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## Step out of the Box... A Training Module for Undergraduate Students

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### **Abstract:**

*The objective of this study is to see the effect of a training program, which will aim at facilitating the participants to see beyond academics. The training module includes divergent thinking activities and activities that help identify personal strengths of the participants with clarity. This study was conducted on first year engineering college students from an engineering college in Bangalore, Karnataka, India. The methodology of the study is to assess the participant's training needs; through a survey based questionnaire. The workshop was conducted seeking to bridge the gap between academics and extra-curricular activities through activities, case studies and related videos to illustrate the theme specified above. After the completion of the workshop, the participants were given the same survey questionnaire for a post workshop analysis. A focused group discussion was also conducted. The results obtained from the pre and post workshop analysis were compared to know the effect of the workshop on the participants, and there is a significant difference between the post and pre survey results showing that there was a positive effect of the training on the participants.*

**Keywords:** Divergent Thinking Activities, Workshop, Pre-Post Survey, Focused Group Discussion

### **1. Introduction**

This chapter gives an overview of the themes that are being dealt with in the paper; it provides an in depth understanding of the conceptual framework of the different variables.

### **2. Divergent Thinking**

Divergent thinking is the process of generating multiple related ideas for a given topic or solutions to a problem. Divergent thinking occurs in a spontaneous, free-flowing, 'non-linear' manner. The idea of divergent thinking has become important in the scientific study of creativity because many widely used tests for creativity are measures of individual differences in divergent thinking ability. The goal of divergent thinking is to generate many different ideas about a topic in a short period of time. It involves breaking a topic down into its various component parts in order to gain insight about the various aspects of the topic. Divergent thinking typically occurs in a spontaneous, free-flowing manner, such that the ideas are generated in a random, unorganized fashion. Following divergent thinking, the ideas and information will be organized using convergent thinking; that is, putting the various ideas back together in some organized, structured way.

There are four general guidelines for supporting divergent thinking:

- Deferring judgment -this includes both criticism and praise.
- Encouraging the numbers—collecting every possible idea
- Supporting the strange—striving for the unusual and encouraging different perspectives
- Looking for combinations of ideas that might work together; i.e., building off the ideas of others.

### 3. Environment and Roles

Divergent thinking is more likely to thrive in an environment that allows for different types of expression, encourages risk, and allows failure. As trainers, we can support divergent thinking by facilitating and supporting individual expression. We also play a role as community leaders, nurturing group environments so that many different voices are heard and respected.

### 4. Socio-Cultural Environment

Humans essentially create their own cultural and social environment. Customs, practices and traditions for survival and development are passed down from one generation to the next. In this way, the members of a particular society become conditioned to accept certain "truths" about life around them. In India we have a unique society and there are certain cultural practices and beliefs very specific to our country, we lay a lot of importance to education and there is a lot of competition when it comes to grades and marks, the children are expected to perform well, also there are certain jobs that carry more value when compared to others and this is a very culturally developed idea, hence there is a lot of pressure on students to enroll in such courses.

### 5. Engineering Education

It is the activity of teaching knowledge and principles related to the professional practice of engineering. It includes the initial education for becoming an engineer and any advanced education and specializations that follow. Engineering education is typically accompanied by additional examinations and supervised training as the requirements for a professional engineering license. Technology education in primary and secondary schools often serves as the foundation for engineering education at the college /university level. There are a variety of disciplines that focus on engineering education like mechanical engineering, construction science, computer science and engineering, electrical engineering, and other forms of related education.

### 6. Problems faced by students

For many students, earning a degree in engineering is less than enjoyable and far from what they expected. Here are the biggest complaints about the educational rite of passage.

#### 1. Textbooks

- Thick, dry, black and white manuscripts are rarely a source of inspiration and sometimes can cause loads of confusion. Often, the text is poorly written and interrupted by lengthy equations with symbols that are different from those used by the professor during lecture.
- Counselling  
College students may not have a sense for how to build their resume and they might be clueless about the variety of career opportunities that await them. Unfortunately, some academic advisers do little more than post fliers about internships and hand out a checklist of classes to take. They should make some projections about the future job market, learn about the interests of each young scholar, and offer them tailored advice for how to best prepare themselves.
- Assignment  
Nearly every homework assignment and test question is a math problem. Only a few courses require creativity or offer hands-on experience.
- Classrooms  
The presence of various groups is inevitable but the groups are divided on the basis of studies and extra-curricular activities, and this creates an unbalanced learning atmosphere.

### 7. Work Orientation

There is a large population of graduate students passing out every year, they have many dreams and aspirations about a job, and work environment, Placement etc, but the reality portrays a stark difference. Most students are of the opinion that good academic knowledge is sufficient to land them in a good job, however this is not the scenario in the work environment along with technical / academic knowledge there are a lot of other areas that need equal attention like-application of the knowledge, communication skills, interpersonal skills, group dynamics etc. the students should be aware of these areas and work on their skills and competencies. This is a very integral part in making the transition from education to work.

The aim of this chapter was to present all the themes and issues in the context that they are being used in this paper, the various issues faced by the engineering students have been presented in a nut shell, and also provides an insight to the entire training process and what it is aiming to achieve.

### 8. Review of Literature

To understand the theoretical background of the research, review of literature was attempted to understand the depth and the needs of the studies. The studies were classified into sub-group and themes based on the ROLs in the Internet.

The study titled 'Link to life: A Supportive Life Skills Program' aims of this study has been to, To enhance the readiness and preparedness of students to life beyond college; To help the student develop a positive self-concept; To build the confidence and self-esteem of Engineering students; To enhance the employability skills of Engineering undergraduates; To prepare them for the placement process in their respective colleges; To provide opportunities to the students to think at higher levels; To develop sensitivity in the student towards environment around; To develop a sense of respect to diversity existing in the society. Young students have to

face many challenges today in terms of their future and their career for which they should be equipped with appropriate life skills and the right attitude. "link to life" is a training program designed to make engineers understand the need to step out beyond their student life towards their career life by bridging the gap between study and work world to face challenges to face the world in a balanced way. A study, was conducted by designing a training module that would enable the participants to understand the differences between "creativity" and "innovation"; to use creativity thinking methods to producing innovative products based on classroom theory and to demonstrate the characteristics of creative thinkers and creative thinking methods. The part 1 of the first exercise given to them was that they had to note down a particular problem that they may have, ideally one that does not have any trivial solutions and tear of that paper, fold it up and hide it somewhere safe. The participants were then asked not to solve the problem but to think of it from different angles and reframe the problem. Certain problem solving games and puzzles were given to them and at the end they were made to recall the problem on the paper that they had written in the part 1 of activity. In the part 2, they were asked to write down a potential solution to the same a separate sheet of paper and again tear and keep aside and then the problem sheets and solution sheets, shuffled, were given to the participants who were divided into groups and they had to match the same. It was found that it had a positive impact on the participants in their problem solving

This study by Denis Rocha (1987) titled 'Impact of individual characteristics and sociocultural environment on academic success' aims at ascertaining the factors of academic success and failure of 1,980 freshmen enrolled for the first time at the University of Brussels in 1987, by means of an ordered probit methodology. The results confirm the impact of variables characterizing social as well as cultural capital of the students. They highlight the significant impact of schooling record prior to attending a university and suggest the importance of variables such as sex and nationality. The results illustrate the respective roles of mothers in transmitting verbal skills and of siblings in conveying "inside information" on university life. Finally, they stress the essential role played by ability, which is proxied by a filtered measure of high school results.

A study by Takhur and Anubuthi titled 'Stepping into the "real world"' in 2009, studied the perception of the final year architecture students regarding their preparedness to step out to the real world outside college and home. The data was collected through observation, interviews to the teachers and focused group interviews to the students of final year architecture. It was found that though the teachers said that the students were trained to be prepared, the students had some issues and concerns in certain areas such as, (1) Budgetary concerns, (2) Understanding the Design Firm Dynamics, (3) Communicating in the Field, (4) Technical and Legal concerns, and (5) Precedent Studies. These issues were taken into consideration and two programs were conducted so as to train them to handle the concerns. Positive changes were seen after the administration of the two programs

## 9. Methodology

The aim of this chapter is to provide an in-depth background about how the research was designed, and the amalgamation of all the components. This chapter helps in understanding the author's intention and inspiration behind the research.

## 10. Research Question

- Training can motivate first year engineering students to have an awareness of the world beyond academics

## 11. Objectives

- By the end of the training workshop, the participants will have awareness of the world beyond academics.
- By the end of the training workshop, the participants should be able to think divergently.

## 12. Hypothesis

- There will be no difference in the scores obtained on the survey questionnaire when compared across the pre and post training administration.
- Independent variable: administration of training

Dependent variable: scores on awareness about the world beyond academics and importance of divergent thinking capacities assessed by the survey questionnaire.

Sample selection: 1st year engineering students.

Sampling method: convenient sampling

Sample size: 14 students

Boys	Girls	Total
10	4	14

## 13. Training Needs Analysis

A survey was conducted before designing the module and, engineering students were contacted and interviewed, students currently perusing engineering were asked about the course, the environment, the expected outcome of the course, their social relationships, difficulties faced etc. students who had passed out from engineering were also interviewed to know how the workplace was treating them, the difficulties faced, areas where the course helped them and where they needed extra help. Certain themes emerged from these interviews- the students were not aware of the application of academics, they had limited freedom to be creative, there were lot

of inter as well as intra group issues, the students were unaware of their personal strengths and areas of improvements, majority of the students wanted a IT job, they had limited time to pursue their hobbies or take part in extra-curricular activities, they were under a lot of pressure to perform and get campus recruitment, they lacked time management skills.

On the other hand engineers who were working had a different set of concerns they said that there are lot of other skills that are needed in the work place like communication skills, interpersonal skills, leadership skills etc., having technical knowledge is not enough other skills are also essential.

A survey questionnaire was created keeping all these points in view; the main themes of the survey questionnaire are divergent thinking, academics, extra-curricular activities, personal strengths, and areas of improvement, interpersonal relationships and communication in classrooms.

The questionnaire was answered using a 5-point rating scale as follows:

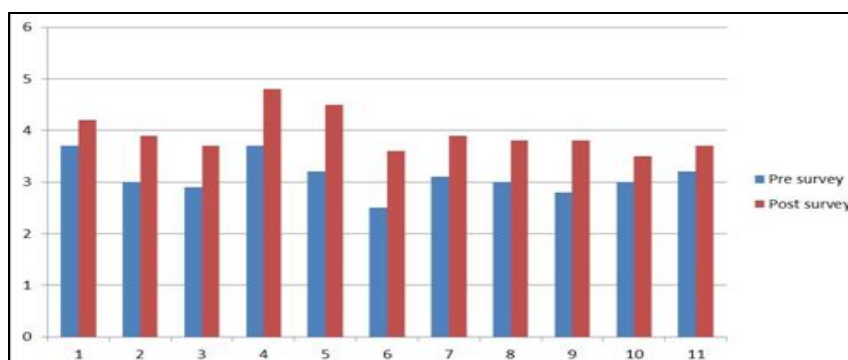
<b>Strongly Agree</b>	<b>Agree</b>	<b>Average</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
5	4	3	2	1

A feedback form was also designed to evaluate the reaction of the participants towards the training and its allied aspects.

**14. Results and Discussion**

The aim of the study was to see the effect of the training program, which will help in facilitating the participants to have an awareness of the world beyond academics. The objective of training module includes divergent thinking activities and activities that help identify personal strengths of the participants with clarity.

*14.1. Comparing of Pre- Post Test Item Wise Scores*



Graph 1: Graphical representation of the average scores obtained by the participants in the pre and post survey

The graph outlined above shows the average score obtained for each question in of the pre and post-tests. In question on that pertains to the ability to think differently the average acquired in pre-test is 3.71 and post-test is 4.21, which indicates an improvement in the factor. For the second item that analysis the use of what is learnt in class, the pre-teat score is 3 and the post-teat average is 3.92, which also shows improvement in the respective area. Similar is the pattern of improvement for items 3, 4,5,6,9 and 10 (pre-avg.: 2.92, 3.71, 3.21,2.5, 2.85,3; post-average 3.78,4.85,4.5,3.64,3.85,3.57) , that indicates development in the areas of hobbies, importance of extra-curricular activities, balancing ac

ademics and extra-curricular activities and future goals respectively. However there are meagre differences in the averages of the pre-test and post-test for the items 7 which deals with interpersonal relations, 8 which refers to the positive qualities of the individual and 11 which deals with communication with classmates (3.14, 3.92; 3.07, 3.85; 3.21, 3.78).

The overall averages of the items comparing the TNA and post-test indicates a positive effect of the training module that brings about an improvement.

*14.2. Comparing the Total Scores with A T Test*

Pre training score		Post training score	
Mean	SD	Mean	SD
34.35		43.93	
t value -11.136		sig-.000	

\*\* Significant at 0.01 level

A 't' test was done on the sum of all the pre and post scores and it was found that the 't' value was -11.136 and it was significant at 0.01 level showing that there is a significant difference between the pre survey and post survey results, also showing that the training has been effective and has had a positive effect on the participants.

Therefore the hypothesis, which states that there will be no difference in the scores obtained on the survey questionnaire when compared across the pre and post training administration, has been rejected.

### 14.3. Qualitative Data

A focused group discussion was held at the end of the training program among the participants to understand their view on the training and what they acquired from undergoing it. The discussion was initiated by asking each participant his or her dreams or what they would like to aspire in future.

While two-thirds of the students stated that they would like to take up an IT profession and excel, there were others who were firm on aspiring other fields.

One of the students stated that her dream would be to aspire in the field of music by inventing new musical instruments by using principles of what she has learnt in engineering. While another student stated that his interests in the future lies in the field of sports. Some were also keen innovating business ideas and becoming successful entrepreneurs.

Hence, it can be stated that students experienced a positive influence of the training, as they realized the importance of following their dreams and "stepping outside the box", which was one of the stated objectives of the training program.

Through the debriefing of the group activity "Eureka", the participants also understood the need to cultivate divergent thinking abilities as it helps in stemming new ideas and creating new products. The requirement of soft skills such as interpersonal skills and negotiation skills, reinforced through the case studies, was interpreted by them as equally important skills in order to survive in any challenging environment, i.e.; a business.

### 15. Conclusion

- From the above discussion, it can be concluded that there is a significant difference in the post and pre surveys showing that there is a positive effect of the training program on the students.
- The hypothesis, which states that there will be no difference in the scores obtained on the survey questionnaire when compared across the pre and post training administration, has been rejected. As it can be seen that there is a significant difference in the scores of the pre and post survey.

### 16. Limitations

The limitations of the study can be as follows:-

- The training program was only for three hours. A bigger difference could have been made on the students if the duration was longer.

### 17. Appendix

#### 17.1. The Training Module

Topic	Activity-1: Ice breaker- Vegas Game
Objective	To get to know the participants and to instill a sense of familiarity
Participant Description	Engineering students from 1 <sup>st</sup> and 2 <sup>nd</sup> year
Sample size	13
Duration:	15 minutes
Materials required	Nil

#### 17.2. Procedure

- Instruct the group that they will all be given a chance to go to Alaska
- Tell them that they are allowed to carry one item along to Alaska, but the trainer will decide if they are permitted to go or not.
- An example is given, with which the trainer introduces her name, eg; "My name is Divya, I am going to Vegas and I am taking drums along with me."
- The participants are given opportunities to go to Vegas, until they figure out the trick that gives them the permit.

*17.3. Debriefing Questions*

- How many of you got to know the trick behind it?
- Don't you see how we complicate life as we get intellectually higher?

Topic	Activity-2: making teams
Objective	To divide the class into activity groups
Participant Description	
Duration:	15 minutes
Materials required	Pick-up-lots

*17.4. Procedure*

- Instruct the group to pick lots.
- Instruct them to represent the item on the paper that they have picked.

They have to identify their group members based on the categories in which the items fall

Topic	Activity-3: Eureka!	
Objective:	1)	To bring out divergent thinking ability
	2)	To help apply theories learnt in class
	3)	To build inter and intra personal communication
Participant Description		
Duration:	1 hour	
Materials required	Empty plastic bottles, Metal wire, Straw, bottle caps, balloons, scissors, duct tape	

*17.5. Procedure*

- Ask the teams that have been divided in the previous activity to pick up the materials provided
- Provide them half an hour to create a running car, with the materials provided
- The criteria for judgment is provided
- The groups are also asked to negotiate with other groups for exchange of materials etc.
- A race is conducted between the teams
- At the end of the activity the teams are asked to judge each other's model/product based on the criteria presented.

*17.6. Debriefing Question*

- How did you come up with the concept/Design?
- How did you work as a team?

What principle/concept/law did you use to design the car?

Topic	Activity-4: Video Presentation: Aravind Gupta's Making of the toy car
Objective	To help participants understand the applicability of what they learn in class and to innovate something new.
Participant Description	
Duration	5 min
Materials required	Video

#### 17.7. Procedure

- Present the video of the making of the toy car by Aravind Gupta
- Link it to the previous activity and show them an alternative of how a toy car is made using the simple principles of physics.

Topic	Activity-5: Case study of Aravind Gupta
Objective	To help participants understand that one can follow one's dreams and interest and make a difference to the society
Participant Description	How individuals from the same field have taken up different career paths. How what we learn in the classroom can be put to use.
Duration	15 min
Materials required	Power point presentation on Aravind Gupta

#### 17.8. Procedure

- Present the ppt. on Aravind Gupta
- Illustrate the importance of following one's dream
- To understand application of academy

Topic	Activity-6: Case study of Flipkart
Objective	To illustrate how people with an engineering background have emerged to be successful and to help participants understand the importance of choosing an innovative career path.
Participant Description	
Duration	15 min
Materials required	Power point presentation on the story of Flipkart Video

#### 17.9. Procedure

- Present the ppt. on the Flipkart story
- Instill the importance of following an innovative path



**18. References**

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