

Moving towards Quality Academic Project Development using Program Specific Research Activities in Engineering Education

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Abstract: To improve engineering education quality of student, project is a major concern. Project experience provides a major pathway for student's career either for their professional career or upgrading the qualification through Post Graduation or Ph.D. in Engineering. Being a very practical field, it requires experience and exposure to the real world to be expertise and successful in a certain domain. Project work integrates hands-on experiences with education which facilitate them while they are on their job desk and are being appreciated for their updated knowledge. Quality projects require effective project management. It is observed that there is very less studies done on the project management skills required for the engineering graduates. This will assist the students to learn and adequately apply their knowledge in their future project work which will help them to convey a superior focused on and more significant projects. To strengthen student project development, there is a need to incorporate innovative practices through set of program specific research activities with defined strategies. Also program specific research activities will attain higher values for program outcome.

Keywords: Quality Academic Project Development, Program Specific Research Activities, Program Outcome

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1. Introduction

Students need to understand how theory and practical work which is included in curriculum can help to solve real world

problems. Program Specific Research (PSR) activities will help to understand it in a better manner. PSR is research and development activity which includes:

- Identification of core domains in your branch of engineering.
- Categorization of curriculum subjects/Holistic Development heads/ In-house Internship tracks in different domains.
- Identify the PSR activities as a piece formative assessment applying learned concepts and practical components studied from curriculum to real time problem identified either societal, environmental, industry or problems observed in own institute. This also led to attain higher values of program outcome.
- Faculty can include new student's ideas from formative assessments to enrich the learning resources. By consistent 2-3 years refining in learning resources, faculty can write book.
- Faculty can design some educational games w.r.t some real time scenarios/problems which can be helpful to explain the difficult concept.
- In practical's multiple modern technologies can be introduced that will help students to keep themselves aware about usage of various platforms and to improve tool handling ability. Also make use of technology to solve problems in that subject area.
- On basis of real time problem identified for formative assignments mini projects can be developed. Before developing any project, problem can be defined properly with 2WH model. Why there is need to solve the identified problem i.e purpose of the project. What are the functional and non-functional should be tended

to while solving the problem. How to solve problem i.e to identify methodology and technology required to tackle the issue and validate the solution obtained.

- Students can write good paper with the help of and the direction of faculty based on mini project.
- Even good projects can be extended towards project ideas for final year project, research grants projects, paid or unpaid consultancy, take part in some competitions and awards and technology transfer.

Academic project development can solve many unaddressed societal, environmental and industrial problems if subject faculty will strengthen PSR activities.

PSR and academic project developments are interlinked. Effective academic project development is outcome of PSR activities.

To encourage good academic projects many intra/intercollegiate/university/state/national/international level project task competitions and hackathon are organized. Many organizations/industries are adopting the solution offered by new budding engineers. There are many opportunities to apply for research grants at college/university/state/national/international level to financially help the students for developing the projects. There are some funding agencies/government body like AICTE and Ministries which provides funds to come with own startups.

2. Related work

Kasturirangan, K. (2020), proposed in National Educational policy that knowledge creation and research are critical in growing and sustaining a large and vibrant economy, elevating society, and consistently moving a country to accomplish even more noteworthy statures. With this motto of national educational policy knowledge creation and research is only possible if as academician we strengthen the academic project development through PSR activities.

Project-based learning may likewise be applied in singular courses throughout a curriculum delivery. Project-oriented study focused investigation includes the utilization of small projects inside singular courses, advancing to a last year project course. The projects will generally be integrated by relating it with curriculum topics inside a similar course. They center around the application, and conceivably the mix of recently obtained information. Tasks might be completed as people or in little gatherings. Project-based educational programs use projects as the organizing standard of the whole educational plan, with subject situated courses outcome as a certain project. Students work in little gatherings with a mentor faculty. Projects are undertaken all through the length of the course and differ in term from half a month up to a whole semester.

(Heitmann, 1996) Shekar (2016) proposes Learning based on and it is a thorough way to deal with instructing and discovering that is intended to lock in understudies in the examination of true issues. Students become dynamic

students and take part in involved exercises, while speakers give direction to understudies during their undertaking work. The PBL technique for learning and encouraging hence requires another attitude and an adjustment of part for the two understudies and instructors. This technique builds understudy inspiration, and permits them to apply their hypothetical information in an intelligent climate, where they talk about ideas with one another and furthermore with staff. Students comprehend how to investigate and characterize the issue plainly, investigate the arrangement space for in excess of a solitary arrangement, and deciphered in what way to repeat and improve their plans to show up at a fitting arrangement that meets the goals.

Understudies gain proficiency with the vital abilities of critical thinking continuously, beginning with less complex applications through to additional complex critical thinking. A first-year engineering-design course is improved to bring issues to light of sustainability issues through project-based learning and research components. Learning results are assessed utilizing a mysterious under study survey. Different components of the course including lecture, group project, and individual presentation were discussed. The process of group-project supervision, marking criteria, and survey results were presented in detail. In light of the outcomes of group projects, individual presentations, and a student survey, the course objectives have been achieved are Improving students' project management skills and teamwork, Improving students' communication and public-presentation skills, Raising awareness of sustainability issues and Introducing different fields of engineering.

(Taheri, 2018) Educational system of helpful undertaking based learning arises in the last year of the undergrad program of the Technical University of Madrid. The advancement of this experience up to its addition in the European Higher Education Area (EHEA), consolidating the undertaking the board abilities of the International Project Management Association (IPMA) and expanding its degree to an whole instructive technique for undergrad and graduate projects. The results show how the approach gives three fundamental benefits: (1) it works with preparing in specialized, individual, and context oriented capabilities; (2) genuine issues in the expert circle are managed; and (3) shared learning is worked with through the combination of instructing and research. (Ignacio et al 2010) Product advancement is considered as an interdisciplinary college class with a focal job in engineering education. An experience of an item advancement college class dependent on a project-based learning (PBL) viewpoint. PBL is a perhaps the best educating systems for engineering courses, but there is still scarce research on PBL implementation in engineering education in developing countries. The course degree was assessed to incorporate designing administration content and to face a few boundaries for PBL execution featured in the writing. The understudy exercises were following a structured stage-gate development process. The outcomes accomplished incorporate a more significant level of learning insight and expanded intricacy of items produced by understudies. Exhibiting the upgrades in the course, PBL exact group of information by investigating an effective drive and its results.

(Eduardo et al 2017) Engineering schooling centers essentially around understudies' capacity to take care of issues. While most designing understudies are capable in tackling paper questions, they may not be capable at giving ideal answers for logical undertaking based issues that require efficient learning methodology, advancement, critical thinking, and execution. An upgraded Project-based learning (PBL) with suitable creative intercessions prompts expanded understudies' capacity to accomplish better learning and venture results. The mediations allude to fusing added learning and working with strategies, in particular, (1) utilization of psyche maps; (2) work of analogies; and (3) utilization of round-table conversations. The investigation was led with a complete number of 60 first-time PBL understudies similarly separated into two classes with one filling in as a trial class and another as a control class. Furthermore, one class of understudies had a lower scholarly standing contrasted with the other (control). The rubric for the venture based module incorporated a composed information test and a situation based oral assessment to test information and critical thinking abilities, a relic show to assess relic's exhibition. There were critical contrasts in information scores, critical thinking capacity and curio execution between understudies going through ordinary and upgraded PBL techniques. It could likewise be induced from this examination that understudies who had gone through upgraded PBL technique planned better frameworks and would be advised to performing ancient rarities than the individuals who were exposed to the traditional PBL approach. It was reasoned that joining upgraded learning and working with techniques to bunch driven, project-based driven training gave a more prolific climate to advance better learning experience and improved critical thinking capacity which could eventually lead to creating inventive and even minded answers for genuine - world designing issues. (Chua et al 2014).

3. Sample Case For Program Specific Research Activities

At Thakur College of Engineering and Technology every department has four-five branch specific subject areas i.e domains. Curriculum courses, Holistic development heads and Internship Tracks are mapped with the domains.

Consider a case of Computer Engineering department. PSR activities in Introduction to Intelligent Systems course which belongs to Intelligent System Design and Development (ISDD) domain. ISDD is one of the domain from the list of Computer engineering department and other domains are as follows:

1. Computing and System Design
2. Communication Networking and Web Engineering
3. Software Development and Information System Management
4. Multimedia System Design and Development
5. Intelligent System Design And Development

Curriculum for Intelligent system is as follows:

□ Introduction

Introduction to Artificial Intelligence, its past trends, categorization of the Intelligent System, its various components, the academic disciplines involved in intelligence, the practical usage of artificial intelligence and its current trends.

□ Intelligent Agents

It mainly focus on agents and the environments. It includes the theory of rationality, environment behavior, structure of the agents and various categories of agents.

□ Problem Solving and Search

This module include problems on the solving agent, Formulation of Problems, Example Problems, various Uninformed search methods, the Informed search methods, Local Search Methods, Genetic algorithms, Adversarial Search and Constraint Satisfaction Problems

□ Knowledge and Reasoning

This involves the fundamental of Knowledge based Agents, concept of the Wumpus World, the Propositional logic, categories of First Order Logic such as Syntax and Semantic, Inference in FOL, the forward and backward chaining, Knowledge Engineering in First-Order Logic, Unification, Resolution, Uncertain knowledge and reasoning:

Uncertainty, exemplifying knowledge in an uncertain domain, the semantics of belief network, Inference in belief network

□ Planning and Learning

This module incorporates planning problem, Planning with state space search, Partial order planning, Hierarchical planning, Conditional Planning. Learning – the miscellaneous forms of Learning, Inductive Learning, Learning Decision Tree, Expert System – Introduction , Phases in building Expert Systems, ES Architecture, difference between ES and Traditional System

□ Sub Areas of Intelligent Systems

Artificial Neural Network, Fuzzy Systems, Natural Language Processing, Robotics

On the basis of the curriculum here is the sample PSR activity as follow:

Aim: Relate how curriculum contents are useful for partial analysis and design of identified societal and environmental problems.

Activity Description: Identified two societal and environmental problems. Students need to relate the concept studied in curriculum and apply them on these problems. Analyze various aspects of the problem with the help of concept studied in curriculum. Also design some aspects of it with help of representation ways studied in the curriculum.

Problem Identified:

- Societal Problem (TE A Div): Quick analysis of quality of cereals, oil seeds and pulses using AI
- Environmental Problem (TE B Div): Tackling climate change using AI.

PO mapping: PO6, PO7, PO8, PO9, PO12

Program outcomes are as follows:

PO 1 ENGINEERING KNOWLEDGE: To apply knowledge of Science, Mathematics, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO 2 PROBLEM ANALYSIS: To identify, formulate,

gather research literature and analyze complex engineering problems reaching substantiated conclusions using the first principles of mathematics, natural sciences and engineering sciences.

PO 3 DESIGN / DEVELOPMENT OF SOLUTIONS:

Design solutions for convoluted engineering challenges and design system components or processes that meet specified needs with appropriate consideration for public well-being and safety, cultural, societal and environmental considerations.

PO 4 CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS:

Using research based knowledge and research methods that includes scheme of experiments, analysis and elucidation of data and synthesis of information to provide valid conclusions

PO 5 MODERN TOOL USAGE

Create, select and apply apt techniques, resources and modern engineering and IT tools including prediction and modelling to complicated engineering activities with an understanding of limitations.

PO 6 THE ENGINEER AND SOCIETY

Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO 7 ENVIRONMENT AND USTAINABILITY:

Understand the influence of professional engineering elucidations in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO 8 ETHICS:

Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practices.

PO 9 INDIVIDUAL AND TEAM WORK:

Function effectively as an individual, and as a member of leader in diverse teams and in multi-disciplinary settings.

PO 10 COMMUNICATION:

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO 11 LIFE-LONG LEARNING:

Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PO 12 PROJECT MANAGEMENT & FINANCE:

Demonstrate knowledge and understanding of engineering and management and leaders in a team to manage projects and in multidisciplinary environments.

Course outcomes of Introduction to Intelligent Systems.

- Understand foundation and applications of Intelligent Systems
- Understand AI building blocks presented in intelligent agents.
- Understand and apply various AI search algorithms uninformed, informed, local, adversarial and

backtracking search algorithms and constraint satisfaction problems to real-world problems.

- Analyze AI approaches for knowledge representation and uncertain knowledge and reasoning.
- Understand various types of planning and forms of learning. Apply decision tree learning to a given problems.
- Understand various sub areas of Intelligent Systems.

Tasks are identified on basis on basis of course outcomes.

Allocation of tasks to various groups are as follows:

- Problem definition and Identify Intelligent System Category (Roll No 1-5)
- Identify Agent Type (Roll No 6-10)
- Give PEAS Representation (Roll No 11-15)
- Give Environmental characteristics (Roll No 16-20)
- Formulate your Problem (Roll No 21-25)
- Represent search Space tree (Roll No 25-30)
- Identify search method (Roll No 31-35)
- Represent it in constraint satisfaction form (Roll No 36-40)
- Identify the facts (Roll No 41-45)
- Prove some imp fact using resolution (Roll No 46-50)
- information in a questionable area (Roll No 51-55)
- Draw Bayesian network (Roll No 56-60)
- Identify type of planning it require (Roll No 61-65)
- Suggest learning method for it (Roll No 65-70)
- Represent it in form of expert system (Roll No 71-onwards)

On the basis of task performed students are evaluated and Course Outcome and Program Outcome mapping attainment is carried out which is represented in fig 1 given below.

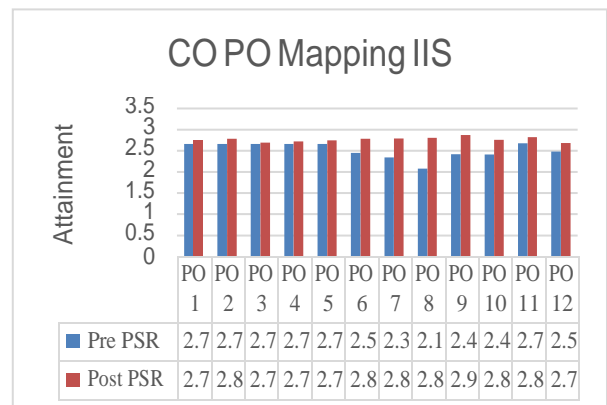


Fig. 1 CO PO Mapping Attainment Pre PSR and Post PSR

It is observed that Program Outcomes i.e Graduate Attributes Attainment values for PO6 onwards are improved after conducting PSR activities. It is indication that students acquired ability to solve societal and environmental problem, team work, lifelong learning and professional skill building through this PSR activities.

Same problem definitions/linked concepts which are included in curriculum some student groups take it to implement as a part of mini project or even they can extend it as a major project.

In Human Machine Interaction (HMI), problem definition given

for formative assessment is implemented in mini project.

HMI Formative Assignment was:

Design low fidelity prototyping (sketches of UI using notebook and pen) for following societal problem definition by considering different design goals.

Here Healthcare tracker is designed which gives the application on the portable application itself. The app is aesthetically pleasing as we have designed the app with buttons to keep in track different parameters of an individual. Application is tastefully satisfying as we have planned the application with catches to keep in track various boundaries of a person. The application is exhaustive as when the client taps on the catches, it furnishes with tracks of wellbeing related and installment related information of each record made. The UI of the application is exceptionally simple and effective to utilize.

The UI of our application was made by taking into consideration various design goals. All of which were to make our application easier what's more, effective to utilize by the user. The design goals taken into consideration were:

1. Usability :-

Usability goals targets for the percentage of users to rate the user interface of the application as easy to use.

2. Visual Goal :-

An aesthetic goal initiative with goal to produce a product that is visually perceived as modern, high quality and stylish.

3. Customer Needs :-

Meeting customer needs is very important which also allows customers to quickly liberate their data.

4. Information Security :-

Information Security related design initiatives such as the goal to detect and block suspicious banking transactions.

5. Accessibility :-

Avoiding assumptions about the user to create things that are usable for however many individuals as possible.

6. Cost :-

Targets for unit cost and operating cost. The target is to minimize cost as an overall aspect of the application.

7. Database :-

Having a speedy database is very important if you aim to provide your users with optimum performance.

8. Supported Platforms :-

In the present day, there are two dominating platforms supporting the market, Android and iOS, so you can develop an app that runs on either of the platforms, but to ensure that your app reaches the pinnacle of success, it is absolutely important that your app runs on both Operating Systems simultaneously.

9. Cohesion :-

Consistency with other features such as information and updates regarding details needs to fit in well with the structure of the application.

10. Performance :-

The performance of the application such as a goal for

the load time and run time of the application.

11. Technology :-

Technology driven goals are common as every developer wants to incorporate trendy technologies into applications to attract more customers.

12. Refinement :-

Refinement relates to perfecting an application in such a way that it performs as extremely high quality.

All above design goals are integrated in Low fidelity prototyping for Healthcare Tracker which is shown in fig 2. This outcome of formative assessment is further converted into mini project by extending this in following way.

It would be the most important to take into account how much the applications or site offers in terms of functionality. Most UX can be created in such a way that they look straightforward or effortless, in fact these results are often the ones that are the hardest to arrive at since there is a need to figure out the path from the client exactly what the interface has to do and go from there. Most of times, the most intricate visual interface will be identical to complexity of the functionality.

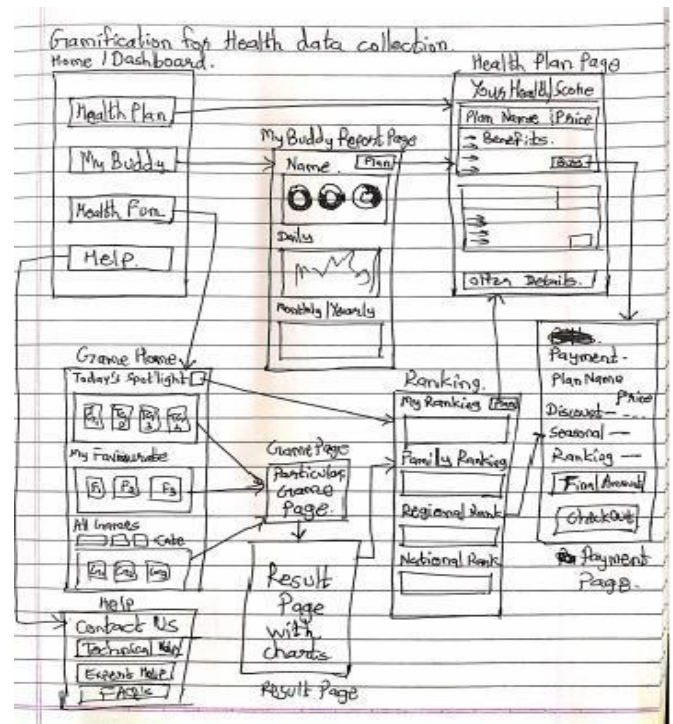


Fig. 2 Low fidelity prototyping for Healthcare Tracker

Insurance has habitually been a push product where the customer is generally marketed an insurance by the agents. This process makes the product marketing or the sales cost too exorbitant due to low conversion rates on insurance sales. It is observed that two factors contribute to this: 1. being seen as a cost instead of a security 2. The long and non-drawing in data catch measure which is needed to give the protection. At Bajaj, we are hoping to tackle this issue by giving a versatile application as a commitment device, which likewise assists you with dealing with your wellbeing better. This application will likewise go about as a source for protection deals premise the information given by the customer. Gamification has transpired as a tool in the financial industry to transform the prevailing

processes (non- engaging) into exhilarating activities. To support the aforesaid, few examples can be acquiring pertinent information through quizzes (on say, world heart day) or health score generators (answer these questions to get your health score/ heart age).

Here are some questions required to ask clients:

- Who is the target audience? - We know what kind of people will be using the interface.
 - Who are your rivals? - We can become familiar with the problem domain and common solutions in this market or industry.
 - What kind of websites do you like/visit? - We understand what sort of expectations and experience the client will have.
 - What is the budget? - We understand what sort of UI we can build.
- Finally based on clients' needs app is developed. Here are some screen shots of the implemented apps.

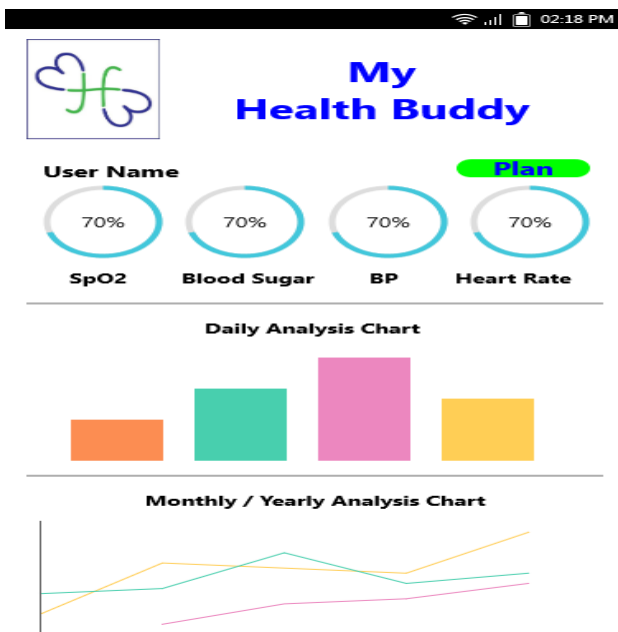


Fig. 3 Screen shots Healthcare Tracker System

Here, a case of how formative assessment based on important NLP concept are used in Major project is described. In NLP there were many formative assessment based on Sentence Segmentation, Word Tokenization, Lemmatization, Identifying stop words and POS tags.

Major Project Title:

Automated Essay Grading System using a hybrid model of Natural Language Processing and Neural Network Approach

Major Project Problem Definition:

The problem with manual grading is that not only is it laborious it is time consuming. This results in physical and mental strain on the grader and also takes a large amount of time in displaying of the grade. Even if a digital medium is used to submit and evaluate them the process still remains the same. As a result, not only should the platform be changed but also the process of grading should be automated. Even though there are many graders out there either they are expensive or not for commercial use.

Hence, the problem is to develop a digital medium called Automated Essay Grading System which requires minimum efforts from both the student and teacher and uses various parameters of essay writing to judge them and produces the grade of the essay within a particular range almost instantaneously which will be visible to both the teacher and the student.

Block diagram towards solution of above problem definition is represented in figure given below:

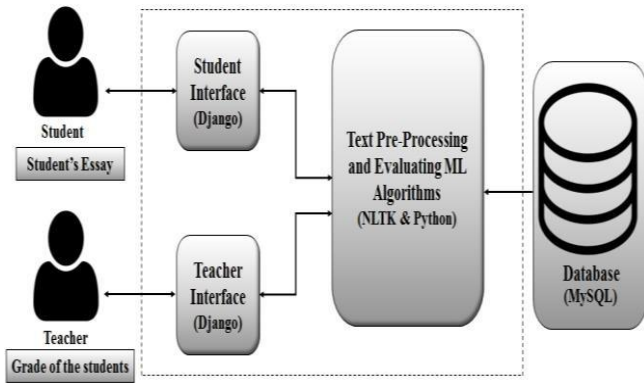


Fig. 3 Block diagram Automated Essay Grading System

Objectives of the project:

1. To design a user friendly interface for teachers and students both.
2. Each student should be able to submit their essay and check their grades.
3. The teacher should be able to view the grades of all students.
4. The system reduces time and efforts of both students as well as teachers.
5. It grades essays on all the parameters that influence the quality of.
6. It efficiently grades them and provides results which are similar to a human grader.

Methodology Used:

Data Cleaning and Feature Extraction: Nltk library, Regex, Textstat library, Vader Library, grammar check library and spellcheck library
 Model Building and Grade prediction: Neural Networks
 User Interface: Django
 Database: SQL

Table 1 is briefing how formative assessments topic are used for major project development.

Table 1: Mapping of FA Topics used for Major Projects

FA Topics	Used For Major Projects
Sentence Segmentation	Splitting the essay corpus into individual sentences and counting the number of sentences.
Word Tokenization	Splitting the sentences into words and then counting the number of words. This will further be utilized for calculation of all the features.
Lemmatization	To count the number of lemmas in the essay corpus.
Identifying stop words	To recognize the stop words in the essay corpus, count them and then remove them from the wordlist.
POS tags	To identify and count various POS like noun, adjective, verb, adverb, determiner and preposition.

Other than curriculum courses at TCET, PSR activities are included in Holistic development Head (Professional skills, Activity based learning, Project based Learning and

Research based learning), Employability skill development (ESD) head, in house internship or even in specialization head (Technology based learning: Tools & Technology/ Industry & application oriented courses / Research oriented courses related to specific emerging/recent trend) to attain higher level of POs(PO6-PO12). Also to create awareness and strengthen various domains in charges conduct various peer learning, alumni/industry/expert connect activity in respective domains. This lead to all round development of students' academic, skill and attitude aspects.

4. Sample Cases For Quality Academic Project Development

Good academic projects either curriculum projects (course mini projects/ BE major project) or projects from HSD/Internship/ESD/Specialization head can be recommended for various project competitions / Hackathons (inter collegiate/ university/state/National), consultancy project, apply for research grants or to apply for some state/national level awards. This may lead to make use of academic project for societal/industry use.

Here are the cases of Internship projects and PBL which are shortlisted for AICTE Vishwakarma Awards'2020.

In the second half of the first year of engineering the students were offered the in-house institutional summer internship in the arena of user experience and user interface designing at institute. In this students were guided about various concepts of user experience design, how to design attractive interface. It is here that they understood the importance of design of interface for succeeding in any project. The students were taught how interface plays a significant role in increasing the popularity of the website .They got acquainted with various parameters (heuristic principals) which can be used to evaluate an interface and find out the best possible interface. During the internship the students also pursued course on Coursera named visual elements in interface design. In the internship it is found a group very much curious and inquisitive. During the due internship one of the group Krishrimitra project group tried to analyze some real world scenario where the interface played a significant role in achieving success. E.g. There were already many chatting apps in the market but WhatsApp superseded all the app that was basically due to simple usability, due to simple interface and this clicked into their mind an idea that even the less educated people can also be connected to the technology if the interface is simple to use. They also analyzed that the condition of farmer were worsened because they were not getting what they deserved. The farmers were paid low for their agricultural produce and the consumers had to pay high price for the same in the market .All the money in between was taken merchants and the agents. Also many at times it was seen that the produce was only low so which crop to grow was a big question to get maximum produce. Now as an engineering student they thought, can this problem be solved using technology? They can sell the produce online and can get better returns but again why isn't it done then till the time? Maybe they will not be able to use as they are less educated. Simple interface can play a significant role in this problem solving phenomenon. The team made a prototype of the website as internship project and took it to some less educated farmer in their villages and asked them to

see if they can understand and they understood as entire thing was in regional language. Institute motivated and asked them to apply for ChhatraVishwakarma Awards 2020 which was initiated by the AICTE. The theme for the competition was India's Economic Recovery Post Covid; Reverse Migration and Rehabilitation Plan to support "Atmanirbhar Bharat". There were various categories in the competition. For one of the category promote value added agricultural Processes, Products and Handicrafts Key Areas this project was found to be suitable.

The students identified the problem statement as the bankruptcy of the farmers is a major problem that the country was facing and this was leading to weakening of the economic backbone of our country. This was due to their crop giving less yield due to less knowledge about which crop suites the soil best and the merchants and the traders paying them less even after taking high price from consumers in the cities". The solution was simple that connect the farmers directly to the consumers and the farmer gets good return for their yield and consumer also pays comparatively low as the middle agents won't be in the picture. The aim of this to make the agriculture a high paying sector. They made the interface simple, attractive and intuitive. Using it, farmer can sell products directly to the consumers at greater price than offered by the merchants in the villages. Consumers can buy Agricultural produce at a cost lower than the local market in the cities .Farmers can also predicts which crop to be grown and ask question about anything they don't know about agriculture. It also had recommendation system for customers that was basically marketing tactics to maximize sale of farmer and increase their revenue. They made the frontend of the website using CSS, HTML, and bootstrap and for backend they used PHP. Python's Keras module was used for machine learning part to make crop recommendation system. Block diagram and business canvas model is given in Fig4 and Fig 5 respectively. In this project mentor guidance and peer learning also helped a lot. The senior students who had already participated and won several such competitions guided this group. On their suggestion the students continued the project work and shortlisted for the Vishwakarma awards.

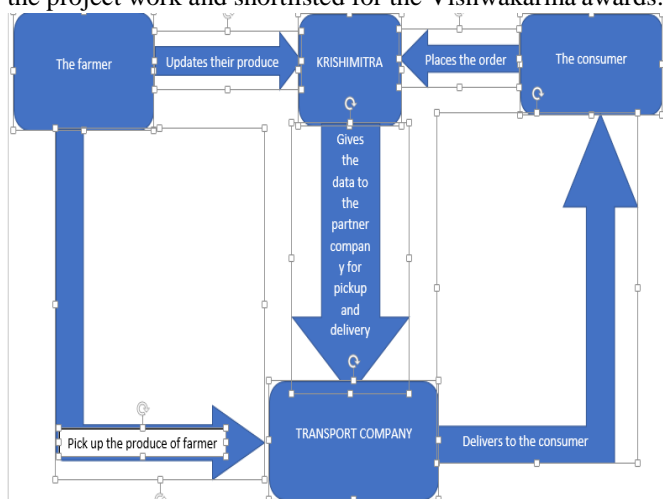


Fig 4 : Block diagram for Krishimitra App

The Business Model Canvas

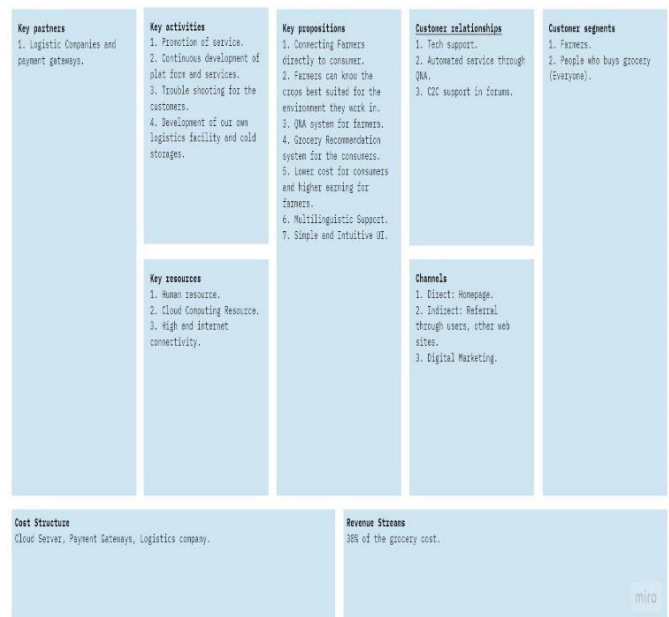


Fig 5: Business Model Canvas for Krishimitra App

In 2nd year PBL is head under holistic development head, Inthe first half of the 2nd year student opted for Healthcare Management System as a part of PBL project. The same project by modifying it they applied for AICTE Vishwakarma Awards'2020.

Healthcare is changing with a new emphasis on patient-centeredness. It is an important sector in human society, so it must be managed properly. One of the most critical elements of delivering high-quality healthcare is Efficient Patient Scheduling and Appointment Management System. Long hold-times, inadequate capture of eligibility and prior-authorization requirements, and cumbersome processes can negatively impact patient satisfaction and referrals from physician. In traditional system, patients have to commute a part of their busy schedule to book appointment. Moreover, it doesn't provide any facility to compare availability of various doctors and then book appointment as-per need. Project Team had identified this problem as were eager to deliver a probable and robust solution. The underlying theme of the project was 'Online Appointment Scheduling System' which would allow the patients from all over the nation to book an appointment through a web application as per their convenience. They had to no longer commute a part of their busy schedule to book an appointment.

Front-End implementation of the client-side part of the website to interact with the users was the also necessary requirement. The designs originally made in the early stages were transformed into special animations and effects. Functions were consequently integrated with the clinch of responsive and friendly use of the web application.

The backend development of the web application was carried out through Relational Database Management System using MySQL. Java was the main programming language used in Back-End.

Project team had planned to propose a solution for the problem themes given for AICTE Vishwakarma Awards'2020. For this it is expanded to 'Healthcare Management System' from 'Online Appointment Scheduling System'. The idea was to develop a web application which will provide a complete 360°

system for patient-care including Checking Availability, Booking In-Person Appointment and Virtual Appointment, Emergency Service, Linked Pharmacy and Laboratory, Multilingual Support and AI Chatbot Assistance. As TCET always encourages mentor guidance and peer learning, features were suggested by mentors and our seniors were Multilingual Support and AI Chatbot Assistance. A coordinated and streamlined appointment scheduling and management process not only helped in gaining patient trust but also significantly impacted the revenue performance. The proactive engagement with the patients through online portal and automated reminders reduced patient no-show rate, on the other hand, appointment management helped providers to better manage their schedule to minimize the long wait-time. In addition, it improved patient engagement for the healthcare service. The long-term outcomes of the system include increasing the efficiency of the healthcare providers as their services would get more exposure to a national-level platform. Hospitals could optimize their space for waiting rooms and more beds can be provided instead. Workflow for the same is diagrammatically represented in Fig 6.

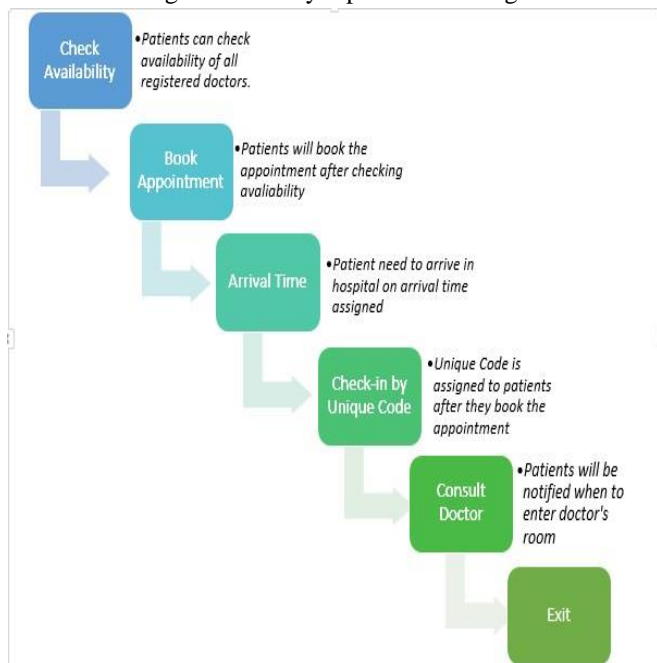


Fig 6: Workflow of Healthcare Management System

5. Conclusion

In the initial years of establishment TCET had a challenge of quality projects. Over the years TCET has strengthened program specific research activities in curriculum, holistic student development (HSD), and internship head. Students are applying concept learned in the curriculum, HSD or internship track to real time problems that may lead to a mini project. That may extended to major project of curriculum or may be applied for consultancy or research grants or presented at intra/inter/state/national level competitions or awards. This may lead to use of quality project for societal/industry use instead of keeping it in blue/black book reports.

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References

- Kasturirangan, K. (2020), National Educational policy , pp 45-46
- Heitmann, G. (1996) Project-oriented study and project-organized curricula: A brief review of intentions and solutions. *European Journal of Engineering Education* 21, 2, 121-131.
- Shekar, A. (2014) Project based Learning in Engineering Design Education: Sharing Best Practices. *121st ASEE Annual Conference & Exposition*
- Ignacio, R., Adolfo, C. José D., José Y. (2010) Project-based learning in engineering higher education: two decades of teaching competences in real environments *Procedia Social and Behavioral Sciences* 2 (2010) 1368–1378
- C Taheri P. (2018) Project-Based Approach in a First-Year Engineering Course to Promote Project Management and Sustainability. *iJEP – Vol. 8, No. 3, 2018, 104-119*
- Eduardo, Z. Thayla S., Paulo C. (2017) Project-based learning approach: improvements of an undergraduate course in new product development. *Production*, 27(spe), e20162252, 201
- Chua, K.J., Yang, W.M. & Leo, H.L. (2014) Enhanced and conventional project-based learning in an engineering design module. *Int J Technol Des Educ* 24, 437–458.
- allah, A., & Bandi, A. (2018).