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I confirm that I understand my coursework needs to be submitted online via Google Classroom under the relevant module page before the deadline in order for my assignment to be accepted and marked. I am fully aware that late submissions will be treated as non-submission and a mark of zero will be awarded.

Acknowledgement

First of all, I would like to open my heart and life in a fresh way where I surrender to acknowledge God the almighty in all my ways that his hand is upon me because of which I am able to study in this prestigious college and acquire to get more knowledge and skills.

I would like to express my special thanks of gratitude to my supervisor MR. Ravi Rouniyar for his guidance and support in completing my Interim Report. His calm nature and interesting conversations led me to ignite the curiosity to research more and make best Interim Report.

I would like to acknowledge my parents and sister for continuous support in a home by providing me a peaceful environment where I could study very well. Last but not least I would like to thank my classmates and seniors (for sample interim report) who all helped me a lot.

Thank you all from the bottom of my heart. God bless you all.

Abstract

In this interim report, you would find the Project description, background of the project, software methodologies, progress, and further work of my FYP 'Prashnottar' (PT). Pt is an android app for students studying in classes 4 to 12. After the completion of the Inception and elaboration phase of RUP, how I would be moving ahead with the construction phase, what were the challenges I found, how I would be tackling them are some of the well-written documentation you would find.

Also, I have explained the design with the wireframes and tried to simplify the purpose of PT with Use Case Diagram (UCD) in the appendix. You would find the technical researches; such as programming languages, libraries, and API which I would be used in building the app. With critical analysis of similar projects and apps, how I would shape my PT will also be highlighted. Hope a few lines of the abstract would help the reader to go through 8 thousand word report.

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Chapter 1. Introduction

1. Introduction to the topic

1.1. Project Description

The name of the FYP is "Prashnottar" (PT), which is a Nepali word, in English, it means the question and answer. As the name suggests, the main theme of 'Prashnottar' is to let users search for the answers to their questions, which would be answered by other users. In brief: 'Prashnottar' is an android app, for students studying in between class 4-12 where they will be choosing their current studying class, then they will start to view answers to the questions asked about different topics of a particular subject, comment it, like it and if the answer is too good, then upvote it for it to come up in search result. In addition to these features, they would also be able to answer others' questions by either writing or sharing images of their written answer.

Nepal is a developing country with a population of almost 30 million out of which more than 1million are students. With the arrival of urbanization, it brought internet in every house and a mobile phone in everyone's hand. 91% population of Nepal has internet access (Khabar, 2021). With COVID19, almost every education system was pledged to continue through the internet staying home, except for government schools and colleges. With the detection of a new variant of COVID, 'Omicron' found in SouthAfrica, the world could again go into lockdown pushing education online. If not 'Omicron', other variants may arise, but with or without lockdown, it's obvious that students don't always rely on school and tuition, but they tend to search for answers and solutions online to have a better understanding of the topic.

1.2. Current Scenario

In Nepal, there were about 35,222 elementary and secondary schools and 10 universities with more than 1400 colleges and campuses until 2016 (WENR, 2021). The number of students in Nepal has increased by 407 percent between 2000 and 2013, from 94,041 to 4,77,077 students in 2013. In 2016, there were about 3,61,077 students in Nepal. (WENR, 2021). At present 2021, the correct number of students studying at the school level is not published, but we can estimate from the above data and growth tendencies that there could be more than one million students in Nepal with a population of almost 29.40 million in January 2021 (Kemp, 2021).

There were 10.78 million internet users in Nepal in Jan 2021 also it's noticeable fact that 567 thousand (+5.5%) internet users increased between 2020 -2021, and it's no surprise that this increment number is of those students who got a new smartphone and other digital gadgets from their parents for their online classes (Kemp, 2021).

1.3. Problem statement

In 1.2, I've mentioned statistics to show the potential in the education field where technology if invented for students to help in the study could be a great idea. It's sad to know that for the Nepali education system, there are no proper, thorough-focused, and well-defined specific education materials present on the internet where students could go and search for solutions to confusion regarding any particular subject module's topic just like a tuition teacher. For e.g: why does stem or root modification occur in plants? Why is a convex mirror used as a side mirror in vehicles? What is the converse of the Pythagoras theorem? Etc.

The below bar graph shows us a result of a survey participated by 77 BIT & BBA students, where they clarified the problems they used to face during their tuition and coaching times which is 3-4 years back.

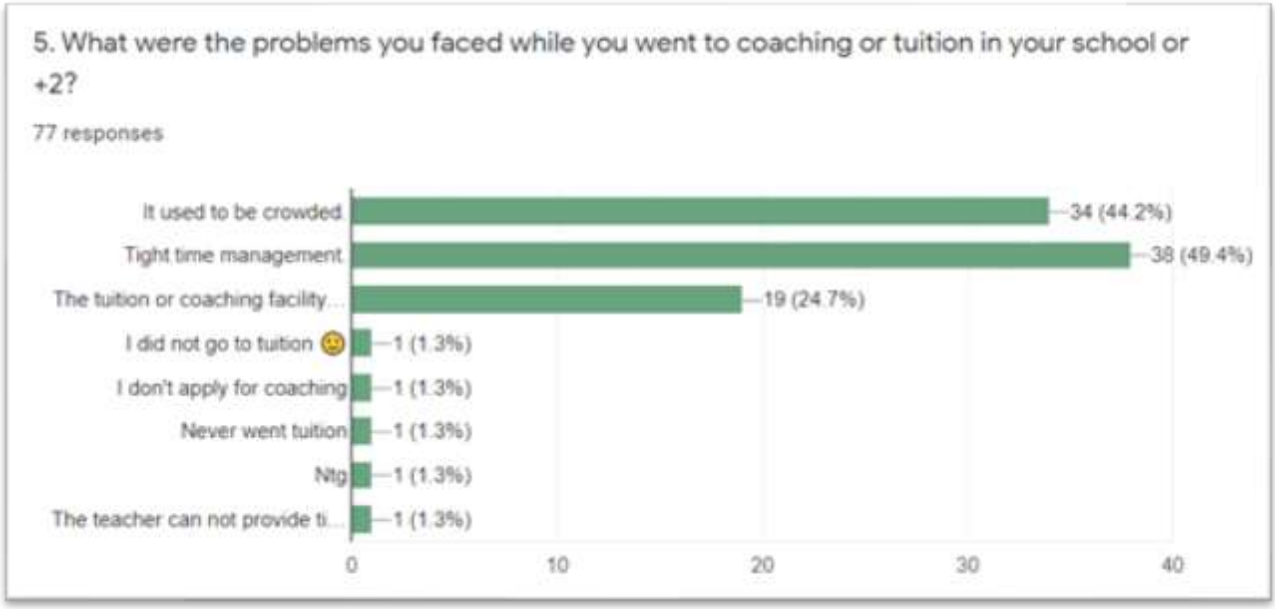


Figure 1 Problem faced in coching and tuition

Again I asked if they had any brothers or sisters going to tuition. The below is a survey result. In the below result, 57% of responders' siblings go to tuition or coaching.

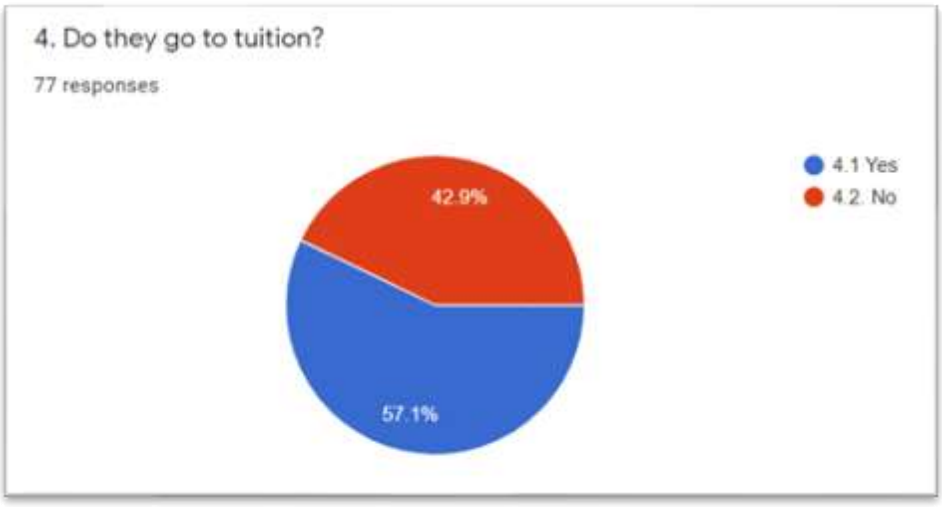


Figure 2 Asking if their siblings go for tuition

The below survey results show us that, 76% of them don't have time to teach their siblings like a teacher. While others either are not able enough to teach or become irritated while teaching.

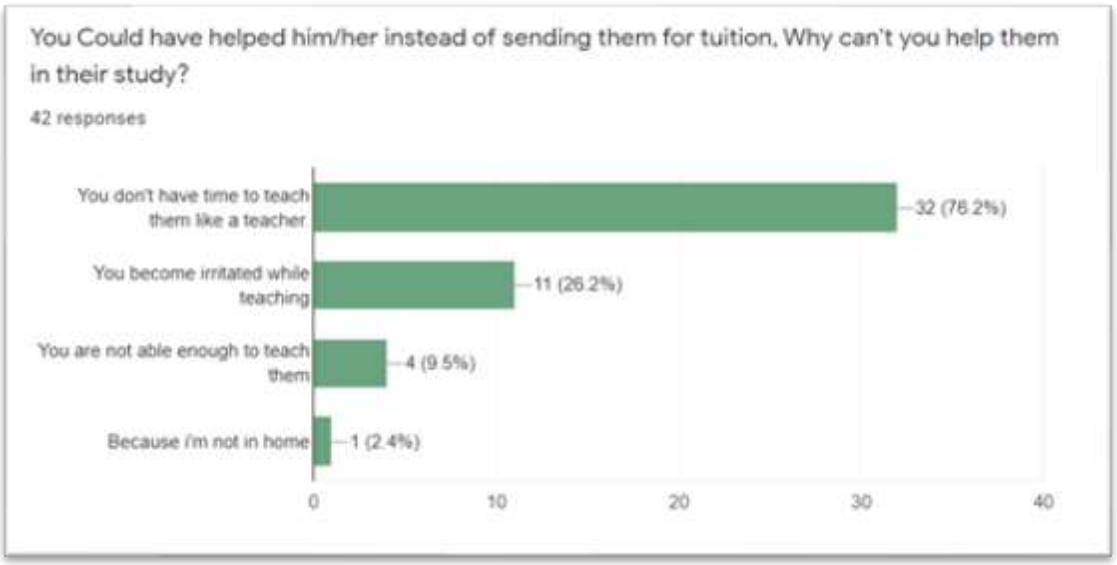
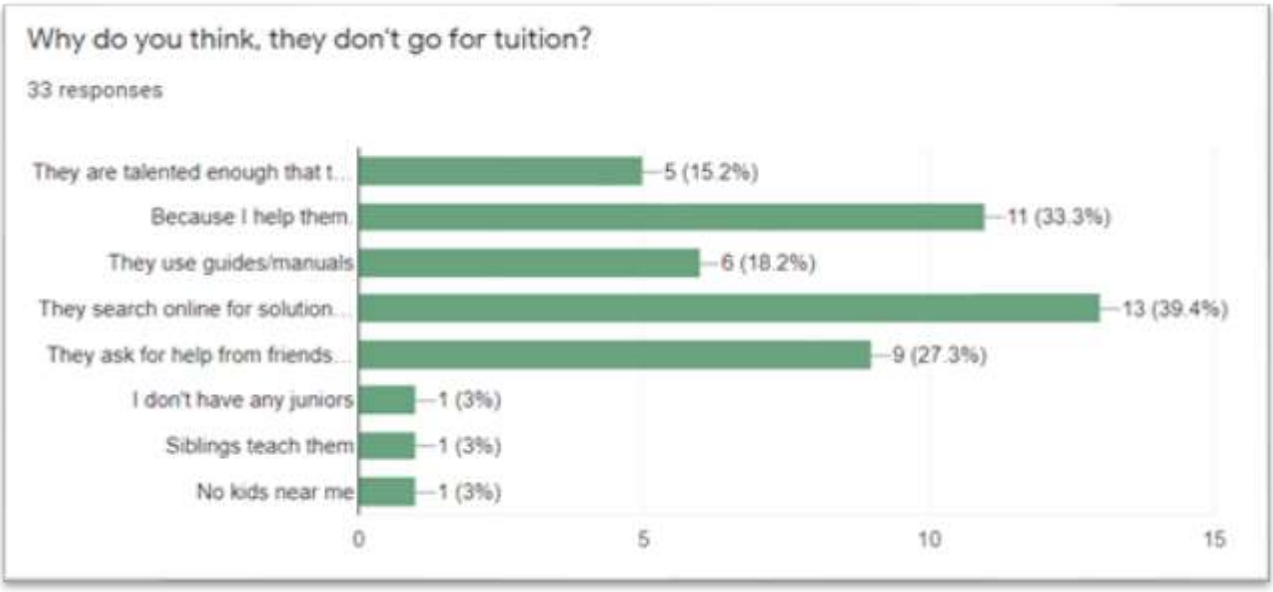


Figure 3 Survey result of why not helping siblings in their studies.

The below is a survey result of those responders, who's siblings don't go to tuition or any coaching centers. The most voted answer as the main reason for not going for help was, they searched solutions and helped out themselves from online educators, which gives us a green signal that students do use the internet to learn their unlearned topics still in 2021 by students



. *Figure 4 Survey result of why their siblings didn't go for tuition.*

I asked participants if they went online on the internet to find solutions and understand book topics when they were studying in school and +2 level. In the below survey result, we see 80% did take help online.

In the below figure 5, we can see 41 percent of students never got their query answers and 28 percent of students were never happy with the quality of solution.

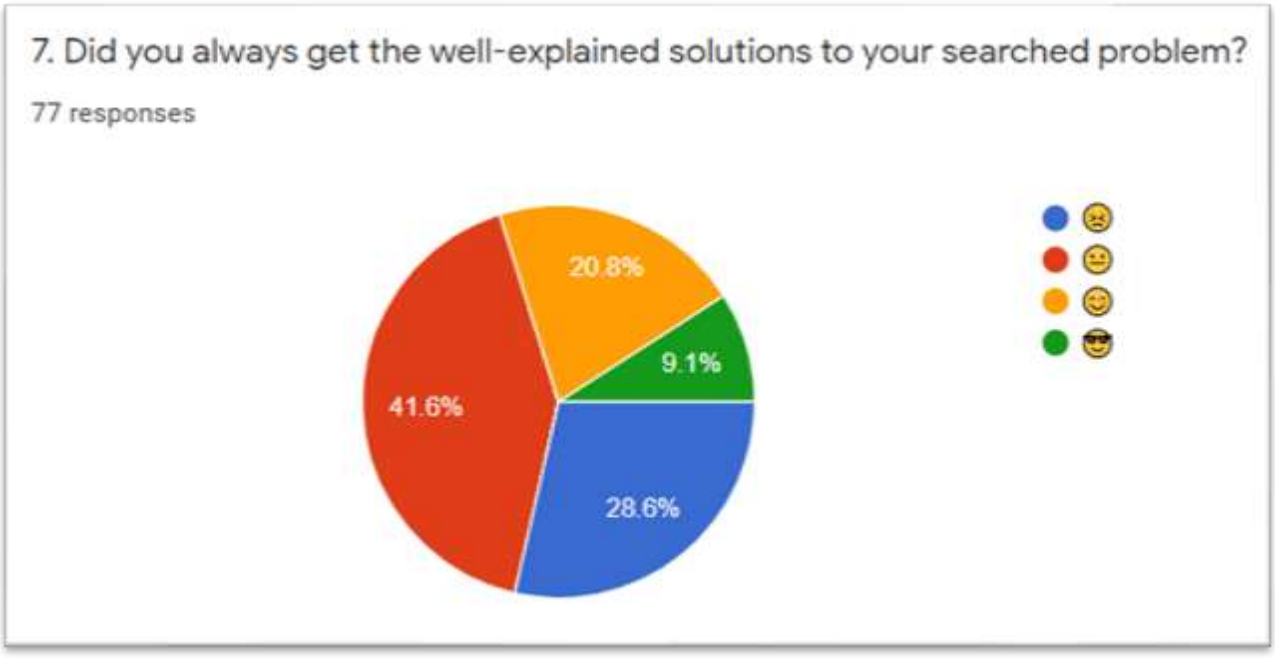


Figure 5 Survey result of whether good solutions are available or not in online platforms.

From the above survey, it was clear that our generation of students faced different problems while studying intuition and coaching centers, did search online for solutions but the satisfactory result was never found.From the survey of 77 participants, It was concluded that in Nepal there is no proper platform for students to rely on for study materials. Since 1993, the year internet was introduced in Nepal, till 2021 still after 28 years, students have to rely on tuition centers to clear their doubt on the study. There is no smart and easy way to explain different concepts of science and math by which students could understand and remember for a longer period.

1.4. The Project as a Solution

As we have seen, students of Nepal during 2020-2021, in general, all have got their smartphones and laptops for education purposes. As in the survey, we have seen that most of the students studying at the school level, search for online help for their subject study:

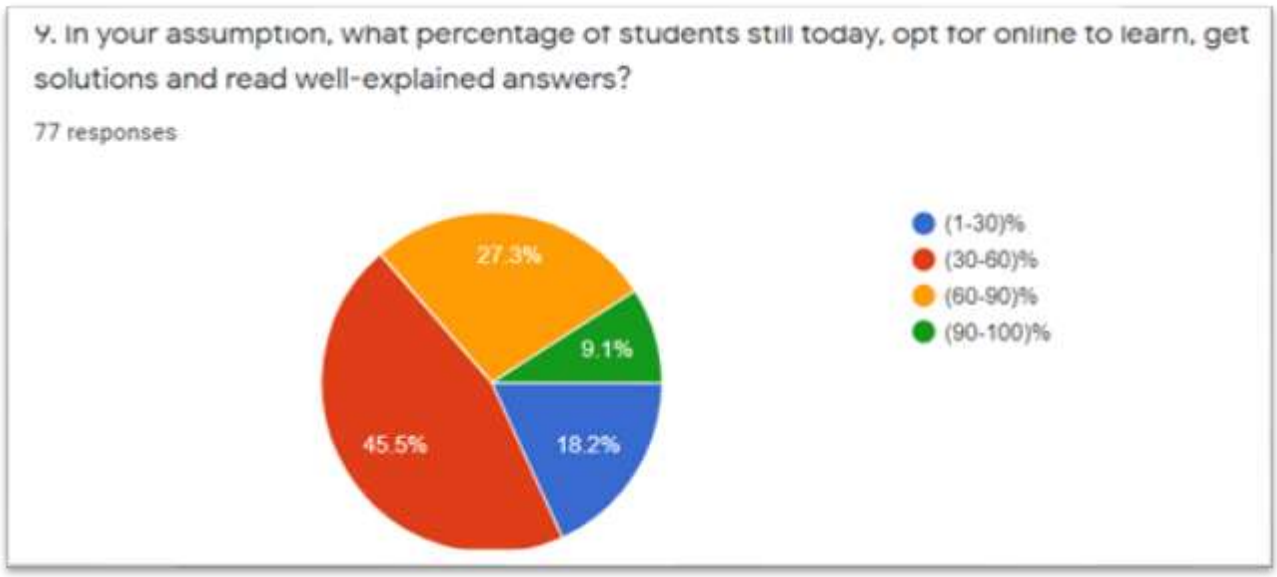


Figure 6 Survey result of assumption of what percentage of students still search online for help.

PT would be for the android platform but if possible, I would love to provide it for IOS platforms as well. Students from class 4 t0 12 would be able to choose their class, then subject, then chapter of which they are having confusion and not being able to solve a problem. There they can find answers, solutions, and explained notes given by another fellow student. For the best answers, it would be voted by thumbs up by other fellow students who have already so that it can come at the top for any other researching student. If the searched question is not there, then they can simply post a question there.

By this, any student can contribute their knowledge with other fellow students, make friends and help or take help online. 'Project as a Solution' below:

i) PT will help students to revise any subject chapter-wise even if they forget after being taught in school.

ii) PT will also help parents to understand the concept of their un-understood topics to teach their small children while teaching. E.g. I had one uncle who was not able to understand geometry to teach his 12-year daughter. With the help of PT, he will be able to understand himself and teach his daughter.

iii) As PT is my FYP, so no one has to pay like tuition fee.

iv) As everyone in the 21st century is internet access, they can use PT. So no need to travel far like for tuition centers.

v) PT won't be crowded and noisy like most of the tuition and coaching centers. It will be ad-free.

vi) PT is like a school where friends are teachers because they will be learning from their friends.

vii) With PT, the students of Nepal would probably be competitive in study fields (I wish), and continuously engaged in study matters rather than being more engaged in social networking apps and online games.

1.4.1 Aims and objectives

1.4.1.1. Aims

The main is to help every student of Nepal by building them an app, 'Prashnottar' where they can take help, share knowledge and take notes of academic subjects like science, math, Optional maths, English, Nepali, etc in case they are not able to understand in school or not able to get tuition classes for any reasons.

1.4.1.2. Objectives

The ways PT will be fulfilling aims are as follows:

i) PT will be built using the flutter framework and dart programming language available for both android and ios users.

ii) PT will be free of cost, it won't charge students to use.

iii) Pt will create an online platform for Nepali students and ways to get 'Prashnottar' (PT)- coins as rewards and push their ranking in PT.

iv) PT will increase awareness on taking help online using PT where they can also help other fellow students.

v) Students can ask questions, answer any asked questions, bookmark their favorite answers in respective folders, create notes in the app, and many more, it'll help students to prepare awesome notebooks to look at exam times.

Chapter 2- Background

2. Background of the Project

2.1. About the end user.

As 'Prashnottar' (PT) is for educational purposes, it's mainly targeted at students and teaching professionals who want to contribute their knowledge online to other students. PT will be accessible to android users, if possible I would love to make it available for IOS users as well. Anyone can signup and login to the app using G-mail, then set up a profile and dashboard (can start to use PT as student or instructor), then make him choose a class which he/she studies (if student option is chosen), then give options to choose any subject, then a particular chapter and start reading answers of questions asked and answered by other students all over the country. Students studying between classes 4-12 would be able to use the app experiencing an ad-free and well-designed interface.

We can estimate the age of the end-user, students could be between (8-21) and users entering as an instructor could be between (18-90). I was able to recall my school days when I used to find a lot of problems in understanding science concepts, maths, social, geography, and many more and I used to try to understand those solutions using different websites and youtube videos. But, rarely I used to find good explained papers and videos. I faced a lot of problems in school and tuition centers as well. Remembering all those ironic and golden days, I decided to make an app targeted especially at students.

2.2. Understanding the solution

In the above 1.3. Problem Statement, survey result showed the problems we all faced in our school life. PT being the android app, it would bring better academic solutions and hence uplift students educations quality. Before drawing the solutions, let us view the problems voted from the survey:

i) Still, Children's and Students have to go to tuition. Many can't afford it.
Many of our parents' generation never got an opportunity to study and focus on their career due to their parents' economic condition and in Nepal, a few decades back, education was not as important as it is today. All parents are able enough to teach their

primary and secondary children, which compels them to send their children for tuition. Also, not every parent can afford tuition fees, which is a more serious topic.

Below is a survey result of how many siblings of survey people go for tuition still.

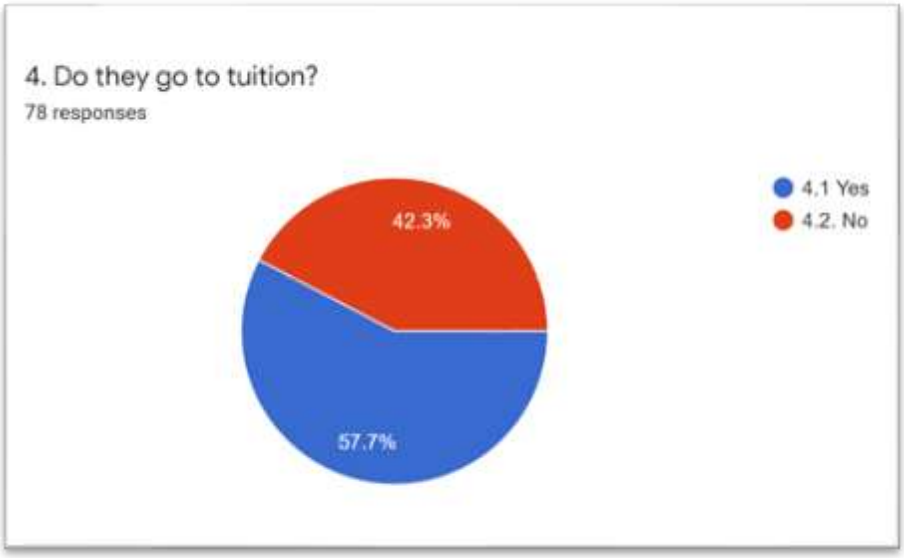


Figure 7 Survey result of children going to tuition.

Understanding solution: Prashnottar (PT) would be able to guide children chapter-wise solution explanations. Only children, parents can also learn from the app.

ii) Tuition and coaching centers were and are crowded and are far most of the time.

In the below figure, we can see everyone faced at least one problem.

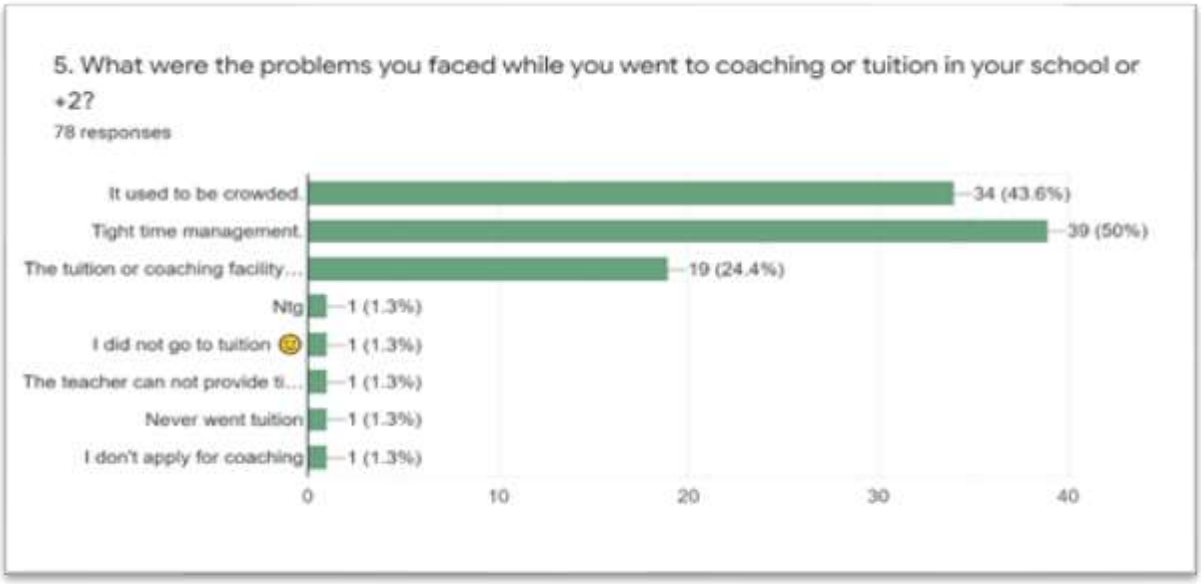


Figure 8 Problem faced by students.

Understanding solution: PT will be an app, where students don't have to face crowded places nor do they have to travel miles to attend a class.

iii) Our elder parents and we elder siblings don't wanna help.

It is not easy to give time to anyone, especially to teach students. The below figure showed us why we can't teach our siblings instead of sending them to tuition.

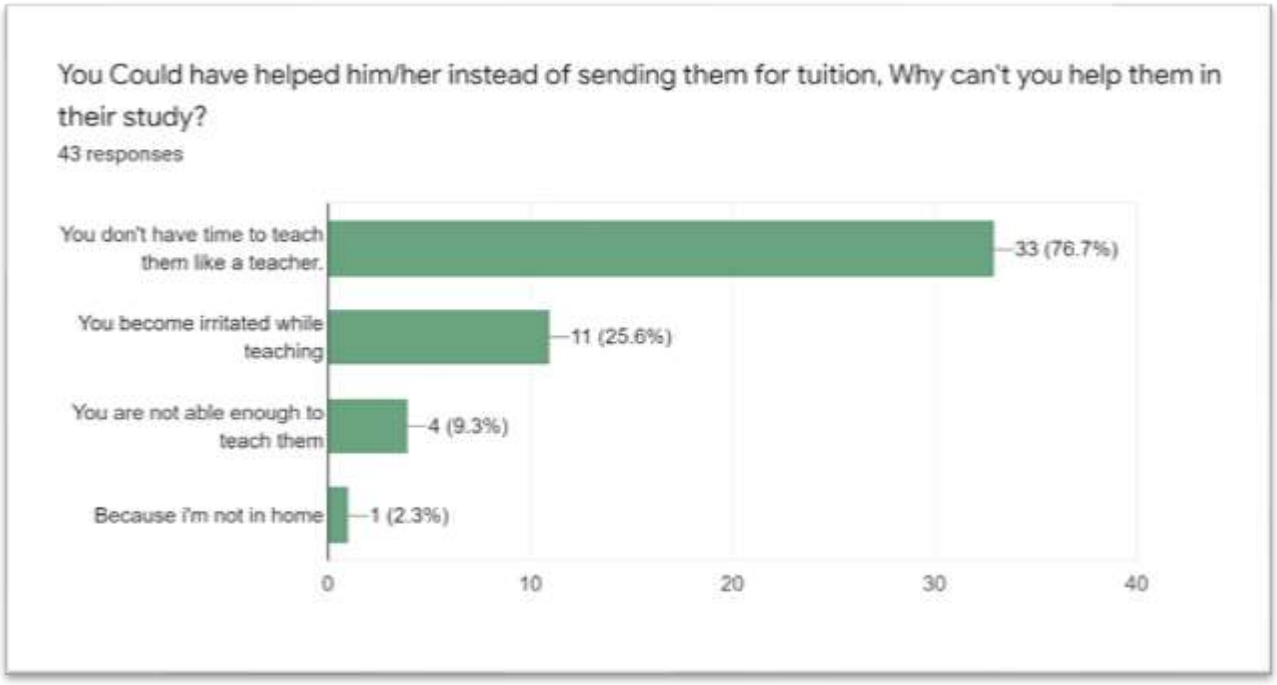


Figure 9 Survey result of: Why we can't teach our siblings.

Understanding solution: Children will be learning online, even if they don't understand a solution answered by any other user of PT, then in the comment section they would be able to ask more queries.

iv) Children who search solutions online don't find well-written and explained notes.
Many times, when we search for something online for hours, then we don't get well-explained answers. The below is a figure from a survey, where they were not happy with web answers.

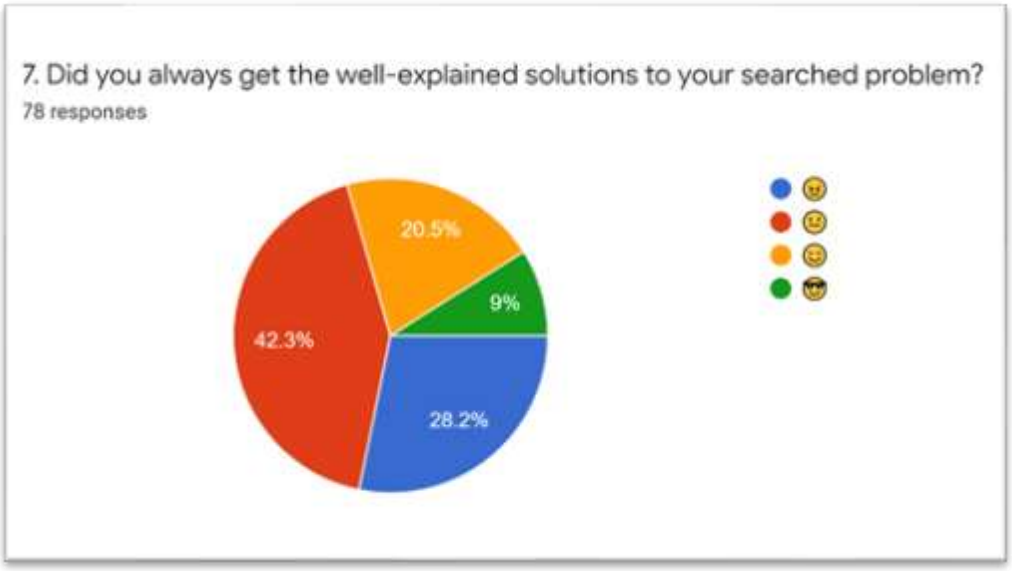


Figure 10 Survey result to know if they were happy with search result.

Till now, we all have understood the need for PT and how it will function. For simple and Omni view, let us see below figure

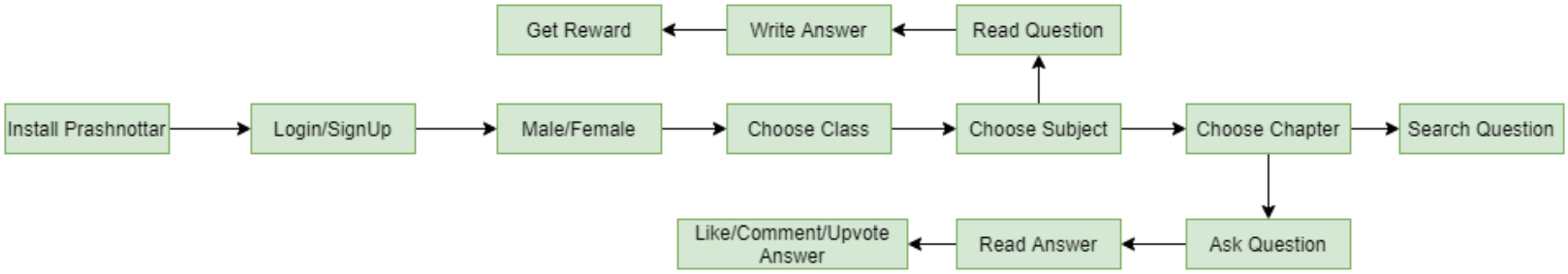


Figure 11 Understanding how Prashnottar will work.

2.3. Review of similar systems/apps/solution

Reviewing similar systems or apps which would be resonating with my solution is a great way to learn many things. Such as designs, technologies, approaches to users, etc. Below are some similar apps which I studied for further clarification:

i) Answers

'Answers' is the homework helping app and contributes to finishing students' faculty assignments from math and chemistry to records and biology. The app is devoted to assisting college students

with fixing phrase troubles, solving math equations, entire technological know-how homework, and lots more! User-pleasant Q&A webpage is the ad-free, fast, and limitless homework helper that scholars can matter on. Answers have over a hundred million questions and solutions and near 10,000 observe subjects like math, algebra, chemistry, calculus, technological know-how, physics, and biology (Google Play, 2021).

I have been using this app to know its potential and usage among students, I find it very helpful. The ad-free user interface and reward system made me a happy user. We can search for answers by writing a question in the search box, surprisingly it brings good answers. But, it seems that the app is still in the development phase. It's not completed yet. When we click particular subjects, then non of the subject is chosen.

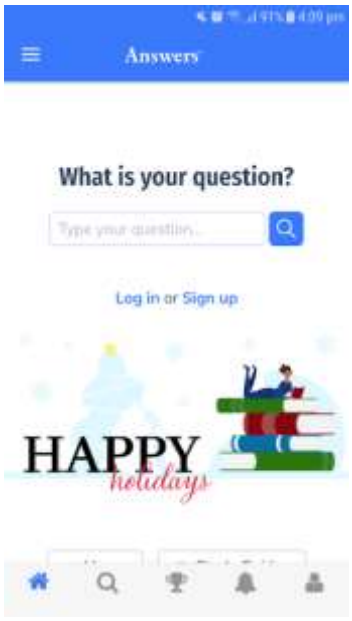


Figure 15 Answers app welcome page

Figure 14 Answers app subject dashboard

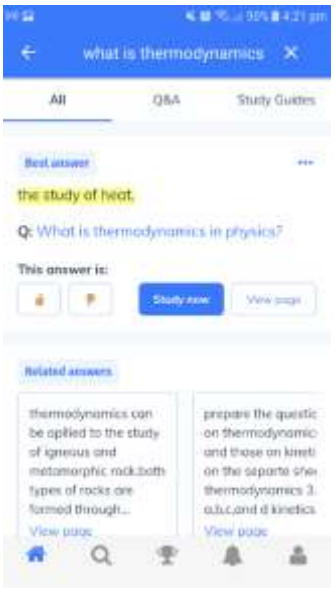


Figure 13 Answers app question asking system.

Figure 12 Answers app writing answer section.

ii) Bartleby

Bartleby is a homework helper app for students. It has a math answer scanner which will help to get a solution faster and easier. If we ask in the search bar, we will get good answers. We can choose a particular school textbook to answer to, it includes math, science, history, geometry, chemistry, engineering, business, and many more. We can snap a photo or send queries to our particular subject matter, we would be getting a proper answer within 30 minutes.

The only thing which I didn't like is that most of the basics and valuable features for students are available only for subscribed students (Google PlayStore, 2021).

Figure 18 Bartleby welccome page.

Figure 16 Bartleby questioning section.

Figure 17 Bartleby math solver section

iii) Mimo

Mimo is an online platform to learn to code, especially web designing and python language. It teaches users from basics to advance. It has a topic-wise explanation and exercises with the best animation and reward system. It allows us to make friends online, with coins and the streak we achieve, it creates competitiveness among each other (Google Play_Mimo, 2021). I liked everything about Mimo, the only thing they can improve is, they could add more topics to learn not just only web development and python.

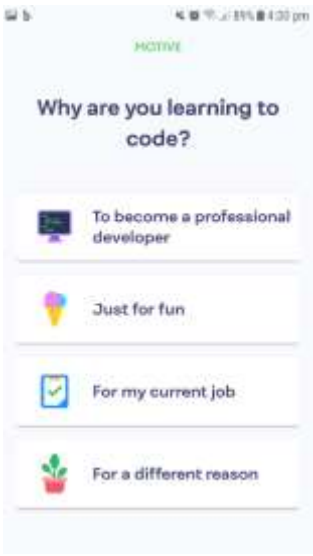


Figure 22 Mimo app welcome section

Figure 21 Mimo asking experience in coding.

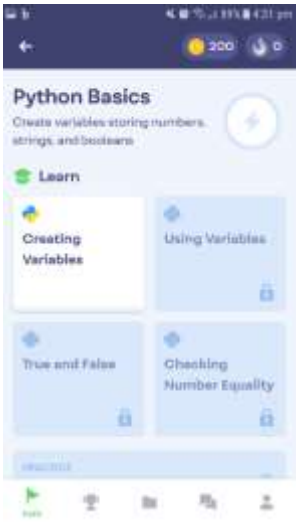


Figure 20 Python Dashboard of Mimo

Figure 19 Mimo exercise section.

iv) Saathi

Saathi is a free MCQ app for Maths and Science with over 250000 questions which all are created by IITians for students of classes 6,7,8,9,10. It can be used as a revision app to help them score more in the exam. There are Personalized Question recommendations powered by Saathi AI. It provides us a Real-Time Statistics and analysis of reports of our study. It provides a beautiful animated user interface that boosts students studying spirit (Google PlayStore, 2021).

Figure 26 Saathi app starting page.

Figure 25 Saathi app welcome page.

Figure 24 Choosing class in Saathi app.

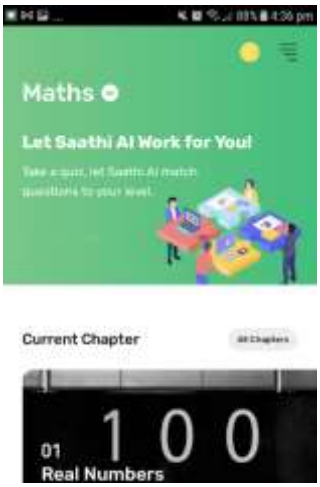


Figure 23 Maths section in Saathi app.

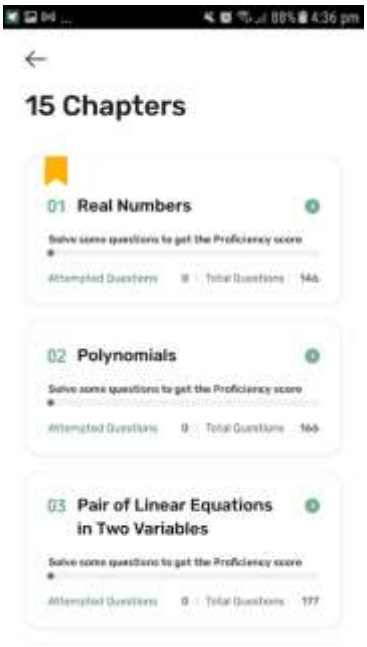


Figure 28 Chapter Section in Saathi app

Figure 27 Quiz section in Saathi app.

v) Khan Academy

For students, in Khan Academy, there are thousands of interactive exercises to do, videos to watch and learn, and lots of articles to read. We can study math, science, economics, history, and many more. Practicing exercises, quizzes, and attending tests can push students' academic performance. We can download videos and bookmark favorite topics which we could watch and study offline. There's nothing I didn't like about Khan Academy.

Figure 32 Welcome page in Khan Academy app.

Figure 31 Subject section in Khan Academy app.

Figure 30 Class choosing section in KA app.

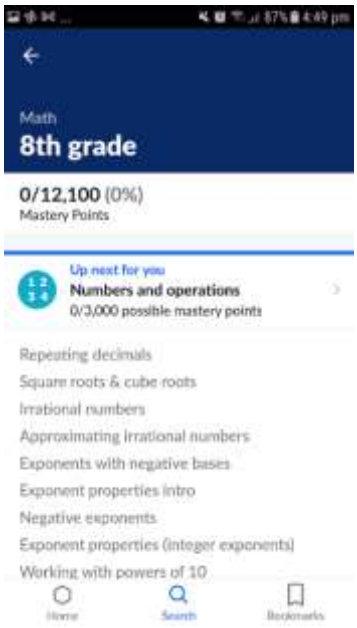


Figure 29 Math Chapters in 8th grade class of Khan Academy.

Name of Similar Application.	Positive Analysis.	Negative Analysis.	Features liked or taken.
1. Answers	Beautiful and simple UI. Users can ask a question and get an answer.	Subjects mentioned in the app don't function. The Reward system is not working.	Learned to make UI as simple and consistent much.
2. Bartleby	Simple and consistent UI. Only three dashboards are present on the home page but the whole app is functional. Math question scanner feature is also present.	Like, comment and upvote features are not present. It cannot help users to judge which answer is better.	Question scanner feature if implemented, the app could be better.

3. Mimo	Beautiful course and user dashboard, the reward system is best, able to make friends in this platform. Beautiful animated designs.	Only a few courses are available(web design and Python).	A better user dashboard and use of animation would be better for student apps.
4. Saathi	Beautiful logo buffering while loading, simple and consistent design. Bookmark and report display features are best.	Only two subjects, Math and Science are present.	Bookmark and statistics report display of user would be great.
5. Khan Academy	Ad-free, clean, and pleasant User experience.	Everything is best.	An ad-free and systematic approach is needed.

Table 1 Analysis of Similar app.

2.4. Review of Similar projects

i) MeroStudy

MeroStudy is a Nepali educational mobile app and web portal which brings contents entire educational sector. It continuously provides information regarding the educational resources We can get notification and update of reslut visited educatioinal website in Nepal (Google play store, 2021).

The only things I liked is, it not only want to deliver educational topics to students but also it brings news on different vacancies, events, scholarship, admissions, universities, courses and many more. But, I don't know why, it's been two months, I am trying to use this app but it's not working, only tab bar and user settings are opened and all contents are empty.

Figure 34 MeroStudy welcome Page

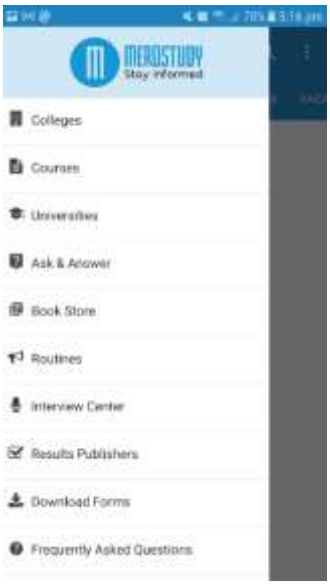


Figure 35 MeroStudy settings.

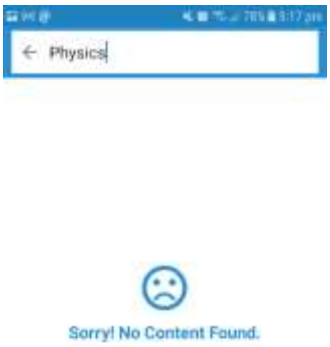


Figure 33 MeroStudy question asking section.

ii) Neema Academy

Neema Academy is a Nepali ed-tech startup formed in 2018. It offers on-demand videos, 3D animations, game-based teachings, textual explanations, and many more study topics. It aims to bridge the gap between in-class learning and visual-knowledge-based learning.

In the app, we cannot search for answers by posting questions but search only for subjects or chapters. It doesn't contain bookmark features, but it does have a progress page where we could view our progress over the week.

Figure 37 Neema Academy User Dashboard.

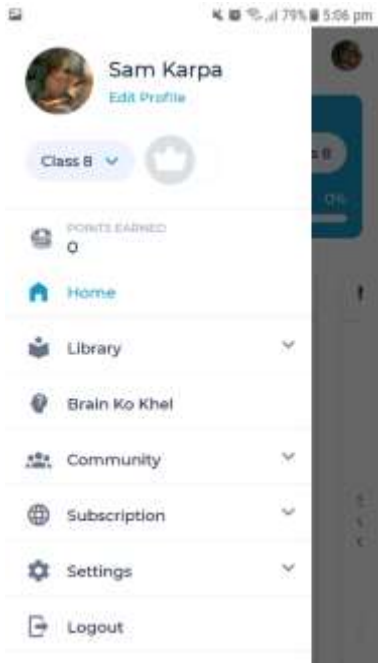


Figure 38 Neema Academy settings section.

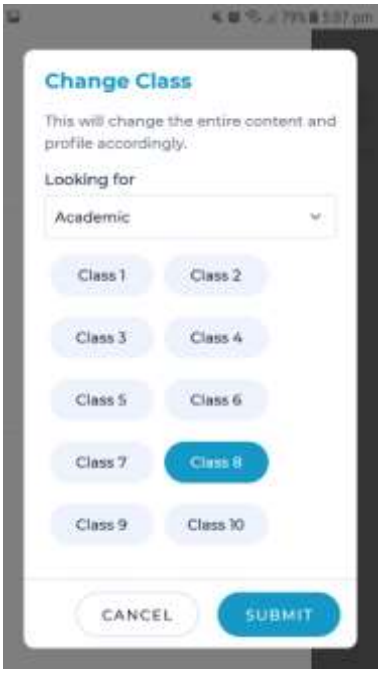


Figure 36 Choosing class in Neema Academy.

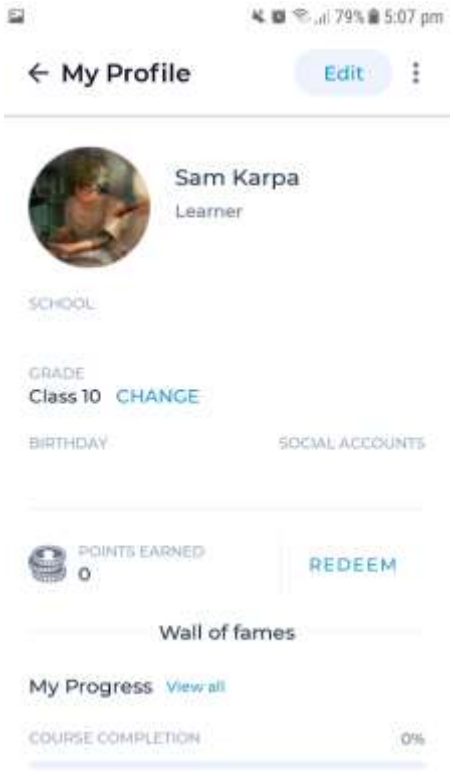


Figure 41 User Profile in Neema Academy

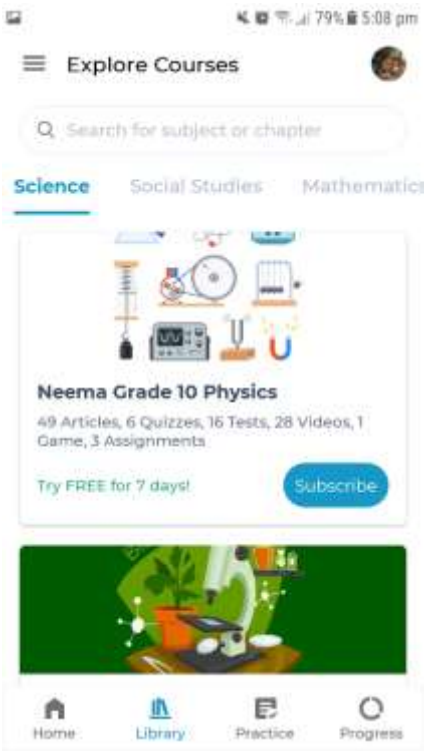


Figure 40 Subject Section in Neema Academy.

Figure 39 Chapter Section in Neema Academy

Figure 42 Video Explanation section in Neema Academy.

iii) Kullabs

Kullabs is an app developed by Kul Techno Lab and Research Centre. Their free product kullabs.com has been providing service to more than 70000 users. There are notes and related videos from youtube for each listed topic. There are solved exercises from each topic. We can select class, then subject, and then can choose any topic to study or revise.

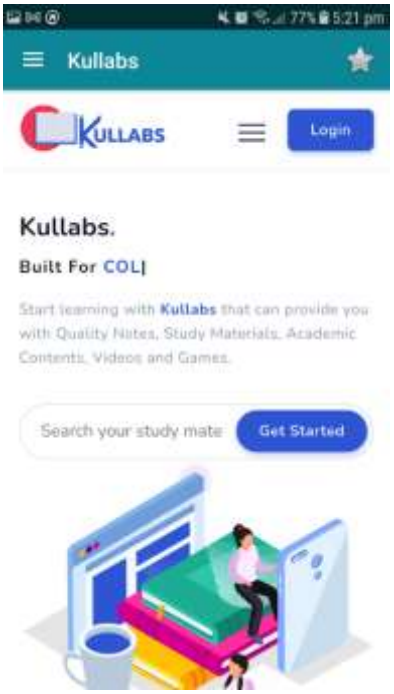


Figure 45 Khullabs Welcome page.

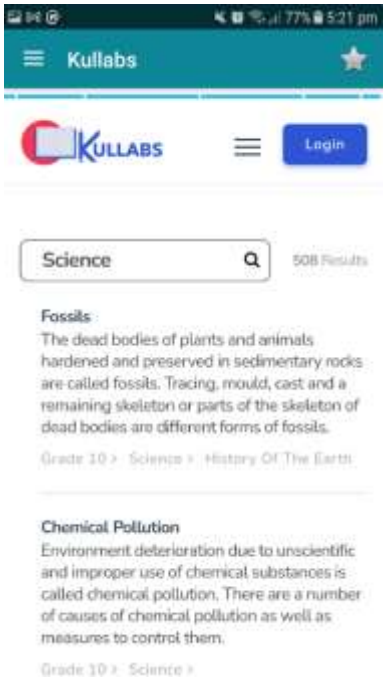


Figure 43 Kullabs question answer section.

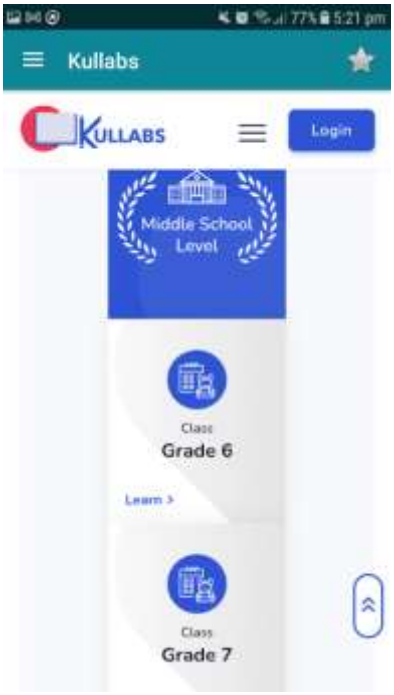


Figure 44 Choosing class section in Kullabs.

Figure 48 Subject section in Kullabs

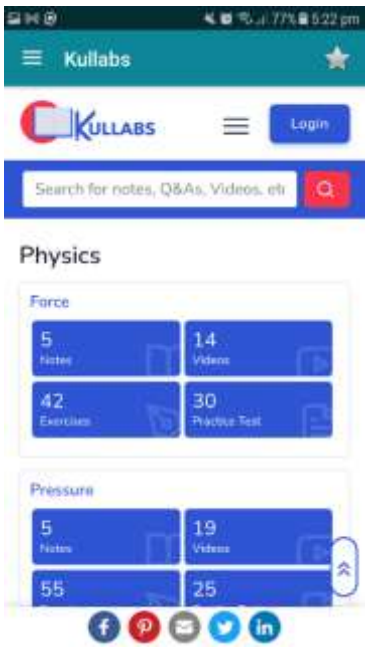


Figure 46 Kullabs subject section.

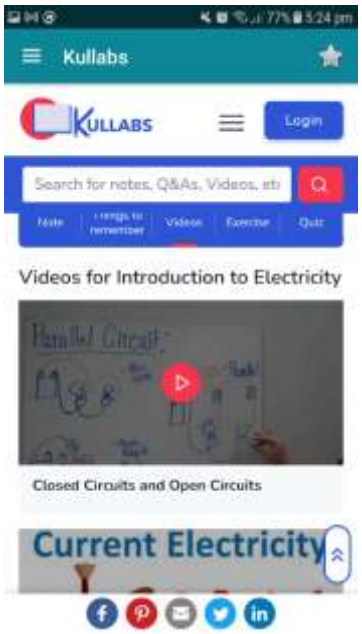


Figure 47 Kullabs video section.

iv) Developing Mobile app for Students – Journal Paper

This paper describes an assignment designed to sell hassle fixing and crucial wondering abilities in popular education, computing path at an open get right of entry to the institution. A visible programming tool, GameSalad, became used to allow college students to create instructional apps for cellular platforms. The college students labored on a sport improvement assignment for the whole semester, incorporating numerous abilities found out during the semester. Pre and submit quiz evaluations confirmed a vast development in college students' capacity to layout complete answers to a given hassle. Survey consequences additionally confirmed expanded student engagement, excessive hobby in computing, and "better" know-how of facts technology.

From the paper, I understood that the student can understand study topic better if they enjoy studying it instead of just reading from lecture slides and research. If study becomes playful, then our classroom can become our playground. (Xin xu, 2021)

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Mobile App Development to Increase Student Engagement and Problem Solving Skills

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ABSTRACT

This paper describes a project designed to promote problem solving and critical thinking skills in a general education, computing course at an open access institution. A visual programming tool, GameSalad, was used to enable students to create educational apps for mobile platforms. The students worked on a game development project for the entire semester, incorporating various skills learned throughout the semester. Pre and post quiz analysis showed a significant improvement in students' ability to design comprehensive solutions to a given problem. Survey results also showed increased student engagement, high interest in computing and a "better" understanding of information technology.

Keywords: Creative problem solving, Critical thinking, General education, Mobile computing

1. INTRODUCTION

With the advancement of technology, computer hardware and software have become essential tools not only for science and engineering fields, but also for business and liberal arts disciplines. For example, in physiology, computers have been used to assist psychological assessment (Fowler, 1985, p.748); in

technology (IT) programs have suffered (Uhadag et al, 2011, p.183) (Computing Research Association, 2011) and students therefore lose out on prime opportunities to develop their problem solving skills and critical thinking ability. Researchers have investigated and discovered that traditional programming courses fail to connect programming and CS concepts with students' diverse interests and backgrounds

authors of this paper

made e-commerce the n

ntax of traditional

Figure 49 Journal Paper of GameSalad, mobile app.

2.5. Review Of technical aspects

This section will be discussing different aspects of software and hardware necessary for 'Prashnottar'.

2.5.1. Programming Language

2.5.1.1. Dart

The Dart programming language is an open-source, general-purpose, OOP language with C-style syntax first launched back in 2011 at a conference in Denmark. Flutter was launched in 2018. Flutter is a UI library with a set of developer tools that uses dart to build web, mobile, and desktop software. For me, a dart is used to make an android mobile app.

It supports classes, interfaces, functions, unlike other programming languages. Surprisingly, it supports the collection, which is used to replicate the data structure such as arrays, generics, and optional strings. Dart is a strongly typed programming language. It means each value has type either string or number. Also, it is a type-safe; it uses static type checking to make sure the variable's value always matches the variable's static type. Dart offers sound null safety, which means that values cannot be null unless we declare them to be. The happy thing about Dart is; Dart VM offers a just-in-time compiler (JIT) with incremental recompilation enabling hot reload, live metrics collections, and rich debugging support (Dart, 2021).

Strong reasons why I chose The Dart:

i) Dart uses Ahead Of Time (AOT) which compiles code fast into naïve. It makes it favorable for developers to code accurately and checks for the response, thereby delivering the program instantly. Customization for developers becomes quick.

ii) Developing animations and transitions are great as animations run at the speed of 60 frames per second.

iii) Dart allows Flutter to avoid the separation of declarative layout languages like JSX and XML.

iv) Dart can also be compiled into Javascript and it allows Flutter developers to use code between mobile and web apps.

v) Dart does object allocation and garbage collection without any locks and does not need preemptive scheduling and shared memory (KodyTechnoLabs, 2021).

2.5.1.2. PHP

PHP stands for "Hypertext Preprocessor". It is widely used in web and mobile software as it an open source scripting language. The first version of PHP was launched 26 years ago. It is executed on the server. It's current version is 8 but 7 remains the most widely used. PHP runs on the Zend engine. Parrot, HPVM(Hip Hop Virtual Machine), and HIP HOP are some well known implementation of PHP (FreeCodeCamp, 2021). PHP is mostly used for making web servers, but also capable of running in command line.

Strong reasons for choosing PHP laravel:

i) PHP is platform-independent. It runs on every platform, whether it's Mac, Windows, or Linux (FreeCodeCamp, 2021).
ii) PHP is an open Source.
iii) PHP is easy to learn for beginners.
iv) PHP has in built support for working hand in hand with MySQL, also I am using MySQL to create database.
v) PHP has a very supportive online community, which I sinerely need (FreeCodeCamp, 2021).

2.5.2. IDE

2.5.2.1. Android Studio

I've decided to use Android Studio to develop my FYP. It is integrated development environment (IDE) especially for Android application development. But for Flutter, app can be build more easily. I've been using it since mid of 2020. It uses Gradle-based build system, emulator, code templates and Github integration which are very helpful. Androids' Instant Push feature to push code and changing into running application is wise and great use in practical world.

i) Android Studio is a professional IDE specifically designed to accelerate the process of Android mobile app development. It picks the changes in the code very soon. This change is seen without restarting the app.
ii) It integrates Gradly build system which offers dependency management.

iii) Editor recommends advanced code compilation and code analysis.

iv) It supports emulator.

v) Lintelligence figure a variety of issues such as Performance, Security, and Correctness in one click.

vi) The APK analyzer provider checks all contents inside our APK.

There are many other features which made me develop PT in android studio, but hope above statements are enough.

2.5.3. Libraries

i) Fl_chart

It is a powerful flutter chart library which supports line chart, bar chart and pie chart.

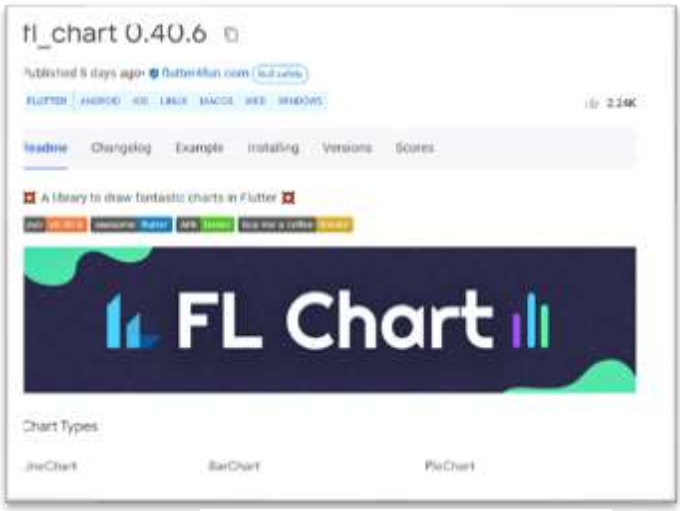


Figure 50 fl_chart library used in PT.

ii) Package_info

It is a flutter plugin for querying information about the application package, such as CFBundleVersion in both IOS and Andriod.

Figure 51 package_info library used in PT

iii) Font_awesome_flutter

The Font Awesome Icon pack is available as Flutter icons.

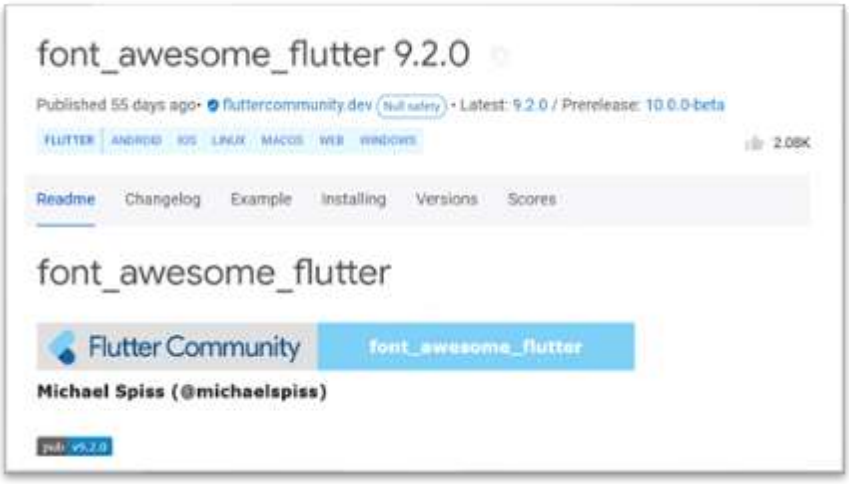


Figure 52 font_awesome_flutter library used in PT

iv) Intro_slider

It is a flutter plugin that helps us to make a cool intro for our apps.

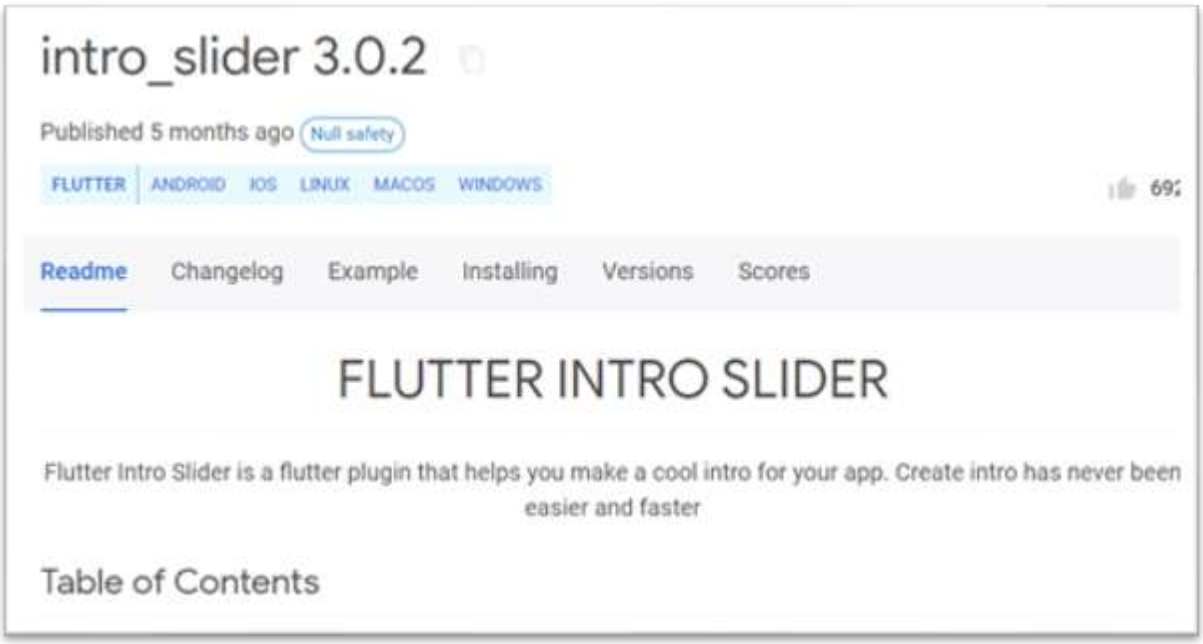


Figure 53 Intro_slider library for PT.

v) Buttom_navy_bar

It is a lightweight, customizable navigation bar widget for flutter. It can be used as a FAB as well as a fixed Widget.

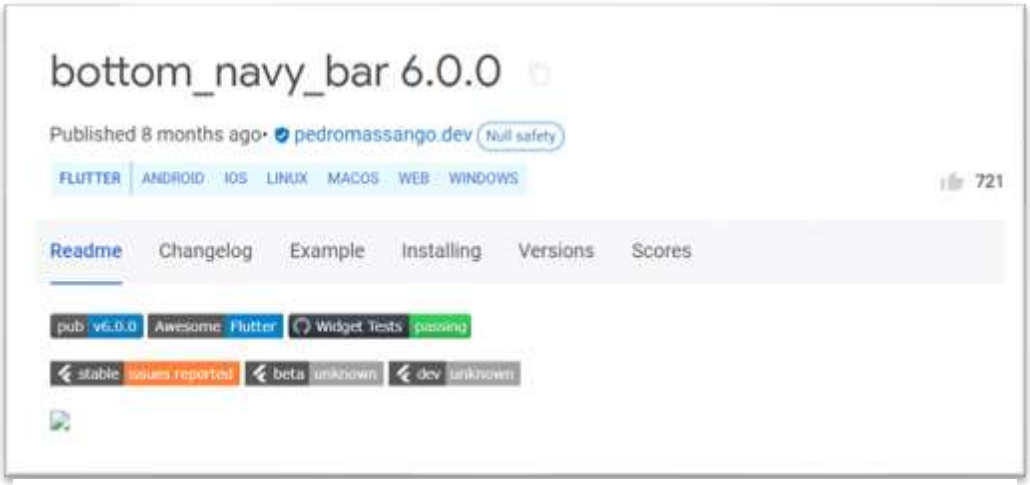


Figure 54 Buttom Navy bar plugin for flutter to make PT

2.5.4. API

REST API:

REST API stands for **RE**presentional **S**tate **T**ransfer and **A**pplication **P**rogramming **I**nterface. It is an architectural style that defines a set of rules to create web services. In a Client-server communication, REST instructs to create an object of the data requested by the client and send the values of the object in response to the user.

Reasons to choose Rest API:

i) It is easy to learn and understand.

ii) We can organize complicated applications and make easy use of resources.

iii) The high load can be managed by HTTP proxy and cache.

iv) HTTP procedure call-outs are carried to retrieve data and requests.

v) With the use of Oauth protocols verifying REST requests, the security of a network is strong.

Chapter 3 – Development

3. Development

3.1 Approach/Methodology Considerations

Software development life cycles (SDLC), is a process used by software engineers to ensure the quality and correctness of the built software. It makes sure, the development is completed in the pre-defined time frame and cost. It tracks and controls different development phases of software development. With speed, it reduces project risks and enhances project management overall with a result of a happy client relationship. (Guru, 2021) Different phases of SDLC are as follows:

- Requirement Analysis
- Feasibility Study
- Design
- Coding
- Testing
- Install Deploy
- Maintainance

Popular SDLC models which I considered using, but was not familiar with some of them are:

- Waterfall Model -
- Prototype Model -
- Incremental Model
- V-Model -
- Spiral Model -
- Big Bang Model
- Rational Unified Process (RUP)

Let me explain a few of the above-mentioned methodologies.

- **Waterfall Model.**

The waterfall model is the earliest Process Model to be introduced. The development process is divided into separate phases. Each phase must be completed before the next phase can begin so there is no overlapping. The output of one phase will be acting as the input for the next phase sequentially. (Point, 2020)

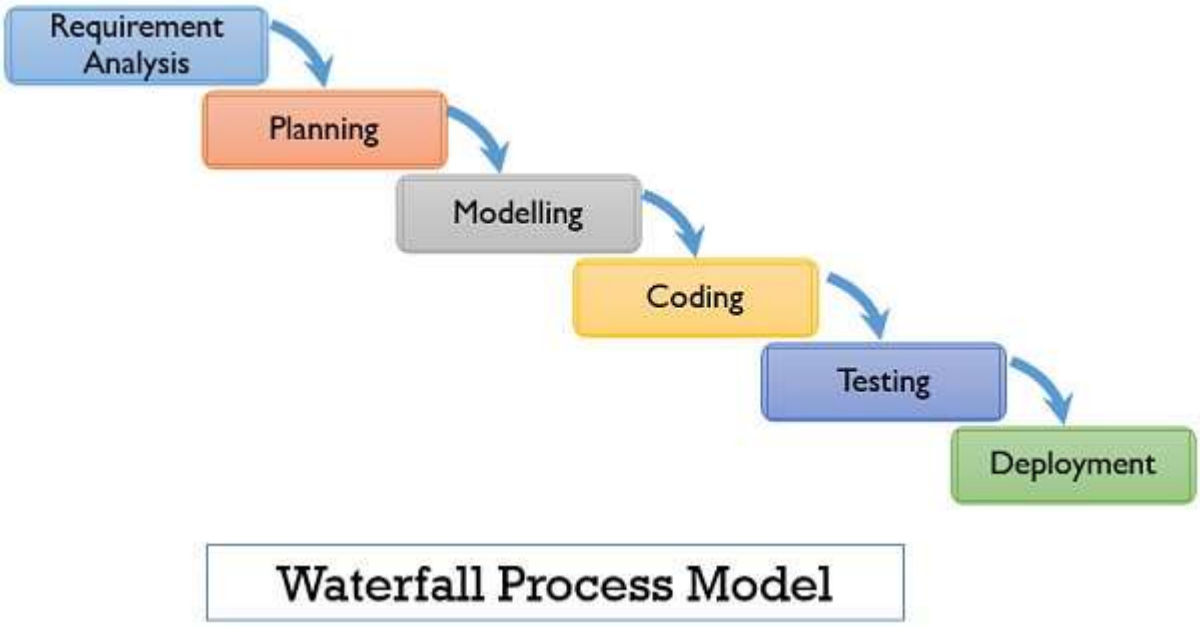


Figure 55 Waterfall model

Advantages of Waterfall Model

- It is quite simple and smooth to recognize and use.
- The requirement is thoroughly documented, clean, and fixed.
- Technology is thought and isn't always dynamic.
- There aren't any ambiguous requirements.
- Ample sources with required information are to be had to guide the product.
- The task is short. (Point, 2020)

Disadvantages of Waterfall Model

- Until late during the life cycle, no working software is produced.

- Too much risk and uncertainty.
- Bad for complex and object-oriented projects.
- Terrible for long and ongoing projects.
- Cannot assist change requirements. (Point, 2020)

❖ Incremental Model

Here, requirements are divided into multiple standalone modules of the development cycle. Each module must go through the requirements, design, implementation, and testing phases. Succeeding the release of the module adds function to the previous release. The process is continued until the system is completed. (JavaTPoint, 2020)

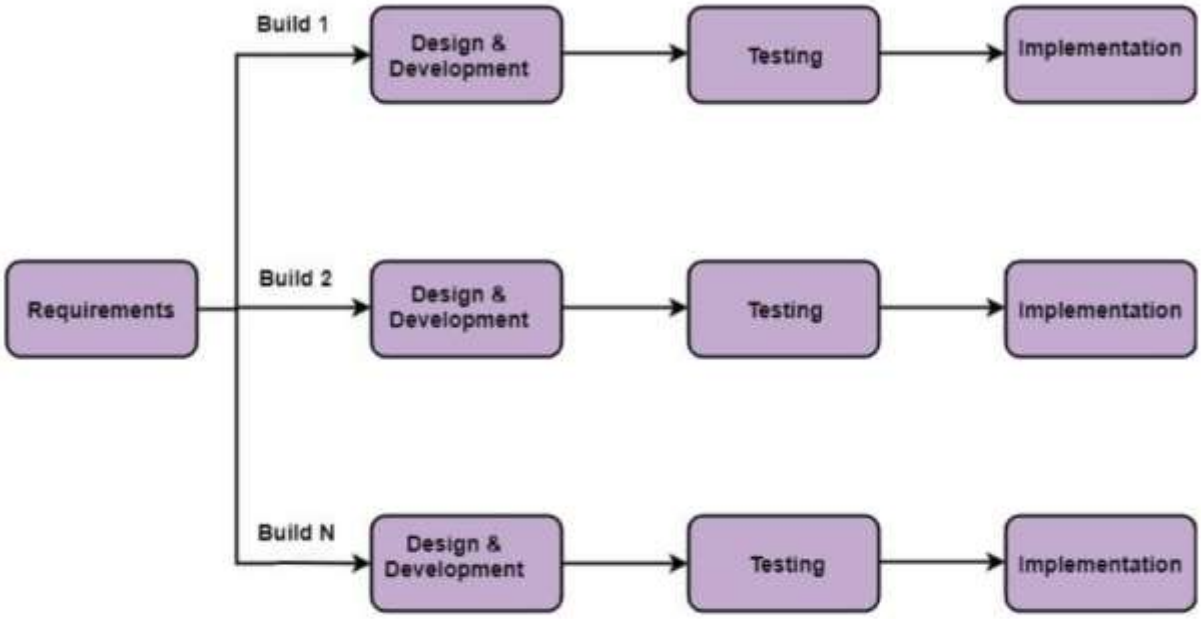


Fig: Incremental Model

Figure 57 Incremental model.

Advantages of Incremental Model.

- Errors are easy to recognize.
- Testing and debugging are easy.
- It is more flexible.

- Risk can be managed simply.
- The client is important. (JavaTPoint, 2020)

Disadvantages of Incremental Model.

- Good planning is needed.
- The total cost is high.
- Good module interfaces are needed. (Point, 2020)

❖ **V-Model**

In this model, the execution of processes happens sequentially in a V-shape. Explicitly known as Verification and Validation model. (tutorialspoint, tutorialspoint, 2020)

It is the same as the waterfall model which is based on the association of a testing phase for each corresponding development stage. It means for every single phase in the development cycle, the testing phase is directly associated. This is a distinctly disciplined model and the next phase starts only after completion of the previous phase. (Point, 2020)

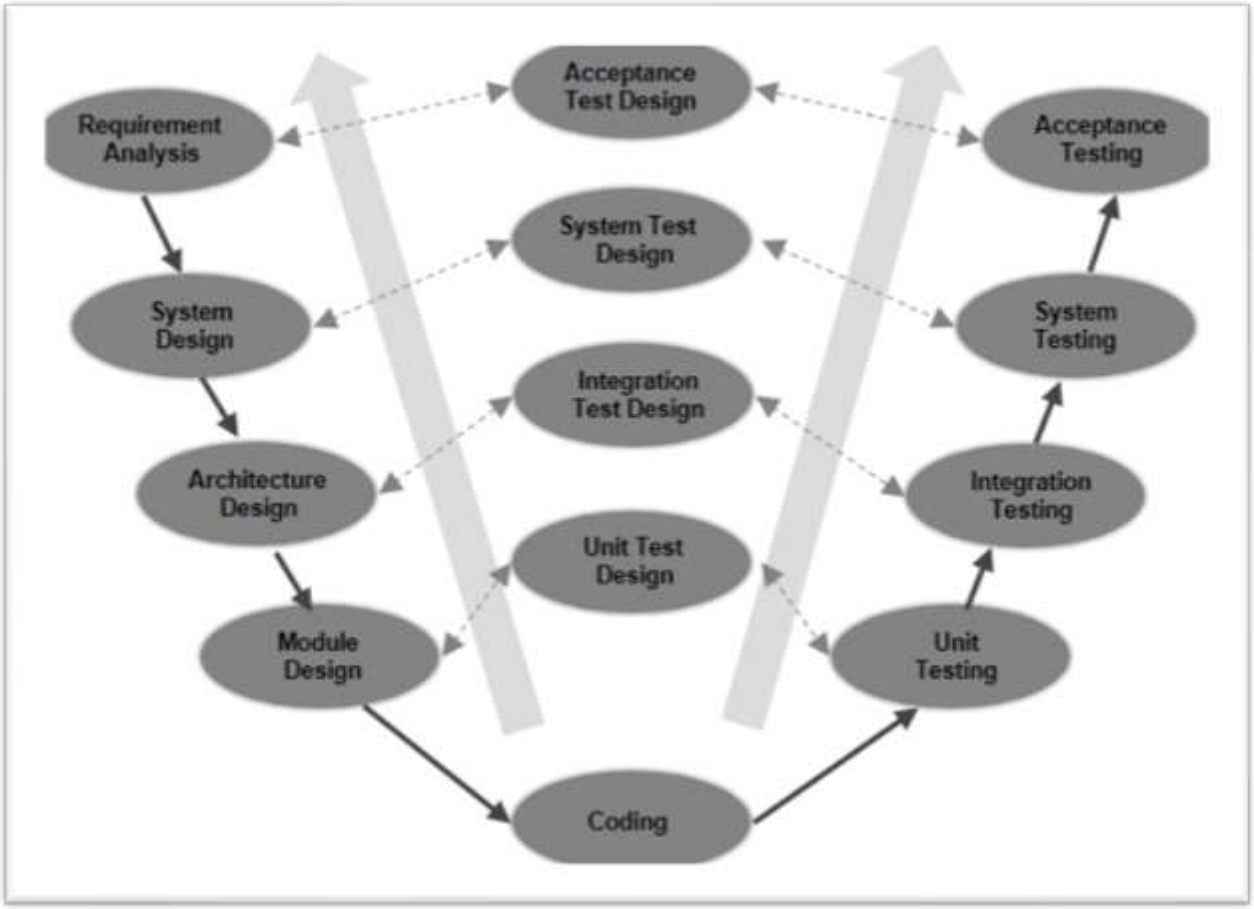


Figure 58 V-Model

Advantages of V-Model

- Requirements are defined well defined.
- Product definition is stable.
- Since technology is not dynamic so it is well understood by the project team.
- It would work well for tiny projects where requirements are very well understood. (Point, 2020)

Disadvantages of V-Model

- There is high risk and uncertainty.
- It is bad for complex and object-oriented projects.
- Cheap for long and ongoing projects.

- There isn't a working software produced until late during the life cycle. (Point, 2020)

❖ Spiral Model

This model combines the idea of iterative development with systematic, controlled aspects of the waterfall model. It allows incremental releases of the product through each iteration around the spiral. (tutorialspoint, tutorialspoint, 2021)

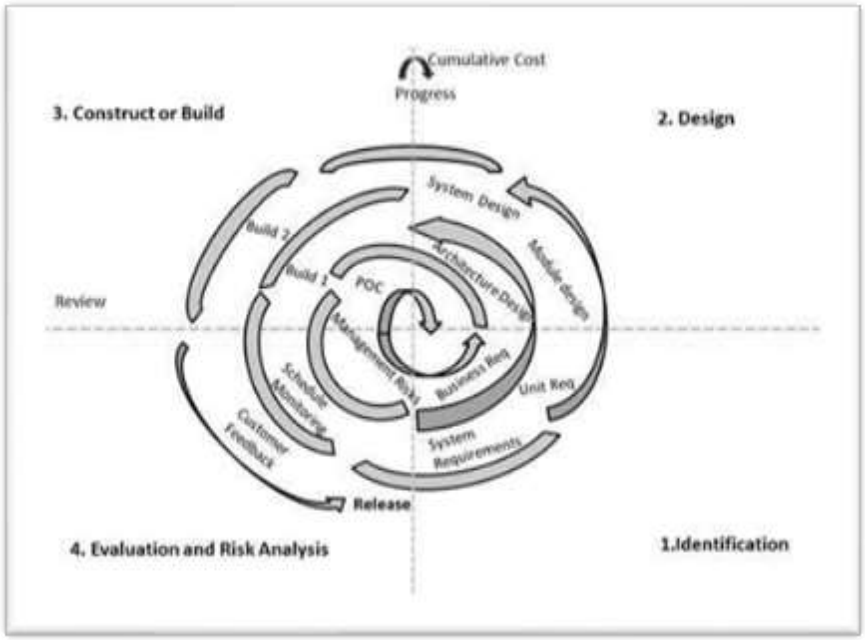


Figure 59 Spiral model.

Advantages of the Spiral model:

- Requirements can be added as it needs a change.
- The explosive use of prototypes is allowed.
- Requirements are recorded precisely.
- Users can view the system early.
- The whole development can be divided into smaller parts.

- Risky parts can be developed earlier which helps in risk management. (tutorialspoint, tutorialspoint, 2021)

Disadvantages of Spiral-Model

- Management becomes more complex.
- The project end date cannot be known earlier.
- Spiral might not go as defined.
- Intermediate stages require excessive documentation. (tutorialspoint, tutorialspoint, 2021)

3.1.1. Justification for Selecting or Rejecting the above Methodology

3.1.1.1 Justification for rejecting Waterfall Model

Project Scenario	Justification
The FYP must be completed within six months and must have successful development stages and a clear deadline.	This model is too much risky and is uncertain.
The FYP is complex and works around some classes and objects.	It is very bad for complex and object-oriented projects.
With time, the project might include different features and designs.	It cannot assist change requirements.

3.1.1.2 Justification for rejecting Incremental Model

Project Scenario	Justification
Need for good planning designing.	A very good planning design is not always to be expected by a student.
Well-defined module interfaces are needed.	The not very module can be finished on time according to Gantt and if not, then further work cannot begin.

Rectifying a problem in one unit requires correction in all the units.	It consumes a lot of time

3.1.1.3 Justification for rejecting V-Model

Porject Scenario	Justification
No prototype guidance is available.	It is developed during the implementation phase, so no initial prototypes for the software are produced.
Mass updating	Massive updates must be done in both test documents and require documents if there is any fault in the system.
Rigidity	It is very rigid and hard to execute as it has limited flexibility and is not suitable for OOP software.

3.1.1.4 Justification for rejecting Spiral Model

Project Scenario	Justification
It has complex processes.	High experts and professionals are required to run the model.
No end goal.	At the early stages of the project, the end date of FYP cannot be evaluated.

3.2 Stages of the chosen methodology

RUP(Chosen Methodology):

I have chosen Rational Unified Process (RUP) for the methodological roadmap to build 'Prashnottar'. It is based on Agile methodology which splits the project life cycle into four phases where on each phase, all six core development disciplines take place which are: business,

modeling, requirements, analysis and design, implementation, testing, and deployment. (Study, 2021)

I have chosen RUP to create high-quality software with a predictable budget and time frame. The most beautiful thing about RUP is, each of the life cycle phases can be repeated, if needed. Let us discuss the 4 phases of RUP in detail:

Inception

I. Scheduling Resources
II. Cost and Time Estimation
III. Planning
IV. Risk Management
V. Prototypes and Development

In the Inception phase, we will have a general vision for the project initiative with multiple parameters. We will get the project scope. (Master, 2020)

Elaboration

I. Analysis of problem domain
II. Use Case Diagram Development
III. System Architecture Development

In the Elaboration phase, we will get functional and non-functional parameters. We will understand the full Software Architecture Description. We might be able to justify whether to prove the project plan or not. We will fully have the result of actual resource cost versus planned resource. (Master, 2020)

Construction

I. System Build
II. System Operational Manual
III. User Manual
IV. Test Cases

In the construction phase, we will be ready to develop all components and features and integrate them into the product. We will fully focus on managing resources to optimize costs, schedules, and quality. The software will be designed, written, and tested successfully. (Master, 2020)

Transition

I. Training
II. Beta Testing
III. Analysis of User's Review
IV. Supporting & maintaining product

In the Transition phase, the last phase is the phase where the product is finally finished, released, and delivered to the customer. In this phase, bugs will be fixed, correct the problems and finish the features which were postponed. This is the phase of deployment after successful beta testing. (Master, 2020)

Strong reasons why I chose RUP:

Project Scenario	Justification
It follows Agile principle number 2.	It welcomes required changes, even late in development.
Documentation is power for any project.	It provides proper documentation of the software.

- It helps to change requirements in the project whether they are coming from customers or from the project itself.
- It welcomes change at any time.
- It provides proper documentation of the software product.
- It helps to find issues early in the process life cycle.
- It reduces development costs and improves process control and risk management.

Cons of RUP

- Individuals must be experts and professionals in their respective fields to develop.

- The integration in the development process might hurt some more fundamental activities such as testing.
- Multiple stages of the workflow might be complex.
- It is challenging for organizations to implement which has small teams or projects. (Master, 2020)

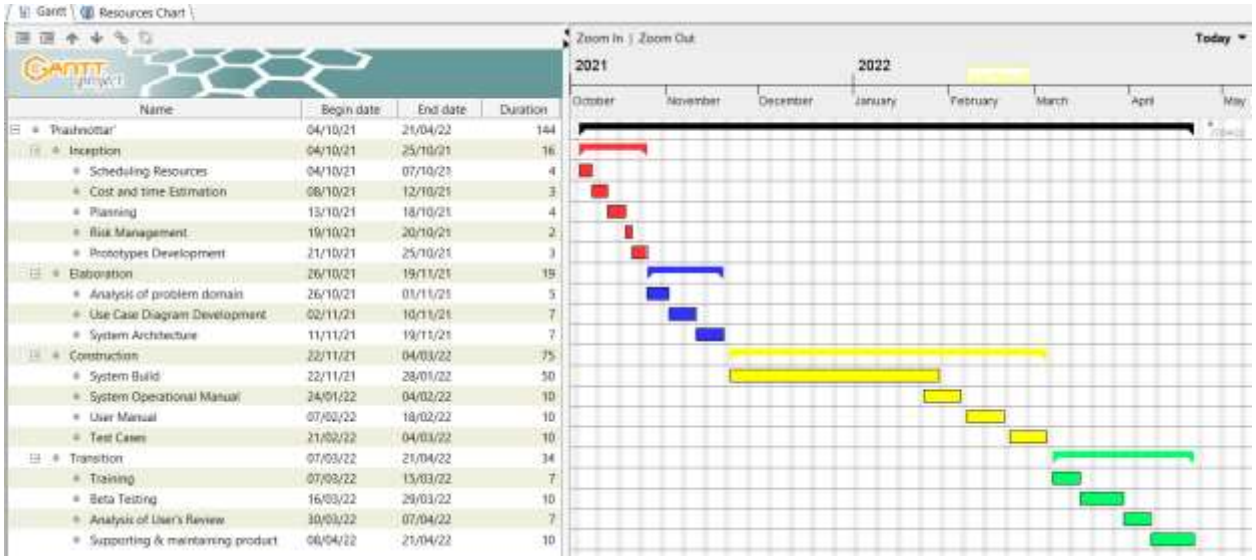
Why didn't choose Scrum?

- A scrum master is needed, also he/she has to be experienced and very committed.
- An inexperienced Scrum master will ruin the development process. (Techvera, 2020)

Why I didn't choose Kanban?

- An up-to-date Kanban board is needed. Since I have to study other modules also so it can be very difficult for me to keep them up to date.
- Why I didn't choose Extreme Programming?
- Customers must participate in the process.
- Large time is invested.

Some specialists say that EP is more focused on the code rather than on design, but for me 'Prashnottar' must have great UI/UX. (Kukhnavets, 2018).



Chapter 4

4. Progress

Progress in another vital chapter of the interim report. Whatever steps I've completed in WBS and concerning the date of the Gantt Chart, truthfully I would like to present to you my progress.

4.1. Progress till date

4.1.1. Feasibility study:

It is a part of the initial design stage of any project or plan. I did a feasibility study to uncover the strengths and weaknesses of the proposed FYP.

a. Firstly, I did a research and survey to find the necessity of 'Prashnottar'. Various problems of survey participants were disclosed along with students still facing at present. As the problems were recorded, the solution was also drawn.
b. I collected similar apps, those apps which were successful, in their respective domain and countries. I learned different solution approaches, technical aspects, and design ideas.
c. I noted necessary time estimation and made mandatory plans.
d. At last, I figured risks to projects from the research of similar projects.

4.1.2. Business Study

a. In taking this study in a business way, I tried to research scope and future stability. I mean I wanted to know the revenue generated by these kinds of apps in other countries.
b. Surprisingly, I found that without subscription or membership also, apps are generating revenues by ads and marketing other premium features.
c. But in Nepal, it's very difficult to find skilled manpower to work on this kind of project, as skilled and experienced ones are needed.
d. If this FYP is started as a start-up it would be very helpful for students but it would not be able to generate a considerable sum as Nepalese still don't believe in spending online.

4.2. Progress Table

Progress till the date of the Inception phase.

	Tasks	Progress	Performed Action
Inception Phase	Project topic approval.	Completed.	Before competing for the final proposal of FYP, it was accepted by my First Supervisor: Mr. Ravi Rouniyar
	Project Conceptualization	Completed.	Technical aspects while making the android app were researched since the first final proposal submission.
	Risk Analysis	Completed	Asked passed out seniors. Also learned from studying similar projects.
	Prototype development	Completed	Using canva at first and Adobe xd afterward.

Table 2 Progress till date. (Inception).

Progress till the date of Elaboration phase:

	Tasks	Progress	Performed Action
Elaboration Phase	Analysis of Problem domain	Completed.	The problem domain was previously discussed in the first FYP proposal.
	Use Case Diagram Development.	Completed.	With the identification of primary and secondary actors, useful use cases were identified. Present in appendix B.
	System Architecture Development.	Completed	Frontend designs and backend design architecture were discussed with the supervisor.

4.3. Analysis Of Progress

The first two phases of RUP are finished, according to the date in the Gantt chart I should have started coding PT using flutter and dart. But with my mistakes, I have learned to start early and finish as soon as possible. I tried to make a login page with the help of Oauth 2.0, but still, it's not finished. I didn't want to share the half-done work of PT. Making wireframes and UI designs helped me a lot understand PT in-depth, of how it would function. Doing research on similar projects and app helped me by showing the direction of design and implementation.

To give an analysis of Progress:

i) Delayed construction phase.

ii) Also, many prototypes, wireframes, and researches were not done on time.

Chapter 5

5. Further Work

Construction Phase	Tasks	Progress	Action to Perform
	System Build	Just Started.	Start to code, add libraries and follow the Gantt chart dates.
	System Operational Manual	Incomplete.	Finish System Build first.
	User Manual	Incomplete.	Create APK of Prashnottar and distribute.
	Test Cases	Incomplete.	After building APK.

Table 3 Further work of construction phase.

As clear above in table 3, I have only started to build a user login page but with no verification. I have started to take various flutter courses from youtube and Linkedin learning, hope it would help me to build PT. I can build necessary designs in-app from UI by studying and researching in the official flutter documentation website. The construction phase will finish by February 1st week.

	Tasks	Progress	Action to Perform
Transition Phase	Training	Incomplete.	Use beta version.
	Beta Testing	Incomplete.	Distribute it to other friends.
	Analysis of User's Review	Incomplete.	Gather reviews from others.
	Supporting & maintaining the product.	Incomplete	Complete it before the submission of the final documentation.

Table 4 Further work of Transition phase.

As seen in above table 4, all of the training and users' feedback is not completed. The transition phase will start on February 2nd week.

6. Conclusion

In life we see, even long roads have an end to them, and the same goes for this coursework (CW). Finally, to conclude, I've got a wonderful opportunity to revise software methodologies during the journey of this interim report. I come across many issues such as Use Case, Gantt Chart, designing Prototype, and researching about similar apps. Their use in software development. After finishing the Interim report I had a blast of happiness and little sadness at the same time. I have learned so many things, especially from research and my mistakes. The report itself was not that much difficult but things started to show up when very few took part in the survey.

A lot of time I needed to ask the supervisor about my interim report progress, but he was also very busy since he has to give his time to other students as well. But my basketful thanks goes to Mr. Ravi Rouniyar Sir for always being there and helping me when I was in trouble.

Everything considered, in the end, I would like to say that researching, planning, and analyzing any kind of project seriously takes a lot of time. I now have learned to sit in front of a laptop screen for several hours without distraction and complaints. Hope to study at this same pace to be a good software engineer someday and make an impact in others' life.

Thank you. Peace. God bless you.

7. References

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Appendices

Appendix A: Survey Result

Below, question and answered responses are presented:

1. The total number of Survey participants.

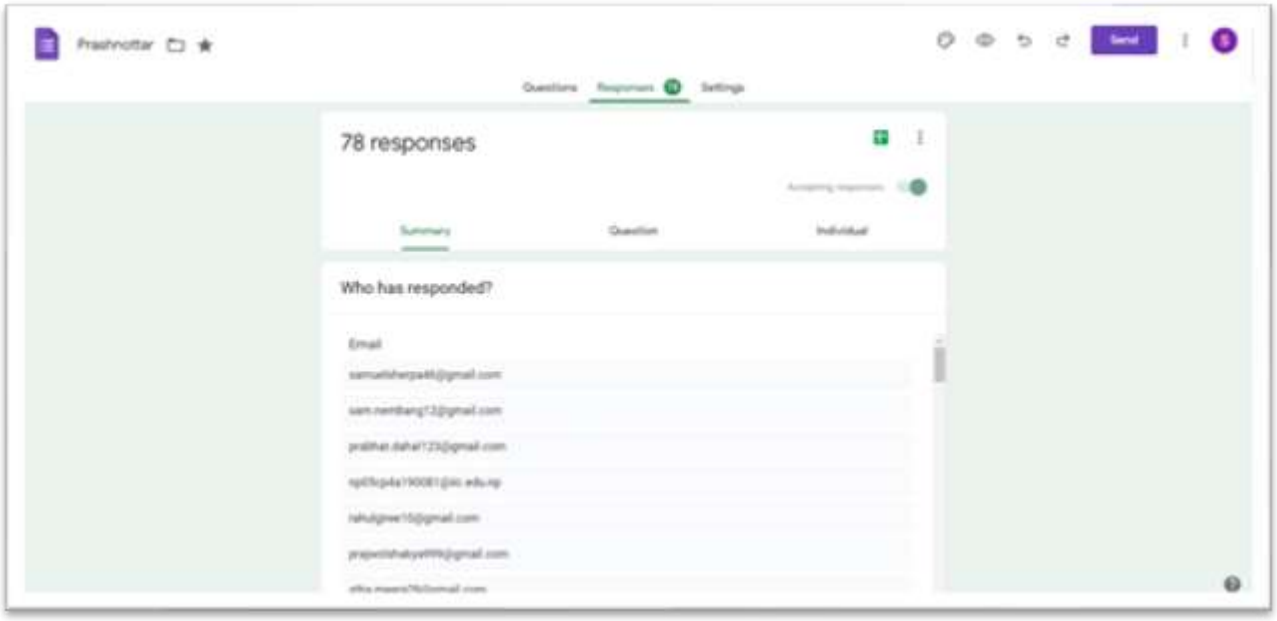


Figure 61 Total participants in the Survey.

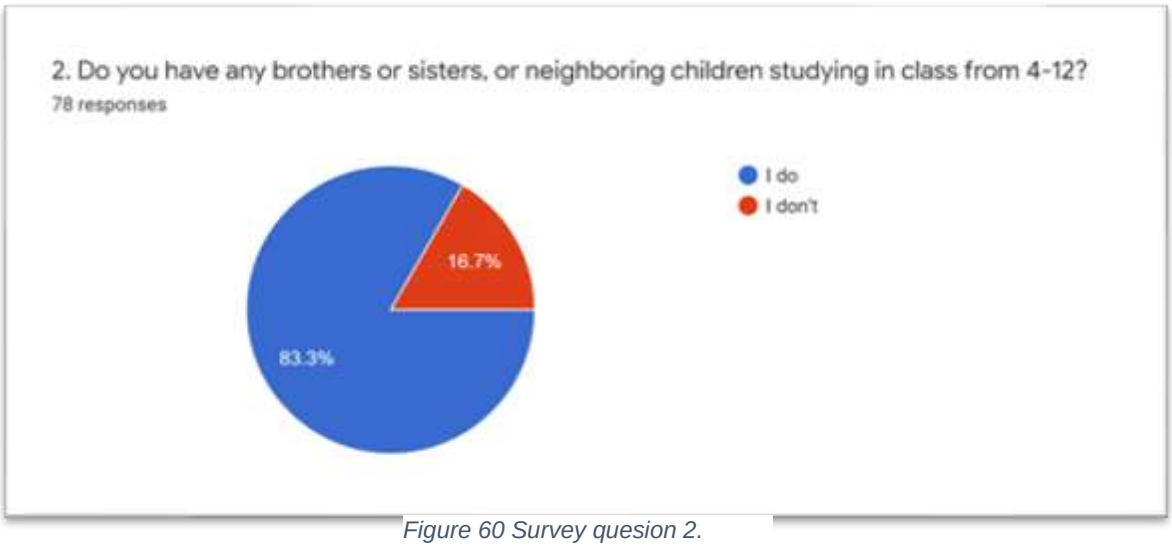


Figure 60 Survey quesion 2.

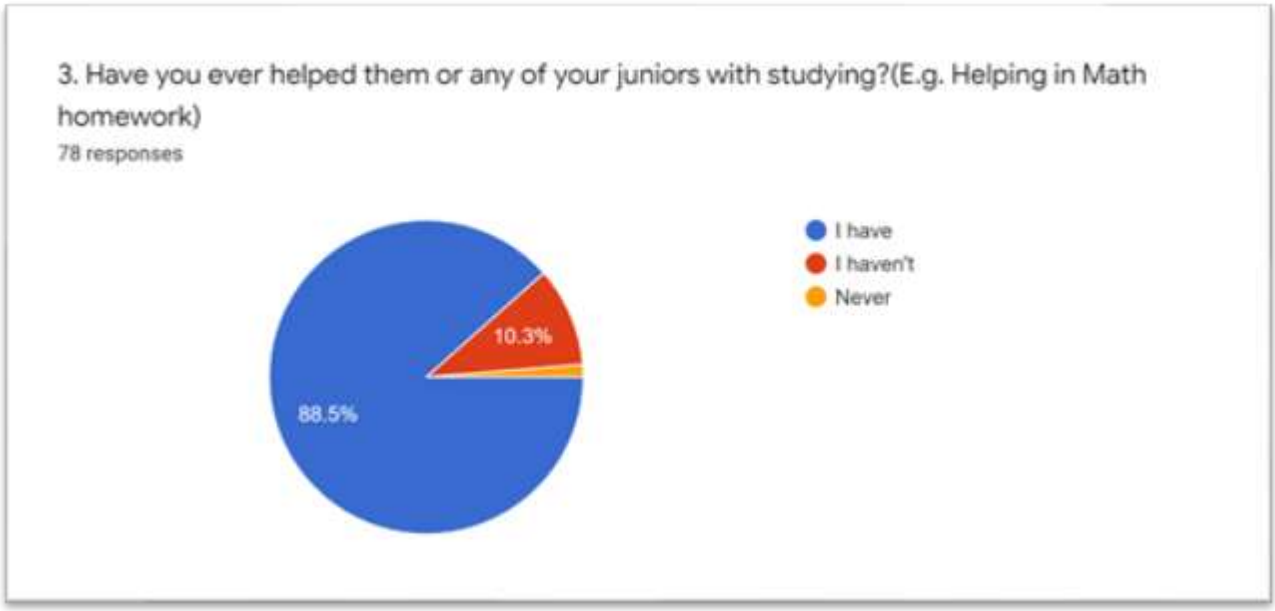


Figure 62 Survey question 3.

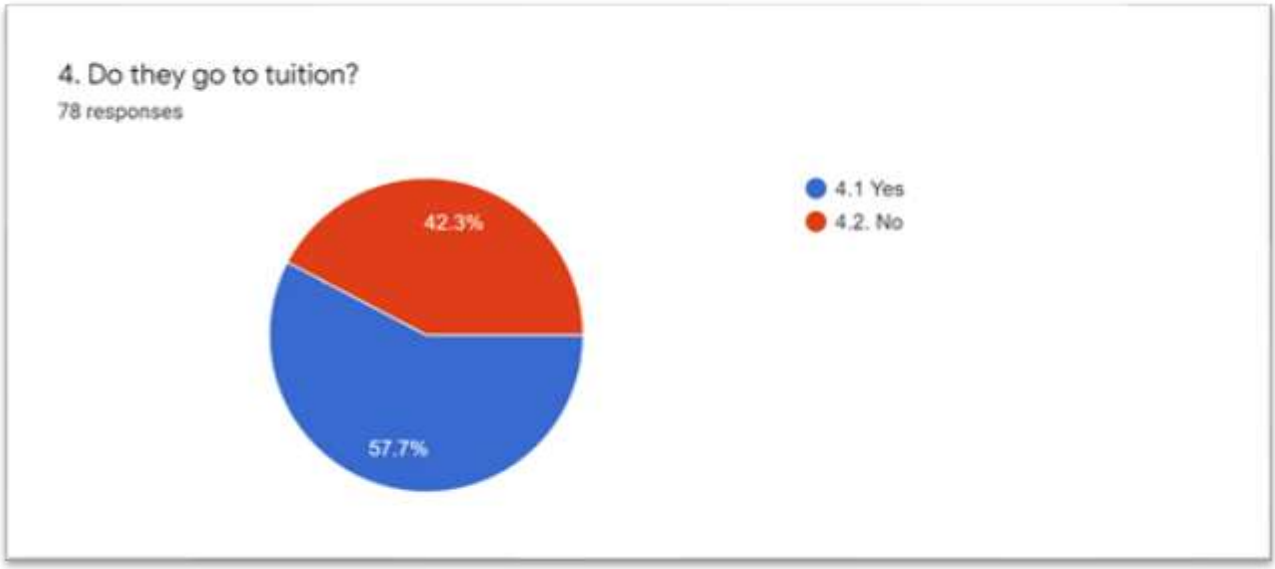


Figure 63 Survey Question 4.

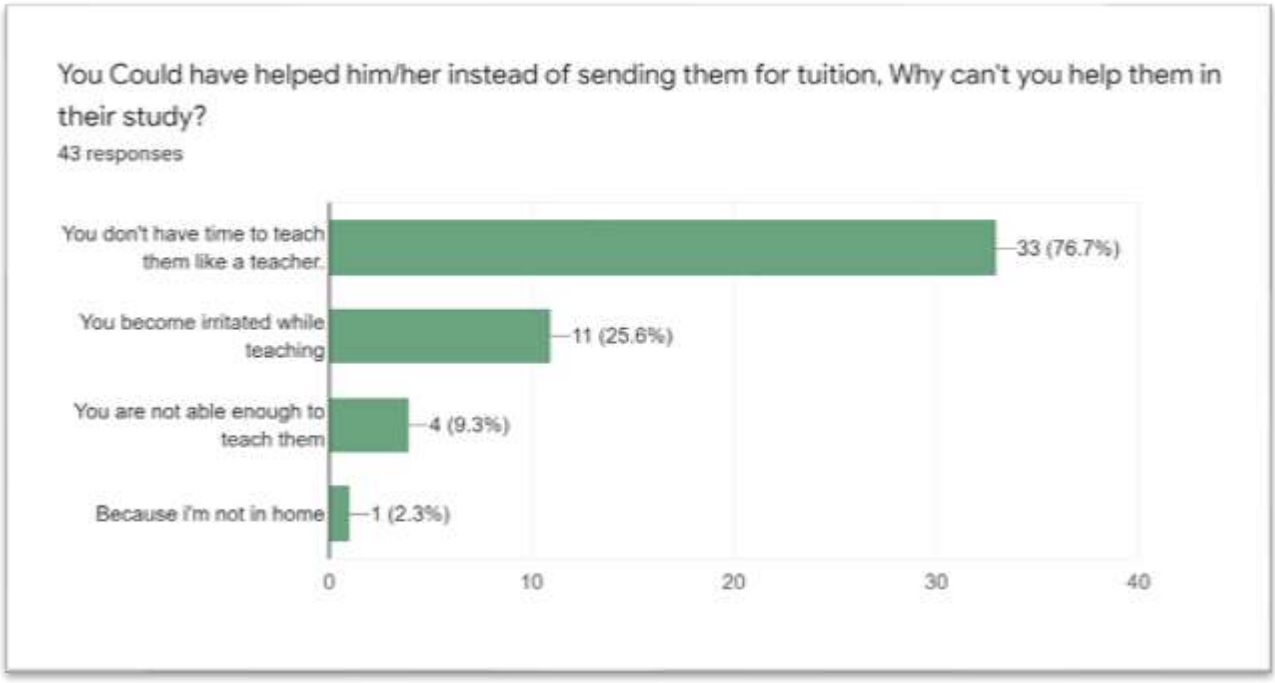


Figure 64 Survey Question 4.1.

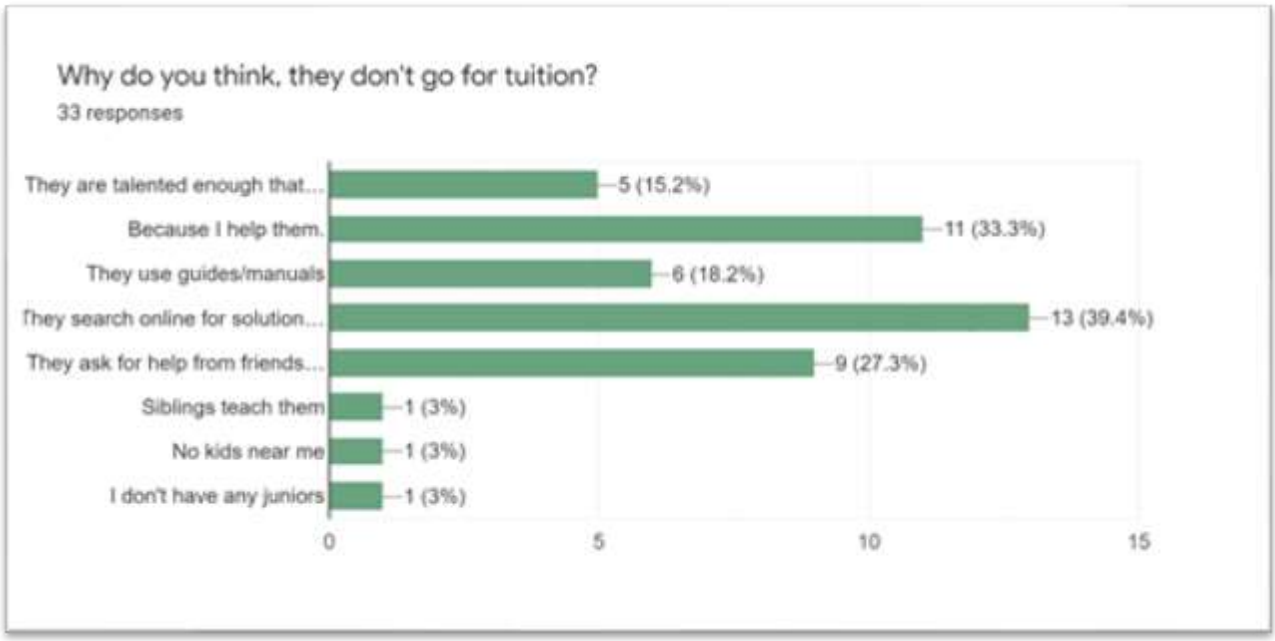


Figure 65 Survey Question 4.2.

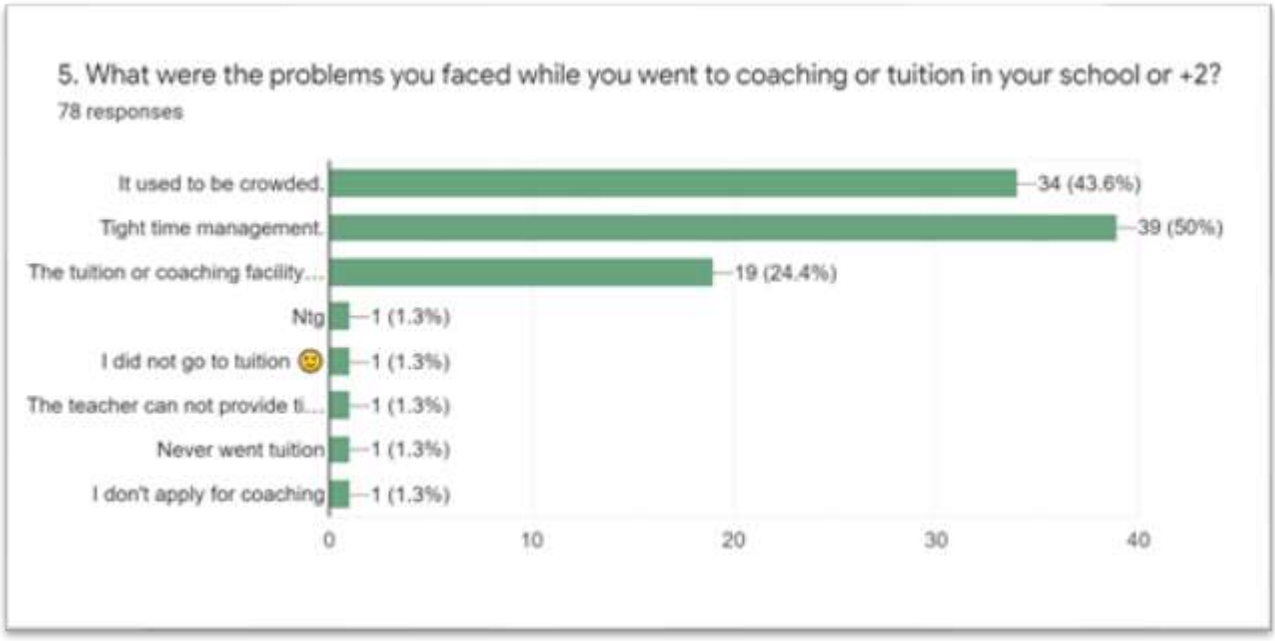


Figure 66 Survey Question 5

Figure 67 Survey Question 6.

Figure 68 Survey Question 7.

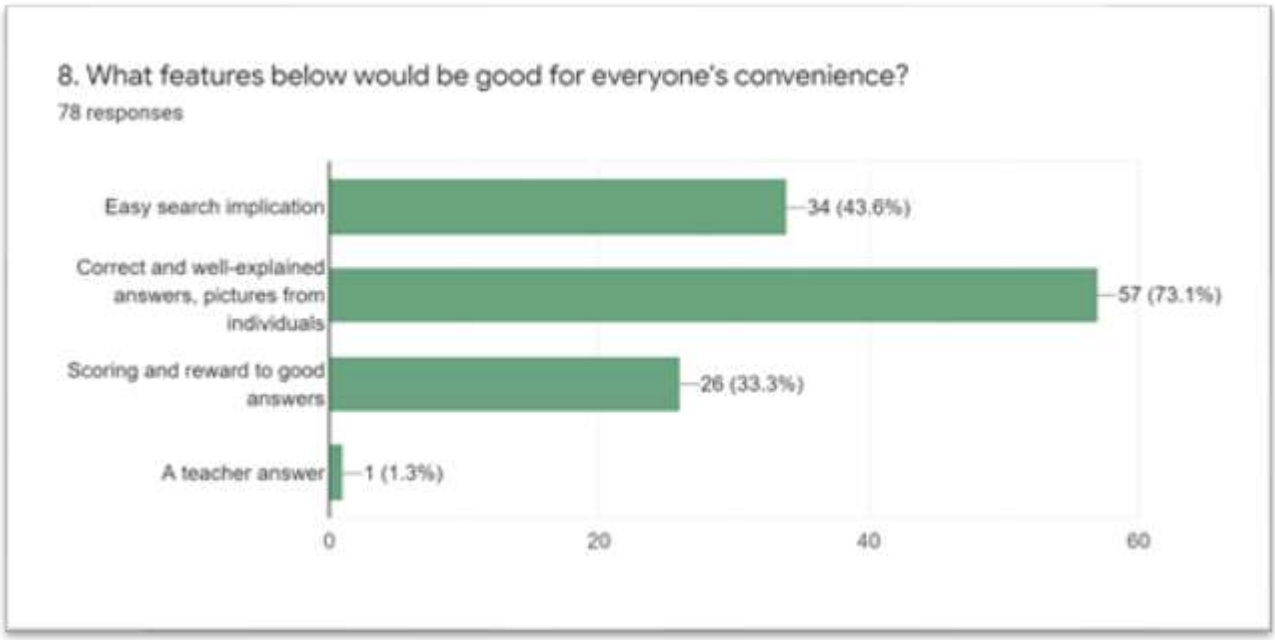


Figure 69 Survey Question 8

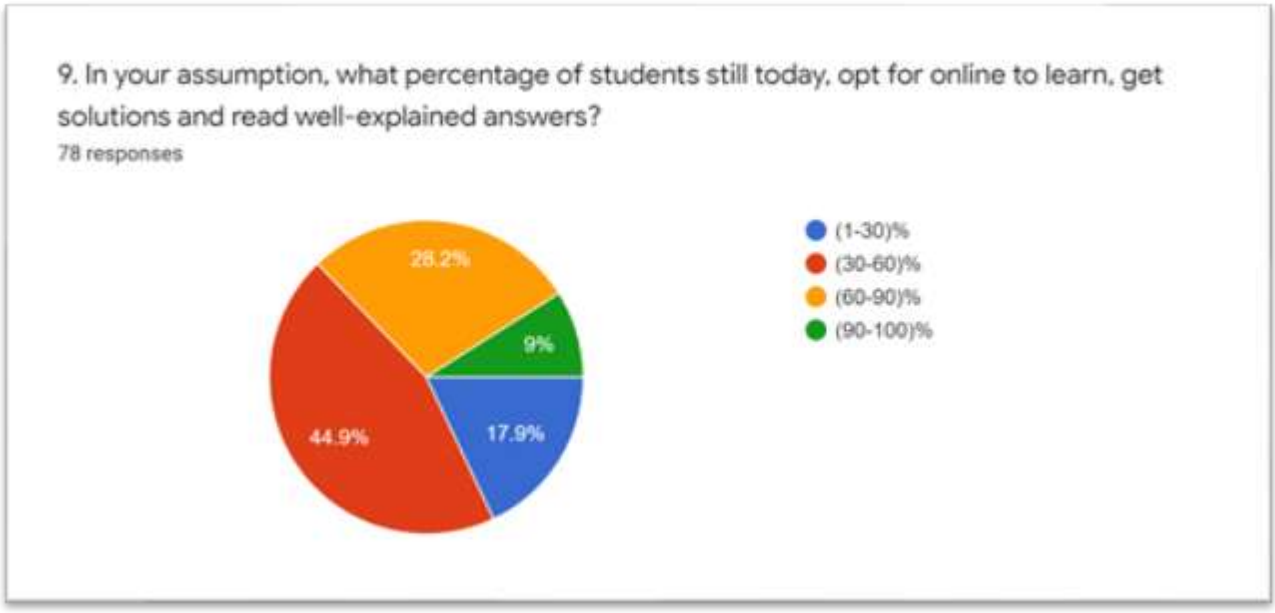


Figure 70 Survey Question 9

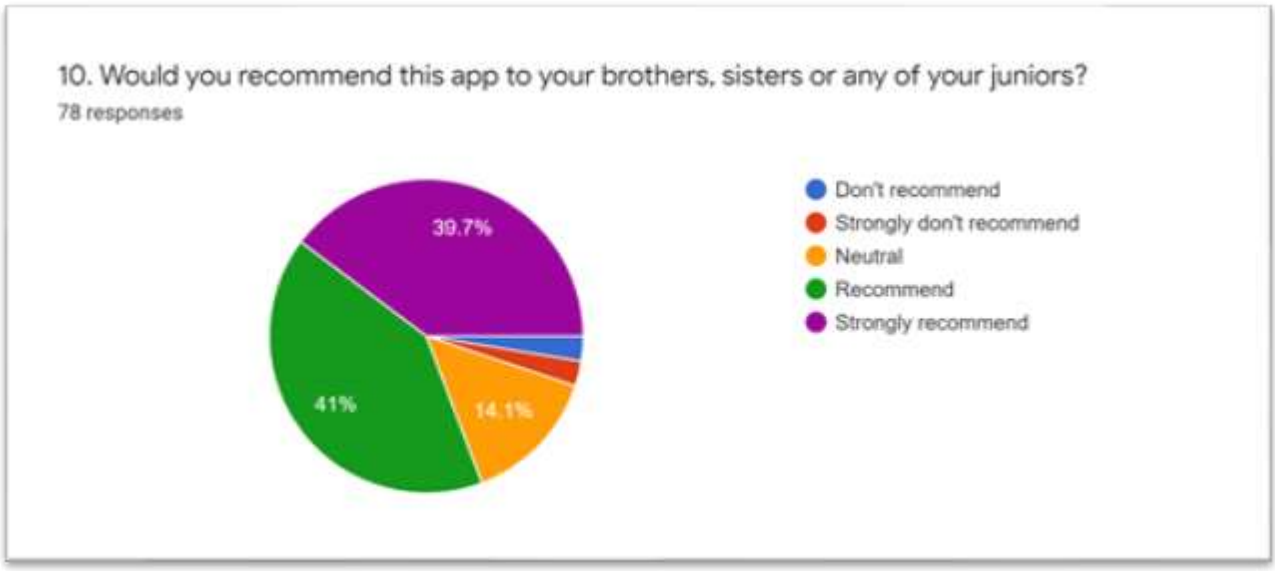


Figure 71 Survey Question 10

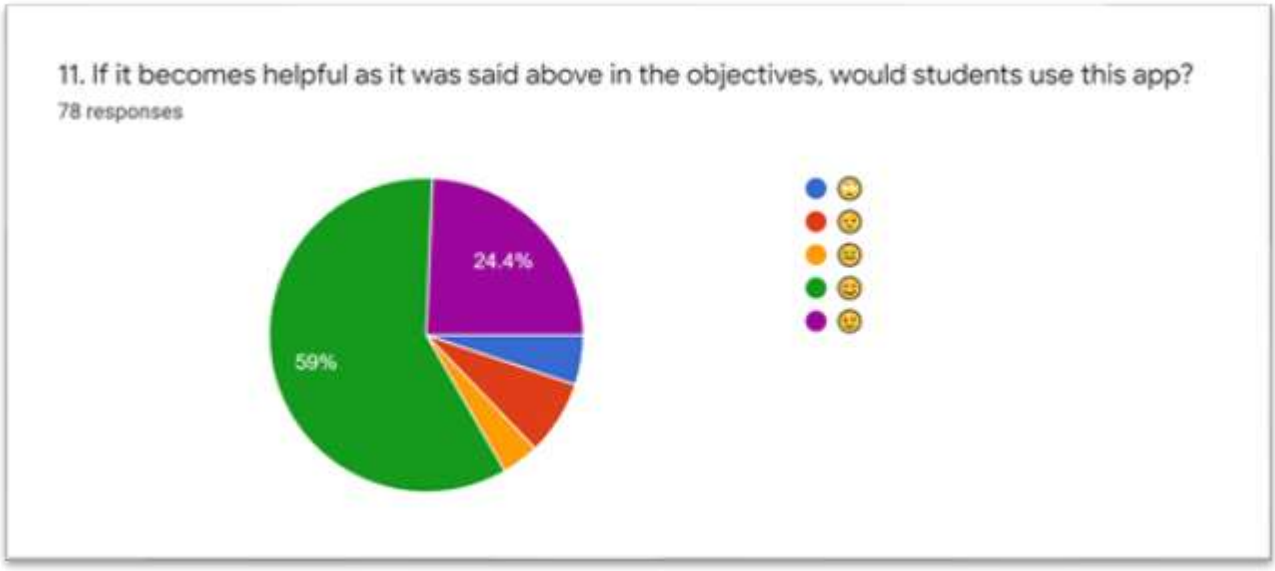


Figure 72 Survey Question 11

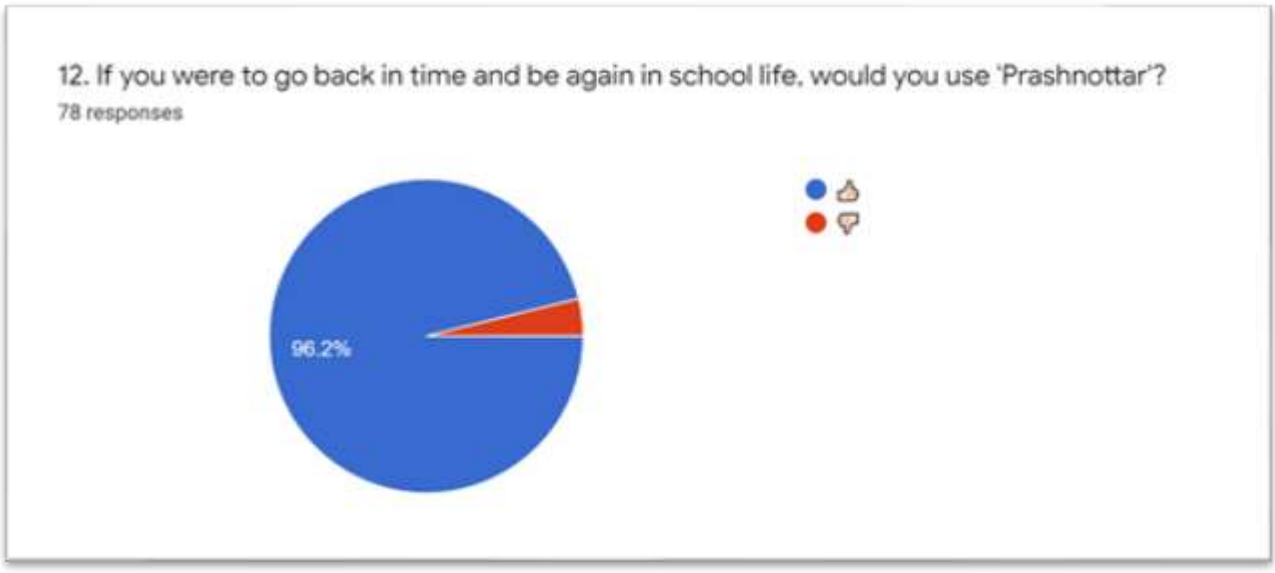


Figure 73 Survey Question 12.

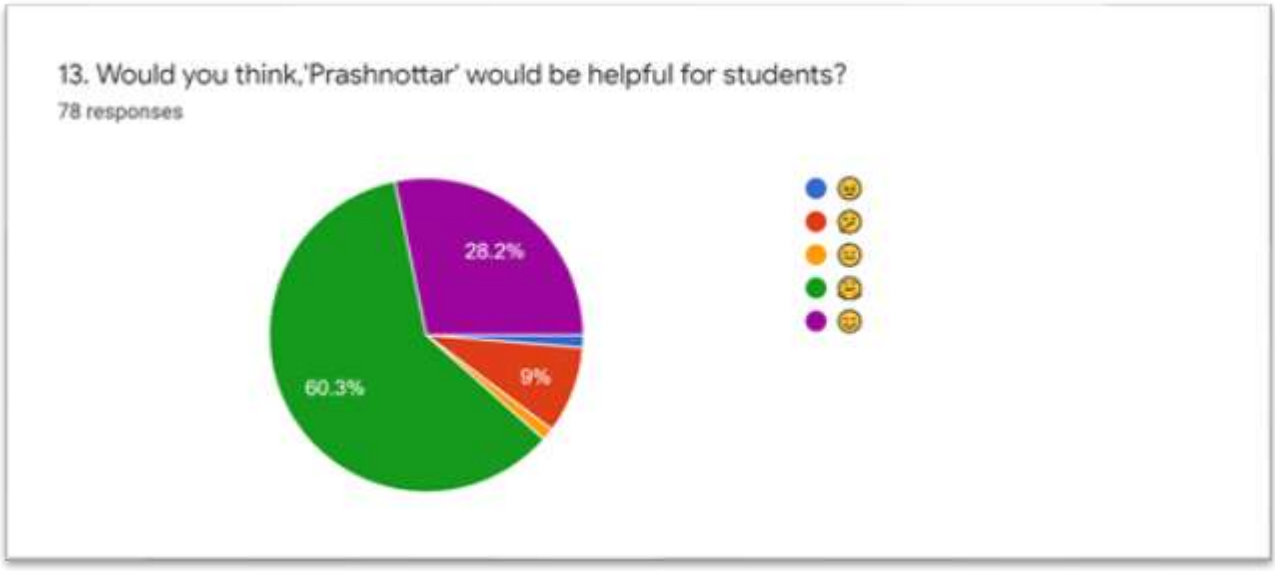


Figure 74 Survey Question

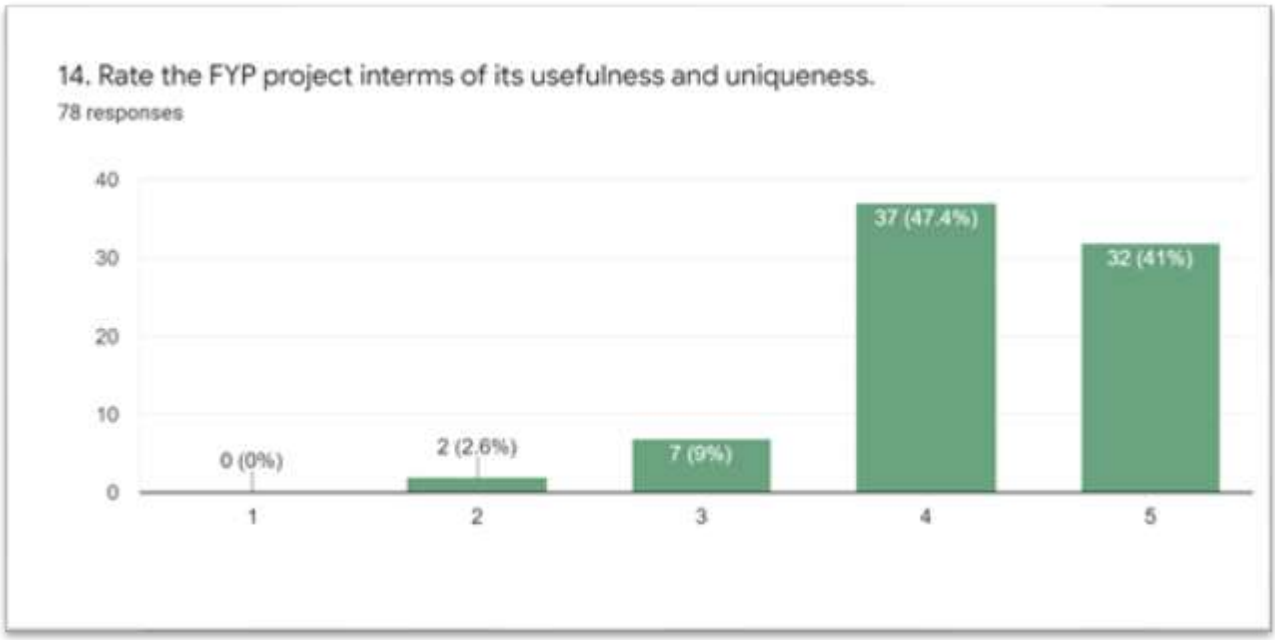


Figure 75 Survey Question 14

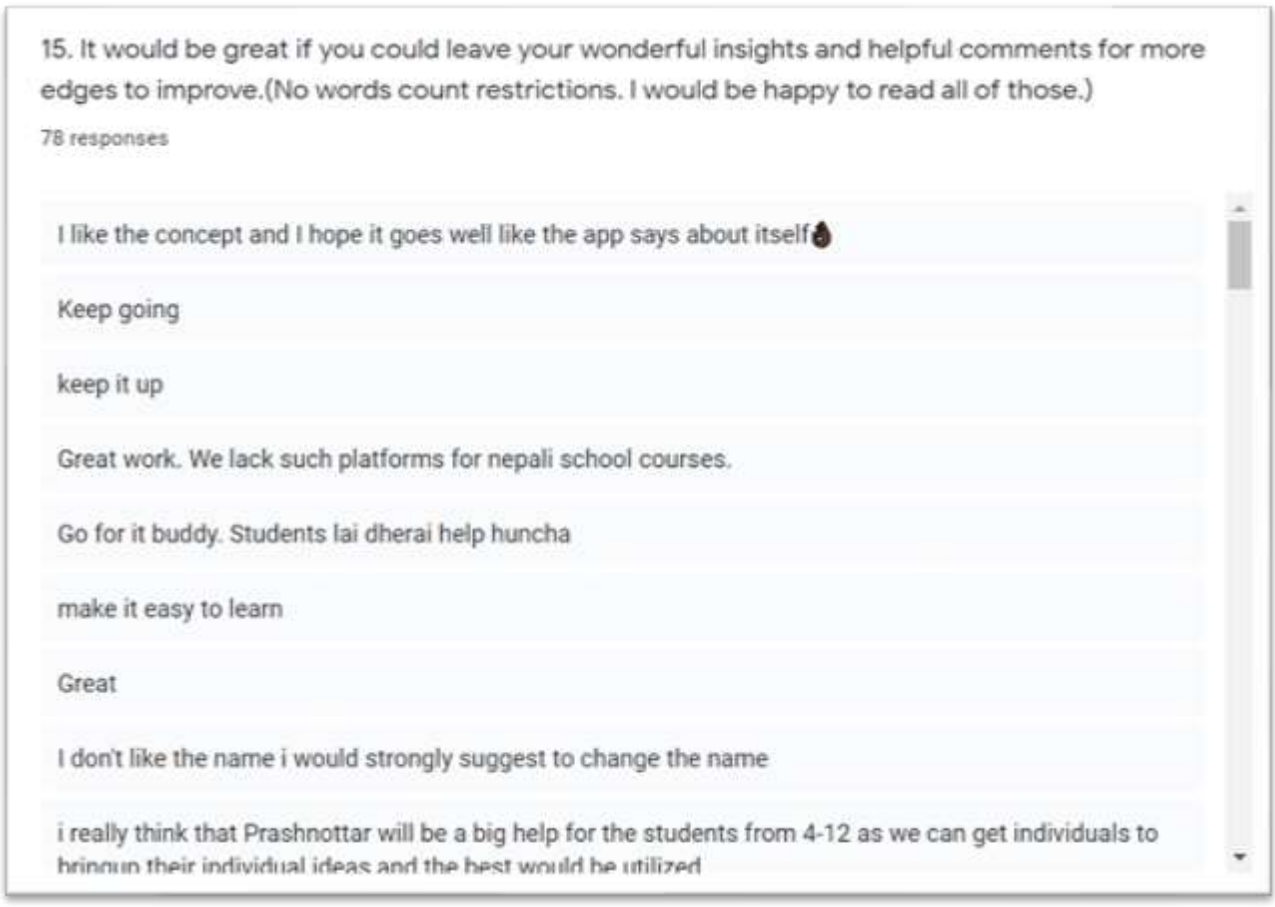


Figure 76 Survey Question 15

Appendix B: WBS, Gantt Chart, Wireframes, Use Case Diagram

1) Work Breakdown Structure

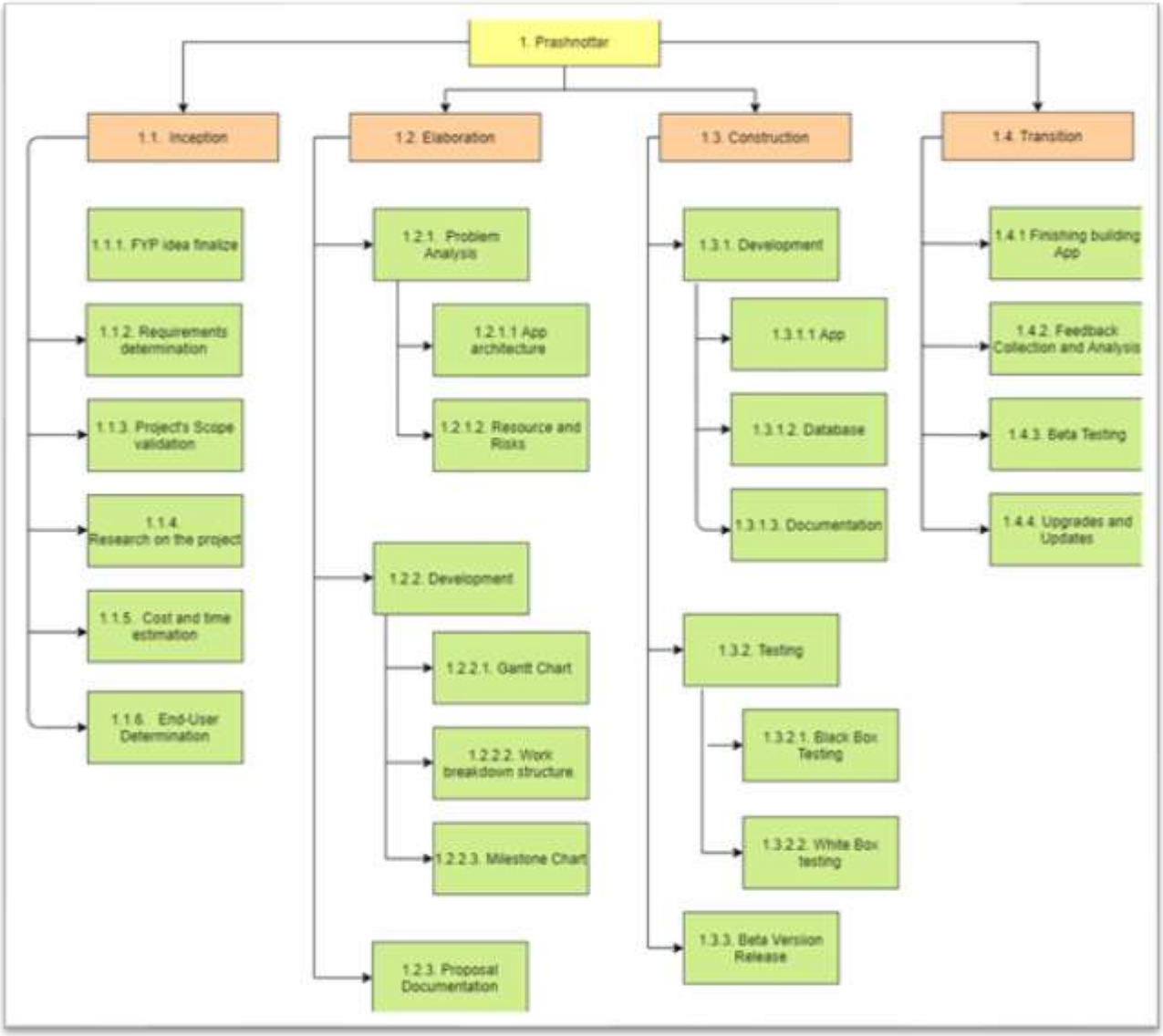
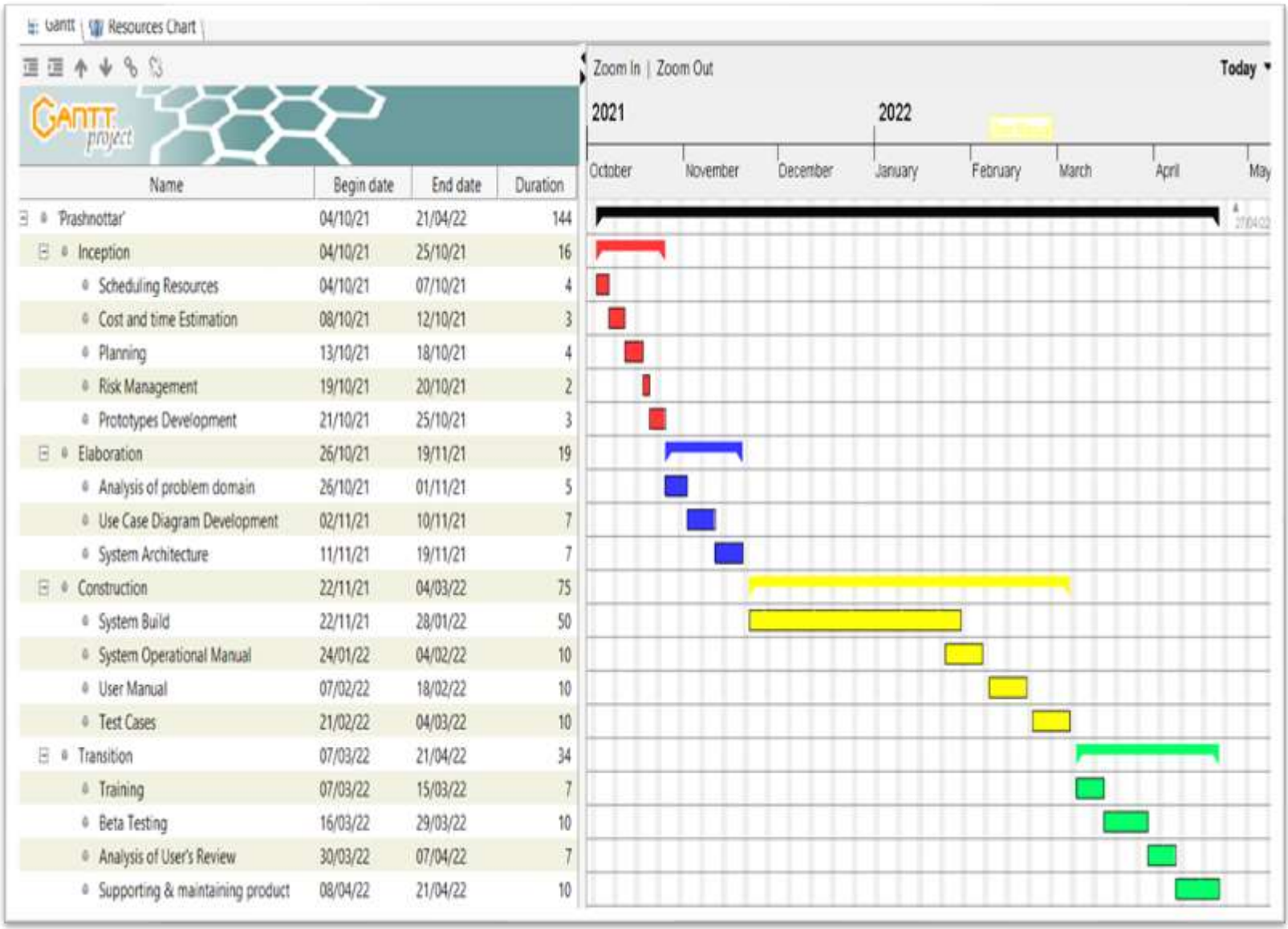


Figure 77 work breakdown structure.

2) Gantt Chart



Name	Begin date	End date	Duration
'Prashnottar'	04/10/21	21/04/22	144
Inception	04/10/21	25/10/21	16
Scheduling Resources	04/10/21	07/10/21	4
Cost and time Estimation	08/10/21	12/10/21	3
Planning	13/10/21	18/10/21	4
Risk Management	19/10/21	20/10/21	2
Prototypes Development	21/10/21	25/10/21	3
Elaboration	26/10/21	19/11/21	19
Analysis of problem domain	26/10/21	01/11/21	5
Use Case Diagram Development	02/11/21	10/11/21	7
System Architecture	11/11/21	19/11/21	7
Construction	22/11/21	04/03/22	75
System Build	22/11/21	28/01/22	50
System Operational Manual	24/01/22	04/02/22	10
User Manual	07/02/22	18/02/22	10
Test Cases	21/02/22	04/03/22	10
Transition	07/03/22	21/04/22	34
Training	07/03/22	15/03/22	7
Beta Testing	16/03/22	29/03/22	10
Analysis of User's Review	30/03/22	07/04/22	7
Supporting & maintaining product	08/04/22	21/04/22	10

Figure 78 Gantt Chart of Prashnottar.

3) Wireframes

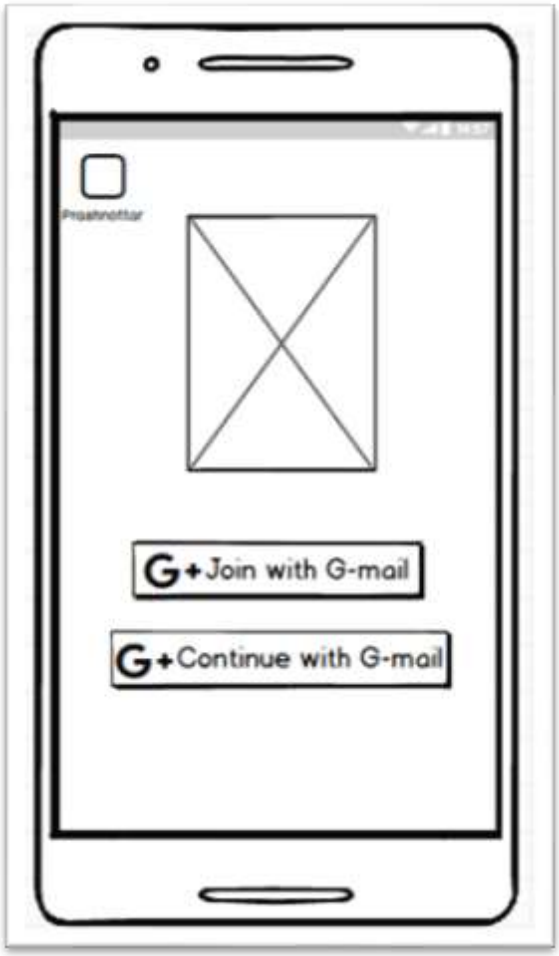


Figure 79 User login page.

Figure 80 Sign up with google.

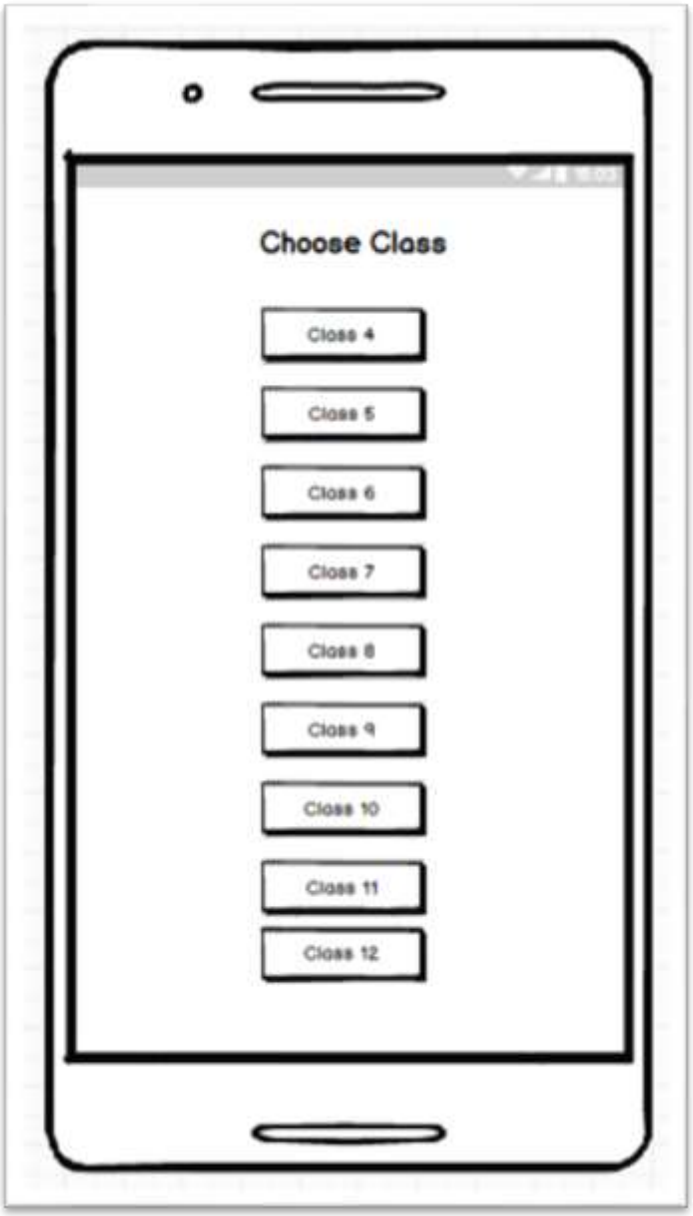


Figure 81 Choosing class.

Figure 82 Welcome page for users.

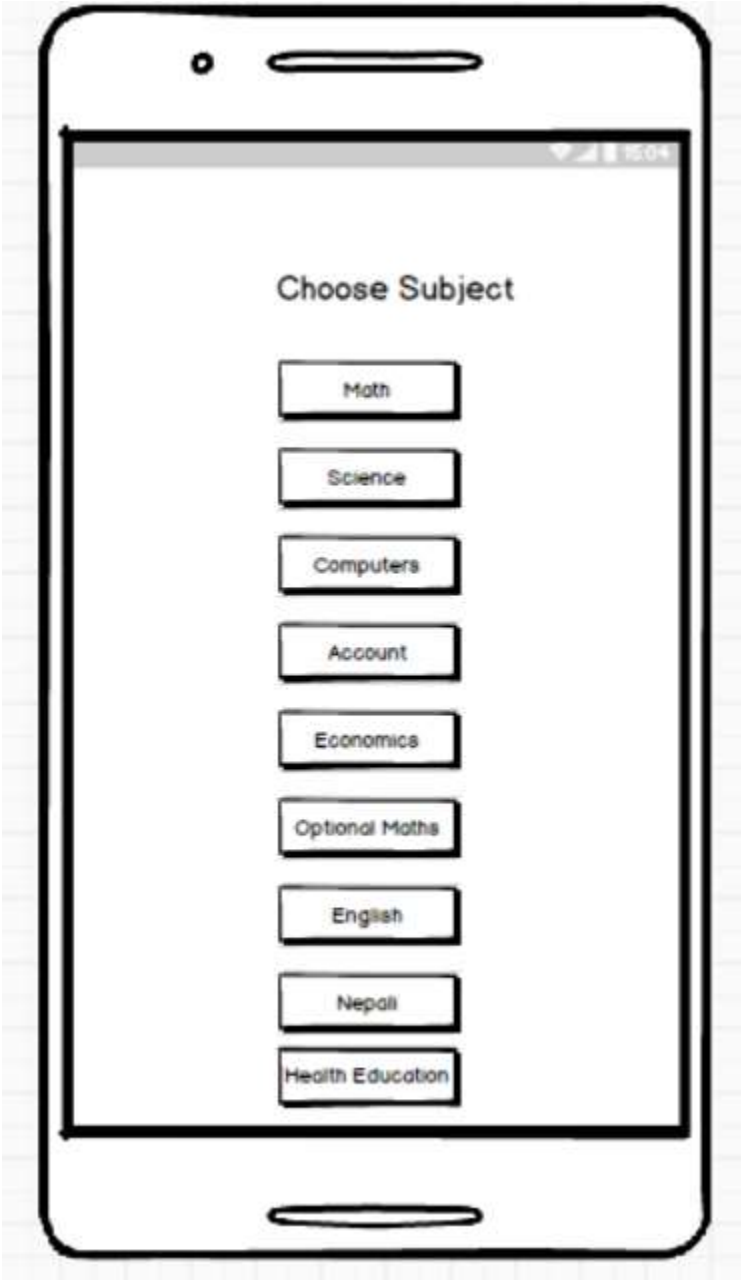


Figure 83 Choosing subject.

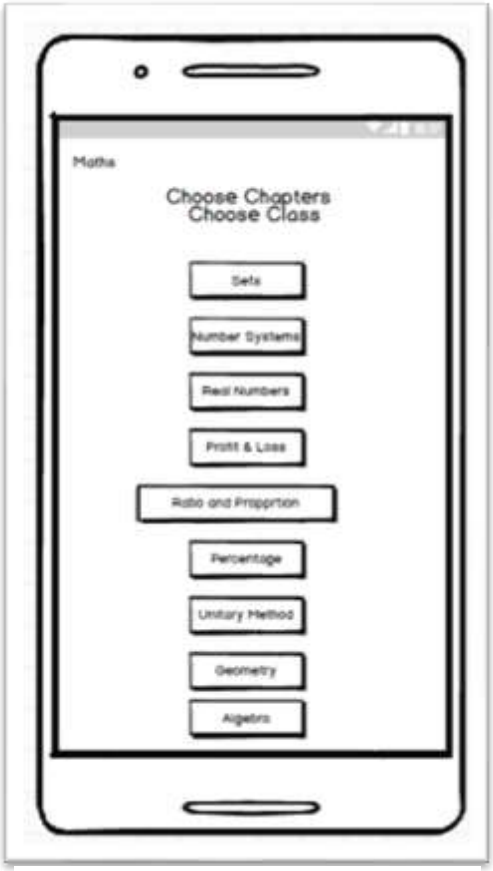


Figure 86 Choosing chapters.

Figure 84 Searching question according to chapters

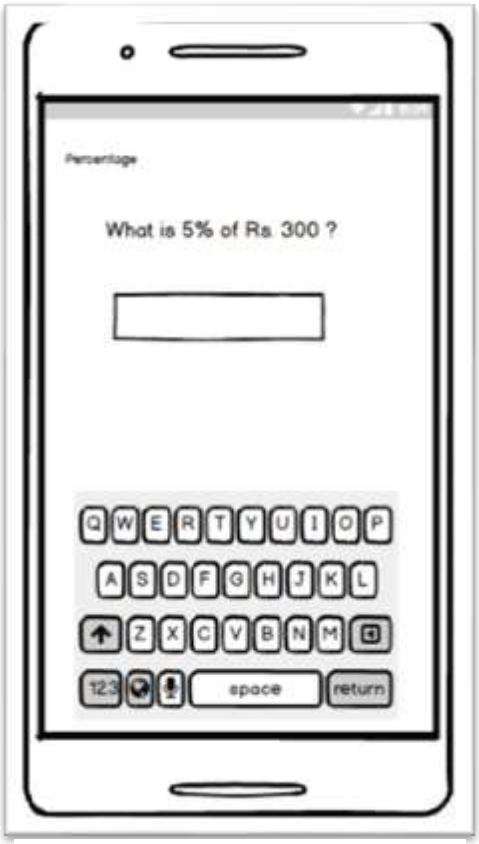


Figure 85 Writing answer to particualr question.

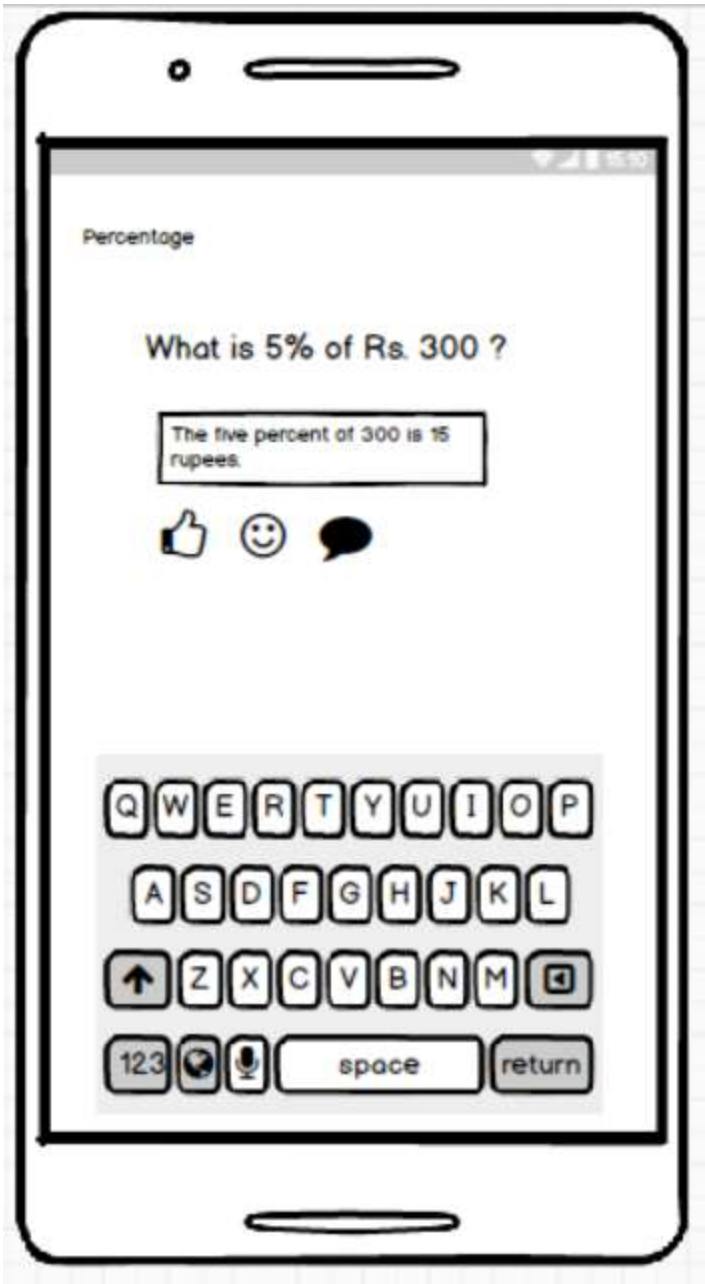


Figure 87 Gettings likes and comments to given answer.

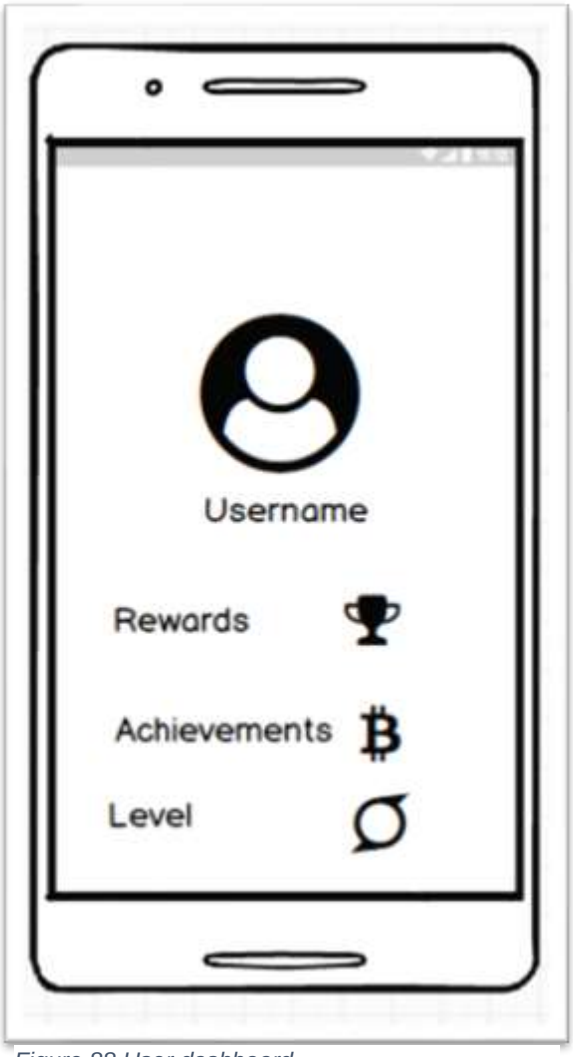


Figure 88 User dashboard.

4) Use Case Diagram.

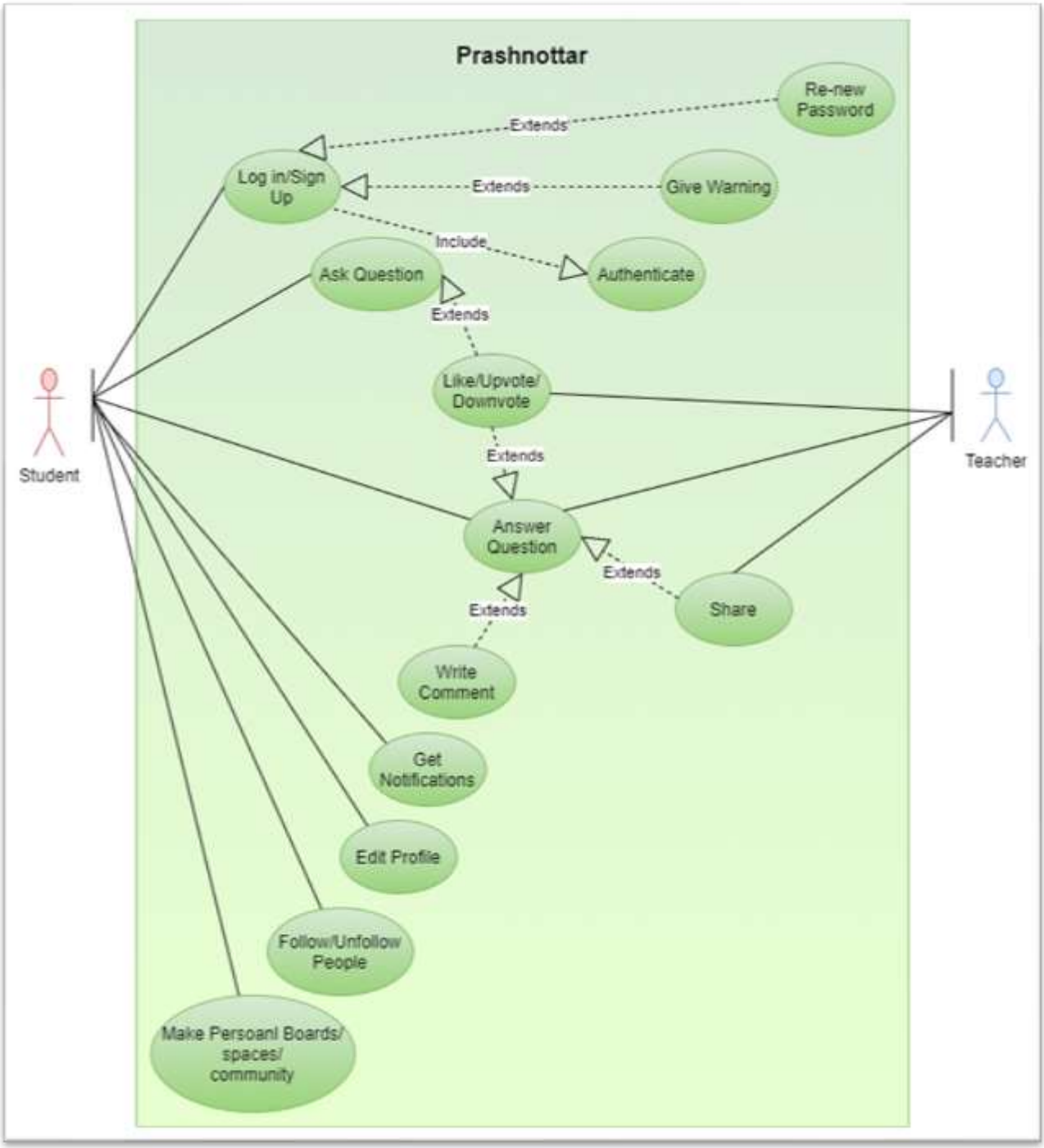


Table 5 Use Case Diagram of Prashnottar.