POLITEKNIK BANTING SELANGOR

GAS TURBINE ENGINE APPLICATION

NAME	MATRIC NO.
RUVANESH A/L MURUGAN @ SURESH	**24DAM21F2018**
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AQMAL DINIE	**24DAM21F2010**

DEPARTMENT OF AIRCRAFT MAINTENANCE

MAY 2024

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A REPORT SUBMITTED TO DEPARTMENT OF AIRCRAFT MAINTENANCE
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR A DIPLOMA
ENGINEERING IN AIRCRAFT MAINTENANCE

SUPERVISOR:

MR. AMALUDDIN SALIHIN

REPORT ENDORSEMENT

This report is being submitted, reviewed, and endorsed to fulfill the conditions and requirements of report writing as specified.

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Date : 27/05/2024

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Date : 27/5/2024

CERTIFICATION OF PROJECT ORIGINALITY & OWNERSHIP

GAS TURBINE ENGINE APPLICATION

SESSION: 2 2023/2024

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"We hereby declare that this report is the result of our own work, except excerpts that we have outlined its sources and this project will be the ownership of polytechnic.

SIGNATURE: WRITER 1

SIGNATURE: WRITER 2

SIGNATURE: WRITER 3

SIGNATURE: WRITER 4

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(SUPERVISOR'S SIGNATURE)

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DATE: 27/05/2024

ACKNOWLEDGEMENT

First and foremost, we would like to express our sincere gratitude to our advisorMr. Amaluddin Salihin, for his unwavering support, insightful guidance, and invaluable encouragement throughout our research. His expertise and advice were essential in shaping this thesis.

We are deeply grateful to our colleagues and friends in Politeknik Banting, especially in the Aircraft Maintenance course who provided a stimulating and fun environment in which to learn and grow. The discussions and collaborations with them were both enlightening and enjoyable. Thus, their constructive feedback and suggestions significantly enhanced the quality of our work.

On a personal note, we are profoundly thankful to our family for their love, patience, andunwavering belief in us. Their support has been our greatest source of strength.

Thank you all.

ABSTRACT

Gas turbine engines play a pivotal role in the aviation industry. Understanding the intricacies of these complex machines is crucial for engineers and technicians involved in their design, operation, and maintenance. Traditional educational methods often struggle to effectively convey the dynamic principles and components of gas turbine engines. To address this challenge, this project proposes the development of an interactive education application focused on gas turbine engines. The application aims to provide an immersive learning experience by employing multimedia elements such as 3D models, infographics, notes, and interactive quizzes. The impact of this project extends to various stakeholders within the education and industry sectors. Educational institutions can integrate the application into their curriculum to enhance student engagement and comprehension of gas turbine engineering principles. Industry professionals can utilize the application for continuous learning and skill development, thereby improving operational efficiency and safety in the workplace. By combining interactive technology with comprehensive educational content, this project aims to empower learners with the knowledge and skills necessary to excel in the field of gas turbine engineering.

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LIST OF ABBREVIATIONS

CMS	-	Content Management System
EASA	-	European Aviation Safety Agency
FAA	-	Federal Aviation Administration
ICAO	-	International Civil Aviation Organization
UI	-	User Interface
WCAG	-	Web Content Accessibility Guidelines

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.0 BACKGROUND OF STUDY

Gas turbine engines are integral components in various industries, including aviation, power generation, and marine propulsion, due to their efficiency, reliability, and versatility. Understanding the principles, components, and operational characteristics of gas turbine engines is essential for engineers, technicians, and students involved in their design, operation, and maintenance. However, traditional educational methods often face challenges in effectively conveying the complex concepts and dynamic nature of these machines.

In recent years, there has been a growing demand for innovative educational tools and platforms that can enhance learning experiences in technical fields such as gas turbine engineering. With advancements in technology, there is an opportunity to leverage interactive multimedia applications to address these challenges and providelearners with immersive and engaging educational experiences.

Gas turbine engines are intricate systems comprised of numerous components and subsystems, each performing specific functions within a dynamic operating environment. Understanding the interplay between these components and the underlying thermodynamic principles requires comprehensive educational resources. As technology evolves and industry standards progress, there is a

continuous need for engineers and technicians to update their knowledge and skills in gas turbine engineering. Traditional educational materials may struggle to keep pace with these advancements, necessitating the development of dynamic and adaptable learning tools.

Hands-on training opportunities for gas turbine engines can be limited due to factors such as cost, accessibility, and safety considerations. An interactive education application can provide a simulated learning environment where users can explore, experiment, and troubleshoot without the constraints associated with physical equipment. Learners have diverse preferences and learning styles, ranging from visual and auditory learners to kinesthetic learners. A multimedia application can accommodate these preferences by offering a variety of interactive elements, such as 3D model, infographics, quizzes, and notes.

Based on these considerations, there is a compelling rationale for developing a dedicated gas turbine engine education application. Such an application has the potential to enhance learning outcomes, improve knowledge retention, and facilitate skill development in gas turbine engineering. By harnessing the power of interactive technology, this project aims to bridge the gap between theoretical knowledge and practical application, thereby empowering learners to excel in the field of gas turbine engineering.

1.2 PROBLEM STATEMENT

Despite the critical importance of gas turbine engines in Malaysian aviation industry, traditional educational methods used by training institution around the country often struggle to effectively convey the complex principles and operational intricacies associated with gas turbine engines to individuals. Conventional educational materials, such as textbooks and lectures, often fail to provide aircraft engineering students with immersive and engaging experiences that facilitate deep understanding of gas turbine engines. Static diagrams and theoretical explanations may not adequately convey the dynamic nature of these systems. Learners face challenges in comprehending the dynamic processes, intricatecomponents, and practical applications of gas turbine engineering.

This gap in educational resources hinders the development of essential knowledge and skills required for engineers, technicians, and students to excel in the field. Addressing these challenges requires the development of an innovative educational solution that leverages interactive multimedia technology to provide learners with immersive, hands-on learning experiences tailored to the complexities of gas turbine engines. Such a solution should bridge the gap between theoretical knowledge and practical application, empowering learners to acquire the skills necessary for success in gas turbine engineering.

1.3 PROJECT OBJECTIVES

1.3.1 GENERAL PROJECT OBJECTIVES

- To develop an educational application focused on gas turbine engines, providing an interactive and comprehensive learning experience for engineering students.
- To enhance the understanding of gas turbine engine concepts through condensed explanations, illustrations, and practical segments of the app.
- To provide an engaging and interactive learning experience

1.3.2 SPECIFIC INDIVIDUAL PROJECT OBJECTIVES

1.3.2.1 Application Development

- To determine the perfect foundation for app development and steps to build the app.
- To develop the apps using online application (JotForm)
- To create a functional prototype of the gas turbine engine education application

1.3.2.2 User Interface Designing

- To design an intuitive and user-friendly interface for the application
- To ensure the ease of navigation and accessibility of the app across multipledevices.
- To provide users with an engaging and immersive learning experience.

1.3.2.3 Content Integration

- To develop and integrate comprehensive educational content.
- To ensure that the content is accurate, informative, and aligned with industry standards.
- To include interactive multimedia elements such as 3D models, infographics, notes and quizzes.

1.3.2.4 User Testing and Feedback

- To conduct rigorous user testing sessions with diverse groups of stakeholders, including engineers, technicians, students, and educators.
- To evaluate the usability, effectiveness, and impact of the application through postsurvey.
- To gather feedback and insights to iteratively refine and improve the application based on user input.

1.4 PURPOSE OF PRODUCT

The purpose of this project is to address the challenges associated with gas turbine engine education by developing an interactive and immersive educational application. This application aims to enhance understanding and provide learners with a comprehensive understanding of gas turbine engines, including their principles, components, operational characteristics, and practical applications, through interactive multimedia content such as 3Dmodels, infographics, notes, and quizzes. This project also serves as a valuable resource for both learners and professionals in the gas turbine industry, offering continuous learning opportunities, updates on industry advancements, and access to relevant educational materials. By catering to diverse learning needs and offering continuous learning opportunities, this project aspires to empower learners with the knowledge, skills, and confidence necessary to excel in the dynamic field of aircraft engineering.

1.5 SCOPE OF PROJECT

1.5.1 GENERAL PROJECT SCOPES

Firstly, this product is only available for students, educators, engineers and technicians in aviation industry because the content of this product is all about gas turbine engine. This gas turbine engine education app can be accessible for both iOS and Android devices. Its vivid array of colorful and intuitive graphics is designed to make this learning tool both informative and engaging. Furthermore, this app is designed with a low-graphic smooth rate to ensure optimal performance across a variety of devices, further enhancing the learning experience.
Finally, contents in this product are from Module 15 - Gas Turbine Engines.

1.5.2 SPECIFIC INDIVIDUAL SCOPE

1.5.2.1 Application Development

The initial focus will be on the development of a functional prototype for the gas turbine engine education application. This prototype will serve as the foundation upon which the entire application will be built. Compatibility and usability across various devices and platforms will be paramount, and basic functionality for navigation, interaction, and content display will be implemented to provide users with a seamless experience as they explore the application. This software is built to have 24/7 availability which means can be accessed anytime anywhere.

1.5.2.2 User Interface Designing

The critical aspect of the project will involve designing an intuitive and visually appealing user interface for the application. This will be achieved through user research to understand the preferences and needs of target audience, which includes engineers, technicians, students, and educators. Based on the insights gained from this research, wireframes and mock-ups will be created to visualize the layout and structure of the interface.

1.5.2.3 Content Integration

The heart of the application lies in its educational content, and the objective will be to develop comprehensive content covering fundamental principles, components related to gas turbine engines. This content will be presented in various formats, including multimedia elements such as 3D models, infographics, notes and quizzes ensuring that users are provided with an engaging and immersive learning experience. The content is accurate, relevant, and based on Modul 15 – Gas Turbine Engines which aligns with industry standards. Integration of the content into the application will be seamless, with a focus on organizing it into logical sections for easy navigation and understanding.

1.5.2.4 User Testing and Feedback

Extensive user testing sessions to gather feedback from representatives of our target audience. Engineers, technicians, students, and educators will be invited to participate in these sessions, Qualitative and quantitative feedback through surveys will be collected, analyzing the data to identify strengths, weaknesses, and areas for improvement. Based on this feedback, the app will be iterated and refined, focusing on enhancing usability, addressing usability issues, and improving the overall user experience

CHAPTER 2

LITERATURE REVIEW

2.1 GENERAL LITERATURE REVIEW

2.1.1 AVIATION INDUSTRY IN MALAYSIA

The aviation industry in Malaysia is experiencing steady growth, driven by factors such as increasing air passenger traffic and government investment. Gas turbine engines play a vital role in this industry, powering a wide range of aircraft.

Education and training in gas turbine engine technology are essential for ensuring safe and efficient operation, maintenance, and advancement of the aviation sector in Malaysia. Various educational institutions and training entrées in Malaysia offer programs related to aviation engineering, including courses specifically focusing on gas turbine engines. This literature review provides a foundational understanding of the aviation industry and gas turbine engines in Malaysia, serving as a basis for further research and development in this field.

2.1.2 DEMAND OF E-LEARNING

The demand for e-learning has been steadily increasing in recent years due to several factors, including advancements in technology, changing learning preferences, and the need for flexible and accessible education options. While e-learning offers numerous benefits, challenges related to the digital divide, quality assurance, and learner engagement need to be addressed to fully harness its potential. Mobile applications have emerged as a tool in meeting this demand as they offer interactive platforms for education. Learning through apps has become increasingly popular due to its accessibility and flexibility with the growth of remote and online education.

2.1.3 TYPE OF E-LEARNING APP IN AVIATION STUDIES

E-learning applications in aviation studies have become increasingly prevalent, offering flexible and accessible ways for individuals to acquire knowledge and skills relevant to the aviation industry. These applications leverage digital technologies to deliver educational content, simulations, and interactive modules tailored to the specific needs of aviation professionals and enthusiasts. Here are a few varieties of e-mastering apps normally observed in aviation studies:

1. Ground School Training Apps**:**

   Ground school training apps provide comprehensive courses covering fundamental aviation topics such as aerodynamics, navigation, aircraft systems, and regulations. Research suggests that ground school training apps are effective tools for preparing individuals for pilot certification exams, such as the Federal Aviation Administration (FAA) written exams.

2. Flight Simulation Apps:

   Flight simulation apps offer virtual environments where users can practice flying aircraft and hone their piloting skills. These apps feature realistic flight controls, cockpit instrumentation, and various weather conditions to simulate real-world flying scenarios.

3. Aircraft Maintenance Training Apps:

   Aircraft maintenance training apps focus on educating maintenance technicians and engineers on aircraft systems, maintenance procedures, and troubleshooting techniques. These apps may include 3D animations, interactive simulations, and diagnostic exercises to enhance learning and skills development.

4. Regulatory Compliance Apps:

   Regulatory compliance apps provide access to aviation regulations, standards, and procedures issued by regulatory authorities such as the FAA, European Aviation Safety Agency (EASA), and International Civil Aviation Organization (ICAO).

2.1.4 EVALUATION OF DIGITAL LEARNING IN AVIATION INDUSTRY

Digital learning, also known as e-learning or online learning, has become increasingly prevalent in the aviation industry as a means of delivering training and educational content to aviation professionals. With the advancement of technology, digital learning platforms offer flexible and accessible ways for individuals to acquire and enhance their knowledge and skills related to aviation. The evaluation of digital learning in the aviation industry is essential for assessing the effectiveness,efficiency, and impact of training programs on learners, organizations, and the broader aviation ecosystem.

2.1.5 MOBILE APP SPECIFICATIONS

Mobile applications have become an integral part of everyday life, offering users a wide range of functionalities and services on their smartphones and tablets. Mobile app specifications refer to the detailed requirements and features that define the functionality, design, performance, and user experience of a mobile application. By carefully defining and documenting app specifications based on user needs, market analysis, technology trends, and regulatory requirements, app developers can effectively guide the development process and deliver successful mobile apps that meet user expectations and business objectives.

2.2 SPECIFIC LITERATURE REVIEW

2.2.1 APP DEVELOPMENT

This literature review explores relevant research and platforms used in mobile app development for gas turbine engine education. JotForm is a suitable platform to develop an app for gas turbine engine education because it has drag-and-drop form builder allows developers to quickly design and customize interface and contents with customizable themes, fonts, colors, and logos, developers can create a cohesive and branded experience for users interacting with the app. JotForm are optimized for mobile devices, ensuring a seamless and responsive user experience across smartphones, tablets, and desktops. JotForm offers flexible pricing plans suitable for organizations of all sizes, including free and subscription-based options with varying features and capabilities. This cost-effectiveness makes JotForm an attractive choice for developing the gas turbine engine education app.

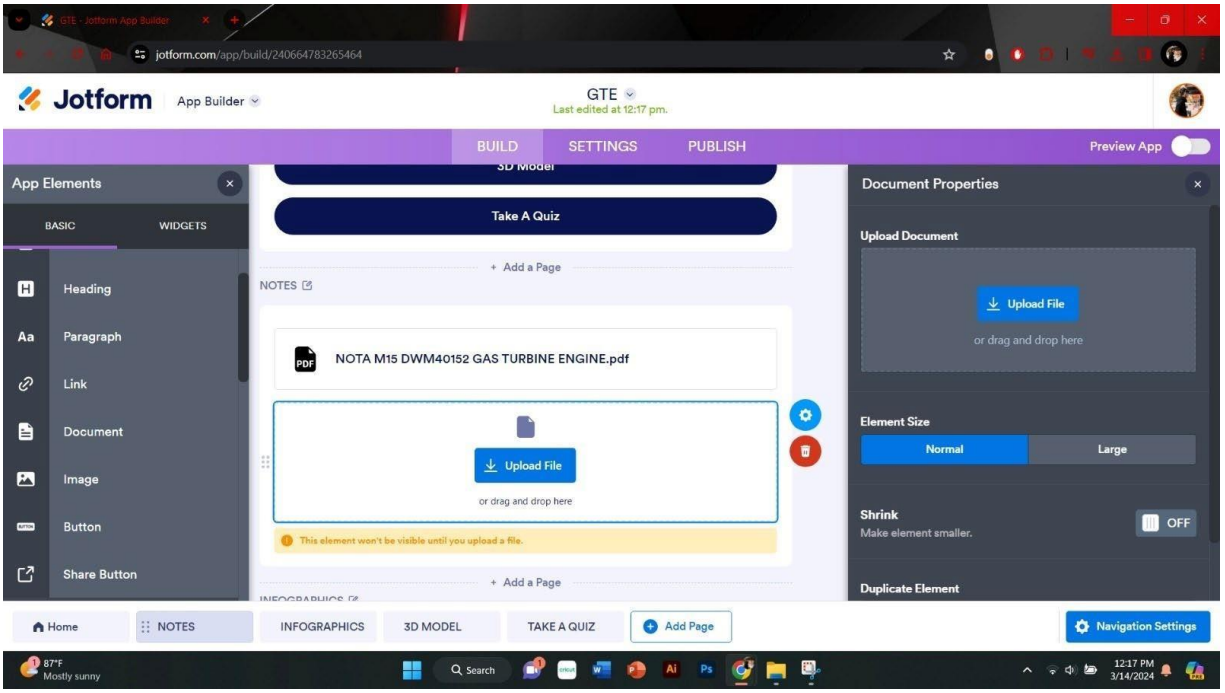


Figure 1.1 User interface of the Jotform app builder platform

2.2.2 USER INTERFACE DESIGNING

The Gas Turbine Engine e-learning apps interface layout carefully thought out to give users an engaging and simple learning experience. The interface has an eye-catching dashboard that makes it simple for users to browse through. Maintain consistency in visual design elements such as color schemes, typography, iconography, and layout to create a cohesive and branded experience for users. Choose colors and fonts that reflect the branding of the gas turbine engine education program, ensuring readability and accessibility across different devices and screen sizes. Use icons and imagery to enhance visual appeal and convey information effectively.

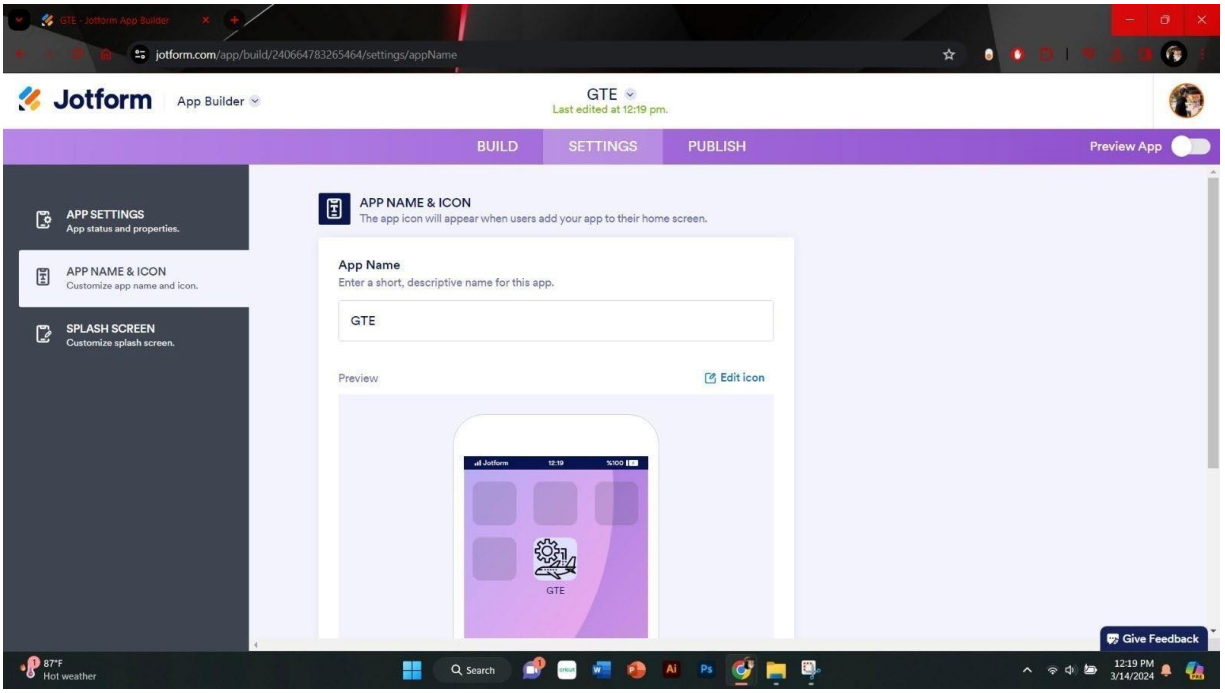


Figure 2.1 : User interface designing of the Gas Turbine Engine app

2.2.3 CONTENT INTEGRATION

Prioritize the presentation of content based on its relevance and importance to users learning objectives. Highlight key educational materials, notes and infographics to capture users' attention and encourage engagement. Incorporate interactive elements such as quizzes and multimedia elements such as 3D model of turbine engine to make learning more dynamic and immersive, fostering active participation and knowledge retention. The main menu is arranged logically, with subsections like "Notes", "Infographics", "3D Model", and "Quizzes".

2.2.4 USER TESTING AND FEEDBACK

Gather feedback from users throughout the design process and interface to identify areas for improvement and refinement. feedback through Google form surveys will be collected from students and educators from aviation industry, analyzing the data to identify strengths, weaknesses, and areas for improvement. Based on this feedback, the app will be iterated and refined, focusing on enhancing usability, addressing usability issues, and improving the overall user experience.

2.3 REVIEW OF RECENT RESEARCH AND RELATED PRODUCT

2.3.1 RECENT MARKET PRODUCT

2.3.1.1 PRODUCT A

Aero EngineS

- Jet engine simulation at design point
- Emissions in different engine technologies

2.3.1.2 PRODUCT B

Jet and Rocket Engine

- Shows how jet turbine and rocket engine work inside until the molecular flow.
- Acceleration mode, transparent mode, rotating view.

2.4 COMPARISON BETWEEN RECENT RESEARCH AND CURRENT PROJECT

2.4.1 PRODUCT A VS OUR PRODUCT

Product	**Aero EngineS**	**GTE app**
Design		
Purpose	Jet engine simulation at design point and emissions in different engine technologies	enhance the understanding of gas turbine engine concepts through condensed explanations, illustrations, and practical segments of the app.
Feature	• Off-design point prediction for HPC • Emissions in different engine technologies • Hybrid rocket engine performance at design point	• Gas turbine engine notes • Infographics • 3D model • Quizzes
Target	Everyone	Aircraft Engineering Students
Platform	Android	Ios & Android

Table 1.1 Product A vs Our Product

2.4.2 PRODUCT B VS OUR PRODUCT

Product	**Jet and Rocket Engine**	**GTE app**
Design		
Purpose	Shows how jet turbine and rocket engine works inside until the molecular flow	enhance the understanding of gas turbine engine concepts through condensed explanations, illustrations, and practical segments of the app.
Feature	• Acceleration mode, transparent mode , rotate view • Jet Engine, Rocket Engine/ Cryogenic Engine	• Gas turbine engine notes • Infographics • 3D model • Quizzes
Target	Everyone	Aircraft Engineering Students
Platform	Ios & Android	Ios & Android

Table 2.1 Product B vs Our Product

CHAPTER 3

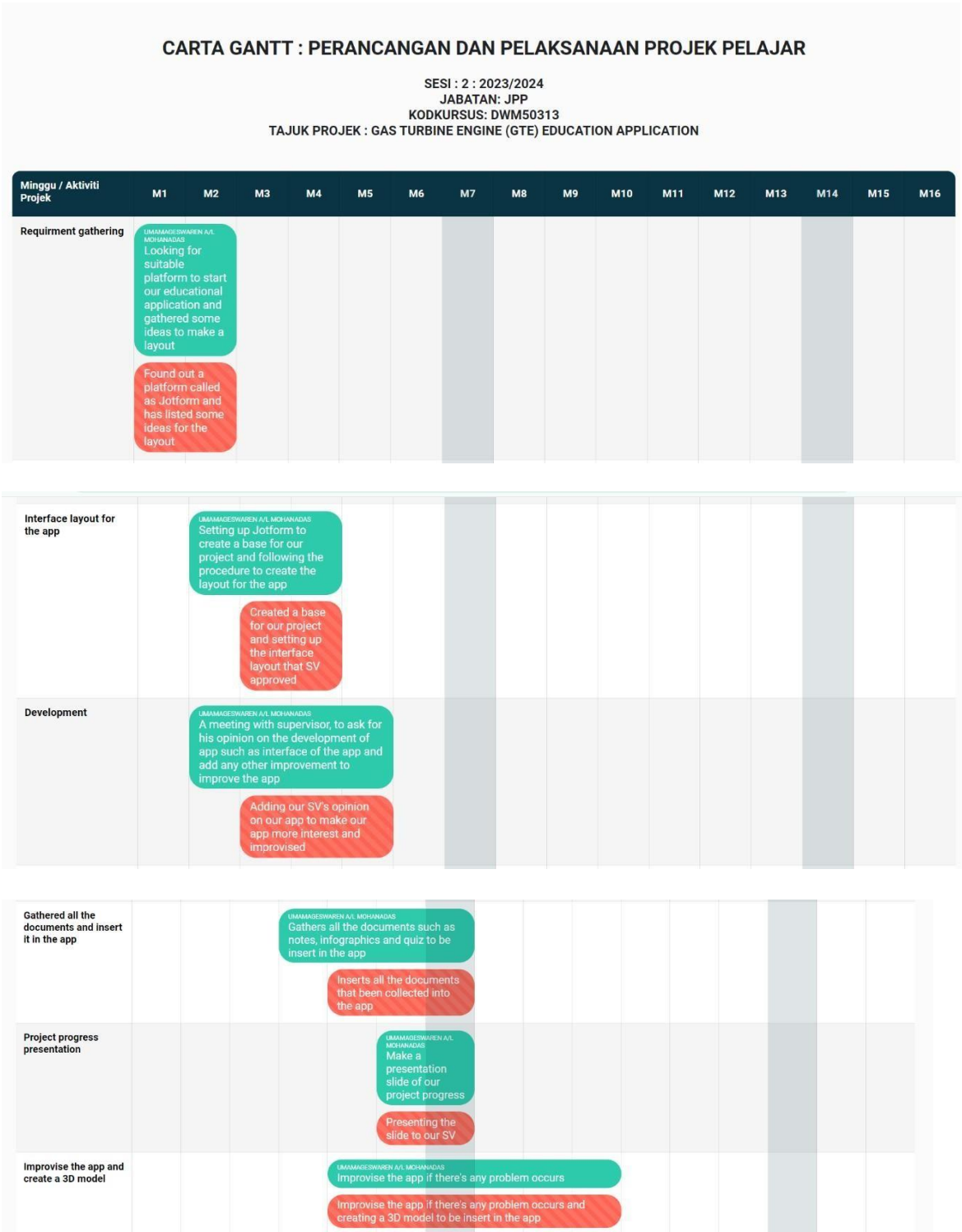
RESEARCH METHODOLOGY

3.1 PROJECT BRIEFING AND RISK ASSESMENT

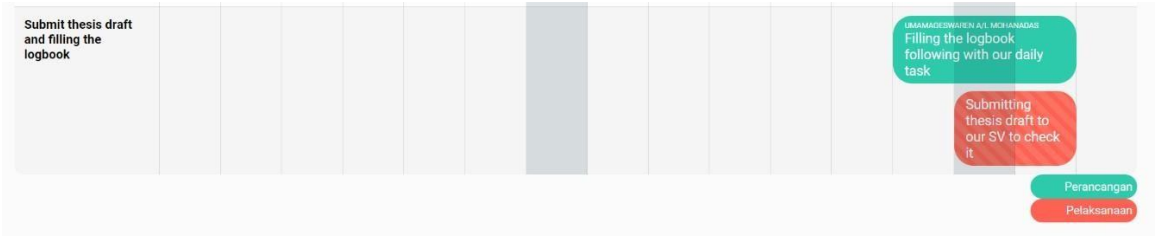
3.1.1 Utilization of Polytechnic's Facilities

The facilities of the Polytechnic, in particular its Wi-Fi infrastructure and the Gas Turbine Engine notes, were extremely important contributors to the successful creation of our educational application. Through the efficient utilization of these resources, we were able to maximize our productivity, our ability to collaborate, and our access to many important tools and information. In light of this experience, it is clear that it is essential to make effective use of institutional resources in order to maximize the results of projects and improve educational opportunities.

3.2 OVERALL PROJECT GANTT CHART




Attempt to run the app
UMAMAGESWAREN A/L MOHANADAS
Attempt to run the app to check whether there's any problem in the app. If there's any problem then would improvise it
Attempt to run the app to check whether there's any problem in the app. No problem's was found
Creating brochures and posters. Preparation for Aeromech
UMAMAGESWAREN A/L MOHANADAS
Creating brochures and posters for Aeromech
Creating brochures and posters for Aeromech


Submit thesis draft and filling the logbook
UMAMAGESWAREN A/L MOHANADAS
Filling the logbook following with our daily task
Submitting thesis draft to our SV to check it
Perancangan
Pelaksanaan

3.3 PROJECT FLOW CHART

3.3.1 Overall Project Flow Chart

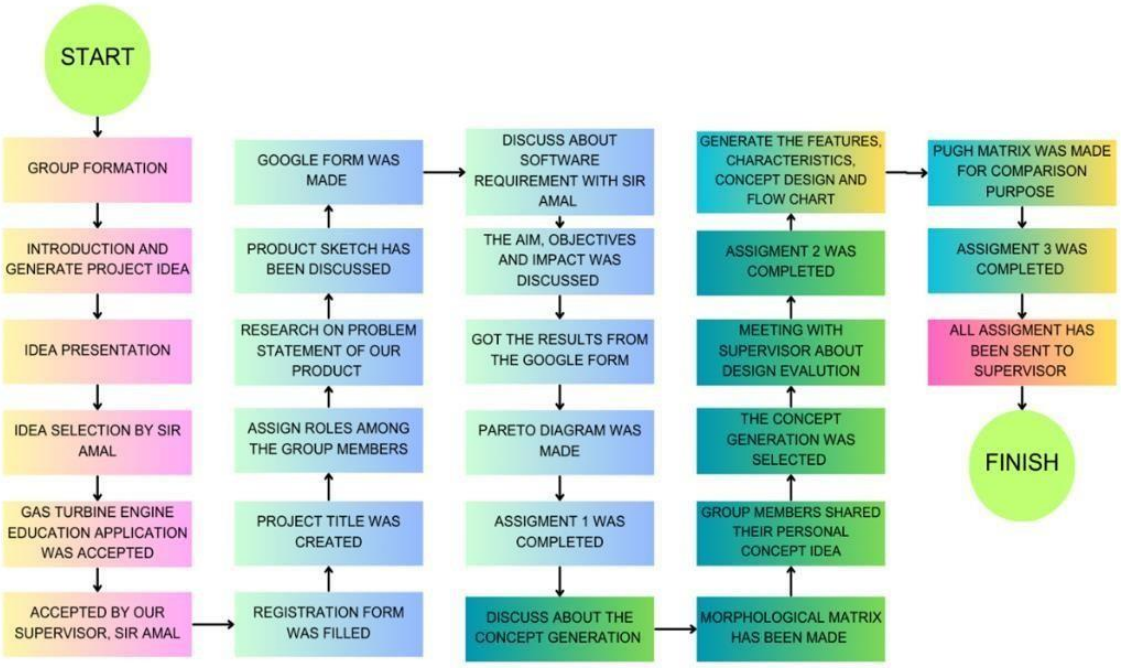


FIGURE 3.1 GTE App flow chart

3.4 DESIGN ENGINEERING TOOLS

3.4.1.1 Questionnaire Survey

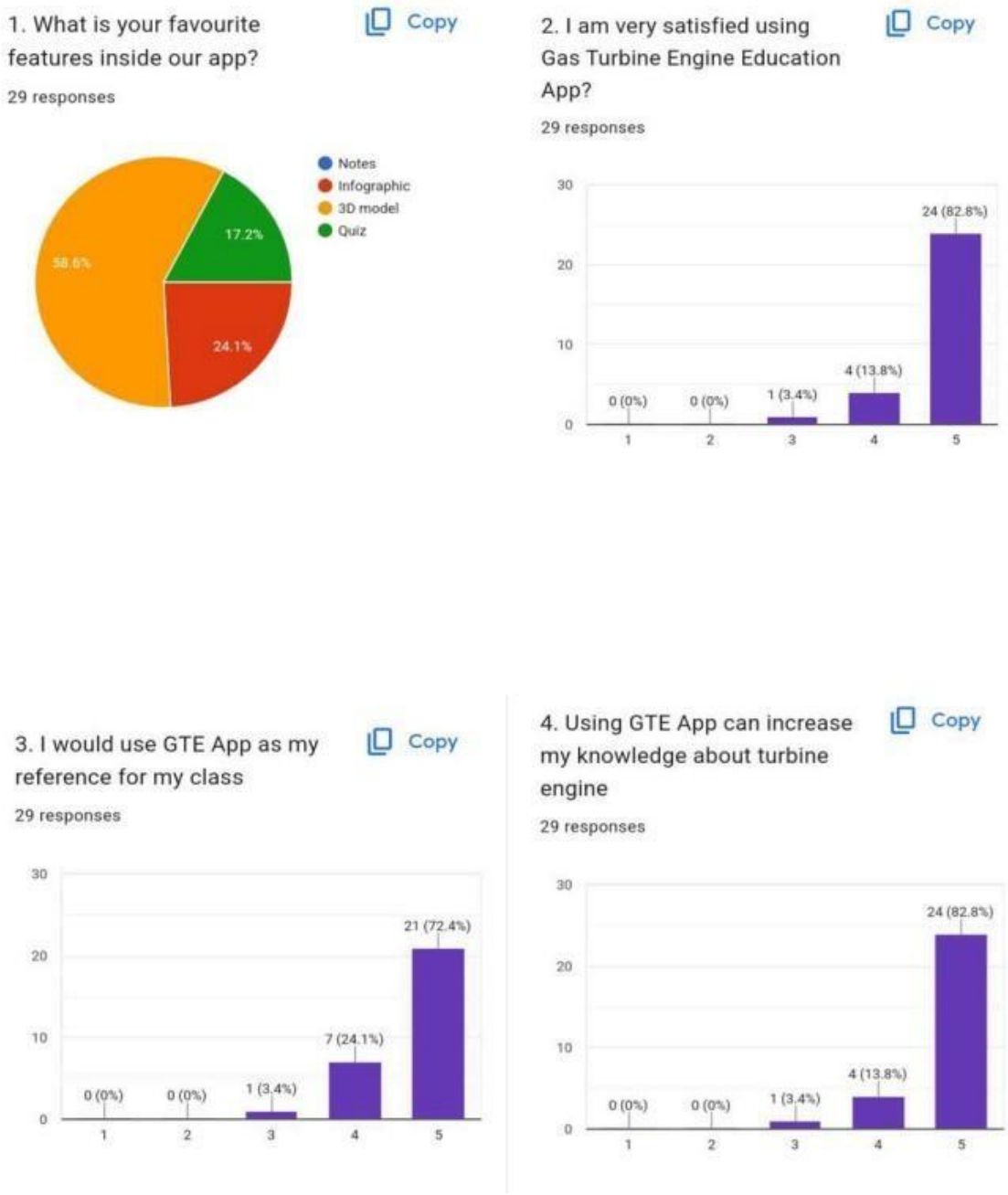
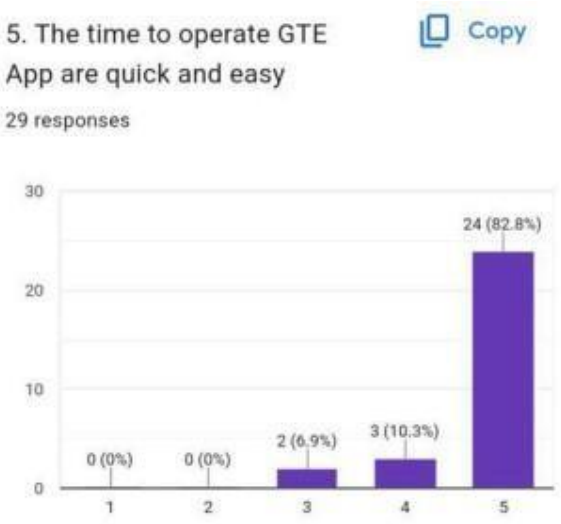
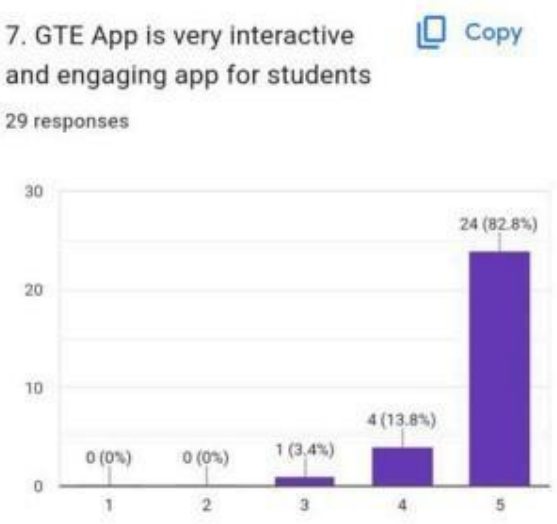


Figure 3.4.1


5. The time to operate GTE App are quick and easy
Copy
29 responses
30
20
10
0
0 (0%)
0 (0%)
2 (6.9%)
3 (10.3%)
24 (82.8%)
1
2
3
4
5


6. I would recommend others to use GTE App as their learning tool
Copy
29 responses
30
20
10
0
0 (0%)
0 (0%)
2 (6.9%)
5 (17.2%)
22 (75.9%)
1
2
3
4
5


7. GTE App is very interactive and engaging app for students
Copy
29 responses
30
20
10
0
0 (0%)
0 (0%)
1 (3.4%)
4 (13.8%)
24 (82.8%)
1
2
3
4
5

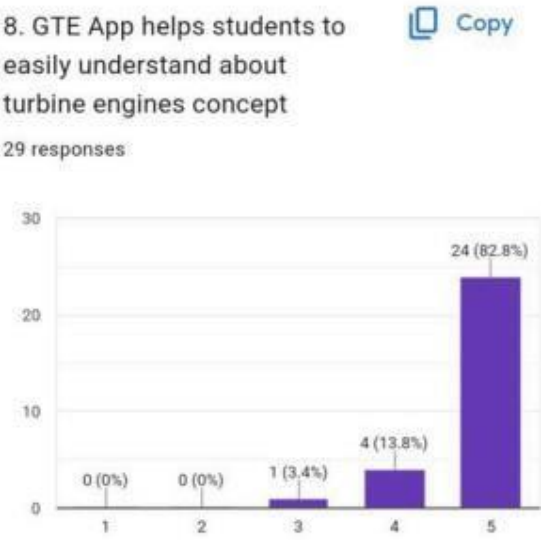

8. GTE App helps students to easily understand about turbine engines concept
Copy
29 responses
30
20
10
0
0 (0%)
0 (0%)
1 (3.4%)
4 (13.8%)
24 (82.8%)
1
2
3
4
5

Figure 3.4.2

3.4.1.2 Pareto Diagram

Pareto Chart :

Challenges	Frequency	Cummulative Percentage	Pareto Baseline
technical issues	6	35%	80%
lack of content	9	88%	80%
limited interactivity	2	100%	80%
GRAND TOTAL	17		

Figure 3.4.3

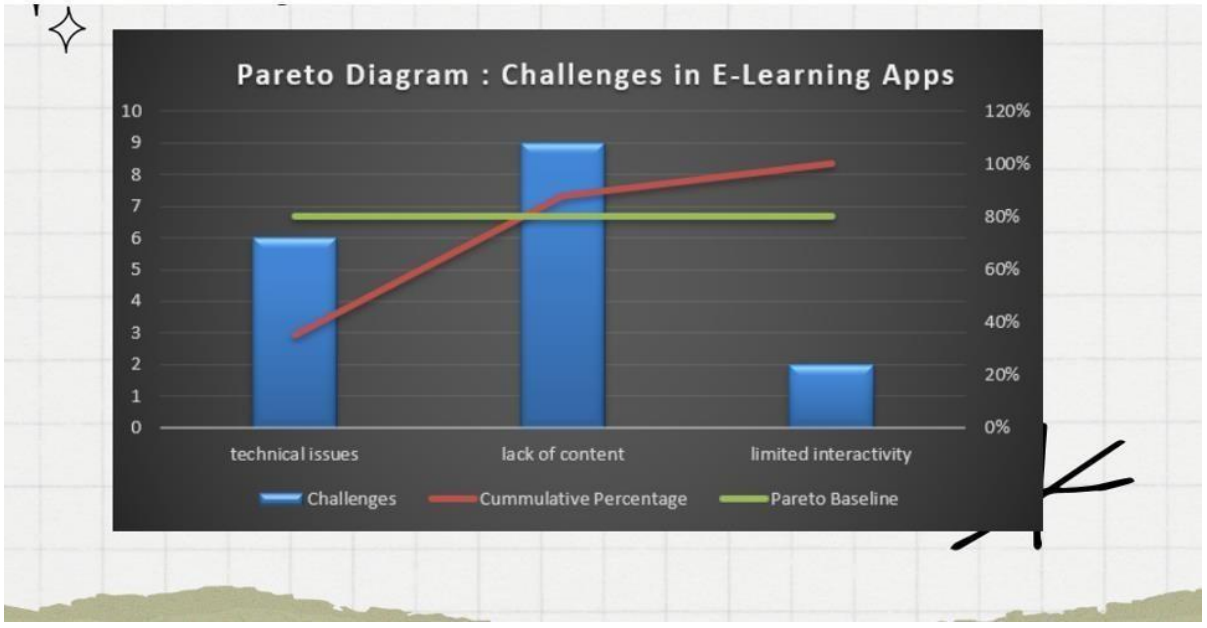


Figure 3.4.4

3.4.2 Design Concept Generation

3.4.2.1 Function Tree

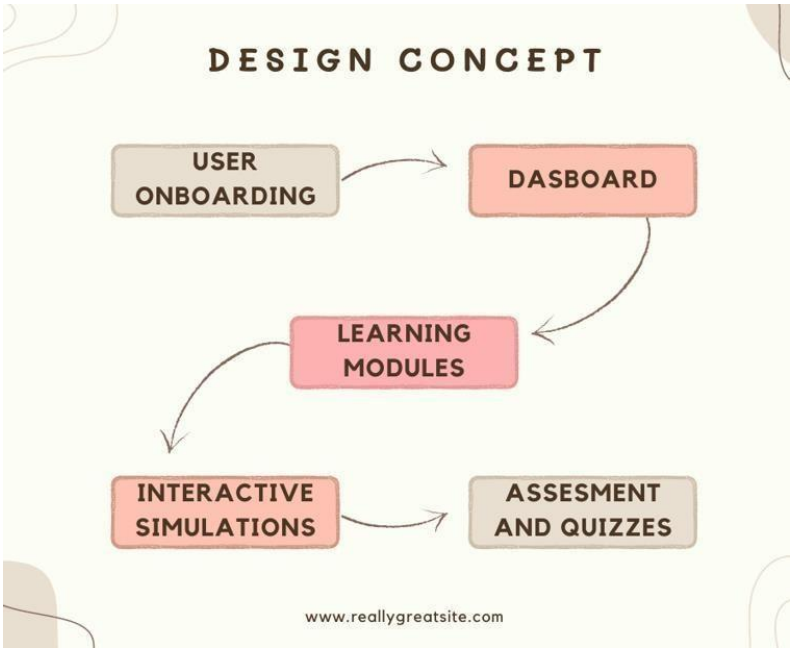


Figure 3.4.5

3.4.2.2 Morphological Matrix

	IDEA 1	IDEA 2	IDEA 3
FONT	ARIAL	CAVOLINI	TIMES NEW ROMAN
VIDEO	YOUTUBE	RECORDING	YOUTUBE
THEME	VARIATION	DARK	LIGHT
EXPLANATION	INFOGRAPHIC	PHOTO	VIDEO
SOFTWARE	JOTFORM 	SUBLIME 	PHYTON 

3.4.2.3 Proposed Design Concept 1

FUNCTION	CONCEPT 1	JUSTIFICATION
Font	Arial	Contemporary sans serif fonts design, softer and fuller.
Video	YouTube	Best way to communicate with users on providing information.
Theme	Variation	Attract readers by creating more interest and variety.
Explanation	Infographic	Better resources and easy to understand overview of a topic.
Software	JotForm	Free and open-source cross platform web server solution stack package.

Figure 3.4.6

3.4.2.4 Proposed Design Concept 2

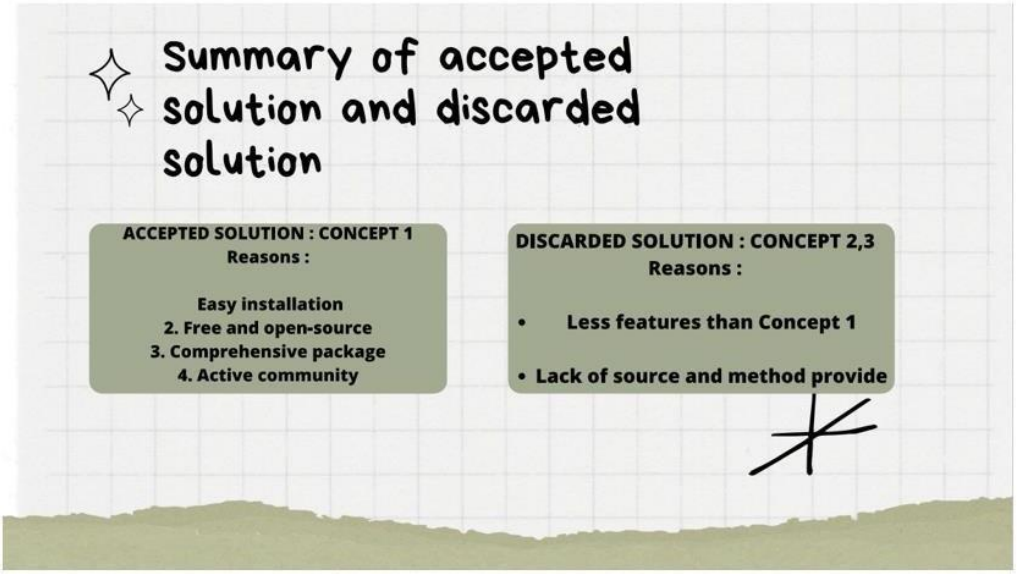
FUNCTION	CONCEPT 2	JUSTIFICATION
Font	Cavolini	It is easily differentiated forms, enable high levels of legibility and readability at small sizes.
Video	Recording	It allows learners to access content at their own pace and convenience. They can review materials as many times as needed to grasp difficult concepts, promoting a personalized learning experience.
Theme	Dark	Reduce eye strain.
Explanation	Photo	Photo add visual appeal to the learning materials, making them more engaging and interesting for learners.
Software	Sublime	It has a clean and intuitive user interface that is easy for learners. It is also known for its speed and efficiency.

3.4.2.5 Proposed Design Concept 3

FUNCTION	CONCEPT 3	JUSTIFICATION
FONT	Times New Roman	Its classic and timeless appearance gives a sense of formality and seriousness to the content.
VIDEO	Youtube	Best ways to communicate with users on providing information
THEME	Light	Light themes are often more accessible, making content easily visible to a wider audience, including individuals with visual impairments.
EXPLANATION	Video	Video content can be easily distributed to a large audience, making it a scalable solution for educational programs with diverse learners.
SOFTWARE	Phyton	Python's syntax can be easily distributed to a large audience, making it a scalable solution for educational programs with diverse learners

Figure 3.4.8

3.4.2.7 Accepted vs Discarded Solution



3.4.3 Evaluation & Selection of Conceptual Design

3.4.3.1 Pugh Matrix

CITERIONS	FACTOR	CONCEPT 1	CONCEPT 2	CONCEPT 3
COST	0.2	D	1	1
ACCESSIBILITY	0.3	A	6	5
TECHNOLOGY/ SOFTWARE	0.5	T U	4	5
TOTAL SCORE	1.0	M	2.2	2.0
RANKING		1	2	3

Figure 3.5

3.5 PRODUCT DRAWING / SCHEMATIC DIAGRAM

3.5.1 General Product Drawing

After entering into the app, there will be an interface layout which contains four main options for the user for using the app. It contains notes, infographics, 3D modeland quiz.

3.5.2 Specific Part Drawing / Diagram

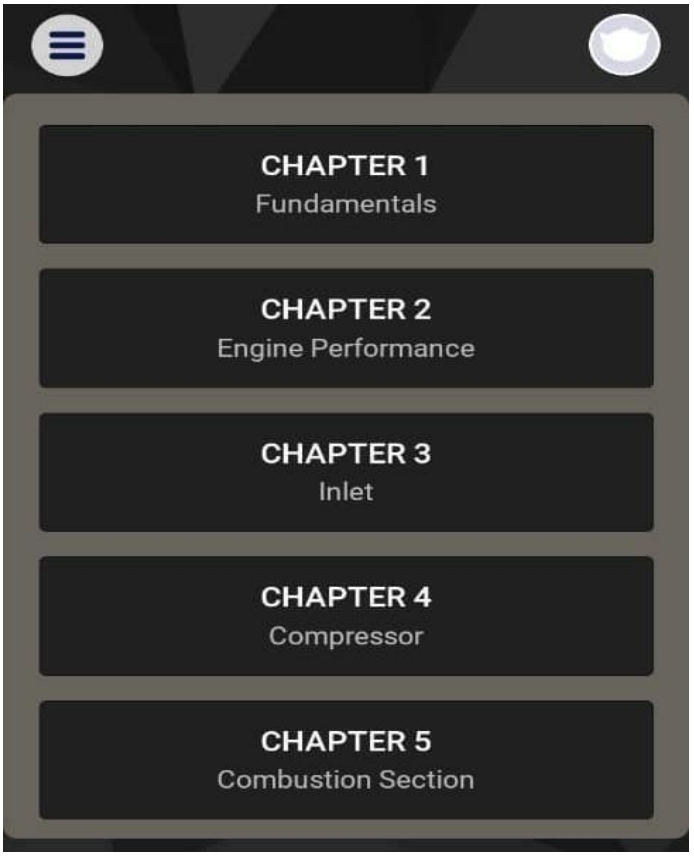


Figure 3.5.2

Once you press into the notes option, it will directly bring us to the notes part which will have 5 Chapter in it. For every Chapter there will be a long note and also some diagrams like other notes do.

Figure 3.5.3

If you guys select to press the infographic option, it will bring us to the infographic section which contains a small note along with the diagram. This will help some students to understand it very well compared to the normal notes out there.

Figure 3.5.4

If you pressed the 3D model option, it would bring us to a 3D model of a turbine. This 3D model has a high feature where it can zoom in and zoom out. It also can rotate 360 degrees where we can see the surroundings of the turbine engine. There is also turbine parts name and also its function when you guys pressed the numbers as shown in the figure 3.5.4.

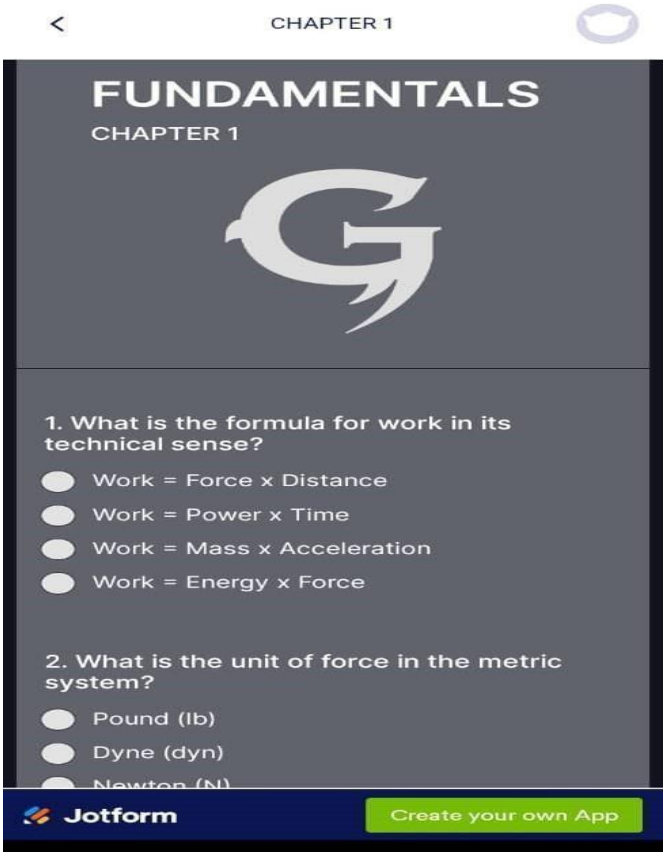


Figure 3.5.5

Then if you want to test yourself after reading the notes or the infographics, you can choose the Quiz option which brings you to the quiz section. There will also be quizzes for each and every chapter. Once you finish with your quiz, the marks will be shown to you guys where we can identify that which question did we answered wrong and it will show you the correct answers too.

3.7 DEVELOPMENT OF PRODUCT

3.7.1 Material Acquisition

Description	Material
Jotform is the main software that we use to build and develop our app	Jotform
A platform that we used to take notes for our app	
A platform that we used to create infographics	Canva
A platform that we used to make quiz for every chapter	W
A platform that we used to create the 3D model	Sketchfab

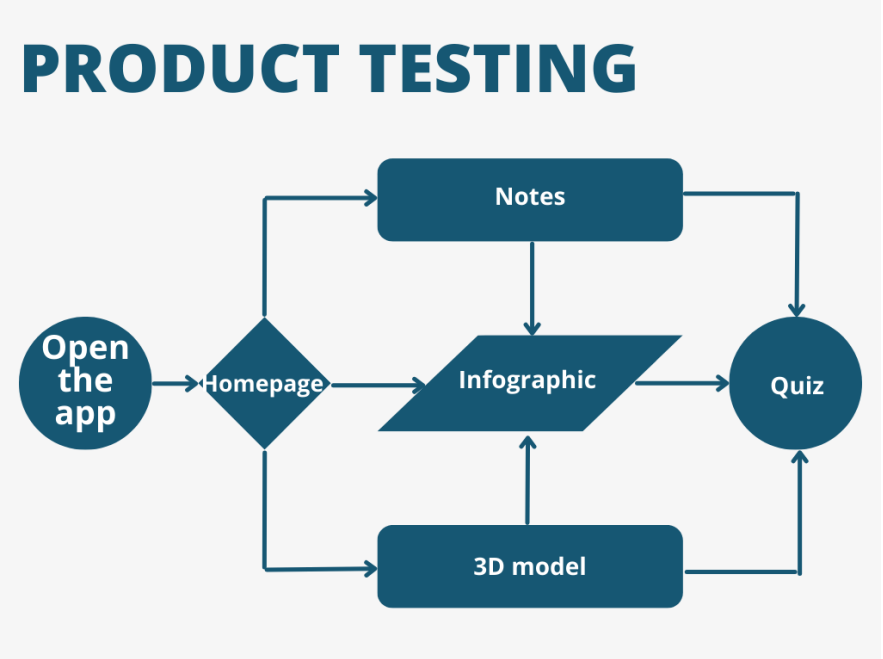
Table 3.7: Material Acquisition

3.7.2 Machines and Tools

To develop this app, we used this laptop for designing, editing, entering 3D model and notes that we collected because it is more flexible that smartphone and much easier to do our job. Besides that, we use this device to access website such as JotForm, Cidos, Canva, word and sketchnfab. Those websites that we've used to create notes, quizzes and 3D model. We can tell that this device is one of the main reasons behind developing this GTE Education App.

We have used smartphones to develop this app so we can use it to test run our app and check for any error. It is small in size compared to the laptop so that we don't need to bring our laptop every time unless any software upgrade on app. Smartphone is also very easy to use and easy to access.

3.8 PRODUCT TESTING / FUNCTIONALITY



3.9 LIST OF MATERIALS & EXPENDITURES

	Items	Unit	Price/Unit	Total
1.	Jotform	1	RM 400.00	RM 400.00
2.	Canva	1	RM 0.00	RM 0.00
3.	Cidos	1	RM 0.00	RM 0.00
4.	Word	1	RM 0.00	RM 0.00
5.	Sketchnfab	1	RM 0.00	RM 0.00
Total				RM 400.00

CHAPTER 4

RESULT AND DISCUSSION

4.1 PRODUCT DISCRIPTION

4.1.1 GENERAL PRODUCT FEATURES AND FUNCTIONALITIES

At the fundamentals of the Gas Turbine Engine Application is our ambition to change the way Politeknik Banting students' study and revise. We designed a colorful and engaging experience that allows consumers to easily understand the complexities of gas turbine engines. Our objective is to make learning about gas turbine engines not only possible, but also enjoyable. We are available to our consumers 24 hours a day, seven days a week, with dedicated customer service to ensure a seamless journey. By remaining current with industry trends through ongoing development and upgrades, we ensure that the Gas Turbine Engine App remains the best option for monitoring, maintaining, and optimizing gas turbine engines.

FIGURE 4.1 APP HOME SCREEN

4.1.2 SPECIFIC PART FEATURES

4.1.2.1 PRODUCT STRUCTURE

The offered teaching software for gas turbine engines includes a number of significant features and capabilities targeted at improving aviation students' learning experiences. At the basis of it, the software provides the 3D model of gas turbine engine operation, allowing users to integrate academic study to real-world settings. Condensed explanations, images, and practical elements inside the software help users comprehend complicated ideas more effectively. Furthermore, the incorporation of quizzes directly into the program improves accessibility and convenience by allowing students to evaluate their learning at any time and on any device.

1) Notes

To make the GTE application more approachable, we have placed a great emphasis on accommodating different learning methods and interests. One of the most important characteristics is the ease of access to notes. Whether users prefer brief study sessions or in-depth dives into topics, they may quickly obtain simplified explanations and extra notes on gas turbine engine topics whenever it is most convenient.

2) Infographics

Integrating graphical elements into the Gas Turbine Engine (GTE) software provides aviation students with a visually appealing and easy-to-digest approach to learn difficult knowledge. Infographics simplify complicated concepts, data, and procedures into simple, visually attractive pictures, making them a powerful tool for presenting information.

3) 3D Model

By combining visualization elements into Gas Turbine Engine (GTE) software, we provide aircraft maintenance students with dynamic and immersive learning opportunities. Students may visually explore GTEs' complicated components and processes via 3D models. These visual illustrations bring fundamental ideas into focus, allowing students to better understand complicated technical principles.

4) Quiz

The addition of a new quiz function to our Gas Turbine Engine (GTE) applications, particularly developed for aviation students. This feature has various benefits. Quizzes let students test their comprehension, reinforce their learning, and receive fast feedback. They serve as effective self-assessment tools,enabling students to actively participate in their educational path.

4.1.2.2 PRODUCT MECHANISMS

1) Assessment

   - We employ quizzes to measure users grasp of gas turbine engine principles. With rapid feedback on quiz results, users may identify their strengths and shortcomings, allowing themto focus their learning efforts where they are most effective. This self-assessment tool encourages individual learning and continuous development, resulting in improved learning results overall.

2) Visualization

   - Visual technologies help consumers grasp abstract topics through concrete representations. Users may visualize gas turbine engine components and operations using our interactive infographics and 3D models, which make complicated conceptsmore real and understandable. Visualization strategies appeal to visual learners while also improving information retention and recall.

3) Accessibility

- This approach makes the instructional program easily available to users across several devices and platforms. By making the app available on smartphones, tablets, and laptops, users may access instructional materials at any time and from any location, increasing ease and flexibility.

  Accessibility methods consider different learning styles and preferences, ensuring that all users can successfully interact with the information.

4) Remote Access

- Remote access techniques allow users to learn gas turbine engine ideas from any location with an internet connection. This encourages flexibility and convenience by allowing users to adjust their learning experiences to their specific schedules and preferences. Remote access strategies support continual learning by allowing users to interact with educational resources whenever and wherever it is most suitable for them.

4.1.2.3 SOFTWARE/PROGRAMMING

To ensure a smooth and fulfilling learning involvement, we have coordinated a few highlights and capacities into the program and programming for our Gas Turbine Motor application.

Our **user interface (UI)** places a tall esteem on clarity and ease of use, making route straightforward and simple with a well-planned format and intelligently highlights such as sliders and buttons. We have made a state-of-the-art recreation motor that can reliably duplicate motor operation, permitting clients to alter settings and see the results in genuine time, to bring gas turbine motor operations to life. This motor produces energetic graphs and immersive 3D models with ease, utilizing WebGL andThree.js APIs to effectively interface with visualization instruments.

We manage the distribution and organization of instructional materials with our powerful **content management system (CMS),** which supports a wide range of user roles and content types. With our feature-rich module, which offers a variety of question formats and automatic grading for immediate feedback, instructors may construct interesting quizzes. By enabling educators to monitor both individual and group success, performance analytics guarantee customized learning opportunities.

Our application uses frameworks like React Native and Flutter to **offer cross- platform compatibility** and uniform user experience across a range of devices and screen sizes. We place a high priority on data integrity and dependability and are supported by scalable and secure infrastructure, including cloud services like AWS and Firebase.

4.1.2.4 ACCESSORIES AND FINISHING

In strengthening the accessories and finishing components of our educational application, we prioritized elements that contribute tomaking the learning experience really focused and engaging are gained.

a) Our platform has integrated **progress monitoring** with visual indications and bars to guide participants along their learning journey. Detailed data and reports give insights into learner's development, allowing them to observe both their achievements and potential for growth.

b) We have included a **feedback mechanism** within our educational offerings to allow students to take part in the course of their experience with us. We appreciate their feedback and recommendations for what is functioning effectively as well as what may be adjusted. This initial point to reach us enables users to contribute their ideas and views, which we utilize to constantly improve the app based on their requirements and goals. We sincerely value their feedback and see it as the inspiration behind the app's continued growth and improvement. It's all about paying attention to our users, learning their requirements, and working together toprovide the greatest learning experience possible.

c) We included **cross-platform sync** in our system to allow our users to seamlessly transition between PCs, tablets, and cellphones. Our programguarantees that their development is fully synchronized across all devices. We feel this feature is game-changing, allowing students to study whenever and wherever they choose without fear of losing their position or missing out on important insights. With cross-platform synchronization, we are convinced that their learning path will always be smoothly connected, regardless of the device they use.

4.1.3 GENERAL OPERATION OF THE PRODUCT

The instructional software for gas turbine engines starts out with an account registration or authentication, which provides access to a wide range of learning tools. Users utilize a range of learning resources after seeing the information, such as brief explanations, visualizations, simulations, and dynamic quizzes. These materials help users grasp the concepts of gas turbine engines by allowing them to watch engine functioning through animated simulations and check their comprehension through quizzes with rapid feedback. Users may track their progress visually and utilize tools like bookmarking and note-taking to improve their learning experience. As users interact with the program, their expertise of gas turbine engines grows, aided by an emphasis on user convenience to continual learning and growth driven by user input along with industry advances.

4.1.4 OPERATION OF THE SPECIFIC PARTS OF THE PRODUCT

4.1.4.1 NOTES

The app allows users to access notes that offer more details and explanations about gas turbine engines. They could go into lengthy explanations, look into other topics, and save significant sections for later reference. To further personalize the learning process, users may even add their own thoughts or comments.

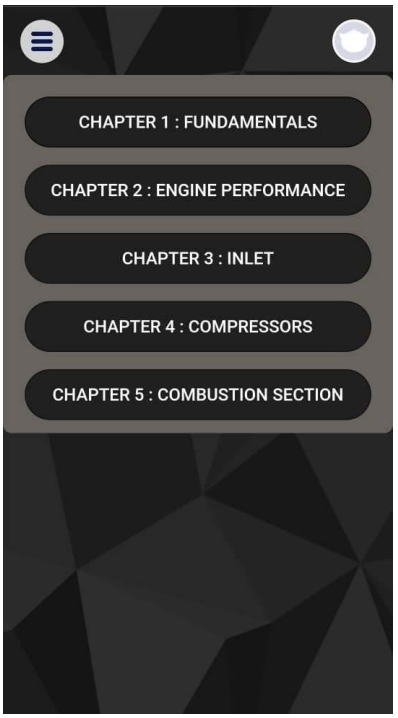


FIGURE 4.2 NOTES

4.1.4.2 INFOGRAPHICS

We also provide infographics, which are visual representations of subjects linked to gas turbine engines. These interactive infographics help users comprehend complex ideas by using eye-catching visuals like graphs, charts, and photos. They make difficult information understandable by simplifying it, which aids in the acquisition and retention of key ideas.

FIGURE 4.3 INFOGRAPHIC

4.1.4.3 3D MODEL

Get hands-on experience with studying with our app's interactive 3D representations of gas turbine engines. The model allows users to study engine parts from any angle twisting, turning, and zooming in. With the help of this interactive technique, students may better comprehend and visualize the processes of gas turbine engines by getting a true sense of how they operate.

FIGURE 4.4 3D MODEL

4.1.4.4 QUIZZES

Students may assess the knowledge of gas turbine engine topics using the quizzes we have provided in the app. There is multiple choice, true/false, and fill-in-the- blank tests available on a variety of subjects. Immediately upon completion, they will receive an assessment detailing the results and an explanation of any questions that may have been overlooked.

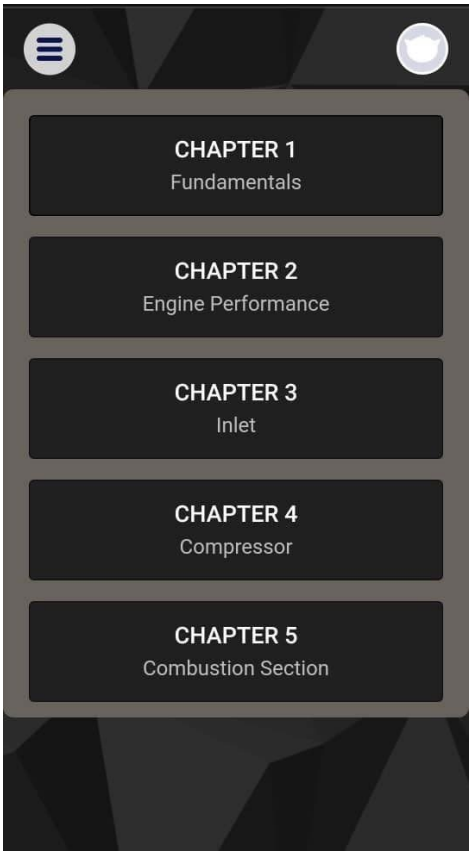
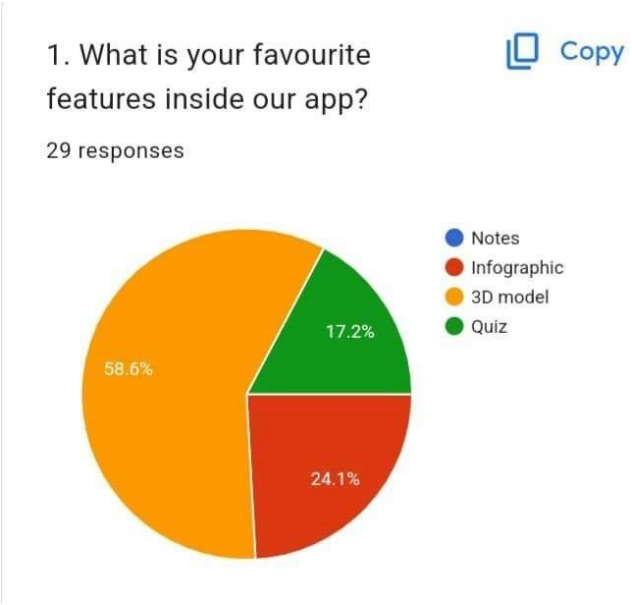
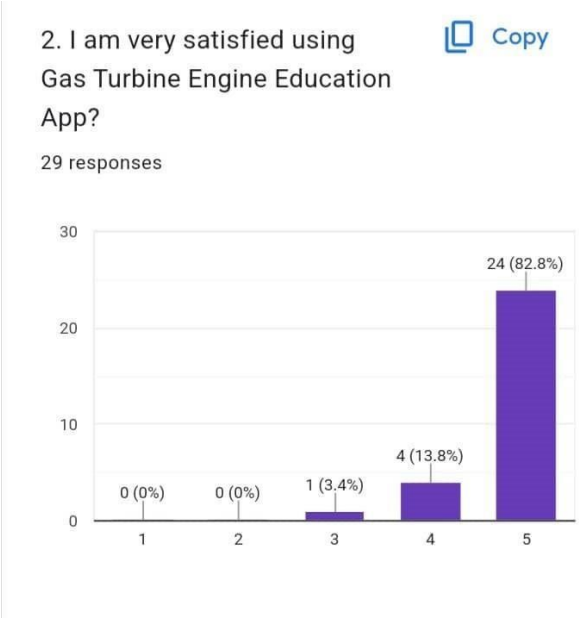


FIGURE 4.5 QUIZZES

4.2 PRODUCT OUTPUT ANALYSIS





3. I would use GTE App as my reference for my class

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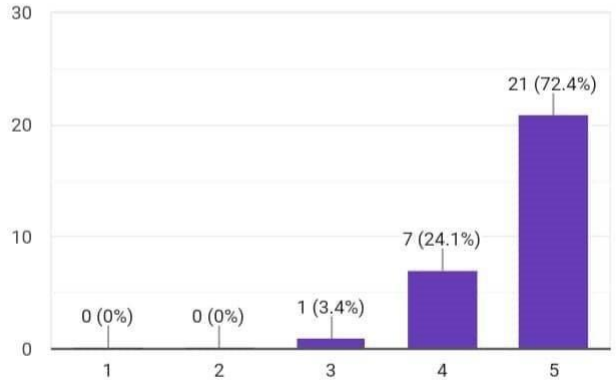
29 responses



4. Using GTE App can increase my knowledge about turbine engine

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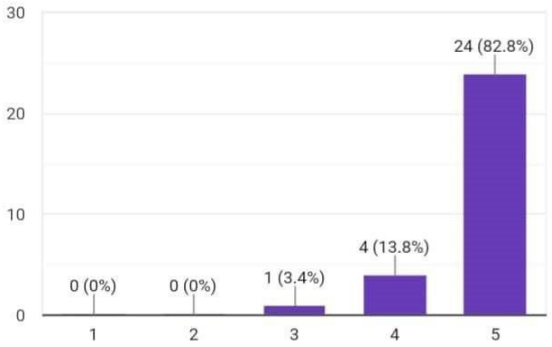
29 responses



5. The time to operate GTE App are quick and easy

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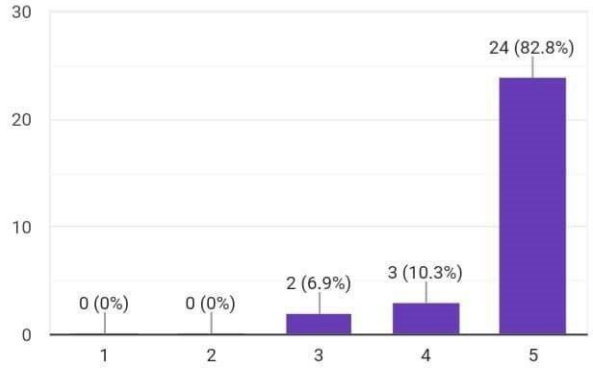

6. I would recommend others to use GTE App as their learning tool

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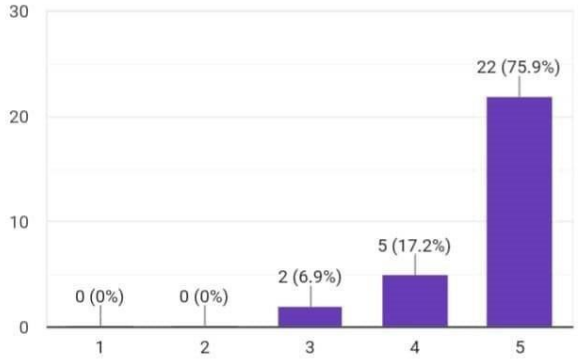

7. GTE App is very interactive and engaging app for students

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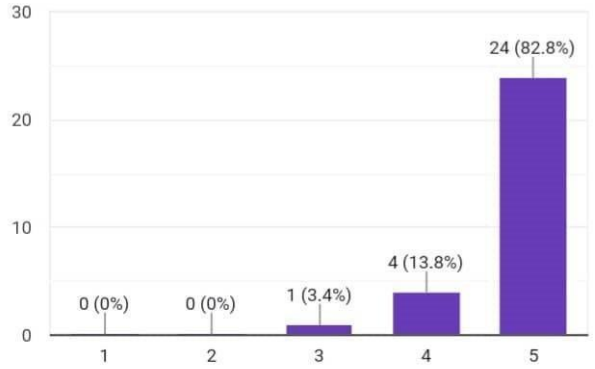
29 responses



8. GTE App helps students to easily understand about turbine engines concept

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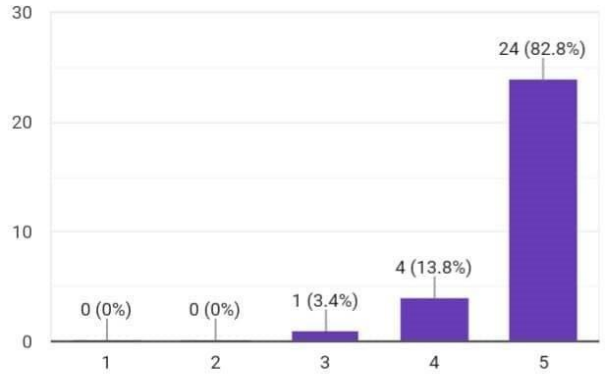
29 responses



4.3 ANALYSIS OF PROBLEM ENCOUNTERED AND SOLUTIONS

Problem: the difficulty of content management

• Analysis: It can be difficult and time-consuming to keep track of a variety of educational resources, such as notes, infographics, 3D models, and quizzes.

• Solution: We've put in place a strong content management system (CMS) with features like version control, collaborative editing, and user-friendly organization. We have also included automation and templates to speed up the development and updating of content.

Problem: User Upkeep and Engagement

• Analysis: It might be difficult to maintain users' motivation and interest in an approved time.

• Solution: We have included gamification features like accomplishment levels, leaderboards, and badges to keep people interested and inspired. To promote continued engagement, we provide rewards for passing exams or meeting goals.

Problem: Ensuring That Everyone Can Use the App

• Analysis: It's important to make sure that everyone can use our app, including people who may have impairments or have language problems.

• Solution: To make sure that everyone can use our software with ease, we adhere to accessibility standards such as WCAG (Web Content Accessibility Guidelines). We also include language options and support for assistive devices, such as screen readers, to ensure that our software is accessible to and beneficial for everyone.

CHAPTER 5

CONCLUSION AND RECCOMENDATION

5.1 ACHIEVEMENT OF AIM & OBJECTIVES OF THE RESEARCH

5.1.1 General Achievements of the Project

In terms of both engineering and technology, the Gas Turbine Engine App project is a first of its kind. The main goal of it is to give gas turbine engine enthusiasts, professionals, and students a place to learn everything they need to know about them. The goal of this project is to give people a variety of experiences, including teaching materials, 3d design, and immediate information analysis. This will be achieved through thorough study, creative design, and strong development. The app uses cutting edge technologies like machine learning to help users learn more about how gas turbine engines work, how to maintain them, and how to improve their performance. Its easy-to-use design and engaging features also keep users interested and make learning easier for people of all skill levels.

5.1.2 Specific Achievement of Project Objectives

5.1.2.1 Product Structure

The Gas Turbine Engine App project has come a long way towards its goals, especially when it comes to developing the product. One important success is the creation of a well-organized and easy-to-use user interface that was carefully thought out to make contact with the system easier and more accessible. The app's modular design also makes it easy to add new features and changes. This makes it flexible and adaptable enough to adapt to changing user needs and technological advances. A strong server system also helps with data handling and access, so you can quickly get to the information that you need.

5.1.2.2 Product Mechanisms

One big achievement is making a dynamic, easy-to-use interface that combines complicated engineering ideas with simple design ideas in a way that works well. This design not only makes it easy to move around, but it also lets users see and learn more about gas turbine engines work. The projecthas also done a great job of putting in place advanced 3d design of gas turbine engine that let users test different working conditions. By carefully calibrating and validating, these models give correct information about engine structure, which helps engineers improve performance and find and fix problems.

5.1.2.3 Software and Programming

Our team has made a strong and flexible software base that works better and is easier to use than expected thanks to careful planning and execution. One impressive achievement is the use of advanced techniques and information structures, notes, infographics, which make it easy for the app to handle. Our team's dedication to user experience has also led to the creation of an easy-to-use interface, which is supported by adaptable design principles and features that are focused on the user.

5.1.1.1 Accessories and Finishing

The app can easily download many different gadgets, such as smartphones, tablet, and laptop. This was made possible by thorough study and teamwork with experts in the field. Each part of the gas turbine engine is carefully modelled and adjusted to make sure it is accurate and realistic. This gives people an experience that is similar to working with a real gas turbine engine. The project also puts a lot of stress on finishing touches that go in addition to just looks. These include user interface design, accessibility features, and improving fast access.

5.2 CONTRIBUTION OR IMPACT OF THE PROJECT

The Gas Turbine Engine App project has had a significant impact on a number of important areas, which shows how important it is for teaching engineering and making technology better. For starters, the project has made it easier for everyone to get information and help with gas turbine technology. People who are interested in, studying, or working with gas turbine engines can all learn more with this app's platform that combines training resources. This makes engineering ideas and their real-world applications available to people from all over the world, regardless of where they live or what school they are in.

Second, the project has helped engineers come up with new ideas and improve their skills. The app makes people interested and creative by giving them hands-on learning opportunities, actual situations, and interactive features. Students can try out different factors, see how one action can lead to another, and fix problems in simulated situations. This helps them get better at handling problems and thinking critically. Professionals can also use the app as a teaching tool to improve their skills, keep up with changes in technology, and find the best ways to do things in real-life situations.

Lastly, the project has made it easier for people from different fields to work together and share their knowledge in business, education, and other places. By involving people from different fields, like education, computer science, and engineering, the project has made it easier for ideas and knowledge to spread. The app's content and usefulness have been improved through collaborative study, development, and validation. This makes it relevant and useful for dealing with current problems and new trends in gas turbine engines. The project also opens the door for new ideas and partnerships in the future, which will help the field make steady progress and have abigger effect.

5.3 IMPROVEMENT AND SUGGESTIONS FOR FUTURE RESEARCH

5.3.1 Product Structure

Improvements and research might improve the Gas Turbine Engine App's product structure for future modifications. First, modular design may provide consumers with more modification possibilities. Simulation models, training modules, and data display tools can be divided to meet users' learning goals and preferences. Adding powerful machine learning algorithms might improve the app's prediction powers, letting user model and understand complicated events more accurately and efficiently. Explore VR and AR technologies to make the app more realistic and allow users to interact more accurately with simulated gas turbine engines.

5.3.2 Product Mechanisms

First, improving simulation accuracy and fidelity using advanced computational techniques and experimental validation would improve the app's educational and professional value. Additionally, machine learning techniques might allow the app to customize user experiences depending on learning preferences and abilities levels. Expanding the app to include gas turbine technology trends like hybrid engines and alternative fuels would keep it relevant to current issues. Collaboration with business partners and academic institutions might improve the app's content and functioning by providing real-world data and knowledge.

5.3.3 Software and Programming

Firstly, demonstrating user feedback and iterative testing may guarantee that software matches closely with user needs and preferences. Incorporating strong error handling systems and attractive user interfaces may further increase user experience and usability. Secondly, studying more emerging technologies like as artificial intelligence and machine learning allows for new capabilities, such as predictive analytics for maintenance scheduling or adaptive machine learning techniques for customized user experiences.

5.3.4 Accessories and Finishing

When it comes to accessories, experts could look into adding a wider range of parts and subsystems, such as advanced monitors for tracking in real time, adaptive control systems to improve performance, and new materials to make them more durable and efficient. Adding features that let users virtually put together and take apart engine parts could also help them learn more about how gas turbine systems work. When it comes to processing, modular design and free applications can make an app more flexible and movable, allowing developers to make custom modules and add new features based on what users want. The app could also be more useful and relevant in real-world engineering situations if it used artificial intelligence and machine learning techniques for forecast maintenance and improvement.

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APPENDIX A: DECLARATION OF TASK SEGREGATION

SUB-CHAPTERS	DETAILS
AQMAL DINIE	
1.3.2.1	Specific Individual Project Objective: Product Structure
1.5.2.1	Specific Individual Scopes: Product Structure
2.3.1.1	Recent Market Product: Product A
2.4.1	Product A vs Your Product
3.4.2.3	Proposed Design Concept 1
3.5.2.1	Specific Part Drawing/ Diagram: Product Structure
3.9.1	List Of Materials and Expenditures: Product Structure
4.1.2.1	Specific Part Features: Product Structure
4.1.4.1	Operation of the Specific Part of The Product: Product Structure
4.3.1	Analysis of the Problem Encountered and Solution: Product Structure
5.1.2.1	Specific Achievement of Product Objectives: Product Structure
5.3.1	Improvement And Suggestions for Future Research: Product Structure

SUB-CHAPTERS	DETAILS
RUVANESH A/L MURUGAN @ SURESH	
1.3.2.2	Specific Individual Project Objective: Product Mechanisms
1.5.2.2	Specific Individual Scopes: Product Mechanisms
2.3.1.2	Recent Market Product: Product B
2.4.2	Product B vs Your Product
3.4.2.4	Proposed Design Concept 2
3.5.2.2	Specific Part Drawing/ Diagram: Product Mechanisms
3.9.2	List Of Materials and Expenditures: Product Mechanisms
4.1.2.2	Specific Part Features: Product Structure Mechanisms
4.1.4.2	Operation of the Specific Part of The Product: Product Mechanisms
4.3.2	Analysis of the Problem Encountered and Solution: Product Mechanisms
5.1.2.2	Specific Achievement of Product Objectives: Product Mechanisms
5.3.2	Improvement And Suggestions for Future Research: Product Mechanisms

SUB-CHAPTERS	DETAILS
MATESHWARAN A/L RAGU	
1.3.2.3	Specific Individual Project Objective: Software/Programming
1.5.2.3	Specific Individual Scopes: Software/Programming
2.3.1.3	Recent Market Product: Product C
3.4.2.5	Proposed Design Concept 3
3.5.2.3	Specific Part Drawing/ Diagram: Software/Programming
3.9.3	List Of Materials and Expenditures: Software/Programming
4.1.2.3	Specific Part Features: Software/Programming
4.1.4.3	Operation of the Specific Part of The Product: Software/Programming
4.3.3	Analysis of the Problem Encountered and Solution: Software/Programming
5.1.2.3	Specific Achievement of Product Objectives: Software/Programming
5.3.3	Improvement And Suggestions for Future Research: Software/Programming

SUB-CHAPTERS	DETAILS
UMAMAGESWAREN A/L MOHANDES	
1.3.2.4	Specific Individual Project Objective: Accessories and Finishing
1.5.2.4	Specific Individual Scopes: Accessories and Finishing
2.3.1.4	Recent Market Product: Accessories and Finishing
3.5.2.4	Specific Part Drawing/ Diagram: Accessories and Finishing
3.9.4	List Of Materials and Expenditures: Accessories and Finishing
4.1.2.1	Specific Part Features: Accessories and Finishing
4.1.4.4	Operation of the Specific Part of The Product: Accessories and Finishing
4.3.4	Analysis of the Problem Encountered and Solution: Accessories and Finishing
5.1.2.4	Specific Achievement of Product Objectives: Accessories and Finishing
5.3.4	Improvement And Suggestions for Future Research: Accessories and Finishing

APPENDIX B: Summary of Similarity Report (Turnitin)

THESIS CP1-5_pagenumber.pdf

ORIGINALITY REPORT

2%	1%	0%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to HELP UNIVERSITY Student Paper	<1%
2	etd.aau.edu.et Internet Source	<1%
3	www.6wresearch.com Internet Source	<1%
4	jaato.com Internet Source	<1%
5	Submitted to Southern New Hampshire University - Continuing Education Student Paper	<1%
6	pdf.secdatabase.com Internet Source	<1%
7	www.putchildrenfirst.org Internet Source	<1%
8	Submitted to Institute of Research & Postgraduate Studies, Universiti Kuala Lumpur Student Paper	<1%

9	umpir.ump.edu.my Internet Source	<1%

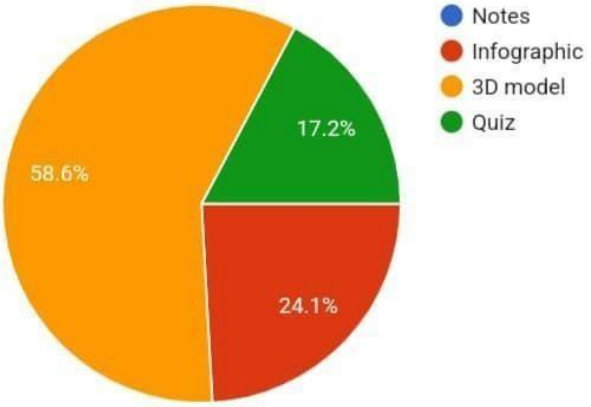
Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		

APPENDIX C: POST SURVEY

1. What is your favourite features inside our app?

Copy

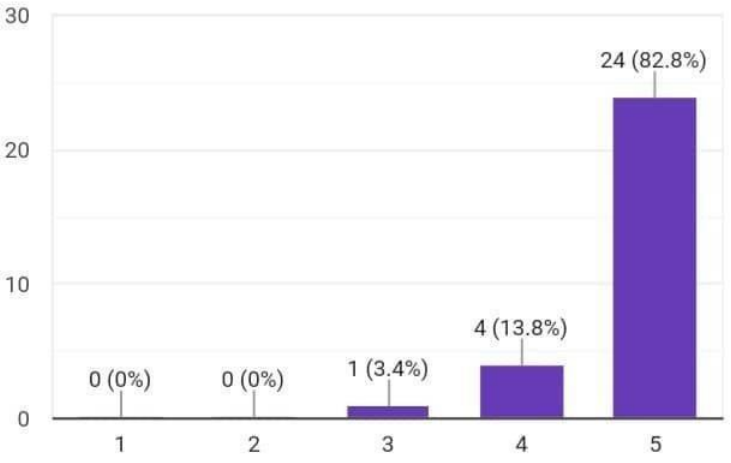
29 responses



2. I am very satisfied using Gas Turbine Engine Education App?

Copy

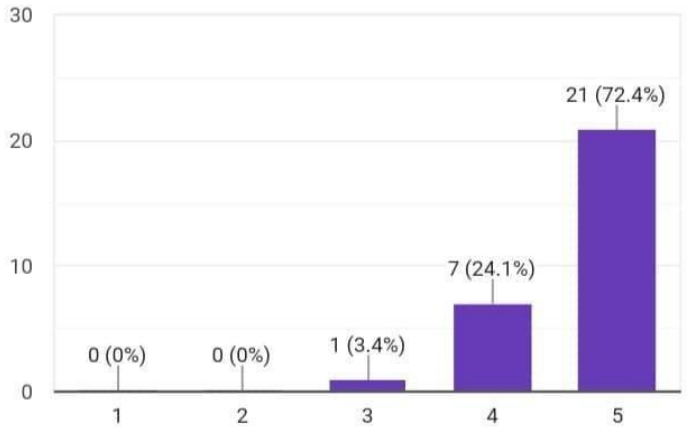
29 responses



3. I would use GTE App as my reference for my class

Copy

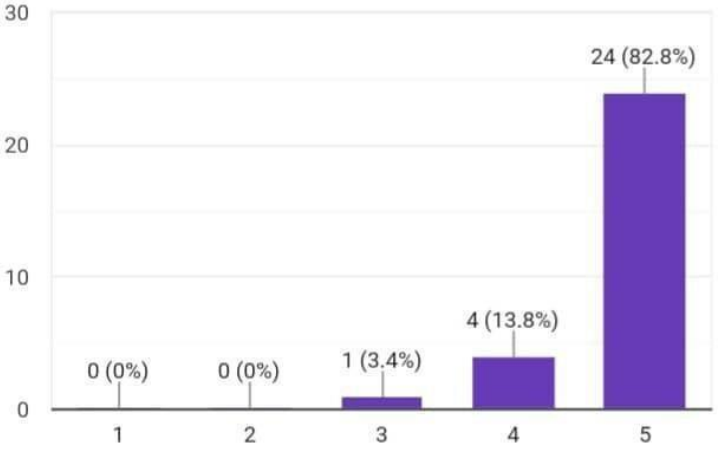
29 responses



4. Using GTE App can increase my knowledge about turbine engine

Copy

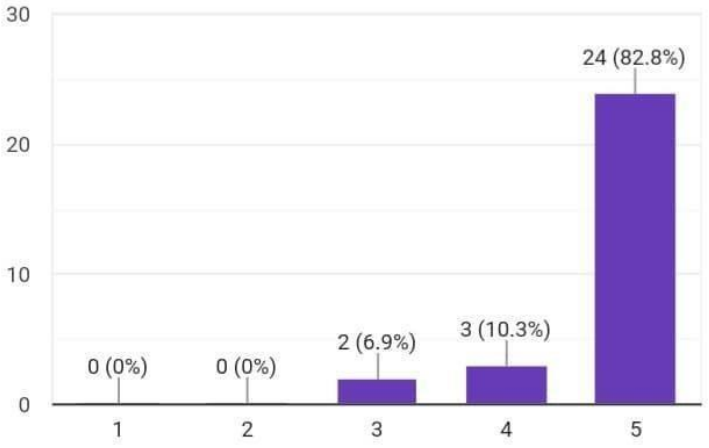
29 responses



5. The time to operate GTE App are quick and easy

Copy

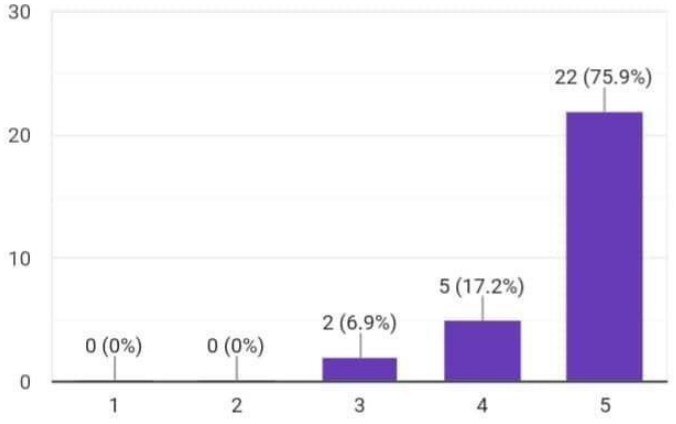
29 responses



6. I would recommend others to use GTE App as their learning tool

Copy

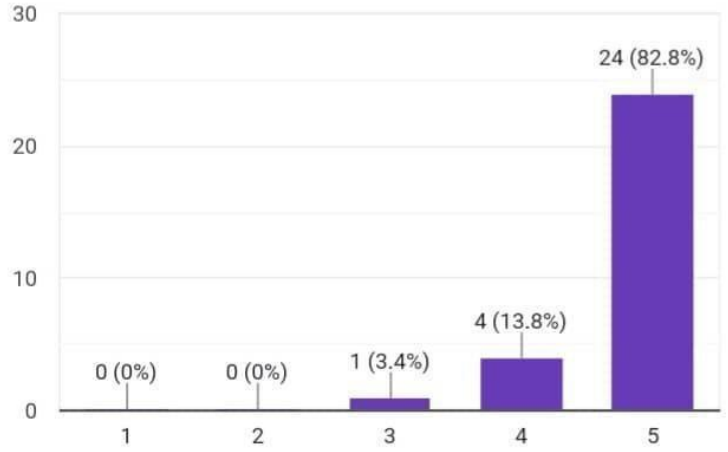
29 responses



7. GTE App is very interactive and engaging app for students

Copy

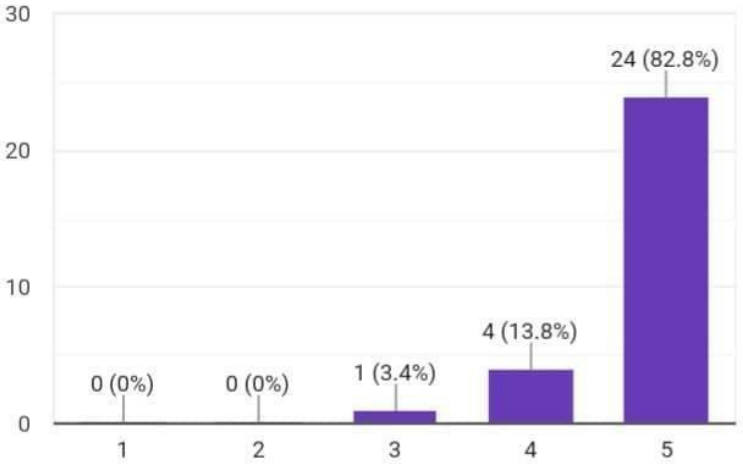
29 responses



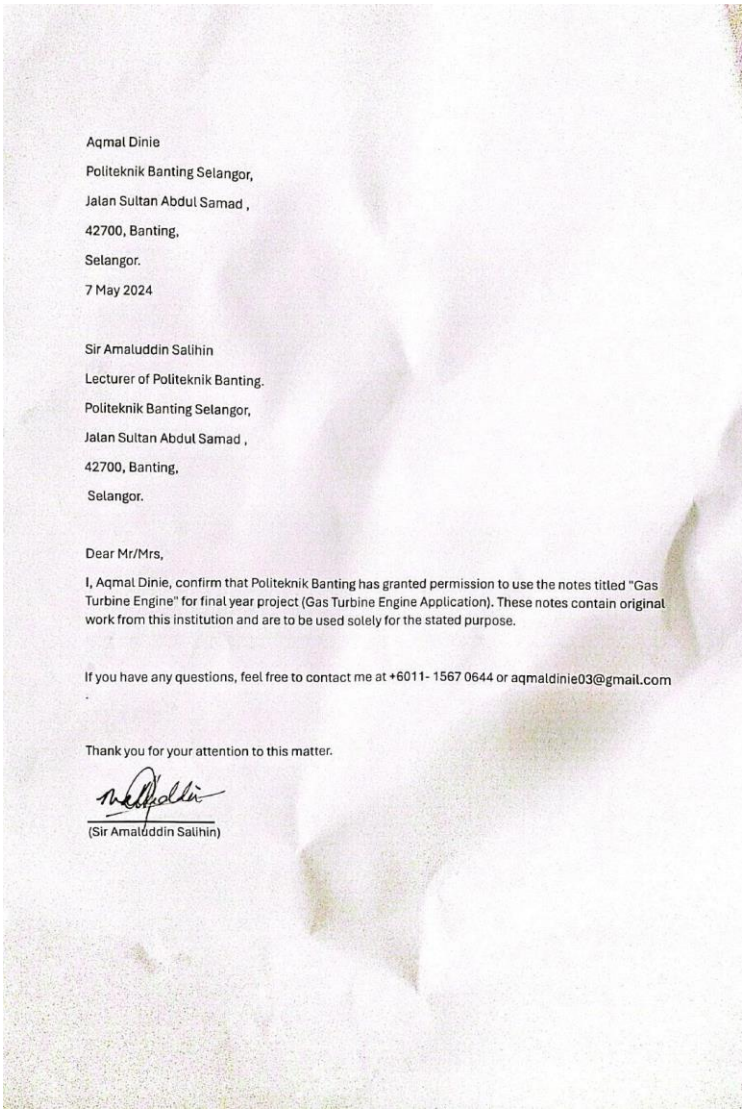
8. GTE App helps students to easily understand about turbine engines concept

Copy

29 responses



APPENDIX D: PERMISSION USING POLITEKNIK NOTES



Aqmal Dinie
Politeknik Banting Selangor,
Jalan Sultan Abdul Samad ,
42700, Banting,
Selangor.
7 May 2024

Sir Amaluddin Salihin
Lecturer of Politeknik Banting.
Politeknik Banting Selangor,
Jalan Sultan Abdul Samad ,
42700, Banting,
Selangor.

Dear Mr/Mrs,

I, Aqmal Dinie, confirm that Politeknik Banting has granted permission to use the notes titled "Gas Turbine Engine" for final year project (Gas Turbine Engine Application). These notes contain original work from this institution and are to be used solely for the stated purpose.

If you have any questions, feel free to contact me at +6011- 1567 0644 or aqmaldinie03@gmail.com .

Thank you for your attention to this matter.

(Sir Amaluddin Salihin)