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Some Interesting Field Projects for Mathematics Students

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Abstract

Under NEP 2020, there has been a paradigm change in teaching and learning processes. In this paper, we suggest a few interesting projects that can be done by Undergraduate Mathematics Students.

Keywords: Industry; Business; Academics; Interdisciplinary; Sports.
2020 Mathematics Subject Classification: 00A69, 00A71, 00A06.

1. Introduction

Mathematics has typically been a subject that has been theoretically studied in the classroom. It is also a subject typically on the cusp of the Science and Arts Stream. With NEP 2020, these borders between disciplines have blurred to a certain extent. Students are mandatorily studying a few interdisciplinary courses in Open Elective, and a subject like mathematics can be studied as an open elective course by students from either stream [1]. Students are encouraged to experiment and collaborate on projects. But it is still observed that there is very rarely a Mathematics Laboratory in any college. A Mathematics Laboratory class is typically considered as a Computer Laboratory class where students either learn a computer language or data analysis tools. While it is said that Mathematics is the Queen of all sciences, very rarely do students experiment in mathematics as in other science subjects. But NEP 2020 has forced students and teachers to think of various projects that a student can undertake. In this paper, we will list a few projects considering the interests and priorities of students.

2. Classification of Projects

We will classify the projects broadly under the following areas: Academically oriented, Research Oriented, Industry Oriented, Business Oriented, Interdisciplinary projects

(i) **Academic Projects:** We consider that the projects have to be designed for students in their second or third year of graduation who have opted for Mathematics as a major subject.

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1) Linear Algebra and its applications in Industry: Here, the students should be encouraged to study various applications first and then select a specific company dealing with designing or Machine learning. They can see the exact connections and how Linear Algebra concepts are used in the companies [2].
2) Study of primes, their patterns, and application of properties of primes in various algorithms in cryptography [3].
3) Interplay of Calculus and Geometry.
4) Interplay of Linear Algebra and Geometry
5) Studying School Geometry using GeoGebra [4].

These are just a few suggestions. Any topic of interest can be studied by adding in a component of enough experimentation. After studying the topics, the students should be encouraged to write a project report without using any AI tools. They can learn how to enhance the study step by step with any convenient AI tools that do not hallucinate. For this, the same topic should be studied using different free AI tools and a comparison can be made.

In case students do not wish to go on to higher studies after graduation but want to teach school-level mathematics, they should focus on projects based on the school curriculum. If possible, they should approach a school in their vicinity and help the school to develop a mathematics laboratory. Various ideas of the Mathematics Laboratory are available.

Another approach is to form a mathematical circle group in a school or college and do a lot of puzzles and mathematical games in the group. Typically, mathematics puzzles and games are very interesting and definitely sharpen logic and enhance creativity. Such circles have existed in the earlier Soviet Union for a long time. A weekly activity of this nature will definitely enhance the academic capacity of a student. Good documentation of the puzzles and games discussed should be made [8].

(ii) **Mathematics in Industry and Business:** Typically, companies aim to increase their profit under given constraints. Students can brainstorm and either work with a company or design some optimization problems. One of them is to offer a department store close to their home advice on optimizing the profit of one particular shelf. This can be done by studying various constraints about footfall, costs, wastage, etc. A similar problem can be solved by approaching a hotel that rents rooms. Students can try to optimize their profit by studying occupancy patterns on different days of the week, the payment capacity of typical clients, the seasons, the services, etc. With a large number of travel websites and homestay services offered, various individuals can be approached too. One can also work on social media presence.

(iii) **Interdisciplinary Research Projects:**

a) **Mathematics and Psychology:** One of the projects carried out by my students is to find a correlation between the time taken to solve a Tower of Hanoi problem and academic, sports, and other cocurricular activities of the students. The Tower of Hanoi is a topic widely studied in psychology, also. There are several interesting variations of the Tower of Hanoi Problem. The use of these variations is still an unexplored area in psychology. Several different experiments can be designed for these variations [6].

b) **Mathematics, Sports, and Ayurveda:** Data about Naadi pariksha and other parameters suggested by Ayurvedic doctors and Nutritionists can be studied for students excelling in sports. Hypotheses can be made based on naadi and sports(Individual, Team, Speed, Endurance), etc. Also, appropriate diet suggestions can be given by studying the Naadi and Sports training plans. This project will require appropriate permissions to be taken. Statistical data may be analysed by Mathematics students.

c) **Mathematics in weather prediction analysis:** Various models in weather prediction can be studied, and some predictions can be made theoretically based on the models. They can be cross-verified with what is happening in reality.

d) **Mathematics in Epidemic Models:** Epidemic models can be studied, and it would be interesting to check the models that fit the covid pandemic [5].

e) **Mathematics in Finance:** Mathematical models for finance can be studied and see how theoretical predictions fit with real-time data [7].

f) **Mathematics in Environmental Science:** Studying CO2 footprint of any one industry and mathematically finding an optimal solution to plant trees, considering the environmental factors and profitability of appropriate trees, can be an interesting project.

g) **Mathematics in various Social Media Algorithms**

In all these research projects, one has to understand various nuances of the project to apply a correct mathematical model, and continuously monitoring data and modifying the methodologies based on factual data is very crucial. Such projects test professional capabilities and require a mature application of mind.

3. Conclusion

Field project is an excellent addition to the syllabus to enable a student to learn mathematics and its applications. The impact of leveraging mathematical knowledge on solving environmental, social and other problems in society is very important. This should be encouraged. Students should be provided a Mathematics laboratory with enough referencing and computational facilities to experiment. The Mathematics Practical should be designed to enhance these capacities of the student. This will certainly make the students industry ready. They will also step into research with more confidence.

Experimentation and mathematical activity skills certainly enriches a person to be a better teacher. Such teachers can make classes very lively and interesting. The impact of these experiments is expected to be felt in the next few years. The chance that NEP 2020 has given to implement several ideas which also give academic credits to the student will certainly enhance a students curriculum vitae. Mathematics teachers too will be able to experiment with students and enhance their own research capabilities with the students. This addition to the syllabus is a win-win situation for all.

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