayed post-test indicated the significant gain in the field knowledge or improvement in technical competence and retention of gained field knowledge as evaluated after the time span of three months of administered PBL internship program of participants.

Author observed that participants explore, investigate, identify and monitor the designed group project activities for the PBL based Internship program and had identified the development in team work, time managements, technical writing , decision making skills while working collaboratively in the groups. Author observed participants did not have much exposure and experience in technical report writing , presentation, so author provided the guided format for the group report writing and presentation to participants for incorporating clear, concise and appropriate content for the group project reports and presentations.

Researcher had considered statistical significance and qualitative studies for this conducted PBL based internship program. As of the significant difference in average mean scores of pre-test and post-test, the assumed the null hypothesis of having no significant improvement in technical competency or in gaining field knowledge was denied. On the basis of the designed rubric, qualitative analysis of students feedback and evaluation responses, prepared project report and presentations identified the development and enhancement in the soft skills such as team work, time management, decision making, technical writing, understanding and confidence, hence the assumed null hypothesis of no development in soft skills of PBL based internship program participants can be denied.

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