

# SIR M. VISHVESHWARYYA ENGINEERING EXPLORATION LABORATORY

## MGM'S JAWAHARLAL NEHRU ENGINEERING COLLEGE

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### 1. Title of the practice

Sir M. Vishveshwaryya Engineering Exploration Programme

### 2. Context of the practice

Several surveys conducted by Aspiring Minds have concluded that there has been no change in the scenario of employable engineers in India since 2010 to 2029. The latest report also suggests that more than 80% of the graduating engineers are unemployable. This suggests that the graduating students do not conform to the twelve internationally accepted graduate attributes. Thus, there is a need to design, develop and deliver a programme, which trains and caters to the graduate attributes. In terms of pedagogy, a “problem-based learning” environment would train the students in that regard.

### 3. Objectives of the practice

In the background laid down by the context, the following are the objectives of the programme:

- a. *Interdisciplinary mode*: Educate the students of the first year to work in an interdisciplinary mode with the knowledge of motors, sensors, micro-electronics and data analysis.
- b. *Team work*: Motivate the students to break across their silos of respective specialisations and work as a team with members from different departments.
- c. *Problem based learning*: Pose different industry or society-oriented statements to the students and enable them to frame objectives, functions and constraints of a final prototype to be designed by the students.
- d. *Engineering design*: Train the students in the several aspects of engineering design, in order to be able to convert the posed need statement to an engineering problem statement.
- e. *Communication skills*: Design and develop interactive sessions to provide an opportunity to the students to communicate their solutions.
- f. *Project management and lifelong learning*: Educate the students about managing a small project and motivate them to apply their skills to their future lives when they handle larger projects.

### 4. The practice

In an engineering curriculum, conventionally the students are supposed to hone / test their skills through a capstone project, done at the end of their curriculum. The motto of the traditional approach is to feed the student with all the essential knowledge and in the end expect them to do a project or address a problem. This approach lacks in testing the skills of the students continuously as well as fails to build up a mechanism of continuous self-evaluation and interest. Essentially therefore, the student tends to focus more on clearing the examinations rather than develop an understanding of the subject, which leads to the student becoming unemployable in the future.

The problem-based learning environment takes a path different from the traditional one. The environment motivates the student to take up a problem, which might be industrial, social or home based, and asks the student to seek the various aspects of the problem i.e. design, techniques, technology, material properties, quality etc. By its innate nature, the requirement

of the problem-based environment is interdisciplinary and therefore, it is imperative to design, develop and deliver a curriculum for this environment. The engineering exploration programme is one small step in this direction.

Interestingly, the Dr. Babasaheb Ambedkar Technological University came up with the idea of a mini-project in the very first year and offers two credits for this course. It was decided and agreed with the college management that this mini-project would be done in a problem-based learning mode and would be named “Sir M. Vishveshwaryya Engineering Exploration Programme”. In the beginning ten faculty members from different departments viz. Mechanical Engineering (3), Electronics Engineering (3), Computer Science and Engineering (2), Electrical Engineering (1) and Civil Engineering (1) were trained on the delivery of the programme. With the aid of the contents developed by KLE Technical University and NETRA, the contents were strongly customised, curtailed and re-designed to address the requirements of the students of the Marathwada region.

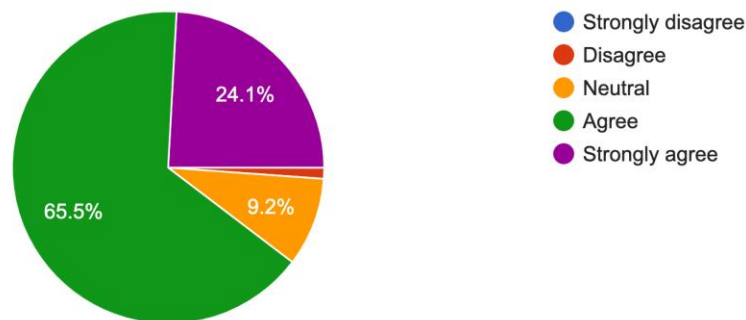
A proposal of a studio measuring 500 sq. ft. and a thinking laboratory (project laboratory) measuring 1500 sq. ft. was submitted to the college management, since no such infrastructure was available. In the meantime, with the help of an existing large classroom (measuring 600 sq. ft.), projector, PA system and traditional classroom furniture, the programme was started with all the ten divisions of the first-year students in the academic year 2018-2019 semester II. Each first-year division was allocated four hours of interactive sessions per week, which meant about 40 hours of total commitment per week on the part of the faculty members.

## 5. Evidence of success

A survey was conducted, wherein several questions were posed to the students. The responses of the students with respects to the questions posed are presented below in the form of graphs and charts.

a. *You were able to identify the problem statement based on the need statement presented to you*

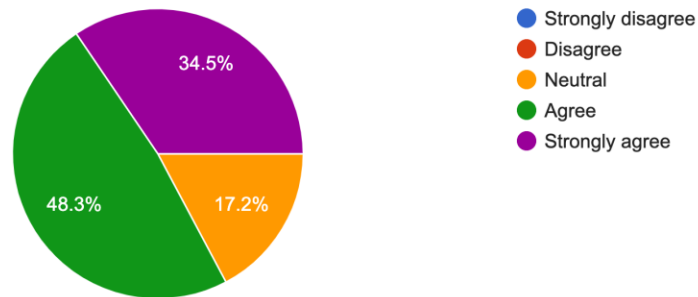
You were able to identify the problem statement based on the need statement presented to you:  
87 responses



b. *You were able to understand mechanisms, motors and sensors through the various interactive sessions of the Engineering Exploration programme*

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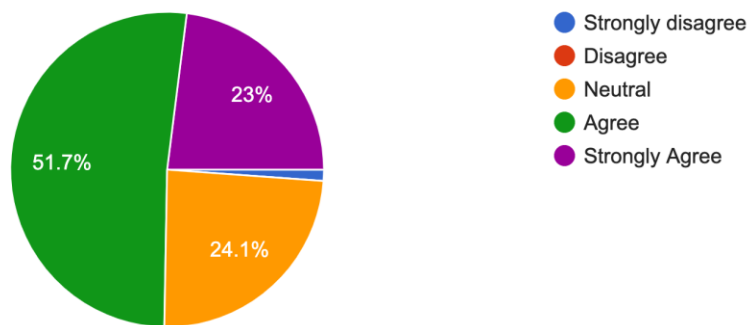
87 responses



- c. *You were able to identify the various steps of solving the problem presented to you, and identify various alternative solutions.*

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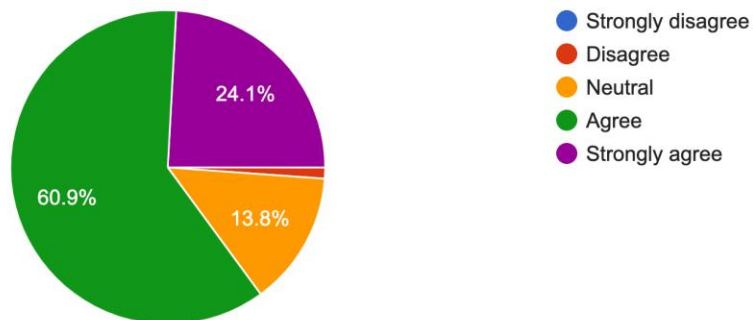
87 responses



- d. *You were able to identify and use the various tools that were required to solve the problem*

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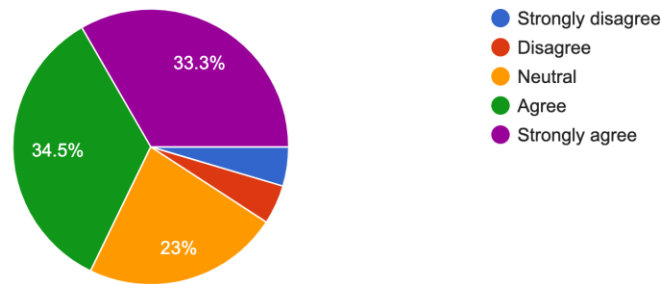
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- e. *Working with students from different departments (multi-disciplinary) & diverse group opened you to various ideas, was helpful for solving the problem*

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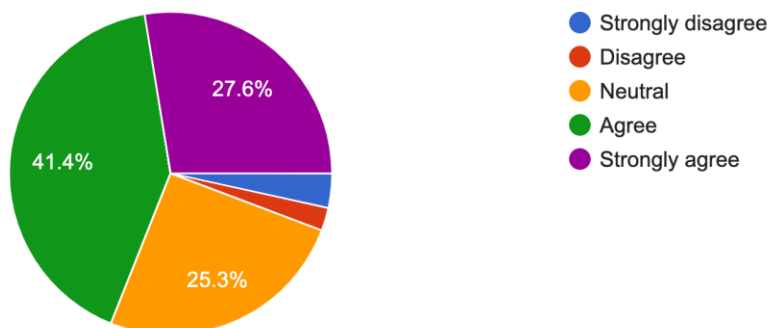
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- f. *The interactions with the mentors during the Engineering Exploration Programme helped you to maintain the attitude for solving the problem*

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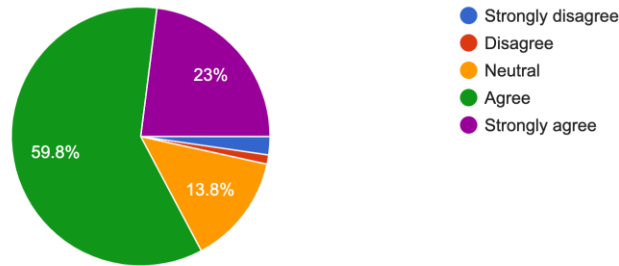
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- g. *The interactive sessions during the Engineering Exploration Programme helped you to learn skills required for an Engineering graduate (cf. Engineering Graduate attributes)*

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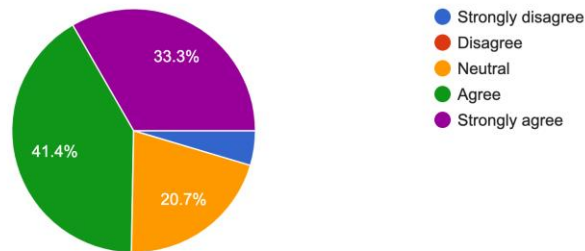
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*h. Working in a group helped you to improve your team work skills and managing time*

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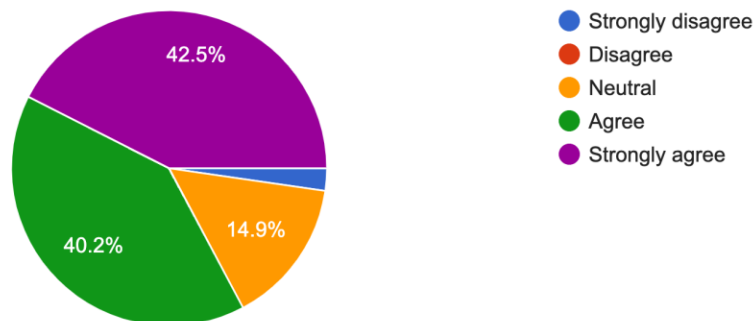
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*i. The Engineering Exploration Programme will help me do better work in the second, third and fourth year*

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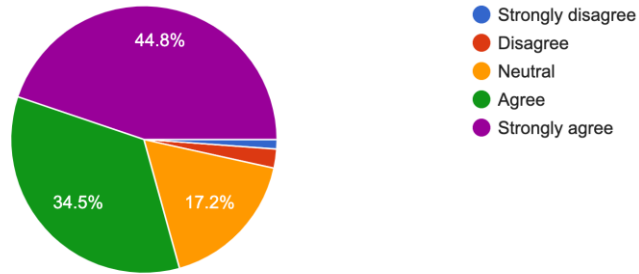
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*j. The Engineering Exploration Programme is beneficial, and we should have similar programmes in second, third and fourth years*

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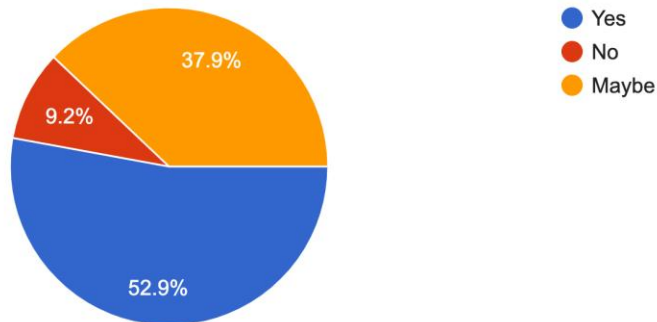
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k. *Would you like to have a STARTUP with your project idea?*

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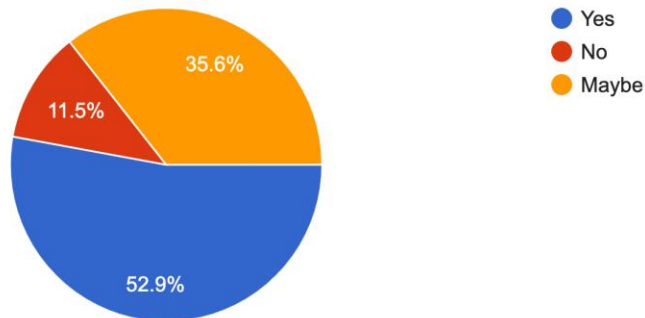
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l. *Would you like to patent your project?*

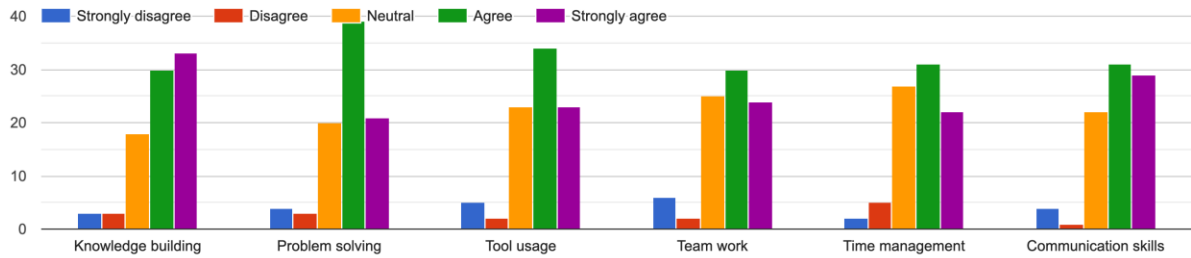
Would you like to patent your project?

87 responses



m. Skill improvement ranking (assessment)

Skill improvement ranking



## 6. Problems encountered and the resources required

- a. *Infrastructure*: As on date, the campus is equipped with several standard classrooms which allow for only one-way interaction. In a problem-based learning environment, where the students are expected to discuss and formulate a solution to any posed need statement, the students require to be enabled for mutual exchange of ideas and debate. Thus, there is a requirement of infrastructure which shall allow them to do so. Further, as on date, the learning studio and the thinking lab (project laboratory) are not yet ready for the students, and the currently available area, facilities and furniture need to be changed and customised for such problem-based learning environments.
- b. *Scheduling*: Each of the first-year divisions are subdivided into four batches each (about 15 students per batch). While one of the batches attends the engineering exploration sessions, the other batches attend other practical sessions. Since the curriculum proposed by Dr. Babasaheb Ambedkar Technological University has been broadly divided into circuit and non-circuit branches, and there are 6 circuit divisions and 4 non-circuit divisions, there is a severe problem in designing the schedule for the programme to be delivered.

## 7. Notes

While it is appreciable that a majority of the students are in for a positive response, as seen from the survey, it is imperative for the group to work on the improvisation for the delivery of the programme since there are areas of improvement strongly seen through the graphs and charts, and to develop further and better infrastructure.