An approach to improve Employability skills : eBridge

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***Abstract*— It has been observed (through feedback from the industry and surveys) that engineering graduates are lacking the skills required to successfully apply subject knowledge. The surveys also indicate that they do not possess professional inputs required by the industry. The industry currently invests huge amounts in training newly recruited fresh graduates and is eager to recruit graduates who possess the required skills. In a bid to satisfy the industry demands, various kinds of trainings are being taken up in colleges to improve the employability skills among their students.**

Nalla Malla Reddy Engineering College (NMREC), affiliated to a state university in Hyderabad, India, is putting in all kinds of efforts to bridge the gap in the employability skills. eBridge – an Employability Bridge program has been initiated at the college level, and is being conducted in the departments. This paper presents these efforts made in Department of Electrical & Electronics Engineering (EEE) at NMREC.

The paper also proposes improvements in the current methods followed for better outcomes in communication skills, analytical thinking, and improvement in subject knowledge.

Keywords— eBridge, graduate employability, graduate attributes, OBE

I. INTRODUCTION

In the current society, it has become difficult to find engineering graduates with good knowledge in engineering and business practices [1]. There is a huge shortage of employable graduates [4] [5]. The Engineering Education has seen many improvements in 100 years. Currently, the emphasis is on design, learning, and social behavioral sciences research, including the role of technology. It is a well researched fact that there is still a need for adapting new quality improvement processes in the education system so that industry ready workforce be generated. One approach that is being widely employed is the outcome based education (OBE) which maps the course work to a desired outcome in a logical way.

Findings of the NASSCOM-McKinsey Report 2005 indicate that, while more than three million students graduate from Indian colleges and the nation produces 500,000 engineers annually, only a very small percentage are directly employable by the industry. Only around 25 per cent of technical graduates and 10-15 per cent of general graduates are estimated to be suitable for employment in the offshore IT and Business Process Outsourcing industries [2].

Industry expects the graduates to invest in life-long learning, and make a constant effort to nurture ones creativity [3]. The Industry invests heavily on graduate trainees to fill this gap.

Recently, the National Board of Accreditation of India has adopted Outcome Based Education (OBE) in which the graduate is expected to have certain attributes by the time they pass out. These attributes include the following:

GA1. Engineering knowledge
GA2. Problem Analysis
GA3. Design/Development of solutions
GA4. Conduct investigations of complex problems
GA5. Modern tool usage
GA6. Engineer and Society
GA7.Ethics
GA8. Environment and Sustainability
GA9. Individual and Teamwork
GA10.Communication
GA11. Project Management and Finance
GA12. Lifelong Learning

These attributes if attained would definitely address the problem of graduate employability. Hence working towards OBE is an approach which can help reduce the gap between industry and institute.

In view of the above we present a new process called Employability bridge (eBridge) to improve the employability levels in graduates. This paper describes this process and studies the outcomes in the department of Electrical and Electronics Engineering at Nalla Malla Reddy Engineering College (NMREC).

Background and the current scenario is described in Section-II. In Section-III, we describe the proposed program. The assessment process is described in section-IV followed by the experimental results and observations. Section-V covers conclusions and future plan.

II. BACKGROUND

Based on the observations made on Electrical Engineering students in the college, placements in core industry and software were poor due to – poor presentation/ communication skills, lack of confidence in interviews, and poor performance in technical interviews.

It has been observed that most of the students who have secured good percentage of marks in their curricular subjects have failed in applying their subject knowledge to practical problems. The reason for the poor performance in technical interviews can be attributed to this fact.

Technical skills of the students are observed to have been confined to the knowledge and comprehension levels in the bloom's taxonomy. One reason for this being the university examinations do not assess the students at higher levels of blooms taxonomy. Levels of Bloom's taxonomy are shown in table.7.

Also, it was being observed in class rooms that there is poor interaction of some students with the faculty due to lack of communication skills. They generally hesitate to speak in the class as they are not confident.

At the Department level, this has been observed during projects. Most of the students hesitate to take up new projects or problems to solve, as they lack confidence about their subject knowledge. Learning beyond the syllabus and getting oneself updated about the current technologies is another aspect which needs to be concentrated on.

Moving up to higher levels in blooms taxonomy helps in achieving the graduate attributes and thus in preparing the students towards becoming an employable graduate. Efforts need to be put in to help the students move up to the next higher levels in the bloom's taxonomy.

Ours being an affiliated college faces some of the following challenges in achieving graduate attributes.

- End semester exams are conducted by the affiliating university
- Existing Exam system does not measure desired outcomes
- Motivating the students and faculty for outcomes that are not measured by the examination system
- Students with lower capability levels also need to attain globally standard Graduate Attributes

In one of our papers [6], it has been proposed to develop mechanisms for student participation and cooperative learning through social constructivism [7],[8],[9]. The method proposed for this approach is Employability Bridge or eBridge program [6].

This eBridge program was started in the academic year 2012-13 at the college level. Based on the analysis made, participation of EEE students in the eBridge events was very poor probably as the topics were not related to them. In view of this, it has been planned to start these events at the departmental level where the topics can be selected in technical fields related to EEE.

III. PROPOSED METHODOLOGY

This paper presents a report on the employability bridge (e-bridge) program conducted at Nalla Malla Reddy Engineering College for undergraduate engineering students.

eBridge is a forum for social interactions among the faculty and students. This program has been designed to inculcate professionalism and improve the technical skills needed for improving employability of a graduate. Fig.1 depicts the process followed.

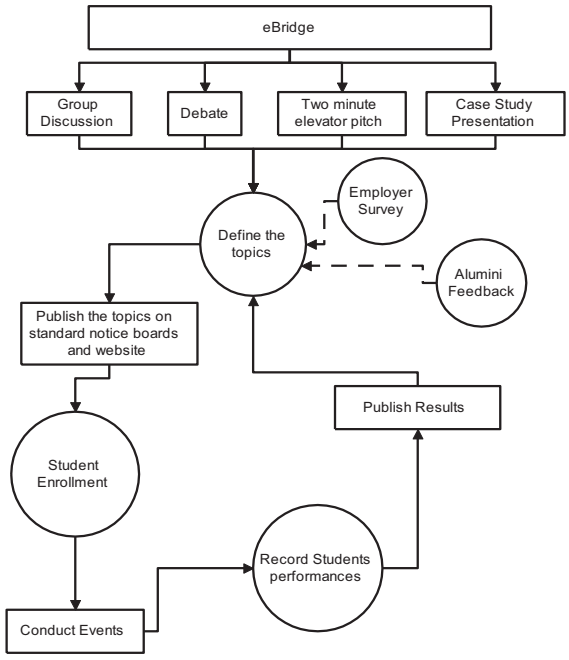

Fig.1 Block Diagram for eBridge Program

Four activities have been designed four activities namely (i) Group discussion (GD) (ii) Debate (DB) (iii) Two minute elevator pitch (EP) and (iv) Case study presentation (CSP). All the activities are base on technical topics relevant to their discipline in engineering.

The Outcomes expected from the eBridge event are: (a) improved communication skills, (b) Increased levels of analytical thinking (c) Expertise in technical knowledge as the topics are being selected from core subjects only.

The Procedure for conducting the events GD, DB, EP & CSP is same as that was done at the college level [6]. The process of conducting the events is again shown in this paper. But at the departmental level, a new approach has been used in selecting the topics and preparing the rubrics for assessment. Finally, an experimental analysis based on the average

assessment of the students was done to understand the level of attainment of outcomes.

The events are intimated through the college website dashboard, college notice board and standard circulation mode. The feedback and suggestions are given to students in real-time and record for future assessment of their performance. The evaluation is based on rubrics that are circulated before start of the event.

Initially It has planned to conduct this event twice or thrice in a semester for each class of department of EEE. Similarly all the departments in our college have also planned for the semester separately. Hence 6 to 9 events are expected at the beginning of the each semester for 2nd, 3rd and 4th year students, each year with a separate schedule of events.

A. Group Discussion (GD)

In GD, students were encouraged to take initiative for starting the discussion. Instructions were given to the participants to help one other in building up the discussion. The topics were selected such that both sides of the students arguments are assessed. Instructions were given to students not to repeat points and if already presented they shall counter or support that argument. One of the students is selected at random to end the discussion. Rubrics for the event Group Discussion are described in table 1.

Many of the students feel that participating in group discussion is easy compared to debate since they can present their views on both sides (positive and negative). But as far as the faculty coordinators feel, GDs are complicated especially when core related topics are given.

TABLE 1: RUBRICS FOR ASSESSING GD

Attribute	**Marks (1)**	**Marks (2)**	**Marks (3)**
Depth of Knowledge	Not able to talk about the content	Can talk about the content and why it is being discussed	Has thorough knowledge of the content and can give examples and applications of the content
Number of creative ideas	Not able to present any ideas	Can present a few ideas	Can present almost all the ideas on the content
Interpersonal skills	Improper body language, no leadership qualities	Proper body language, doesn't involve others in the discussion	Pleasant body language, Listens to other's discussions, Involves others in the discussion
Communication skills	No fluency, Errors in language, Improper pronunciation	No fluency, Error free English, Proper pronunciation	Good fluency, Error free English, Proper pronunciation
Accepting criticism	Cannot accept criticism	Takes criticism in a negative way	Accepts criticism positively

When one of the groups (say group 1) points out the views which the other group (say group 2) also had prepared to discuss, it becomes difficult for group 2 to proceed further with new points for discussion.

Since the topic is a technical one, the analysis of the topic can be done in depth through discussions. This is a big advantage for present day students who are generally learning subjects only at the knowledge or comprehension levels in the bloom's taxonomy [10]. This activity enhances the analytical thinking in the participants. One of the topics "Future of High Voltage DC transmission: Is it an alternative" was given to students.

B. Debate (DB)

Debates are organized between two teams each consisting of four students. The member of each team gets one minute to present an opinion or view. For around five minutes each side opposes each other's view. The entire debate is moderated by a faculty member. Rubrics for assessing debate are shown in Table.2.

TABLE 2: RUBRICS FOR ASSESSING DB

Attribute	**Marks (1)**	**Marks (2)**	**Marks (3)**
Depth of Knowledge	Not able to talk about the content	Can talk about the content and why it is being discussed	Has thorough knowledge of the content and can give examples and applications of the content
Strength of arguments	Less number of arguments	Can argue on some points but doesn't have strength	Can argue the points with strength
Ability to contradict	Not able to contradict	Able to contradict but not able to substantiate with sufficient arguments	Able to contradict with sufficient arguments
Body language & respect for other opponents	Improper body language, Doesn't show any respect for opponents	Proper body language but doesn't respect other opponents	Pleasant body language, respects other opponents
Communication skills	No fluency, Errors in language, Improper pronunciation	No fluency, Error free English, Proper pronunciation	Good fluency, Error free English, Proper pronunciation
Accepting criticism	Cannot accept criticism	Takes criticism in a negative way	Accepts criticism positively

Students need to analyze the topic in depth as they have to argue strongly on their side. Sometimes based on the topic one team may have less strong points to argue. In that case, students try to argue on the few strong points they have and concentrate much on how to convince the other team. Debate

increases the attention from the audience who are their fellow students. This may motivate the audience who are hesitant towards participation. It identifies a leader who will encourage the other participants to talk and to bring back the discussions into the right track when it goes out of scope. They have to present the examples or incidents to support their arguments and this process will improve the ability of the students to relate the theory with practice. Moreover, this improves the confidence levels since the topics are being selected on related technical subjects. One of the topics announced for debate is "DC welding Vs AC welding".

C. 2-Minute Elevator Pitch (EP)

In the elevator pitch event, the students are instructed to prepare a short summary that can give a quick and simple definition of a product, service, an organization or an event and it's value to the listener. Here, the students have to talk on a given topic for 2 minutes, and convince the audience of the issue being addressed.

The students were encouraged to make their message memorable by building a good story line as a vehicle to convey a message that someone with a problem can find a useful solution. Many of them think that 2-minute elevator pitch is same as presenting a seminar. But there is a lot of difference between the both. One has to convince the audience here with his/her views in 2 minutes even though there are some disadvantages. A topic titled "Why the frequency should be kept constant" was chosen for elevator pitch. Table.3 shows rubrics for assessing 2-minute elevator pitch event.

TABLE 3: RUBRICS FOR ASSESSING EP

Attribute	Marks (1)	Marks (2)	Marks (3)
Depth of Knowledge	Not able to talk about the content	Can talk about the content and why it is being presented	Has thorough knowledge of the content and can give examples and applications of the content
Ability to convince the audience	Not able to present the topic properly	Able to talk but cannot convince the audience	Able to convince with powerful & strong points
Communication skills	No fluency, Errors in language, Improper pronunciation	No fluency, Error free English, Proper pronunciation	Good fluency, Error free English, Proper pronunciation
Time management	Not able to talk for the total time given	Cannot conclude the presentation within time	Concludes presentation within time

D. Case Study Presentation (CSP)

The case study is a group activity wherein the team has to research and compile information about a project or product as a case study. The presentation material is subjected to plagiarism checks and then accepted for presentation. Here, the students have to prepare a power point presentation on the topic they have given. Presentation can be given by one person or a group. Generally the topics are being selected on the present trends of the industry and with a future scope. Guidelines were given to students to highlight some of the key challenges faced in the project/product, successes, failures, lessons learnt, what could have been done for better and so on. Table.4 shows the rubrics for assessing case study.

TABLE 4: RUBRICS FOR ASSESSING CSP

Attribute	Marks (1)	Marks (2)	Marks (3)
Depth and breadth of information covered	Not able to cover much information about the topic	Can present about the topic but doesn't go into the depth	Presents the topic in depth with applications, future scope etc.
Quality of presentation	Presentation material not clear	Presentation with clear information	Creative approach used in presenting
Communication skills	No fluency, Errors in language, Improper pronunciation	No fluency, Error free English, Proper pronunciation	Good fluency, Error free English, Proper pronunciation
Amount of information gathered	Refers only one resource	Refers more number of resources but confined to the topic only	Refers more number of resources and gathers information beyond the topic

The students can hence make an analysis which will help not only themselves but also the audience to know what is going on around the world. A topic titled "Super conductors" was suggested for one of the event.

E. Expected Outcomes related to Bloom's Taxanomy

As shown in Table.5 students are expected to reach higher levels in Bloom's taxonomy viz., analysis, synthesis and evaluation during their participation in eBridge events.

TABLE 5: MAPPING OF EBRIDGE EVENTS WITH LEVELS IN BLOOM'S TAXANOMY

Levels in Bloom's taxonomy	GD	DB	EP	CSP
1) Knowledge	✓	✓	✓	✓
2) Understanding	✓	✓	✓	✓
3) Application			✓	✓
4) Analysis	✓	✓	✓	✓
5) Synthesis			✓	✓
6) Evaluation			✓	

IV. OBSERVATIONS AND EXPERIMENTAL RESULTS

A. Assessment

Assessment for the above events is done based on the defined rubrics. These rubrics are different for different events (tables 1,2,3, and 4). The main aim of this program is to increase the participation. The participation levels increase with more numbers of interested students and also preparedness of the participants. The students should hence be given ample time to prepare. Hence topics for the events would be announced one week prior to the day of conducting the events.

During the first e-bridge program some videos were shown to the students on how exactly debate and group discussions would be conducted and the rubrics based on which they would be assessed. The assessment is done by not only the faculty coordinators but also the experts in those topics. For each event at least two evaluators perform the assessment. Sometimes feedback is taken from a group consisting of winner of the event, coordinator of the event, and the audience. This has helped the involvement of audience in the events who are students. Finally the winners have been declared based on assessment by the evaluators and the feedback from the audience. Sample assessment for the event Debate is shown in table-6.

TABLE 6: SAMPLE ASSESSMENT SHEET FOR DB

Roll no	**Depth of argument**	**Strength**	**Communication skills**	**body Language**	**ability to contradict**	**taking criticism**
L-202	2	2	1	2	1	2
216	2	2	1	1	1	2
214	2	2	2	3	1	2
234	2	2	2	3	1	1
250	2	1	2	2	2	2
246	2	2	3	2	2	2
241	3	2	2	3	2	3
L-207	1	1	1	2	1	1

B. Observations in various phases

The eBridge events were conducted two times for each class (2^{nd}, 3^{rd} & 4^{th} year) in the department of Electrical & Electronics Engineering. Totally, 6 sessions were conducted, among which the first 3 sessions are considered as initial phase and the last 3 sessions as second phase. Out of 175 students in the department 75 students participated in different events. Table. 6 shows the observations in the Initial phase and the second phase.

Observations shown in Table.6 were made on the students those who have participated in more than one event. Some students were insisted for mandatory participation in the initial phase. Observations made on them are (a) no enthusiasm (b) No preparation (c) Passive participation.

TABLE 7: OBSERVATIONS IN THE INITIAL AND SECOND PHASE

Attribute	**GD**		**DB**		**EP**		**CSP**	
	Initial	***2nd***	***Initial***	***2nd***	***Initial***	***2nd***	***Initial***	***2nd***
Depth of knowledge	No	Yes	No	yes	No	yes	No	yes
Analytical skills	Poor	Good	Poor	Good	Poor	Good	Poor	good
Body language	Poor	Good	poor	good	NA	N	NA	NA
Listening and conceptualizing abiliy	Poor	Good	Poor	Good	NA	NA	NA	NA
Communication skills	Poor	Avg*	Poor	Avg	Avg	Avg	Poor	Avg
General awareness	Poor	Good	Poor	Good	Poor	Good	Good	Good
Leadership skills	Avg	Good	Avg	Good	NA	NA	NA	NA
Quality of presentation	NA	NA	NA	NA	Poor	Avg	Avg	Good
persuasive skills	Poor	Avg	Poor	Good	Poor	Avg	NA	NA

* Avg - Average

C. Selection of the topics for the events

Selection of topics is the most important part in this program. The selection is being done based on various factors like curricular subjects, technical trends, alumni feedback, and employer/ industry feedback.

The reason for restricting the selection to technical topics is mainly to increase the preparedness and analytical thinking in technical areas. Apart from this, advantage of selecting core subject topics is that a strong background is necessary to participate, which will initiate the students to learn more in the subject.

Initially, many of the students felt that topics for the events should be on current affairs rather than technical subjects. The reason for this being that the students were not comfortable with the background knowledge for the topic announced, and hence could not participate thoroughly in the events. The students were convinced and were advised on their preparation which motivated them to participate.

Sometimes the students were forced to participate, but the events were unsuccessful because of their least interest levels. As an alternative, we have invited the topics from the students for different events; this helped a lot us to motivate more students.

Selection of topic for debate among the four events was a challenge for us, because in the debate the arguments on the both the sides should be strong enough. For the second year students, who are fresh to the core subject felt difficulty with technical topics in debate.

D. Experimental Results

In order to analyze whether outcomes achieved or not, we have compared both the phases with the assessments of students in their communication skills, subject preparation and analysis levels. Among the 75 students 12 students have participated in both the phases. Among 12 students, 3 participated in GD, 5 participated in DB, 3 participated in EP & 1 participated in CSP twice. Chart in Fig. 2 shows comparison of Subject preparation and analysis levels of the students during initial phase & second phase. The reason for choosing these two attributes for the study is that subject preparation maps to all the events(GD, DB, EP & CSP) in level1 (knowledge) and level2 (understanding) in Bloom's taxonomy, and Analytical skills map to level 4(Analysis).

Here, we have considered the average assessment in percentage for those students who have participated in both the phases. While making the average assessment for subject preparation and analytical skills of a student, the assessments of two or more attributes mentioned in rubrics are considered. From the chart, we can observe that average assessments for subject preparation are 50% & 59% during initial and second phases and for Analysis levels, they are 45% & 58%. Hence it concluded that the outcomes were met to some extent and there is a need to conduct more number of phases to meet the outcomes as expected. Comparison of communication skills during both the phases was not shown, because the second phase events were done one month just after the initial phase and a little improvement in their communication skills was observed.

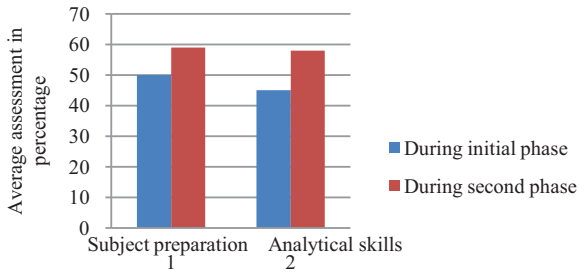

Fig.2 : Comparison of Subject preparation and analysis levels of the students during initial phase & second phase.

Some of the observations on the participant performance after the eBridge program include

- Improved communication skills
- Some of them had overcome their stage fear
- Shown better understanding of the subject,
- Better performance in placements
- recognizing their strengths and weaknesses
- Ability to gather information relevant to the topic and preparation relevant to the topic is improved
- Increased Confidence levels

Most of the participants have said that these sessions are helping them to participate in class activities also. Those who do not usually show interest in participating in class activities also showed interest to speak. After the session they slowly started showing interest in class activities even.

It has been observed that students are moving up to higher levels in Bloom's taxonomy by taking part in this program.

V. CONCLUSIONS & FUTURE WORK

We hereby conclude that the hypothesis chosen from i.e., cooperative learning through social constructivism has been proven with positive results. It has been observed that students of EEE have improved in subject preparation, and analytical thinking in technical subjects.

In future, we would like to make the choice of topics from the subjects they study in that particular semester and additional topics relevant to the subject. The events would be conducted weekly. This would increase the participation percentage and also improve the levels of attainment of Graduate Attributes among the students.

VI. ACKNOWLEDGEMENTS

We sincerely thank Dr. M. Naresh Kumar for his valuable suggestions and Mr.V.Vijaya Kumar, for his cooperation in conducting eBridge events.

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