

UNIVERSITI MALAYSIA SARAWAK

THESIS STATUS ENDORSEMENT FORM

TITLE PATHOQUEST : A MOBILE GAME APP FOR DISEASE
IDENTIFICATION AND HEALTH EDUCATION

ACADEMIC SESSION: 2024/2025

DANIEL ANAK MIL

(CAPITAL LETTERS)

hereby agree that this Thesis* shall be kept at the Centre for Academic Information Services, Universiti Malaysia Sarawak, subject to the following terms and conditions:

1. The Thesis is solely owned by Universiti Malaysia Sarawak
2. The Centre for Academic Information Services is given full rights to produce copies for educational purposes only
3. The Centre for Academic Information Services is given full rights to do digitization in order to develop local content database
4. The Centre for Academic Information Services is given full rights to produce copies of this Thesis as part of its exchange item program between Higher Learning Institutions [or for the purpose of interlibrary loan between HLI]
5. ** Please tick (✓)

☐

CONFIDENTIAL (Contains classified information bounded by the OFFICIAL SECRETS ACT 1972)

☐

RESTRICTED (Contains restricted information as dictated by the body or organization where the research was conducted)

☒

UNRESTRICTED



(AUTHOR'S SIGNATURE)

Validated by


(SUPERVISOR'S SIGNATURE)

Permanent Address

LOT 7498, SL 2, LORONG PUNAN 8,
NEX RESIDEN, 94300 KOTA SAMARAHAN,
SARAWAK, MALAYSIA

Date: 21 JULY 2025

Date: 21 July 2025

Note * Thesis refers to PhD, Master, and Bachelor Degree

** For Confidential or Restricted materials, please attach relevant documents from relevant organizations / authorities



Faculty of Computer Science and Information Technology

FINAL REPORT

PATHOQUEST: A MOBILE APP GAME FOR DISEASE IDENTIFICATION AND HEALTH EDUCATION

Daniel Anak Mil

79155

Bachelor of Computer Science With Honours

Information Systems

2025

Declaration

I hereby declare that this project is my original work. I have not copied from any other student's work or from any other sources except where due reference or acknowledgement is not made explicitly in the text, nor has any part had been written for me by another person.

Daniel

DANIEL ANAK MIL

17th January 2025

DATE

Acknowledgement

I would like to take this opportunity to express my sincere gratitude to my great supervisor, Associate Professor Ts. Dr Hamimah binti Ujir, for her unwavering guidance and support throughout this project. Her assistance has been invaluable, especially during challenging times. Additionally, I want to extend my heartfelt thanks to my parents, my siblings, friends and everyone else who supported and prayed for the success of my endeavour.

Abstract

PathoQuest is a mobile application designed as an interactive quiz game to enhance public health education and disease awareness, addressing gaps in traditional methods and existing educational platforms. Developed using the Waterfall methodology with Flutter and Dart, the app aims to provide engaging content on various diseases, including symptoms and preventive measures, through riddles and multiple-choice questions. It incorporates gamification, provides immediate feedback, tracks user performance, and includes features like mini-games and a BMI calculator, with an initial focus on the Android platform and future plans for iOS. The project seeks to empower individuals to make informed health decisions and contribute to a more health-conscious community.

Keywords : PathoQuest, Mobile App, Health Education, Interactive Quiz Game, Disease Awareness

Abstrak

PathoQuest ialah aplikasi mudah alih yang direka sebagai permainan kuiz interaktif untuk meningkatkan pendidikan kesihatan awam dan kesedaran penyakit, menangani jurang dalam kaedah tradisional dan platform pendidikan sedia ada. Dibangunkan menggunakan metodologi Waterfall dengan Flutter dan Dart, aplikasi ini bertujuan untuk menyediakan kandungan menarik tentang pelbagai penyakit, termasuk simptom dan langkah pencegahan, melalui teka-teki dan soalan pelbagai pilihan. Ia menggabungkan gamifikasi, menyediakan maklum balas segera, menjejaki prestasi pengguna, dan termasuk ciri-ciri seperti permainan mini dan kalkulator BMI, dengan tumpuan awal pada platform Android dan rancangan masa depan untuk iOS. Projek ini bertujuan untuk memperkasakan individu membuat keputusan kesihatan yang bermaklumat dan menyumbang kepada komuniti yang lebih mementingkan kesihatan.

Kata Kunci : PathoQuest, Aplikasi Mudah Alih, Pendidikan Kesihatan, Permainan Kuiz Interaktif, Kesedaran Penyakit

Table of Contents

Declaration.....	I
Acknowledgement	II
Abstract	III
Abstrak	III
CHAPTER 1 : INTRODUCTION	1
1.1 Introduction.....	1
1.2 Problem Statement	2
1.3 Scope	3
1.4 Aim And Objectives	3
1.5 Brief Methodology	4
1.6 Significance Of The Project.....	1
1.7 Project Schedule.....	1
1.8 Expected Outcome	2
1.9 Thesis Organisation	3
CHAPTER 2 : LITERATURE REVIEW.....	4
2.1 Introduction.....	4
2.2 Background.....	4
2.3 Review Of The Existing System	5
2.3.1 Kahoot!	6
2.3.2 Quizlet.....	7
2.3.3 Physical Flashcard	8
2.3.4 CDC Health IQ.....	10
2.4 Comparison Of Features Between Existing Systems	1
2.5 Comparison Of Features Between PathoQuest And Existing Systems	2
2.6 A Direction Of Proposed Solution For PathoQuest.....	4
2.7 Summary.....	4

CHAPTER 3 : SYSTEM ANALYSIS AND DESIGN	5
3.1 Introduction.....	5
3.2 Waterfall Methodology	5
3.2.1 Analysis Phase.....	1
3.2.1.1 Questionnaire.....	1
3.2.2 Design Phase	5
3.2.2.2 System Architecture	6
3.2.2.3 Sequence Diagram	7
3.2.2.4 Flowchart.....	12
3.2.2.5 Use Case Diagram	16
3.2.2.6 Wireframe	21
3.2.4 Testing Phase.....	23
3.2.5 Maintenance Phase	24
3.3 Level Of Usage	25
3.3.1 User Categories And Usage Levels	25
3.3.2 Frequency Of Use.....	25
3.3.3 Context Of Usage	26
3.3.4 Device Usage And Accessibility	26
3.4 Summary.....	26
CHAPTER 4 : IMPLEMENTATION	27
4.1 Introduction.....	27
4.2 System Configuration.....	27
4.3 Implementation of The Proposed Systems	31
CHAPTER 5 : TESTING	47
5.1 Introduction.....	47
5.2 Functional Testing	47
5.3 User Testing	65

5.4 Conclusion	115
CHAPTER 6 : CONCLUSION	116
6.1 Introduction.....	116
6.2 Achievements.....	116
6.3 Future Works.....	117
6.4 Summary.....	118
Reference	1
Appendices	1

CHAPTER 1 : INTRODUCTION

1.1 Introduction

In recent years, many new diseases have emerged, some of which can cause significant harm on a large scale. The rapid spread of these illnesses, especially infectious diseases, poses serious threats to public health and well-being. A clear example is the COVID-19 pandemic, which affected the health of countless people worldwide, regardless of age, socioeconomic status, or location. DeSalvo et al. (2021) discuss that the severity of existing resource gaps will substantially increase due to the pandemic's potentially long-lasting effects on population health. COVID-19 spread rapidly because early protective measures were difficult to implement, largely due to a lack of public knowledge about the symptoms and nature of the virus. Setyawati et al. (2024) mentioned that early detection in disease management is a key factor in improving the effectiveness of treatment and reducing the negative impact of disease on individuals and society. Not only applicable to COVID-19, but Setyawati et al. (2024) also stated that early detection such as cancer allows for more effective intervention and can avoid further spread, while early detection of diabetes allows lifestyle adjustments and timely treatment to prevent serious complications.

1.2 Problem Statement

The growing threat of emerging diseases, like the COVID-19 pandemic, has exposed significant gaps in public health education, with many struggling to recognize symptoms and take preventive actions due to a lack of accessible information. This lack of awareness delays detection and worsens health outcomes, highlighting the need for more effective, proactive health education.

Limited awareness of diseases significantly impacts individuals' ability to recognize symptoms early. This delay leads to late diagnoses and more severe health outcomes. When people fail to understand the signs and risks, they are less likely to seek timely medical attention, worsening their condition and increasing treatment complexity and costs. This lack of awareness endangers individual health and contributes to the broader public health crisis.

The lack of interest in health education further exacerbates this issue, preventing individuals from engaging with critical information on disease prevention and healthy living. Traditional health education methods such as lectures, pamphlets, and textbooks are often seen as dull or overly complex, making it difficult to capture the attention of younger audiences or those unfamiliar with medical topics. As a result, these approaches miss key opportunities to promote awareness and encourage proactive health behaviours', increasing the risk of preventable illnesses.

Current platforms like Quizlet and Kahoot! offer some benefits, but these platforms fail to fully address the unique needs of public health education. Quizlet primarily focuses on memorization through flashcards, which does not offer contextual information necessary for users to connect disease symptoms, causes, and prevention strategies. While Kahoot! provides a gamified quiz format, it often relies on user-generated content that may lack depth or accuracy, especially when it comes to health topics. These limitations highlight the need for a more targeted and accurate approach to health education.

To address these challenges, innovative solutions are needed to enhance public health education, making it more accessible, engaging, and effective. By leveraging mobile apps and gamified platforms, it is possible to bridge gaps in awareness, spark interest in health topics, and provide accurate content that empowers individuals to make informed decisions about their health. A mobile app that counts and displays users' quiz results can further motivate engagement by fostering a sense of achievement and encouraging self-improvement, making learning about diseases both educational and rewarding.

1.3 Scope

The scope of PathoQuest encompasses the development of a mobile quiz-based educational app designed to increase awareness and knowledge of various diseases. Targeted at the public especially the younger generations, the app is designed to be accessible and appealing to users of all ages. To make the learning about diseases both fun and approaches, PathoQuest utilizes the user-friendly interface and interactive elements such as riddles and multiple-choice questions.

PathoQuest will cover a wide range of diseases, from common to rare conditions, with information on symptoms, preventive measures, and key facts about each disease. Additionally, the app will include explanations after each answer, providing users with valuable context and reinforcing learning. PathoQuest also will be regularly updated with new health data, ensuring content remains relevant and informative to keep up with evolving health needs.

Furthermore, the project recognises an initial development focus on the Android platform, given its popularity among the target user base, while also making plans for future expansion to iOS devices. This strategic scope ensures that the application's benefits reach a broad audience, including younger generations, to foster a proactive approach to health and safety in the community.

1.4 Aim And Objectives

The primary aim of PathoQuest is to educate and engage users about various diseases through an interactive mobile quiz game. By providing a fun and accessible platform, the app seeks to enhance public knowledge of health issues, enabling users to recognize symptoms and take proactive measures in their health management.

Objectives:

1. To develop an innovative mobile application aimed at enhancing public awareness and understanding of various diseases through educational content
2. To design an engaging mobile app featuring a quiz game with multiple difficulty levels which promoting interactive learning
3. To create a mobile app that effectively tracks and displays users' quiz performance which providing insightful feedback at the end of each session

1.5 Brief Methodology

The PathoQuest mobile app will follow the Waterfall Methodology, which provides a structured, sequential approach to development. In the analysis phase, requirements for the app will be gathered, including its purpose, target audience, platform, functionality, and non-functional aspects like performance and scalability. During the design phase, the app's architecture, database, UI, game flow, quiz generation algorithm, and methods for displaying hints and explanations will be planned. In the implementation phase, the app will be developed in Flutter, including UI coding, data integration, and quiz logic. The testing phase will ensure the app meets all requirements, focusing on quiz functionality, hint accuracy, and bug fixing. Lastly, in the maintenance phase, the app's performance will be monitored post-launch, with any issues fixed and improvements made based on user feedback. Overall, the Waterfall Methodology ensures each phase is thoroughly addressed, leading to a successful development process.

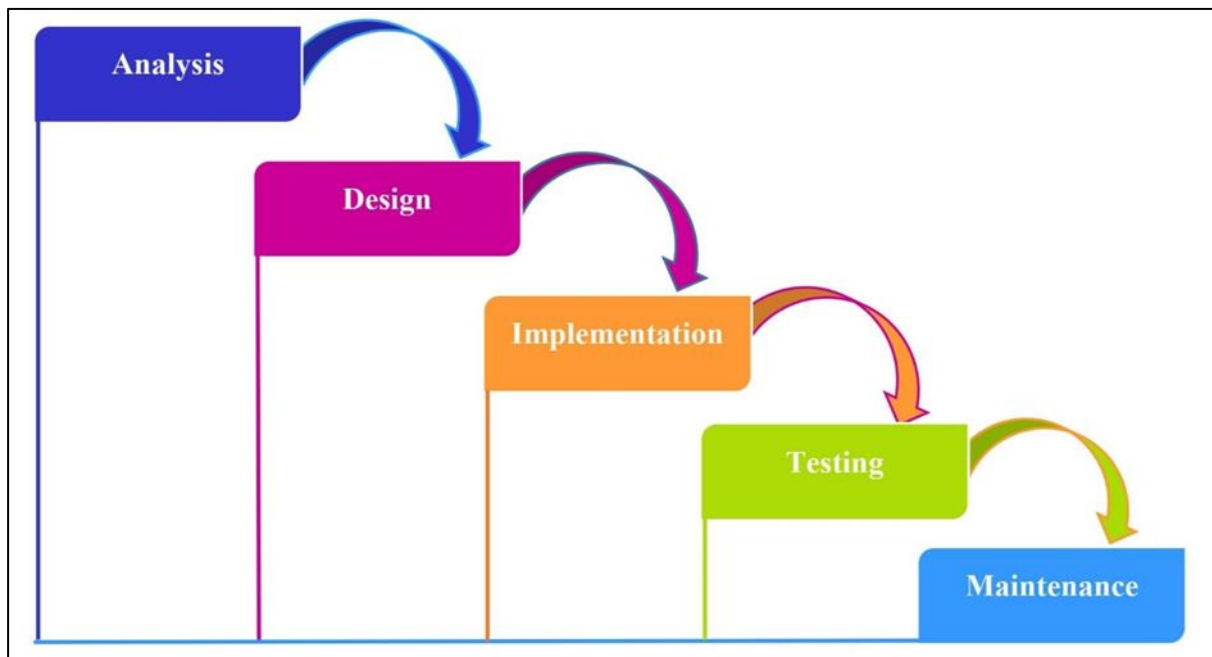


Figure 1.1 Waterfall Software Development Methodology

1.6 Significance Of The Project

The PathoQuest project is important because it has the potential to change the way health education is provided by making it more approachable, interesting, and effective for a wide range of people, particularly younger ones. With the constant emergence of new diseases, such as COVID-19, there is a growing need for effective tools that increase public awareness and understanding of diverse health issues. Traditional health education can often feel overwhelming or inaccessible, leading to low engagement. To solve these issues, PathoQuest provides a mobile, quiz-based platform that encourages users to investigate symptoms, preventative strategies, and important health information. PathoQuest helps people make educated health decisions and identify early warning signs by filling in the information gap about lesser-known diseases, ultimately fostering a more prepared and health-conscious community that is better able to handle future medical emergencies.

1.7 Project Schedule

This project is divided into two phases, Final Year Project 1 with the schedule below, and Final Year Project 2 with the schedule to be announced.

Table 1.1

Project Schedule

Task	Start Date	End Date	Duration
Submission of the Approved Brief Proposal	10 October 2024	20 October 2024	10 days
Feedback and Comment from Reviewer/Examiner	21 October 2024	28 October 2024	7 days
Submission of Full Proposal	29 October 2024	14 November 2024	16 days
Submission of Chapter 1	15 November 2024	21 November 2024	6 days
Submission of Chapter 2	22 November 2024	13 December 2024	21 days
Submission of Chapter 3	14 December 2024	5 January 2025	21 days

Submission of FYP 1 Final report & Paper for assessment	6 January 2025	12 January 2025	6 days
---	----------------	-----------------	--------

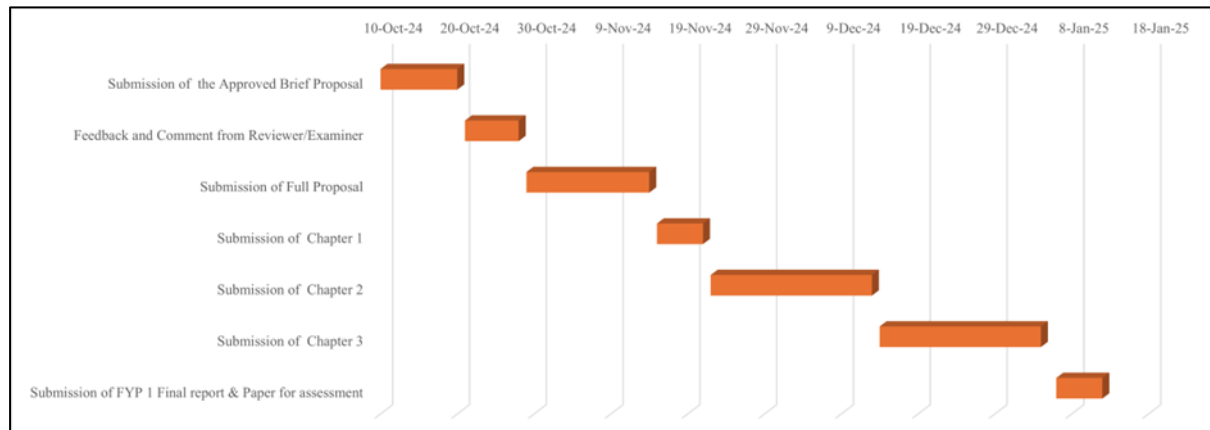


Figure 1.2: Gantt Chart For Final Year Project 1

1.8 Expected Outcome

The PathoQuest is expected to have a positive impact on public health by improving awareness and understanding of various diseases. By making health education more accessible, engaging, and enjoyable, PathoQuest hopes to empower users of all ages to recognize symptoms, understand preventive measures, and stay informed about different health conditions. Through its interactive quiz-based platform, the app will help bridge the knowledge gap regarding lesser-known diseases, encouraging proactive health management. Ultimately, PathoQuest seeks to contribute to a more health-aware society, where individuals are better equipped to identify early signs of illness, make informed decisions, and strengthen community resilience against future health difficulties.

1.9 Thesis Organisation

This thesis is organized into three chapters, each focusing on a key aspect of the development of the PathoQuest mobile app. The chapters are designed to guide the reader through the project, from its introduction to the planning and design phases.

Chapter 1 introduces the project, including its background, objectives, and significance. This chapter outlines the motivation for developing PathoQuest and the specific problems it aims to address in public health education, along with an overview of the project's scope.

Chapter 2 presents the literature review, which explores relevant research and theoretical concepts related to public health education, gamification, and mobile app development. This chapter establishes the foundation for the project by analysing existing studies and identifying gaps that PathoQuest seeks to address.

Chapter 3 focuses on system analysis and design. It details the requirements gathering process, system architecture, and design methodologies employed to develop PathoQuest. This chapter includes an analysis of the app's intended features and functionalities, as well as a description of the design process to ensure the app meets user needs effectively.

Chapter 4 explains the implementation of PathoQuest, focusing on how the system was developed using Flutter and Dart. It describes the setup of the SQLite database, the integration of core features, and the development of the app's interface, including quizzes, mini-games, notes, and the BMI calculator.

Chapter 5 discusses the testing phase of PathoQuest. It covers functional testing of each system component and presents user testing results from high school students to evaluate usability, understanding, and overall experience.

Chapter 6 concludes the thesis by summarizing the project's accomplishments. It reflects on the system's impact on health education and suggests future improvements, such as expanding features and platform support.

CHAPTER 2 : LITERATURE REVIEW

2.1 Introduction

In this chapter, four existing systems that shared similar features with the proposed game application for diseases identification and health education will be discussed. The selected systems are Kahoot!, Quizlet, Physical Flashcard and CDC Health IQ. These systems have been chosen for review to analyse their functionality and how they address the current issues. Following the review of these existing systems, a comparison will be made between them and the proposed solution. Additionally, this chapter will cover the tools and the technologies used for the proposed system. Finally, the summary of the chapter's key point will be provided.

2.2 Background

Health education plays a crucial role in shaping the well-being of adolescents, particularly considering increasing health challenges. However, traditional methods of teaching health topics often fail to capture the interest of young people, leading to a lack of engagement and retention. To address these issues, innovative approaches such as gamification have emerged as effective tools for improving health awareness. The following sections explore the key aspects of this issue.

Rising Health Concerns Among Adolescents

The emergence of various diseases, particularly those related to lifestyle choices such as obesity, diabetes, and mental health issues, as well as global health crises like COVID-19, has underscored the necessity for effective health education among adolescents. The COVID-19 pandemic has highlighted the importance of understanding infectious diseases, preventive measures, and overall health literacy. As these health challenges become increasingly prevalent, it is crucial to equip young people with the knowledge and skills to make informed decisions about their health.

Limitations of Traditional Health Education

Traditional health education methods, which often rely on lectures and passive learning, may not adequately engage today's youth or address their specific needs. The limitations of conventional teaching methods have become evident as young people exhibit decreased interest and engagement in traditional health education formats. Research indicates that passive learning environments fail to capture the attention of adolescents, leading to a lack of

motivation and retention of information. The urgency of learning about health issues, especially in the context of a pandemic, necessitates a shift in educational strategies.

Gamification as an Educational Tool

As a result, there is a growing recognition that health education must evolve to meet the expectations and preferences of the younger generation. Gamification, which incorporates game design elements into educational contexts, has emerged as a promising solution to this challenge. By making learning interactive and enjoyable, gamification can enhance user engagement and motivation, ultimately leading to better health outcomes.

Learning-Based Games for Health Education

Learning-based games represent a transformative approach to health education, providing an engaging platform for adolescents to explore health topics in a dynamic and interactive manner. These games not only facilitate knowledge acquisition but also encourage the development of critical thinking and problem-solving skills related to health issues, including those arising from pandemics like COVID-19. By integrating gamification into health education, users can create a more relevant and appealing learning experience that resonates with young people. This innovative strategy has the potential to bridge the gap between traditional education methods and the needs of today's youth, fostering a generation that is better equipped to navigate the complexities of health and wellness.

2.3 Review Of The Existing System

There are four existing systems that will be reviewed which are Kahoot!, Quizlet, Physical Flashcard and CDC Health IQ. These four systems will be reviewed based on their features, capabilities and drawbacks.

2.3.1 Kahoot!

Figure 2.1 illustrates one of the existing systems called Kahoot! where it is an online learning platform that enables users to participate in interactive quiz games. It allows users to engage participants through live, real-time quizzes, where participants can respond using their personal devices. As shown in Figure 2.1, the quiz questions appear on a shared screen which help to foster the collaboration and competition among participants. This platform makes use of gamification to increase motivation and involvement in the learning process. Kahoot! creates an energetic and dynamic classroom environment by incorporating elements like leaderboards and instant feedback which allow for users to stay focused and eager to participate (Basuki & Hidayati, 2019).

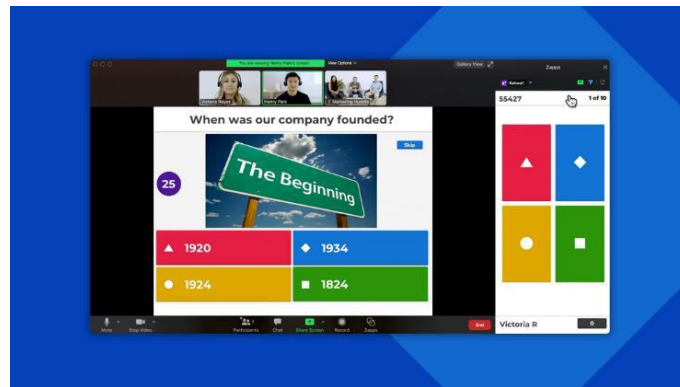


Figure 2.1 : User Interface showcased in Kahoot!

One of the key advantages of Kahoot! is its ability to foster collaboration and teamwork among participants. By encouraging users to engage in group-based quiz sessions, Kahoot! promotes peer learning and communication. The competitive aspect of Kahoot!, combined with collaboration, helps to motivate users to perform better and share knowledge. The collaborative nature of Kahoot! supports a positive, engaging learning experience, where participants can work together while competing to achieve top scores. It creates an atmosphere where users are actively participating and interacting with both their peers and the course content (Basuki & Hidayati, 2019).

However, Kahoot! has its limitations. One significant disadvantage is in terms of pacing. Since all participants are required to answer the quiz questions at the same time, slower learners may feel stressed or left behind. This lack of individualized pacing can hinder some users' ability to fully engage with the material. The shared pace might lead to focus distractions, especially when users are under pressure to answer quickly. While the fast-paced environment

is motivating for many, it can also create anxiety for those who need more time to process the questions (Basuki & Hidayati, 2019).

2.3.2 Quizlet

Figure 2.2 and Figure 2.3 illustrate one of the existing systems called Quizlet where it is an online learning platform that allows users to create and use digital flashcards, quizzes, and games to aid in the learning process. It is especially popular for vocabulary acquisition and language learning. As shown in Figure 2.2 and Figure 2.3, the platform offers various study modes, such as matching games and multiple-choice questions, to make learning more interactive. Quizlet is accessible both on desktop and mobile devices, allowing users to study anytime and anywhere. This flexibility makes it a convenient tool for users of all ages and academic levels (Duarte, 2019).

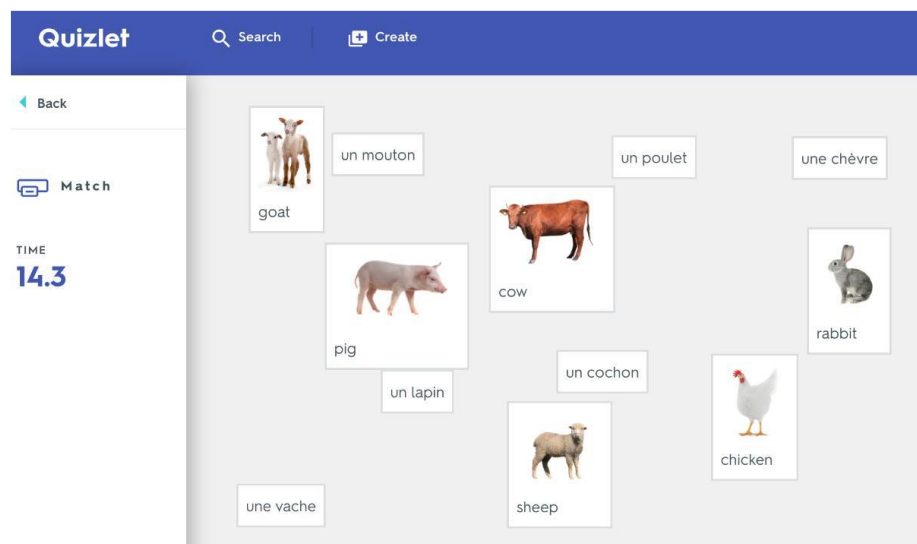


Figure 2.2 : User Interface showcased in Quizlet matching games

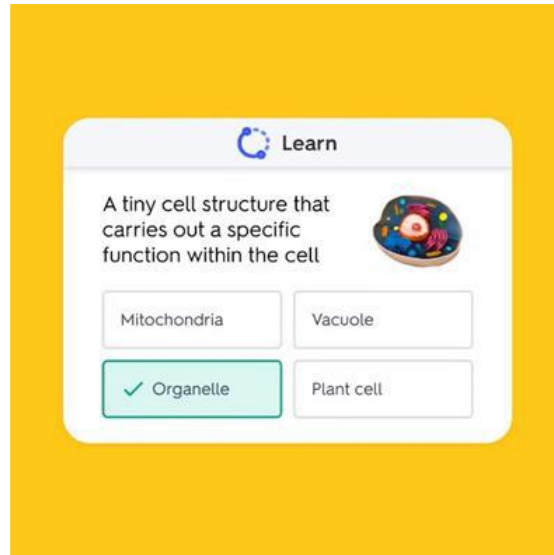


Figure 2.3 : User Interface showcased in Quizlet multiple-choice questions

One of the key advantages of Quizlet is its accessibility anywhere. The mobile app ensures that learning is not confined to the classroom, enabling users to review vocabulary and other content at any time. This feature was particularly beneficial for frequent users in the study, who integrated short study sessions into their daily routines. As a result, they were able to maximize their learning opportunities, making it easier for them to study outside of class and continue reinforcing their knowledge (Duarte, 2019).

However, Quizlet has its limitations. One significant disadvantage is its learning scope. Quizlet's primary focus is on memorization, particularly vocabulary learning, which limits its ability to address more complex learning needs, such as critical thinking or problem-solving. While it is effective for vocabulary acquisition, the platform is not designed to explore more in-depth concepts or facilitate higher-order thinking. As such, it may not be suitable for educational objectives that require a deeper understanding of topics beyond basic memorization (Duarte, 2019).

2.3.3 Physical Flashcard

Figure 2.4 illustrates another existing system which is the physical flashcard where is a simple, tangible learning tool typically made of cardstock or paper, with a question or prompt on one side and the corresponding answer or explanation on the other. They are often used for memorization and self-testing, helping learners reinforce their knowledge by actively engaging with the material. Flashcards can cover various topics, from vocabulary and math problems to more specialized subjects like diseases or historical events. These cards offer a hands-on,

interactive learning experience that can be both convenient and effective (Sage et al., 2019). The figure 2.4 below shows a set of physical flashcards, each featuring a word and its synonym, representing how they can be used for quick recall and active review.



Figure 2.4 : Physical Flashcard showcased

One of the key advantages of Physical Flashcard is the tactile nature of the learning process. The act of flipping through cards and physically handling them can create a stronger connection to the material, potentially improving memory retention. Studies have shown that the sensory engagement with paper can enhance the encoding process, making it easier to recall the information later. The simple act of holding and reviewing physical flashcards encourages active participation and reduces distractions compared to digital formats. The physical presence of the cards allows learners to control the pace and order of their review, making it an adaptable study method (Sage et al., 2019).

However, Physical Flashcard has its limitations. One significant disadvantage is their lack of interactivity and feedback. Unlike digital flashcards, which can offer immediate feedback or automatically shuffle questions, physical cards require manual organization and management. This can become cumbersome, especially when dealing with large volumes of

cards. Furthermore, there is no way to track progress or customize difficulty levels without additional effort, limiting their effectiveness for advanced learners. While useful for basic recall, physical flashcards may not be as versatile or dynamic as their digital counterparts, making them less suitable for more complex or adaptive learning needs (Sage et al., 2019).

2.3.4 CDC Health IQ

Figure 2.5 illustrates one of the existing systems which called CDC Health IQ app where it is an interactive health trivia game developed by the Centres for Disease Control and Prevention (CDC) (CDC, 2024). It aims to educate users on various health topics through engaging trivia questions and word scrambles. The app is designed to be both fun and informative which makes it an enjoyable way for users to learn about important health information (CDC, 2024).

The primary goal of the CDC Health IQ app is to increase public awareness and knowledge about health and safety topics. By using a gamified approach, the app encourages users to test their knowledge and learn new information in an interactive manner (CDC, 2024). This method helps to make health education more accessible and appealing, especially to younger audiences who might prefer learning through games (CDC, 2024).

Overall, the CDC Health IQ app seeks to promote healthier lifestyles by providing users with accurate and relevant health information. Through regular updates and a variety of questions, the app ensures that users stay informed about current health issues and best practices (CDC, 2024). By making health education engaging and fun, the CDC hopes to foster a more health-conscious and informed public. The figure 2.5 illustrates how the questions are presented along with the multiple choice (CDC, 2024).

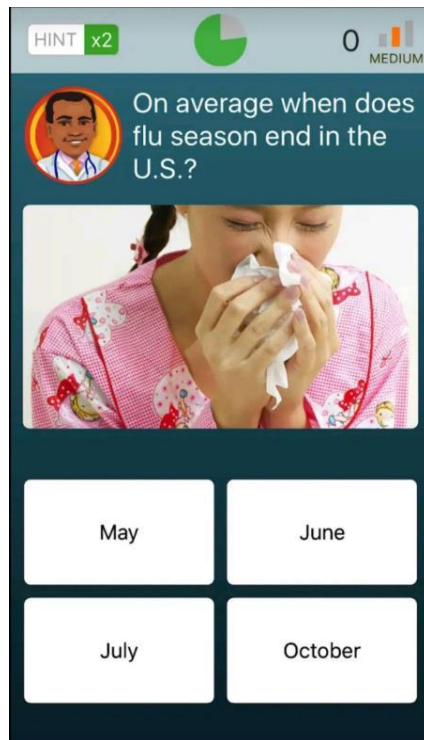


Figure 2.5 : User Interface showcased in CDC Health IQ multiple-choice answers

2.4 Comparison Of Features Between Existing Systems

Table 2.1

Comparison of Features between the PathoQuest and Existing Systems

Criteria	PathoQuest	Kahoot!	Quizlet	Physical Flashcard	CDC Health IQ
Learning Topic Focus	✓	✗	✗	✗	✗
Gamification	✓	✓	✗	✗	✓
Target Audience	✓	✓	✓	✓	✓
Content Type	✓	✓	✓	✓	✓
Ease Of Use	✓	✓	✓	✗	✓
Educational Depth	✓	✗	✗	✗	✗
Interactivity	✓	✓	✓	✗	✓
Accessibility	✓	✗	✓	✓	✓
Feedback Mechanism	✓	✗	✓	✗	✓
Health-Specific Focus	✓	✓	✓	✓	✓
Mini Games	✓	✗	✗	✗	✓
Appeal To Younger Audiences	✓	✓	✓	✓	✓
Tracks & Displays User Answers	✓	✗	✗	✗	✓
BMI Calculator	✓	✗	✗	✗	✗

2.5 Comparison Of Features Between PathoQuest And Existing Systems

Table 2.1 presents a comparison of features between the proposed PathoQuest system and existing platforms such as Kahoot!, Quizlet, CDC Health IQ, and physical flashcards. This comparison highlights the unique features that PathoQuest intends to incorporate, distinguishing it from other widely used educational tools.

The first feature is learning topic focus. This feature is about the specific subject the platform covers. PathoQuest plans to focus on health education, particularly on disease recognition and prevention. Unlike Kahoot!, Quizlet, and physical flashcards, all of them focus to general learning topics. As for CDC Health IQ, it targets health topics but does not specialize in disease-specific education as PathoQuest aims to do.

The second feature is gamification. This feature incorporates game-like elements, such as challenges and rewards, to enhance engagement. PathoQuest plans to introduce mini games, making it more interactive than CDC Health IQ, Quizlet and physical flashcards, which lack this level of gamification. As for Kahoot!, it does include gamification but does not focus specifically on health education.

The third feature is targeting audience. This feature identifies the group of users the platform serves. PathoQuest and all the existing platforms aims to serve a broad audience, but it specifically targets individuals interested in improving their health literacy. This sets it apart in terms of specialization.

The fourth feature is educational depth. This feature is about the level of detail in the content. PathoQuest aims to provide detailed explanations of diseases and preventive measures which set it apart from Kahoot! and Quizlet where both offer more basic educational material. Physical flashcards are limited to the depth of their printed content and cannot provide detailed explanations or updates like PathoQuest aims to do. While CDC Health IQ offers general health quizzes, it does not provide the in-depth disease focus that PathoQuest plans to include.

The fifth feature is interactivity. This feature focuses on user engagement with the platform. Like Kahoot!, Quizlet, and CDC Health IQ, PathoQuest aims to offer interactive experiences through quizzes and instant feedback. As for physical flashcards, it lacks this dynamic element.

The sixth feature is ease of use. This feature evaluates how user-friendly the platform is. PathoQuest aims to match the simplicity of digital platforms like Kahoot!, Quizlet and CDC

Health IQ by making it easy to use for various demographics. Physical flashcards are less intuitive as it requires manual effort and not the interactive design PathoQuest intends to offer.

The seventh feature is health-specific focus. This feature emphasizes content related to health. PathoQuest plans to specialize in diseases and prevention, which is more specific than the general health focus of CDC Health IQ. Kahoot!, Quizlet also can focus on health education but it will require more depth and specialization to ensure it is working. Physical flashcards can cover health topics but a huge amount of manual effort is required.

The eighth feature is mini games. This feature involves short games to reinforce learning. Like CDC Health IQ, PathoQuest plans to include mini games specifically designed to enhance health education. However, this feature absents in Kahoot!, Quizlet, and physical flashcards.

The ninth feature is accessibility. This feature ensures the platform is usable on multiple devices. Like Quizlet and CDC Health IQ, PathoQuest plans to be accessible on both mobile and desktop platforms. Kahoot! is more limited in its accessibility, and physical flashcards are universally available but lack digital convenience.

The tenth feature is feedback mechanism. This feature provides users with responses to their answers. PathoQuest plans to include real-time feedback like Quizlet and CDC Health IQ. As for Kahoot! and physical flashcards, this feature absent in both.

The eleventh feature is track and display user answers. This feature records user responses and progress. PathoQuest plans to include this feature which enables the users to monitor their learning. For existing platforms, this feature is only available in CDC Health IQ but not available in Kahoot!, Quizlet, and physical flashcards.

The final feature is BMI calculator. This feature calculates the BMI result. PathoQuest plans to include this feature which enables the users to monitor their BMI to make sure it is in healthy range. For existing platforms, this feature is not available in CDC Health IQ, Kahoot!, Quizlet, and physical flashcards.

In conclusion, table 2.1 illustrates how PathoQuest seeks to fill gaps in existing educational tools by combining gamification, interactivity, and health education in ways that platforms like CDC Health IQ do not fully achieve. These planned features make PathoQuest a potentially innovative and engaging platform for health education.

2.6 A Direction Of Proposed Solution For PathoQuest

One significant challenge with existing educational tools like Kahoot!, Quizlet, CDC Health IQ, and physical flashcards is their lack of specialized focus on critical health topics. While Kahoot! provides a broad platform for quizzes and interactivity, it doesn't delve deeply into health education, particularly in identifying and preventing diseases. Similarly, Quizlet serves as a general study tool, but it lacks health-specific content and gamified elements. CDC Health IQ focuses on improving public health knowledge through quizzes but does not offer an interactive or gamified experience tailored to disease education. Physical flashcards, while effective for memorization, lack interactivity, feedback, and progress tracking, limiting their ability to support deeper learning and application. These tools, while valuable in their respective domains, fail to fully address the need for accessible, engaging, and focused health education.

To address these challenges, PathoQuest proposes a solution that combines the benefits of gamified learning with a health-focused educational approach. Designed to fill the gap in health education, particularly in disease recognition and prevention, PathoQuest introduces interactive quizzes, mini-games, and real-time feedback on user responses. These features provide a more engaging learning experience than CDC Health IQ, which lacks gamification, and physical flashcards, which cannot offer dynamic feedback or interactivity. Additionally, PathoQuest aims to provide progress tracking and personalized feedback, key features absent in both physical flashcards and platforms like Kahoot!.

PathoQuest seeks to bridge the gap between traditional learning tools like physical flashcards and modern platforms like Kahoot!, Quizlet, and CDC Health IQ by focusing on health education. Through its combination of gamification, interactivity, and detailed health-specific content, PathoQuest intends to empower users to retain and apply knowledge effectively. By offering a dynamic and engaging approach, PathoQuest addresses the limitations of existing tools, ensuring a more comprehensive and meaningful learning experience tailored to health education.

2.7 Summary

In summary, Chapter 2 examined the functionality and unique features of three existing system and PathoQuest. The section also evaluated the strengths and weaknesses of these existing systems and compared the features available in the proposed PathoQuest to those of the reviewed applications.

CHAPTER 3 : SYSTEM ANALYSIS AND DESIGN

3.1 Introduction

In this chapter, it discusses the chosen methodology to develop the PathoQuest project which is Waterfall Methodology. This methodology has been adopted to effectively meet the systems requirements. This chapter serves the purpose of offering an encompassing understanding of the project's requirements, presenting a comprehensive overview of the system's functionalities. By aligning with the identified problem in Chapter 1, the goal is to clearly articulate the system's capabilities and what it is intended to deliver to fulfil the specified requirements and needs.

3.2 Waterfall Methodology

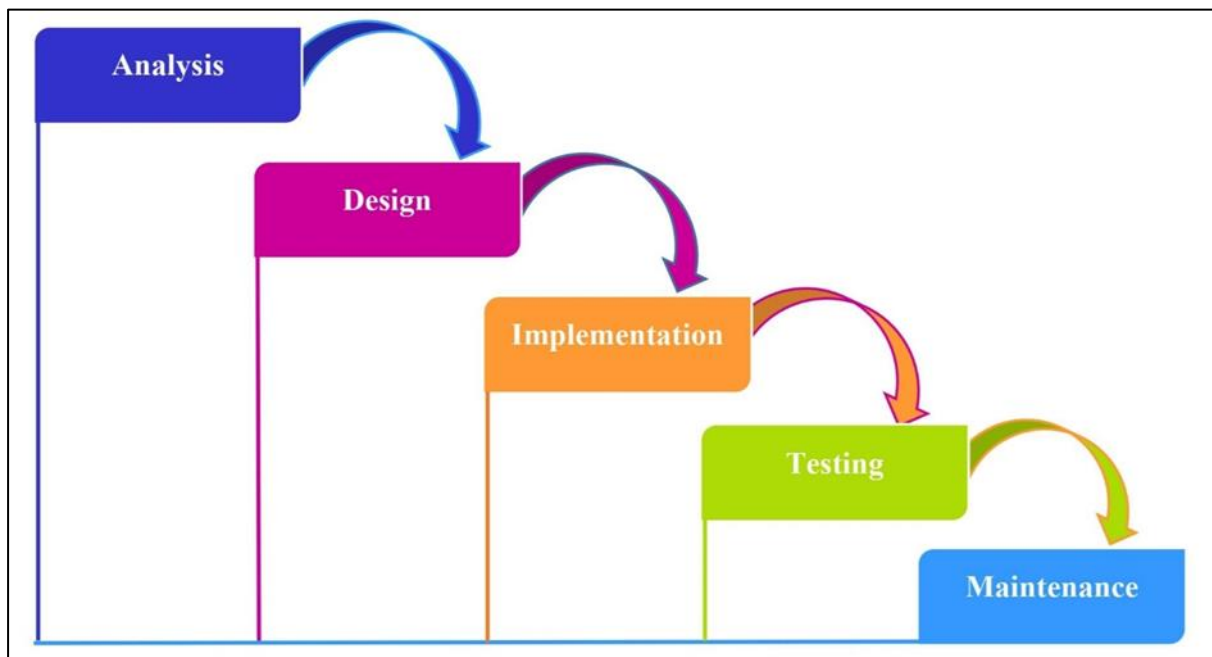


Figure 3.1 : Waterfall Methodology

3.2.1 Analysis Phase

In the analysis phase, it will focus on gathering and defining the functional and non-functional requirements of the app to ensure that it meets user needs effectively. Both functional requirements and non-functional requirements are identified in this phase. For functional requirements, it include such as quiz mechanics, disease explanations and score tracking. As for non-functional requirements, it include reliability, scalability and user friendliness. The significant part of this phase involves collecting input from potential users through a google form questionnaire which helps to understand the users' expectations, preferences and the features that they find most valuables in the PathoQuest.

3.2.1.1 Questionnaire

This survey was conducted with 50 respondents with the purpose of exploring and understanding theirs' opinion on the features of PathoQuest application. Based on the figure 3.2, the demographic analysis revealed that 42% were male and 58% were female. The figure 3.3 illustrates the respondent age distribution where respondents' ages ranged from under 18 until 45 years and above. Based on the figure, 22% were under 18 years old, 54% were ages ranged from 18 until 29 years old, 16% were ages ranged from 30 until 44 years old, and 8% were ages 45 and above. The figure 3.4 illustrates the occupational distribution of respondents, which includes the following categories student, healthcare professional, GOV worker, IT executive, programmer, fresh graduate, IT worker, alumni, guard, and retired.

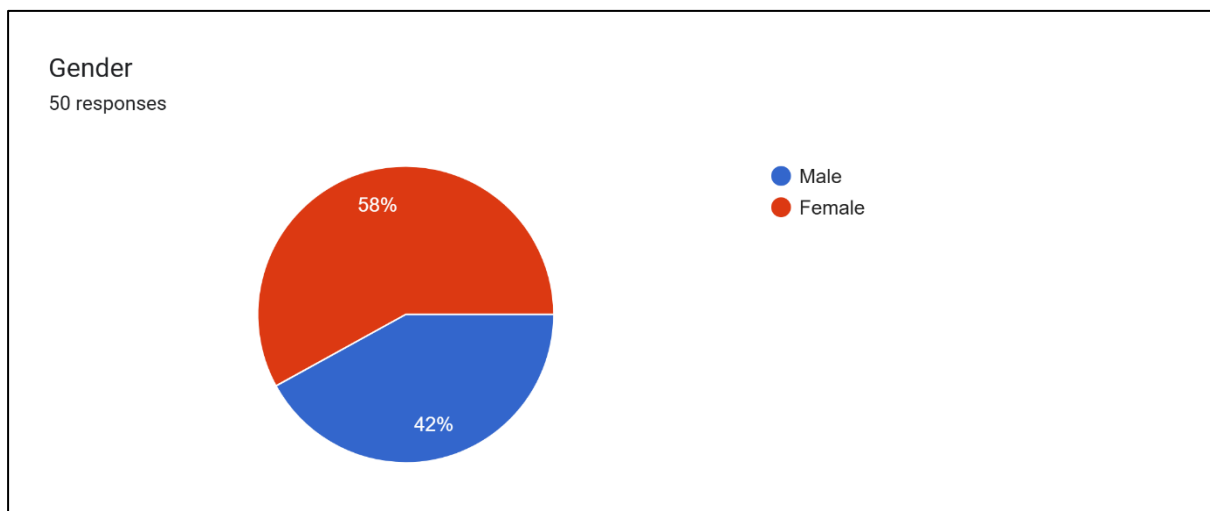


Figure 3.2 : Gender Distribution

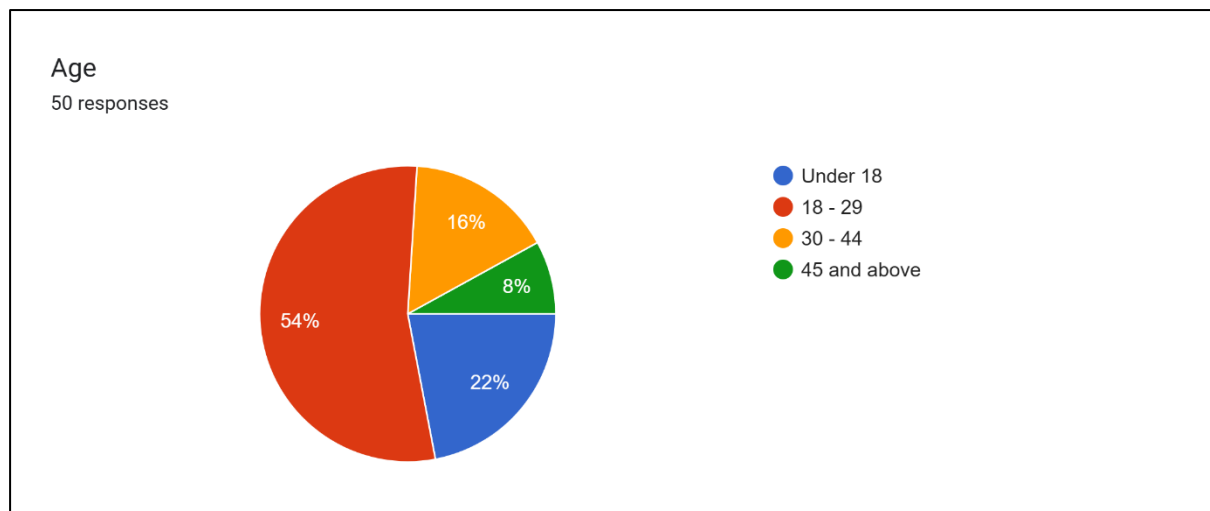


Figure 3.3 : Age Distribution

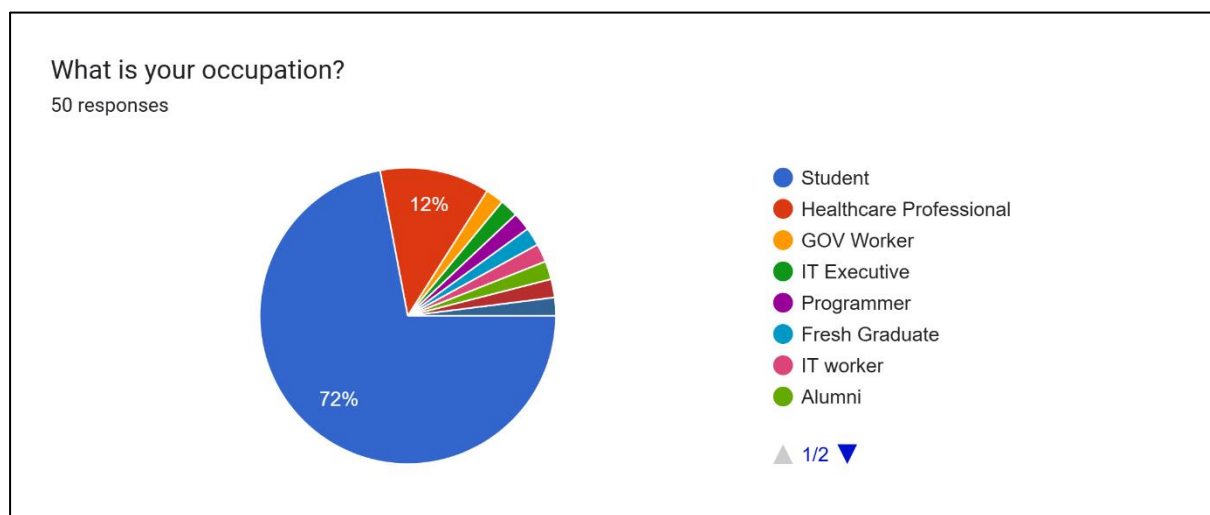


Figure 3.4 : Occupational Distribution

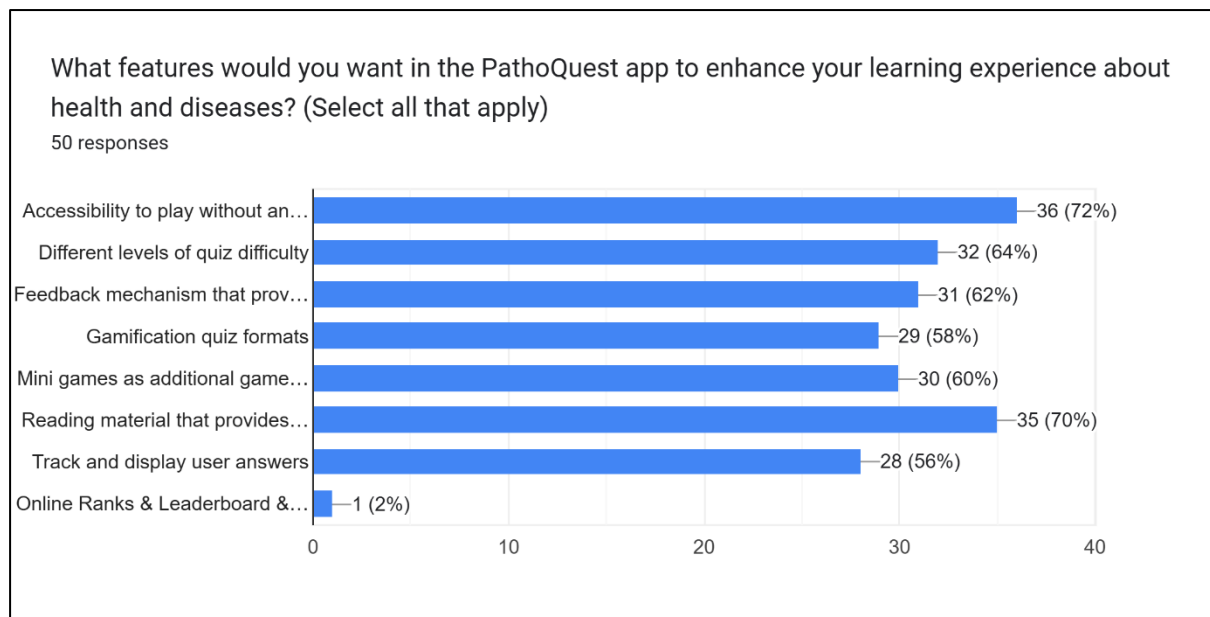


Figure 3.5 : Desired Features for Enhancing Learning Experience in PathoQuest

What features would you want in the PathoQuest app to enhance your learning experience about health and diseases? (Select all that apply) *

- ☐ Accessibility to play without an account and offline
- ☐ Different levels of quiz difficulty
- ☐ Feedback mechanism that provides feedback after answering questions
- ☐ Gamification quiz formats
- ☐ Mini games as additional games beyond quizzes
- ☐ Reading material that provides brief notes about diseases
- ☐ Track and display user answers
- ☐ Other...

Figure 3.6 : Desired Features for Enhancing Learning Experience in PathoQuest

Based on the survey data from 50 respondents as illustrated in Figure 3.5 and 3.6, several desired features had been identified. The features will be ranked from the most desired to the least ones. In the first rank with significant majority with 36 responses (72%), the respondents expressed their desired to access the PathoQuest application without having to set up the account and can be played offline. This indicates that it is essential to have easy access so that it is convenient for the user to be able to use the application. In the second rank with 35 responses (70%), the respondents interested in having a reading material that provides brief notes about diseases. This highlights the needs to have a reading section where user can add up their knowledge about diseases not only by answering the quiz. In the third rank with 32 responses (64%), the respondents are manifesting to have different levels of quiz difficulty. It shows that it is important to have this feature to ensure the engagement both for beginners and experts. In the fourth rank with 31 responses (62%), the respondents show their desired to have the feedback mechanism feature that provides feedback after answering questions. It indicates that it is essential to have this feature to allow users to identify the questions they are getting wrong. In the fifth rank with 30 responses (60%), these respondents suggest that it is important to have mini games as additional games. This will offer the variety in learning about diseases other than answering quiz questions. In the sixth rank with 29 responses (58%), there are respondents that interested in having the quiz in gamification format. This highlights that it is necessary to have a twist in traditional quiz format to make it more engaging to the users. In the seventh rank with 28 responses (56%), the respondents also invested in having the feature that able to track and display their answers. It indicates that having the feature will allow them to keep track of the questions they were getting wrong. Finally, with 1 response (2%), the respondent suggests one feature which is to have online ranking and leaderboard between players. This feature can be study more for future development to as it is also contributed to make the application become more engaging and appealing.

3.2.2 Design Phase

Table 3.1 shows the essential tools and software required for the development of the system.

Table 3.1

Essential Tools and Software for System Development

Tool And Software	Description
Visual Code Studio	Visual Studio Code is a free and open-source code editor developed by Microsoft, designed to provide a powerful environment for coding, debugging, and version control, facilitating contributions to open-source projects (Plainer, 2021).
Figma	Figma is a web-based design platform that provides collaborative design tools and functionalities, enabling users to create professional-grade UI/UX designs efficiently while integrating seamlessly into educational app development workflows (Huang, 2024).
SQLite	SQLite is an embeddable, cross-platform database engine designed for efficient online transaction processing (OLTP), which allows applications to manage databases directly within their process without requiring a separate server (Gafney et al., 2022).
Web Browser	A web browser is a software application that enables users to access, retrieve, and view content on the World Wide Web, facilitating online behavioural research by allowing participants to interact with experiments hosted on various platforms (Anwyl-Irvine et al., 2021).
Draw. Io	Draw.io is a software application used for simulating computer networks, enabling users to create network diagrams and visualize complex technological principles, which facilitates the design and analysis of network systems (Hendrawan et al., 2022).
Lucid Chart	Lucidchart is a concept mapping tool that enables students to visualize and organize relationships between ideas, facilitating higher-level cognitive learning and enhancing the teaching-learning process in virtual environments (Sehrawat & Mathur, 2020).
Android Studio	Android Studio is an integrated development environment (IDE) designed for building Android applications, offering features like a

	visual layout editor, code analysis, and support for various programming languages to streamline the app development process (Qodirov et al., 2022).
Flutter	Flutter is an open-source UI software development kit created by Google for building natively compiled applications across multiple platforms, including Android and iOS, using a single codebase with the Dart programming language (Hussain et al., 2021).
Dart Language	Dart is an open-source, general-purpose programming language designed for client-side development, enabling the creation of fast and efficient web and mobile applications, particularly when used with the Flutter framework (Urathal et al., 2022).

3.2.2.2 System Architecture

The figure 3.7 illustrates the architecture of the proposed system, PathoQuest, detailing the interactions between its key components. Users interact with the system through the front-end, which is developed using Flutter and Dart. The front-end processes user interactions and directly interacts with the SQLite database to retrieve or store data locally. This design ensures that all necessary operations are handled within the app, providing a seamless and efficient user experience even in offline mode.

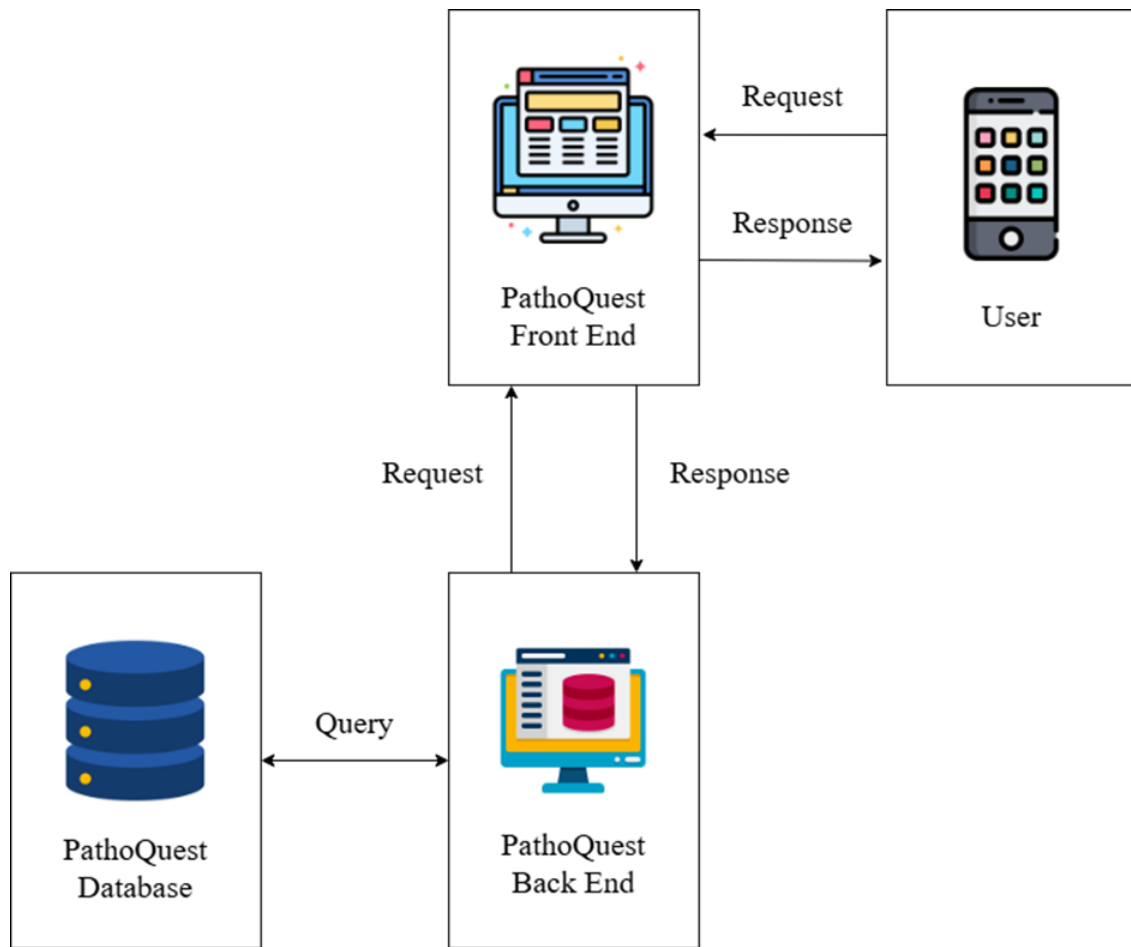


Figure 3.7 : Architecture of The Proposed System

3.2.2.3 Sequence Diagram

The UML Sequence Diagram is a visual representation used in object-oriented analysis to illustrate how objects interact and exchange messages over time within a system. It serves to map events or activities from use cases to the operations of object classes. In other words, it helps to bridge user requirements with the structural model. Sequence diagrams are valued for their intuitive nature and ability to depict partial behaviours which helps to clarify system operations and visualize interactions. The figure 3.8, figure 3.9 and figure 3.10 illustrate the sequence diagram of the proposed system flow.

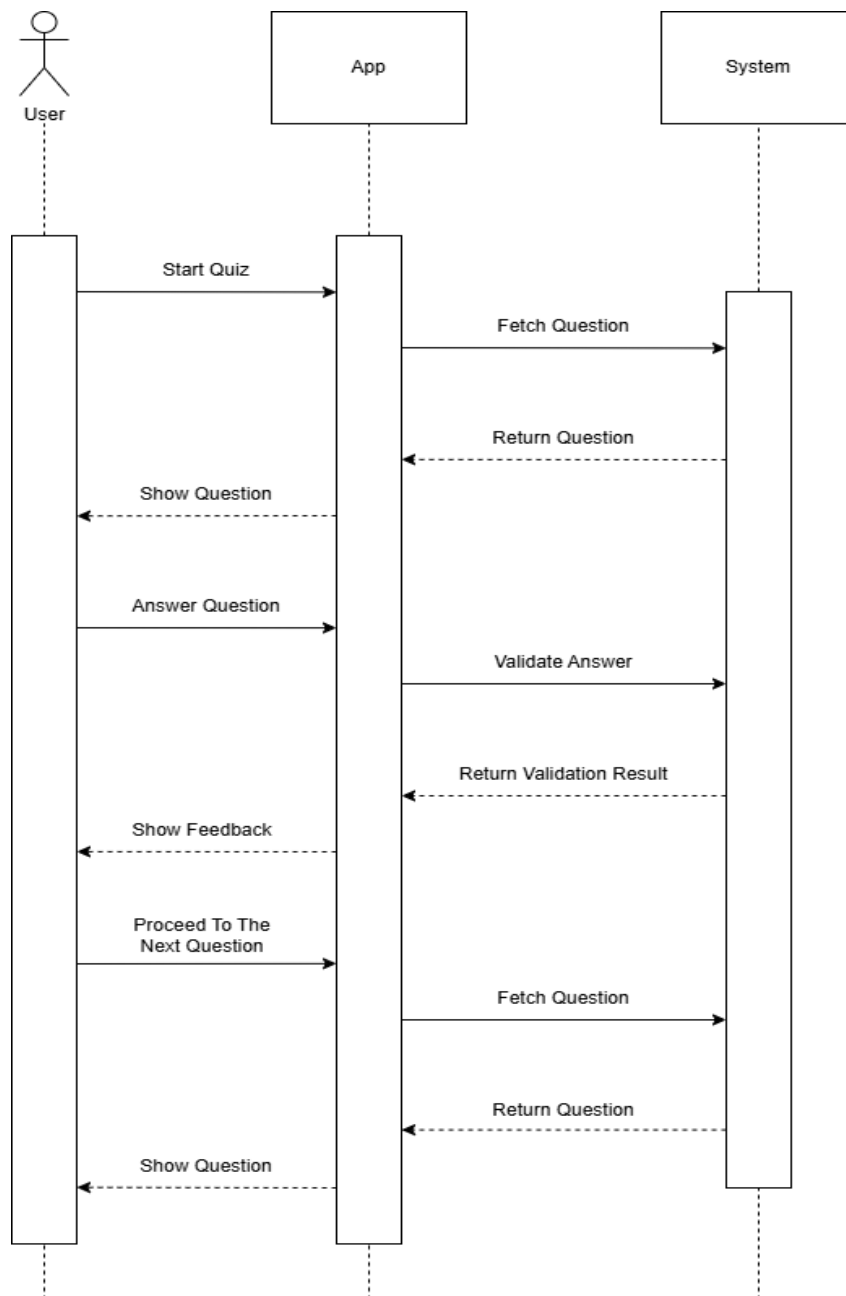


Figure 3.8 : Sequence Diagram of Quiz Interaction Flow

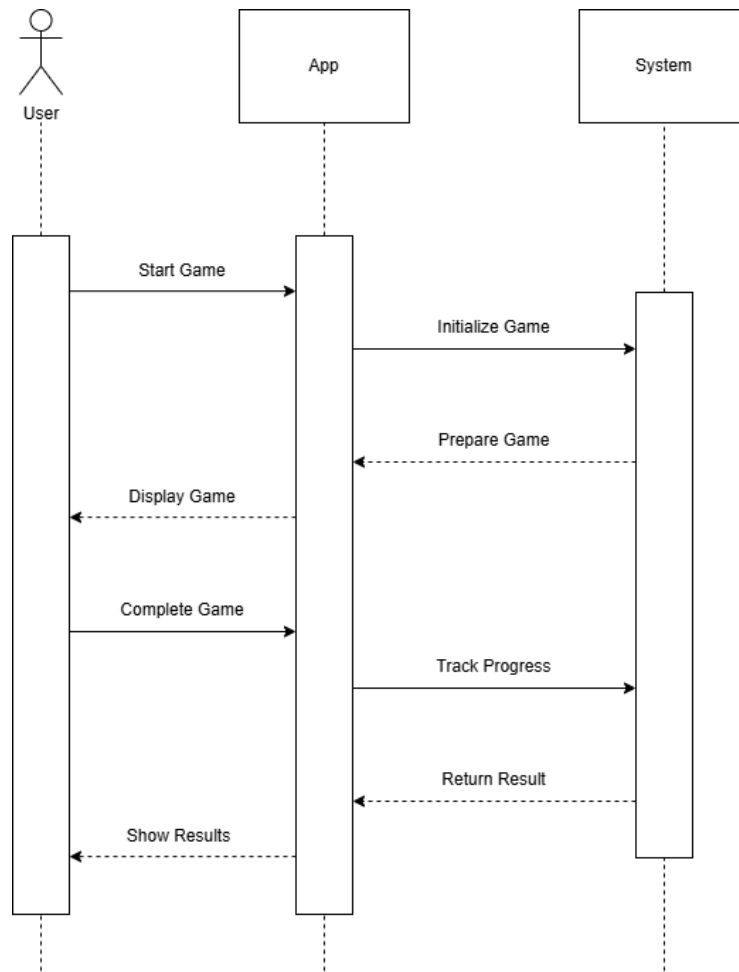


Figure 3.9 : Sequence Diagram Of Mini Games Interaction Flow

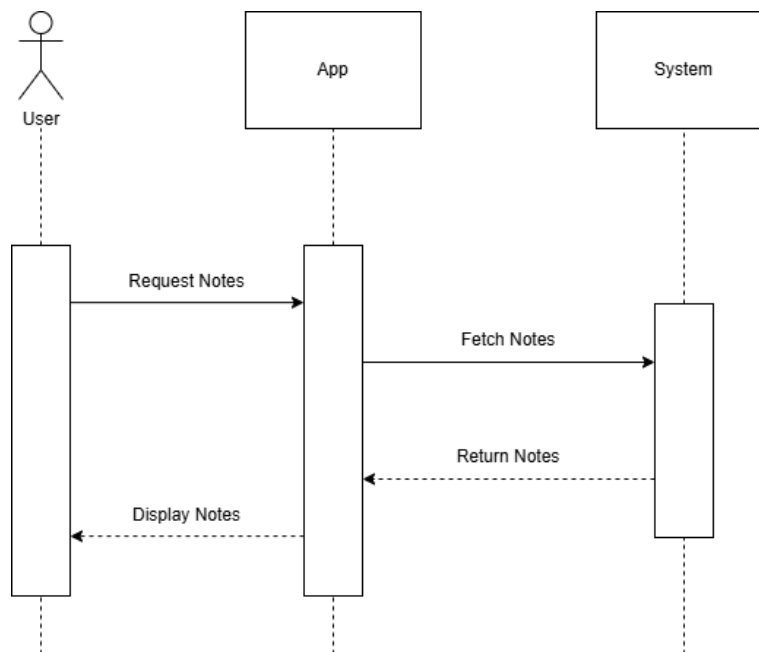


Figure 3.10 : Sequence Diagram of Notes Request Flow

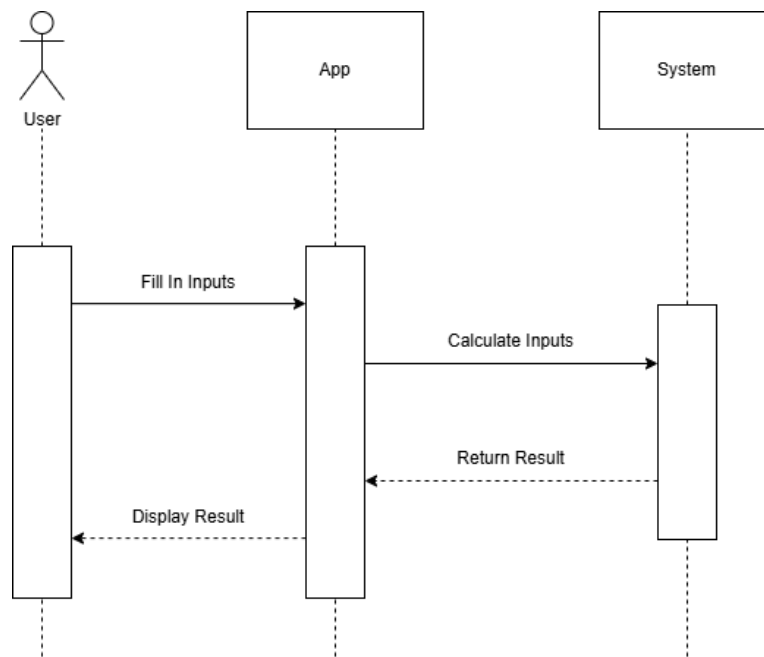


Figure 3.10 : Sequence Diagram of BMI Calculation Flow

Sequence Diagram Explanation

Table 3.2

Sequence Diagram of Quiz Interaction Description

Sequence Diagram Name	Quiz Interaction
Actor	User
User	1. App 2. System
Action 1	1. The User starts the quiz by interacting with the App 2. The App fetches the question from the System 3. The System returns the question to the App 4. The App displays the question to the User
Action 2	1. The User answers the question by interacting with the App 2. The App validates the answer by sending it to the System 3. The System returns the validation result (correct or incorrect) to the App 4. The App shows feedback (correct or incorrect) to the User

Action 3	1. The User proceeds to the next question by interacting with the App 2. The App fetches the next question from the System 3. The System returns the next question to the App 4. The App displays the next question to the User
----------	--

Table 3.3

Sequence Diagram Of Mini Games Interaction Description

Sequence Diagram Name	Mini Games Interaction
Actor	User
User	1. App 2. System
Action 1	1. The User starts the game by interacting with the App 2. The App initializes the game by sending a request to the System 3. The System prepares the game and returns the necessary data to the App 4. The App displays the game to the User
Action 2	1. The User completes the game by interacting with the App. 2. The App tracks the progress and sends the data to the System. 3. The System returns the result of the game for example score or completion status to the App 4. The App shows the results to the User

Table 3.4

Sequence Diagram Of Notes Request Description

Sequence Diagram Name	Notes Request
Actor	User
User	1. App 2. System
Action 1	1. The User requests the notes by interacting with the App 2. The App fetches the requested notes from the System

	3. The System returns the notes to the App 4. The App displays the notes to the User
--	---

Table 3.5

Sequence Diagram Of BMI Calculation Description

Sequence Diagram Name	BMI Calculation
Actor	User
User	3. App 4. System
Action 1	5. The User fills in the required input by interacting with the App 6. The App calculate the inputs from the System 7. The System returns the result to the App 8. The App displays the result to the User

3.2.2.4 Flowchart

A flowchart is defined as a visual tool that outlines the steps of a process in a clear and organized manner by using symbols and arrows to represent the sequence of actions. It helps users understand complex concepts by breaking them down into manageable parts, making it easier to follow procedures and make decisions. The figure 3.11 illustrates the flowchart of the proposed system workflow.

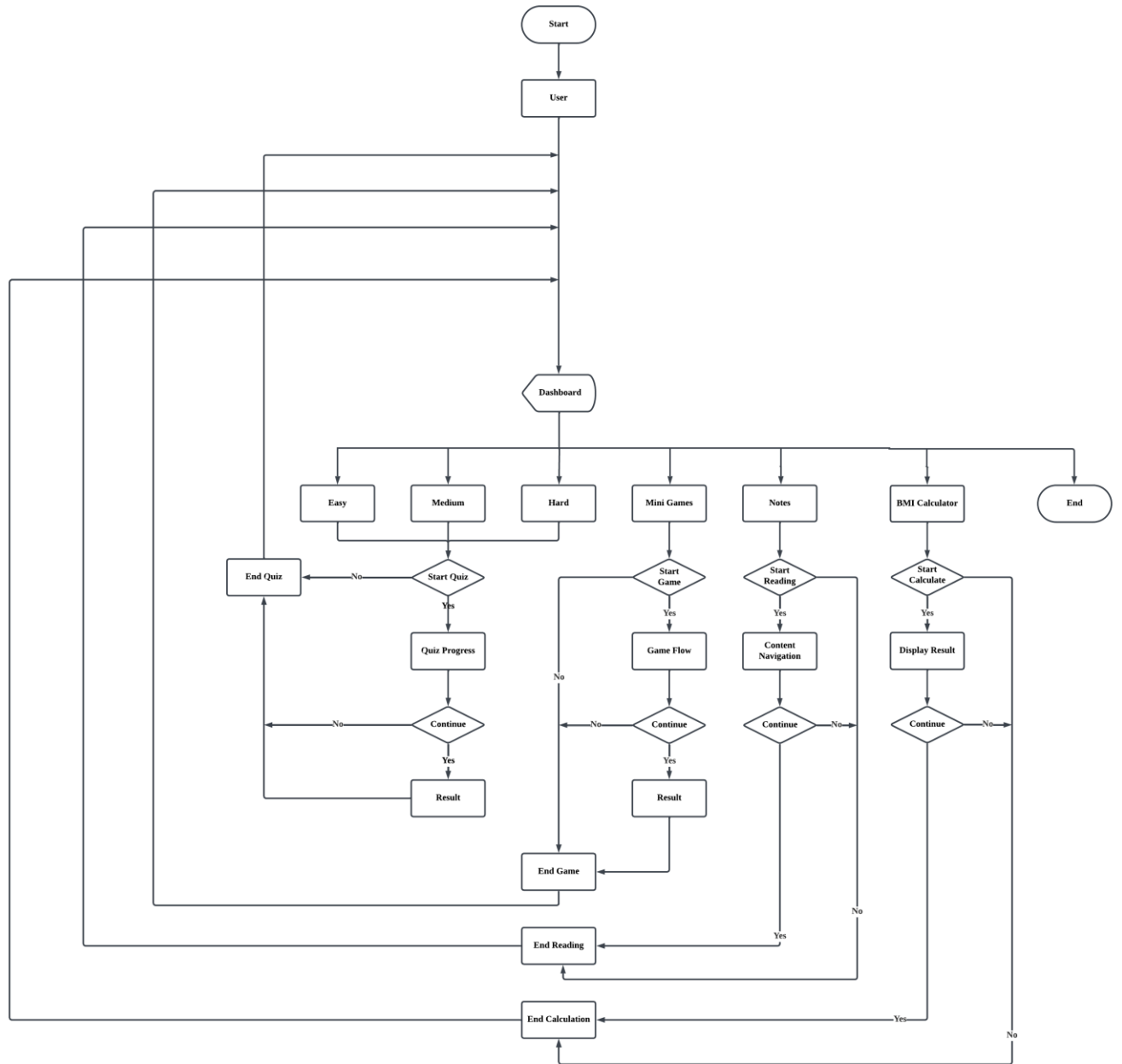


Figure 3.11 : Flowchart of the Proposed System Workflow

Flowchart Explanation

Table 3.5

General Process Description

No.	Assessment	Explanation
1.	Start	Beginning of session for application
2.	Dashboard	Showcased the user interface and options that user can choose to do with the app
3.	End	End of session for application
4.	User	User who participates in using the application

Table 3.6

Quiz Level Process Description

No.	Assessment	Explanation
1.	Easy	Quiz with an easy level of difficulty
2.	Medium	Quiz with a medium level of difficulty
3.	Hard	Quiz with a hard level of difficulty
4.	Start Quiz	Beginning of session of quiz section
5.	Quiz Progress	The progress during user answers the quiz
6.	Continue	During the quiz progress, user can choose to continue or discontinue answering the question
7.	Result	After user managed to answer all the questions, the result will be displayed
8.	End Quiz	End of session for quiz section

Table 3.7

Mini Games Process Description

No.	Assessment	Explanation
1.	Mini Games	Alternative option if user decided not to play quiz games
2.	Start Game	Beginning of session of mini games
3.	Game flow	The game flow during user plays the mini games

4.	Continue	During the quiz progress, user can choose to continue or discontinue playing the mini games
5.	Result	After user managed to complete the mini games, the result will be displayed
6.	End Game	End of session for mini game section

Table 3.8

Notes Process Description

No.	Assessment	Explanation
1.	Notes	Educational reading if user wants to read instead of participating in quiz or mini games
2.	Start Reading	Beginning of session for reading section
3.	Current Navigation	The current navigation during the reading process
4.	Continue	During the reading progress, user can choose to continue or discontinue reading the material
5.	End Reading	End of session for reading section

Table 3.9

BMI Calculation Process Description

No.	Assessment	Explanation
1.	Notes	BMI Calculator if user wants to calculate the BMI instead of participating in quiz or mini games
2.	Start Calculate	Beginning of session for BMI calculator section where user fills in the input and click calculate to get the BMI result
3.	Display Result	The user receives the result after calculating the BMI
4.	Continue	After getting the BMI result, user can choose to continue or discontinue using the calculator
5.	End Reading	End of session for BMI calculation section

3.2.2.5 Use Case Diagram

A use case diagram is a visual representation that illustrates the various usage scenarios of a system which details what the system should accomplish without delving into implementation specifics such as data structures or algorithms. It identifies the actors interacting with the system and the functionalities they can access where it effectively capturing the customer's requirements and expectations for the system. This diagram serves as a fundamental tool in object-oriented development that aiding in both the analysis and design phases by documenting system functionality and user interactions. It is also highlighting potential errors in requirements that could lead to increased development costs and user dissatisfaction if not carefully addressed. The figure 3.12 illustrates the use case diagram of the proposed system workflow.

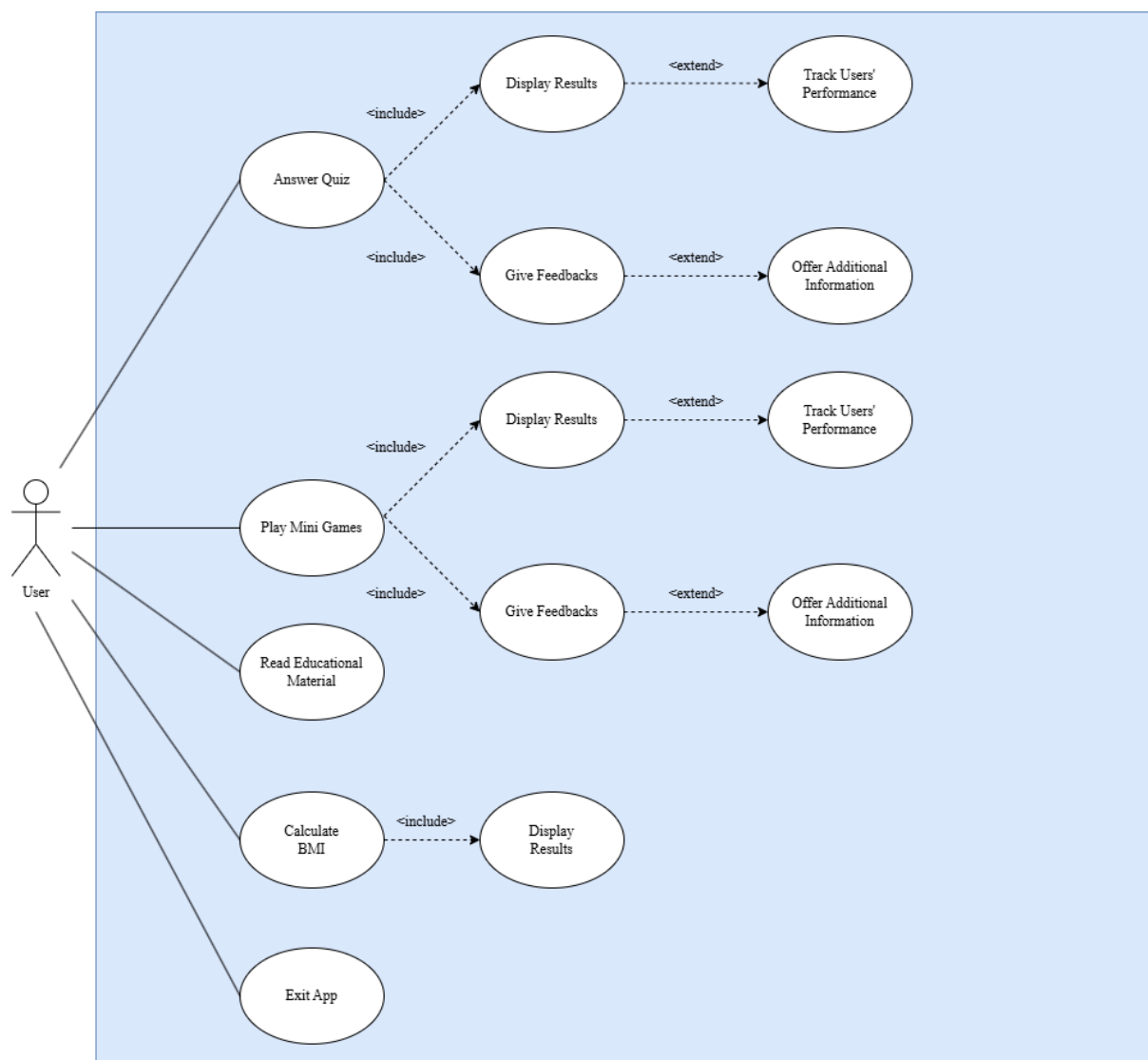


Figure 3.12 : Use Case Diagram for PathoQuest App

Use Case Diagram Explanation

Table 3.9

Use Case Answer Quiz Description

Use Case Name	Answer Quiz
Actor	User
Description	The user participates in a quiz about diseases
Preconditions	1. The app is installed and running 2. The user has selected the quiz options
Postconditions	1. Results and feedback are displayed. 2. The user's performance is tracked, and additional information is available
Main Flow	1. User selects the quiz option. 2. User answers a series of questions. 3. The app calculates and displays results. 4. Feedback is provided based on the user's answers. 5. Additional information is shown if required.
Alternative Flow	If the user skips a question, the app marks it unanswered and proceeds.
Exceptions	If the app encounters a technical error, the quiz may not load.

Table 3.10

Use Case Play Mini Games Description

Use Case Name	Play Mini Games
Actor	User
Description	The user engages in mini games related to diseases to reinforce learning.
Preconditions	1. The app is installed and running. 2. The user selects the mini-games option.
Postconditions	1. Results and feedback are displayed. 2. The user's performance is tracked, and additional information is available offline.
Main Flow	1. User selects the mini-games option. 2. User plays a game for example word guess

	3. The app calculates and displays results offline. 4. Feedback is provided based on performance. 5. Additional information is shown if applicable
Alternative Flow	If the user quits a game mid-session, the app saves partial progress.
Exceptions	If the app crashes, progress might not be saved

Table 3.11

Use Case Read Educational Material Description

Use Case Name	Read Educational Material
Actor	User
Description	The user reads health-related educational materials in the app.
Preconditions	The app is installed and running.
Postconditions	Educational material is viewed by the user offline
Main Flow	1. User selects the educational material option. 2. The app displays the requested material.
Alternative Flow	None.
Exceptions	None.

Table 3.12

Use Case Exit App Description

Use Case Name	Exit App
Actor	User
Description	The user exits the application
Preconditions	The app is installed and running
Postconditions	The app is closed.
Main Flow	1. User selects the exit option. 2. The app saves any unsaved progress and closes
Alternative Flow	None
Exceptions	None

Table 3.13*Use Case Display Results Description*

Use Case Name	Display Results
Actor	1. User 2. System
Description	The app displays quiz or mini-game results
Preconditions	The user has completed a quiz or mini game
Postconditions	Results are shown to the user offline
Main Flow	1. The system calculates results based on user input 2. Results are displayed in a clear format offline
Alternative Flow	None
Exceptions	If the app crashes, results cannot be displayed

Table 3.14*Use Case Give Feedback Description*

Use Case Name	Give Feedback
Actor	User
Description	The app provides feedback to users based on their quiz or mini-game performance
Preconditions	The user has completed a quiz or mini game
Postconditions	Feedback is displayed to the user offline
Main Flow	1. The system analyses the user's answers or performance. 2. The app displays feedback with suggestions for improvement
Alternative Flow	None
Exceptions	If the app crashes, feedback cannot be displayed

Table 3.15*Use Case Calculate BMI Description*

Use Case Name	Calculate BMI
Actor	User
Description	The user calculates the BMI
Preconditions	The app is installed and running
Postconditions	Results are shown to the user offline
Main Flow	1. User enters the required input for BMI 2. Results are displayed in a clear format
Alternative Flow	None
Exceptions	If the app crashes, results cannot be displayed

3.2.2.6 Wireframe

A wireframe is defined as a visual representation or blueprint of a website or application design which is used to outline the structure, layout, and functionality of the interface without delving into detailed design elements. It serves as a foundational tool in the design process which helps to facilitate communication among team members. It also helps both beginners and experienced users conceptualize ideas before developing a final product, whether through tangible materials or digital software. In the proposed system, several wireframes are included to illustrate how it works. The figures below which are Figure 3.13, Figure 3.14, Figure 3.15, Figure 3.16, Figure 3.17 and Figure 3.18 are the wireframes for the proposed system which include the Welcome Screen, Home Screen, Quiz Section, Mini Games Section, Notes Section and BMI Calculator Section.

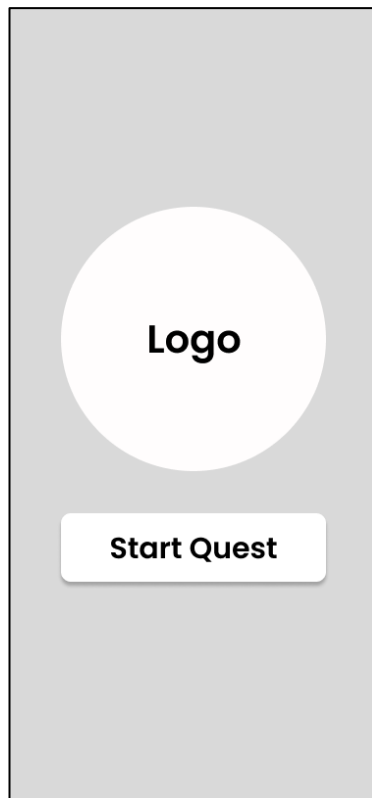


Figure 3.13 : Welcome Screen

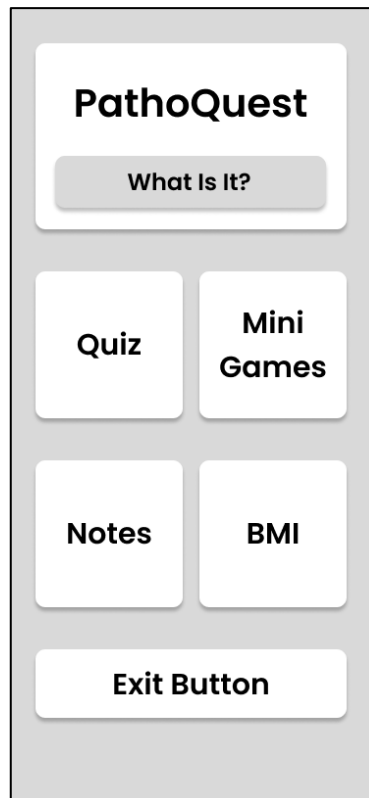


Figure 3.14 : Home Screen

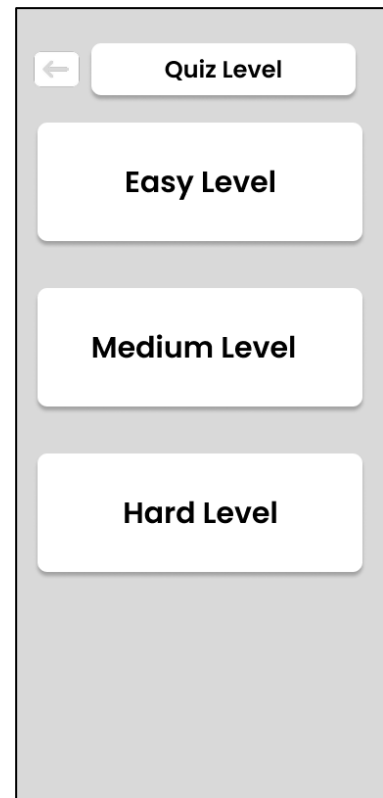


Figure 3.15 : Quiz Section



*Figure 3.16 : Mini Games
Section*

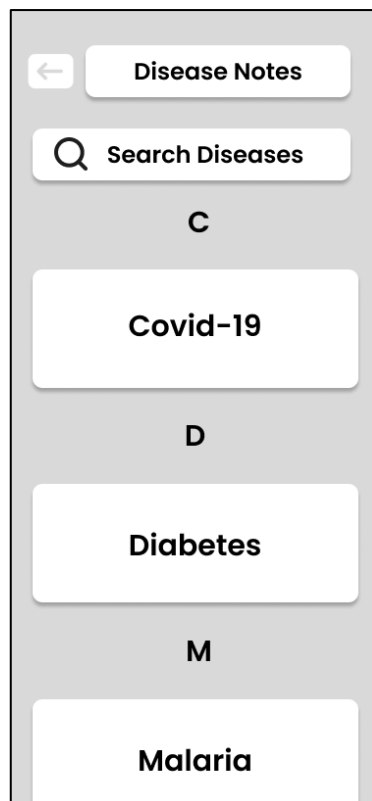


Figure 3.17 : Notes Section

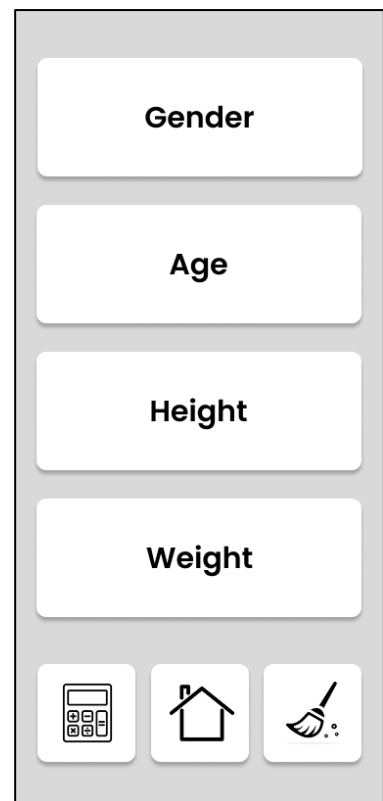


*Figure 3.18 : BMI
Calculator Section*

3.2.3 Implementation Phase

In the implementation Phase, , it will focus on transforming the detailed designs and specifications into a fully functional PathoQuest app. This phase involves writing real code and compiling it into a working application., The front-end and back-end components are developed by using Flutter and Dart. It will also include in developing the interactive quiz interface, hint displays, and scoring system. Additionally, the database which is designed in the previous phase is implemented using SQLite to store essential data such as disease information, user scores, and game progress. The aim is to bring together all the elements outlined in the design phase and create a cohesive app that aligns with the defined requirements.

Furthermore, this phase includes integrating all the modules and ensuring smooth communication between the app's components, from the user interface to the database. The clean and efficient code is written to ensure the app runs smoothly and performs well. At the end of this phase. the result it will produce is a working PathoQuest prototype. Although it is functional, but it is not yet perfect. Thus, it will proceed to the testing phase, where issues will be identified, refined, and improved.

3.2.4 Testing Phase

In the testing phase, it will focus on verifying and validating to ensure that the app meets its original specifications and functions as intended. Verification involves evaluating the app against the requirements established in the earlier phases to ensure that the app's features such as quiz mechanics, hint systems, and score tracking are implemented correctly. During this process, functional testing is carried out to confirm that each function performs as expected such as checking if the app presents questions accurately, calculates scores correctly, and displays the disease information seamlessly. This phase verifies that the system behaves according to the defined use cases and meets the expected standards.

As for validation, it focuses on ensuring that the app meets the needs and expectations of its users. This is essential for PathoQuest's goal of educating users through a gamified quiz experience. In this phase, user testing plays the crucial role where real users interact with the app to provide feedback on its usability, engagement, and functionality. This helps identify any user interface issues, navigation difficulties, or areas where the app may fail to meet user expectations. Feedback from user testing is analysed to refine the app, fix bugs, and enhance the overall experience. Both verification and validation ensure that PathoQuest is both technically sound and user-friendly, ready for launch and future improvements.

3.2.5 Maintenance Phase

In the maintenance Phase, it will focus on refining PathoQuest after its launch to ensure optimal performance, user satisfaction, and relevance over time. This phase involves modifying the app to address any issues that arise post-deployment, such as correcting bugs or errors reported by users. Additionally, the app may need to be adapted to accommodate new user requirements, integrate feedback, and ensure compatibility with the latest operating systems. This ongoing maintenance helps to ensure that PathoQuest remains stable, functional, and performs efficiently across a range of devices and platforms.

Furthermore, additional maintenance tasks include enhancing the app's performance, improving the quality of features like mini-games and quiz mechanics, and adding new content, such as additional questions for the quiz game or updated disease information. These updates keep the app engaging and informative for users, while ensuring that it continues to fulfil its educational purpose. The maintenance phase ensures that PathoQuest remains reliable, up-to-date, and effective as an educational tool, continuously improving to meet the evolving needs of its users. This phase ensures long-term success and user retention, allowing the app to stay relevant and maintain a high level of user engagement.

3.3 Level Of Usage

PathoQuest is designed to be an interactive and educational mobile application aimed at enhancing public health awareness through gamified learning. The application caters to various user groups, each engaging with the app at different levels of usage. This section outlines the expected levels of usage based on user categories, frequency, context, and accessibility.

3.3.1 User Categories And Usage Levels

PathoQuest is expected to be used by different groups of individuals, each with varying levels of engagement:

Table 3.15

User Categories And Usage Levels

Casual User	Individuals who use the app occasionally for entertainment and general knowledge about diseases.
Regular User	Students, healthcare trainees, or individuals with an interest in medical knowledge who engage with the app frequently to enhance their understanding.
Educators And Professionals	Teachers, lecturers, and healthcare professionals who may recommend or integrate the app into their educational activities as a supplementary learning tool.

3.3.2 Frequency Of Use

The application is designed to accommodate various user engagement patterns:

Table 3.16

Frequency Of Use

Daily User	Individuals who engage with the app regularly, using it as a daily quiz challenge to reinforce their medical knowledge.
Occasional Users	Those who use the app intermittently, such as when they have free time or need specific health information.
Challenge-Based Users	Individuals who participate primarily in special events, competitions, or group challenges facilitated within the app.

3.3.3 Context Of Usage

PathoQuest serves multiple purposes depending on the user's needs and background:

Table 3.16

Context Of Usage

Self-Learning Tool	Designed for individual users who wish to expand their medical knowledge in a fun and engaging manner.
Educational Supplement	Can be used by educators to complement traditional teaching methods, providing students with interactive learning experiences.
Public Health Awareness	Acts as an informative platform for the public, raising awareness of diseases and preventive measures in an accessible format.

3.3.4 Device Usage And Accessibility

PathoQuest is designed to accommodate various levels of accessibility, ensuring users can engage with the app regardless of their internet connectivity or device preferences:

Table 3.16

Device Usage And Accessibility

Offline Functionality	Given that PathoQuest is designed to work offline, users can engage with the app without requiring continuous internet access, ensuring accessibility in areas with limited connectivity.
Mobile-Optimized	The app is designed for mobile users, allowing seamless access anytime and anywhere, making it a convenient tool for learning and engagement

3.4 Summary

The chapter concludes with a detailed description of the proposed system's methodology, which will be developed using the iterative model. It covers the requirement phase, clarifying the essential requirements for the system. Additionally, the chapter explains various diagrams, including sequence diagrams, flowchart, use case diagrams, and wireframes.

CHAPTER 4 : IMPLEMENTATION

4.1 Introduction

In this chapter, it discusses the implementation of PathoQuest System. This chapter also will be focusing on the interface of the system that had been developed by using the chosen tools and programming languages. Not only that, the flow of the system implementation also will be explained in detail which include from the beginning until the end of the development process.

4.2 System Configuration

4.2.1 Database

PathoQuest is using SQLite as a local database engine to store and manage data directly on the device, ensuring offline functionality. Since PathoQuest works offline, the database schema and initial data are defined in an SQL file, which includes 'INSERT' statements to populate the database with questions, answers, and hints for the game. SQLite is used to interact with SQLite, allowing the app to execute SQL commands such as creating tables and inserting data into the database. This setup enables the system to manage and retrieve game data locally, without requiring an internet connection, with SQLite providing the interface for seamless communication between the app and the SQLite database.

Figure 4.1 illustrates the SQL file for quiz easy level. Figure 4.2 illustrates the SQL file for medium level. Figure 4.3 illustrates the SQL file for quiz hard level. Figure 4.4 illustrates the SQL file for diseases notes. Figure 4.5 illustrates the SQL file for puzzle word game.

```

quiz_easy.sql X
assets > quiz_easy.sql
1  INSERT INTO quiz (level, question, option1, option2, option3, option4, answer, explanation)
2  VALUES
3  ('easy', 'Which disease is caused by the influenza virus?', 'Flu', 'Malaria', 'Chickenpox', 'Tuberculosis', 'Flu', 'The influenza virus causes a
4  ('easy', 'What is the most common symptom of chickenpox?', 'Cough', 'Skin rash', 'Fever', 'Nausea', 'Skin rash', 'Chickenpox typically causes a
5  ('easy', 'Which of the following is a major risk factor for heart disease?', 'High blood pressure', 'Lack of sleep', 'Frequent headaches', 'Skin
6  ('easy', 'Which disease is spread through contaminated food or water?', 'Malaria', 'Hepatitis A', 'Tuberculosis', 'Chickenpox', 'Hepatitis A', '
7  ('easy', 'What is a common symptom of asthma?', 'Shortness of breath', 'Coughing', 'Rash', 'Swelling', 'Shortness of breath', 'Asthma commonly c
8  ('easy', 'Which disease is characterized by swollen, painful joints?', 'Rheumatoid arthritis', 'Chickenpox', 'Measles', 'Tuberculosis', 'Rheumat
9  ('easy', 'Which of the following is a type of fungal infection?', 'Athlete's foot', 'Malaria', 'Flu', 'Pneumonia', 'Athlete's foot', 'Athlete's
10 ('easy', 'What is the main cause of food poisoning?', 'Bacteria', 'Virus', 'Parasites', 'Fungi', 'Bacteria', 'Bacteria, such as Salmonella or E.
11 ('easy', 'What is the primary symptom of the common cold?', 'Fever', 'Sneezing', 'Skin rash', 'Swelling', 'Sneezing', 'Sneezing is one of the m
12 ('easy', 'Which of these diseases can be prevented by vaccination?', 'Chickenpox', 'Malaria', 'Tuberculosis', 'HIV/AIDS', 'Chickenpox', 'The chi
13
14 INSERT INTO quiz (level, question, option1, option2, option3, option4, answer, explanation)
15 VALUES
16 ('easy', 'Which disease is caused by the influenza virus?', 'Flu', 'Malaria', 'Chickenpox', 'Tuberculosis', 'Flu', 'The flu is caused by the inf
17 ('easy', 'What is the most common cause of chickenpox?', 'Bacteria', 'Virus', 'Parasite', 'Fungus', 'Virus', 'Chickenpox is caused by the varic
18 ('easy', 'Which disease is caused by a lack of insulin in the body?', 'Diabetes', 'Asthma', 'Measles', 'Malaria', 'Diabetes', 'Diabetes occurs v
19 ('easy', 'Which of the following is a common symptom of asthma?', 'Shortness of breath', 'Headache', 'Rash', 'Stomach ache', 'Shortness of breat
20 ('easy', 'Which disease is caused by a deficiency of iron?', 'Anemia', 'Scurvy', 'Rickets', 'Pellagra', 'Anemia', 'Anemia is a condition caused
21 ('easy', 'What is the primary treatment for bacterial infections?', 'Antibiotics', 'Painkillers', 'Rest', 'Surgery', 'Antibiotics', 'Antibiotics
22 ('easy', 'Which disease is commonly spread through contaminated food or water?', 'Hepatitis A', 'Flu', 'Measles', 'Chickenpox', 'Hepatitis A', '
23 ('easy', 'Which type of virus causes the common cold?', 'Rhinovirus', 'Influenza virus', 'Herpes virus', 'HIV', 'Rhinovirus', 'The common cold i
24 ('easy', 'Which of these diseases is caused by a parasite?', 'Malaria', 'Pneumonia', 'Flu', 'Tuberculosis', 'Malaria', 'Malaria is caused by the
25 ('easy', 'Which of the following is a common symptom of food poisoning?', 'Diarrhea', 'Coughing', 'Fatigue', 'Rash', 'Diarrhea', 'Food poisoning
26
27 INSERT INTO quiz (level, question, option1, option2, option3, option4, answer, explanation)
28 VALUES
29 ('easy', 'Which of these diseases is caused by a virus?', 'Flu', 'Chickenpox', 'Malaria', 'Tuberculosis', 'Flu', 'The flu is caused by the influ
30 ('easy', 'What is the main symptom of a cold?', 'Cough', 'Fever', 'Skin rash', 'Itchy throat', 'Cough', 'A common symptom of the cold is coughin
31 ('easy', 'Which disease causes a red rash on the skin?', 'Measles', 'Chickenpox', 'Malaria', 'Tuberculosis', 'Measles', 'Measles is known for ca
32 ('easy', 'Which of the following is a symptom of food poisoning?', 'Headache', 'Stomach cramps', 'Coughing', 'Fatigue', 'Stomach cramps', 'Stoma
33 ('easy', 'Which disease can be prevented by a vaccine?', 'Flu', 'Asthma', 'Diabetes', 'Heart disease', 'Flu', 'The flu can be prevented with the

```

Figure 4.1 : Quiz Easy Level SQL File

```

quiz_medium.sql X
assets > quiz_medium.sql
1  INSERT INTO quiz (level, question, option1, option2, option3, option4, answer, explanation)
2  VALUES
3  ('medium', 'What is the main cause of a cold?', 'Bacteria', 'Virus', 'Fungus', 'Parasite', 'Virus', 'The common cold is caused by a virus, typic
4  ('medium', 'Which of the following is a symptom of the flu?', 'Rash', 'High fever', 'Diarrhea', 'Dry skin', 'High fever', 'Flu often comes with
5  ('medium', 'Which type of disease is chickenpox?', 'Bacterial', 'Viral', 'Fungal', 'Parasitic', 'Viral', 'Chickenpox is caused by a viral infect
6  ('medium', 'Which of these can help prevent the spread of the flu?', 'Eating healthy foods', 'Getting the flu vaccine', 'Drinking tea', 'Washing
7  ('medium', 'What is the primary cause of food poisoning?', 'Bacteria', 'Virus', 'Parasites', 'Fungi', 'Bacteria', 'Bacteria like Salmonella and
8  ('medium', 'Which disease is caused by a virus and causes painful, swollen glands?', 'Mumps', 'Measles', 'Chickenpox', 'Polio', 'Mumps', 'Mumps
9  ('medium', 'Which of these is a symptom of asthma?', 'Sneezing', 'Shortness of breath', 'Nausea', 'Rash', 'Shortness of breath', 'Asthma often c
10 ('medium', 'Which organ is primarily affected by hepatitis?', 'Liver', 'Lungs', 'Heart', 'Kidneys', 'Liver', 'Hepatitis is an inflammation of th
11 ('medium', 'What is the most common symptom of a sinus infection?', 'Headache', 'Nausea', 'Blurred vision', 'Chest pain', 'Headache', 'Sinus inf
12 ('medium', 'Which of these diseases can be prevented with a vaccine?', 'Chickenpox', 'Hepatitis C', 'HIV', 'Asthma', 'Chickenpox', 'The chicken
13
14 INSERT INTO quiz (level, question, option1, option2, option3, option4, answer, explanation)
15 VALUES
16 ('medium', 'What is the primary risk factor for developing lung cancer?', 'Smoking', 'Diet', 'Lack of exercise', 'Alcohol consumption', 'Smoking
17 ('medium', 'What is the most common cause of stomach acid reflux?', 'Eating large meals', 'Lack of sleep', 'Stress', 'Eating spicy food', 'Eatin
18 ('medium', 'Which disease is caused by a lack of iron?', 'Anemia', 'Rickets', 'Beriberi', 'Scurvy', 'Anemia', 'Anemia is caused by a lack of ir
19 ('medium', 'What is the common symptom of an allergic reaction?', 'Sneezing', 'Coughing', 'Stomach pain', 'Headache', 'Sneezing', 'Sneezing is a
20 ('medium', 'Which disease is caused by a virus and affects the respiratory system?', 'Influenza', 'Chickenpox', 'Diabetes', 'HIV/AIDS', 'Influe
21 ('medium', 'Which of the following is NOT a symptom of the common cold?', 'Rash', 'Sore throat', 'Runny nose', 'Cough', 'Rash', 'Rash is not typ
22 ('medium', 'What is the best way to prevent the spread of the flu?', 'Wash hands frequently', 'Take antibiotics', 'Drink hot tea', 'Get plenty o
23 ('medium', 'Which condition is caused by inflammation of the joints?', 'Arthritis', 'Asthma', 'Diabetes', 'Hypertension', 'Arthritis', 'Arthriti
24 ('medium', 'Which disease is caused by a viral infection and can cause a skin rash?', 'Chickenpox', 'Asthma', 'Hypertension', 'HIV/AIDS', 'chick
25 ('medium', 'What is a common symptom of an ear infection?', 'Pain in the ear', 'Coughing', 'Fever', 'Sore throat', 'Pain in the ear', 'Ear infec
26
27 INSERT INTO quiz (level, question, option1, option2, option3, option4, answer, explanation)
28 VALUES
29 ('medium', 'Which disease is caused by a lack of vitamin C?', 'Scurvy', 'Rickets', 'Anemia', 'Measles', 'Scurvy', 'Scurvy is caused by a defici
30 ('medium', 'What is the most common cause of stomach ulcers?', 'Bacterial infection', 'Viruses', 'Stress', 'Too much exercise', 'Bacterial infec
31 ('medium', 'Which disease is known as the "common cold"?', 'Asthma', 'Influenza', 'Bronchitis', 'Rhinovirus', 'Rhinovirus', 'The common cold is
32 ('medium', 'Which of these is a disease caused by a lack of calcium?', 'Rickets', 'Flu', 'Cold', 'Asthma', 'Rickets', 'Rickets is a disease cau
33 ('medium', 'What is the leading cause of foodborne illness?', 'Bacteria', 'Virus', 'Parasites', 'Fungus', 'Bacteria', 'Bacterial infections, suc

```

Figure 4.2 : Quiz Medium Level SQL File

```

quiz_hard.sql X
assets > quiz_hard.sql
1  INSERT INTO quiz (level, question, option1, option2, option3, option4, answer, explanation)
2  VALUES
3  ('hard', 'Which of the following can be a long-term effect of untreated diabetes?', 'Kidney damage', 'Shortness of breath', 'Diarrhea', 'Coughi
4  ('hard', 'What is a common way to reduce the risk of heart disease?', 'Healthy diet exercise', 'Drinking plenty of water', 'Taking medicine for
5  ('hard', 'What causes a person to get a cold?', 'A virus', 'Bacteria', 'Poor hygiene', 'Insects', 'A virus', 'The common cold is caused by a vi
6  ('hard', 'Which of these diseases is most likely to cause a fever?', 'Flu', 'Asthma', 'Diabetes', 'Eczema', 'Flu', 'The flu is often associated
7  ('hard', 'Which of the following is a symptom of pneumonia?', 'Cough with mucus', 'Itchy skin', 'Rash', 'Back pain', 'Cough with mucus', 'Pneum
8  ('hard', 'Which disease is caused by the bacteria *Salmonella*?', 'Food poisoning', 'Malaria', 'Measles', 'Tuberculosis', 'Food poisoning', '*S
9  ('hard', 'What is a common result of untreated high blood pressure?', 'Heart attack', 'Cold hands', 'Fatigue', 'Rashes', 'Heart attack', 'High
10 ('hard', 'Which of the following is NOT a common symptom of an allergic reaction?', 'Itchy skin', 'Sore throat', 'Sneezing', 'Rash', 'Sore thro
11 ('hard', 'Which disease is caused by a virus and affects the liver?', 'Hepatitis', 'Malaria', 'Asthma', 'Diabetes', 'Hepatitis', 'Hepatitis is
12 ('hard', 'Which of these is a major cause of tooth decay?', 'Sugary food and drinks', 'Brushing too hard', 'Drinking milk', 'Skipping meals', '
13
14 INSERT INTO quiz (level, question, option1, option2, option3, option4, answer, explanation)
15 VALUES
16 ('hard', 'Which disease is caused by a lack of insulin in the body?', 'Diabetes', 'Asthma', 'Hypertension', 'Cancer', 'Diabetes', 'Diabetes is
17 ('hard', 'What can happen if high cholesterol levels are left untreated?', 'Heart disease', 'Cold sores', 'Coughing', 'Asthma', 'Heart disease'
18 ('hard', 'Which of the following diseases is NOT caused by a virus?', 'Bacterial pneumonia', 'Common cold', 'Chickenpox', 'Flu', 'Bacterial pne
19 ('hard', 'Which organ is primarily affected by hepatitis?', 'Liver', 'Heart', 'Lungs', 'Kidneys', 'Liver', 'Hepatitis is an infection that caus
20 ('hard', 'What is a major risk factor for stroke?', 'High blood pressure', 'Lack of sleep', 'Diarrhea', 'Low cholesterol', 'High blood pressure
21 ('hard', 'What disease is commonly spread through contaminated water?', 'Cholera', 'Asthma', 'Tuberculosis', 'Cancer', 'Cholera', 'Cholera is a
22 ('hard', 'What type of cancer is linked to smoking?', 'Lung cancer', 'Skin cancer', 'Breast cancer', 'Colon cancer', 'Lung cancer', 'Lung cance
23 ('hard', 'Which disease is caused by a deficiency of iron?', 'Anemia', 'Rickets', 'Scurvy', 'Beriberi', 'Anemia', 'Anemia is a condition caused
24 ('hard', 'What is a common symptom of an asthma attack?', 'Wheezing', 'Coughing', 'Sneezing', 'Itchy skin', 'Wheezing', 'Asthma attacks are com
25 ('hard', 'What is the main cause of stomach ulcers?', 'Bacterial infection', 'Stress', 'Diet', 'Lack of sleep', 'Bacterial infection', 'Stomach
26
27 INSERT INTO quiz (level, question, option1, option2, option3, option4, answer, explanation)
28 VALUES
29 ('hard', 'What is the leading cause of death from heart disease?', 'Clogged arteries', 'High cholesterol', 'Obesity', 'Smoking', 'Clogged arter
30 ('hard', 'Which disease is caused by an abnormality in the immune system?', 'Lupus', 'Chickenpox', 'Measles', 'Flu', 'Lupus', 'Lupus is an auto
31 ('hard', 'What is the main cause of cirrhosis of the liver?', 'Chronic alcohol use', 'Hepatitis A', 'Hepatitis C', 'Fatty liver disease', 'Chro
32 ('hard', 'Which of the following is a symptom of meningitis?', 'Stiff neck', 'Rash', 'Coughing', 'Diarrhea', 'Stiff neck', 'Meningitis, an infe
33 ('hard', 'Which viral infection can cause severe damage to the liver?', 'Hepatitis B', 'Influenza', 'HIV/AIDS', 'Chickenpox', 'Hepatitis B', 'H

```

Figure 4.3 : Quiz Hard Level SQL File

```

notes_diseases.sql X
assets > notes_diseases.sql
1  INSERT INTO diseases (title, description, content)
2  VALUES
3  ('COVID-19', 'A contagious respiratory disease caused by the coronavirus SARS-CoV-2.',
4  'COVID-19 primarily spreads through respiratory droplets that are released when an infected person coughs, sneezes, talks, or even breathes. The
5  The symptoms of COVID-19 are varied, but common signs include fever, dry cough, and shortness of breath, with some individuals also experiencing
6
7  ('Malaria', 'A life-threatening disease caused by parasites transmitted through the bites of infected mosquitoes.',
8  'Malaria is a serious and potentially fatal disease that is primarily prevalent in tropical and subtropical regions of the world. It is caused b
9  If left untreated, malaria can lead to severe complications such as anemia, kidney failure, and even death. Children, pregnant women, and travel
10
11 ('HIV/AIDS', 'A virus that attacks the immune system, weakening the body's defense against infections.',
12 'HIV (Human Immunodeficiency Virus) is a virus that attacks and weakens the immune system by targeting CD4 cells, which are crucial for immune r
13 Early symptoms of HIV infection include flu-like symptoms, fever, swollen lymph nodes, and fatigue. If left untreated, the virus progresses over
14
15 ('Cancer', 'A group of diseases involving abnormal cell growth that can spread to other parts of the body.',
16 'Cancer refers to a collection of diseases characterized by uncontrolled cell division and growth, often resulting in the formation of tumors.'
17 Symptoms of cancer depend on the type and stage, but they often include unexplained weight loss, fatigue, pain, and changes in bodily functions.
18
19 ('Stroke', 'A medical condition where poor blood flow to the brain causes cell death.',
20 'A stroke occurs when there is a disruption in the blood supply to part of the brain, either due to a blocked artery (ischemic stroke) or the r
21 Immediate medical attention is critical as treatments like clot-busting drugs or surgical procedures can help restore blood flow and minimize br
22
23 ('Pneumonia', 'An infection that inflames the air sacs in one or both lungs, causing them to fill with fluid or pus.',
24 'Pneumonia is a serious respiratory infection that can be caused by bacteria, viruses, fungi, or parasites. It results in the inflammation of th
25 In severe cases, it can lead to sepsis, respiratory failure, and death, particularly in young children, elderly individuals, and those with weal
26
27 ('Diabetes', 'A group of diseases that affect how your body uses blood sugar (glucose), leading to high blood sugar levels.',
28 'Diabetes is a chronic condition that occurs when the body either does not produce enough insulin (a hormone that helps regulate blood sugar) or
29 The symptoms of diabetes include excessive thirst, frequent urination, blurred vision, fatigue, and slow wound healing. If left uncontrolled, di
30
31 ('Alzheimer's Disease', 'A progressive disease that destroys memory and other vital mental functions.',
32 'Alzheimer's disease is a progressive form of dementia that gradually impairs memory, thinking, and behavior. It is characterized by the accumu

```

Figure 4.4 : Notes Diseases SQL File

```
games_puzzle_word.sql X
assets > games_puzzle_word.sql
1  INSERT INTO games (minigames, question, hint, answers, explanation)
2  VALUES
3  ('puzzle_word', 'What disease causes high blood sugar?', 'It is a chronic disease that affects how your body processes sugar, leading to high bl
4  ('puzzle_word', 'What disease affects the heart?', 'It can lead to chest pain, shortness of breath, and can affect your heart's ability to pump
5  ('puzzle_word', 'What disease involves difficulty breathing and wheezing?', 'It is a chronic disease that affects the lungs and causes inflammat
6  ('puzzle_word', 'What disease is characterized by fever, chills, and muscle aches?', 'It is caused by a viral infection and can lead to body ach
7  ('puzzle_word', 'What is the disease caused by a bacterial infection in the lungs?', 'It is contagious and spreads through the air when an infec
8  ('puzzle_word', 'What viral infection causes painful rashes?', 'It often affects people older than 50 and results in painful, blistering rashes.
9  ('puzzle_word', 'What disease causes itchy, dry skin?', 'It is often triggered by allergens or irritants, leading to inflammation and discomfort
10 ('puzzle_word', 'What disease causes swelling of the parotid glands?', 'It affects children most commonly, causing swelling in the neck and jaw
11 ('puzzle_word', 'What disease is caused by mosquito bites?', 'It is common in tropical areas and can cause symptoms like fever, chills, and flu-
12 ('puzzle_word', 'What disease results in abnormal cell growth?', 'It can affect any part of the body and is typically marked by uncontrolled gro
13 ('puzzle_word', 'What disease is caused by a virus and affects the nervous system?', 'It can cause paralysis in extreme cases, particularly in t
14 ('puzzle_word', 'What disease results from low thyroid hormone production?', 'It leads to fatigue, weight gain, and slow metabolism. Other sympt
15 ('puzzle_word', 'What disease causes an enlarged thyroid?', 'It is often linked to iodine deficiency or other thyroid disorders and can cause vi
16 ('puzzle_word', 'What disease causes swelling and redness of the skin?', 'It is usually bacterial and painful. This condition often leads to an
17 ('puzzle_word', 'What disease involves a shortage of platelets?', 'It causes easy bruising and bleeding. This condition can make minor injuries
18 ('puzzle_word', 'What disease causes fluid buildup and swelling in the body?', 'It can result from heart failure or kidney disease, and often ca
19 ('puzzle_word', 'What disease involves abnormal growth of uterine tissue?', 'It causes pelvic pain and heavy periods, and the tissue may grow o
20 ('puzzle_word', 'What disease causes brittle bones?', 'It often occurs in older adults and can lead to fractures from minor falls or injuries.',
21 ('puzzle_word', 'What disease occurs when the body's immune system attacks itself?', 'It is often linked to chronic inflammation and can affect
22 ('puzzle_word', 'What disease is caused by a viral infection of the liver?', 'It is transmitted through contaminated food and water, and can cau
23
```

Figure 4.5 : Puzzle Word SQL File

4.3 Implementation of The Proposed Systems

PathoQuest is designed as an accessible and enjoyable learning tool for everyone. PathoQuest is aiming to educate the public to a variety of diseases and make learning about health more approachable. Below are the sections that the user will go through.

4.3.1 Welcome Screen

Figure 4.6 illustrates the welcome screen section which will appear once the user clicks the application. It will feature the PathoQuest logo and a “Start Quest” button. It is required for the user to click the “Start Quest” button before proceeding to the next page.



Figure 4.6 : Welcome Screen

4.3.2 Home Screen

Figure 4.7 illustrates the home screen page. The user will be redirected to this page once they click on the “Start Quest” button in the welcome screen page. In this page, there is “What Is It?” button that states the introduction of PathoQuest. Figure 4.8 illustrates the introduction pop-up. When the user clicks on the “What Is It?” button, it will show the introduction of the PathoQuest. Next, it will also feature four different sections which are Quiz, Mini Games, Notes, and BMI. Not only that, but it will also feature the “Exit” button if the user decides to exit from the application.

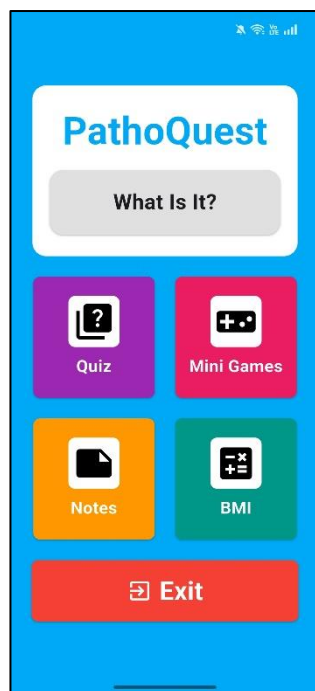


Figure 4.7 : Home Screen



*Figure 4.7 : Introduction
Pop-up*

4.3.3 Exit Section

The “Exit” button allows the user to exit from the application. Figure 4.9 illustrates the Exit Pop-up with the question to confirm the action.

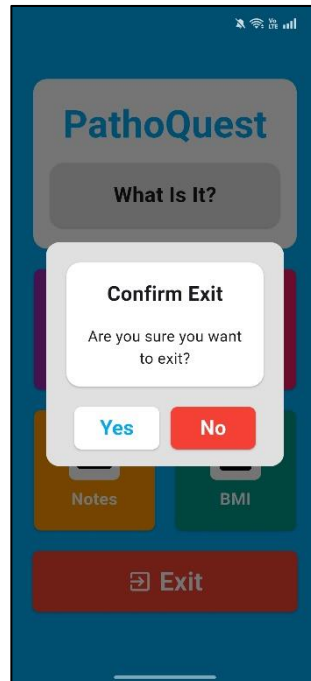


Figure 4.9 : Exit Pop-up

4.3.4 Quiz Section

Figure 4.10 illustrates the Quiz Levels. If the user decides to choose “Quiz” section in the home screen page, it will redirect the user to Quiz page. In this page, it will feature three different levels of quiz which are “Easy”, “Medium” and “Hard”. It also includes the “Play” button to allow the user to start the quiz game. Once the user clicks the “Play” button, it will redirect the user to the quiz game. Figure 4.11, figure 4.18 and figure 4.19 illustrate the interface for each level “Easy”, “Medium” and “Hard” respectively. There are three buttons at the bottom of the page. From left side which possess the refresh icon, it is called as “Restart” button which allows the user to restart the quiz from the beginning. Figure 4.13 illustrates the popout with the question to confirm the action. On the middle side which possess the home icon, it is called as “Home” which allows the user to return to home screen page. Figure 4.14 illustrates the popout with the question to confirm the action. On the right side which possess the fast forward icon, it is called as “Skip” button which allows the user to skip to the next question. Figure 4.15 illustrates the popout with the question to confirm the action. Figure 4.12 illustrates the wrong answer pop-up if the user chooses the wrong answer. Figure 4.16 illustrates the correct answer pop-up if the user chooses the correct answer. Figure 4.17 illustrates the congratulations pop-up if the user already answered all the given questions.

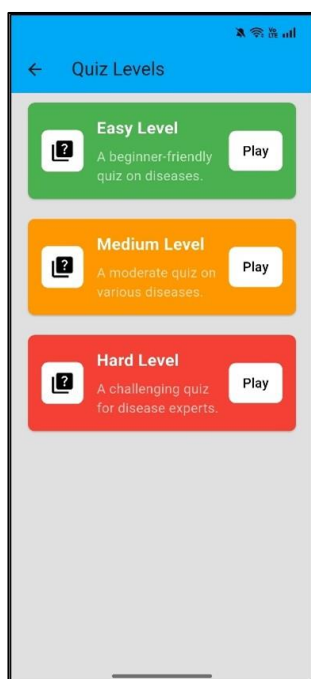


Figure 4.10 : Quiz Level

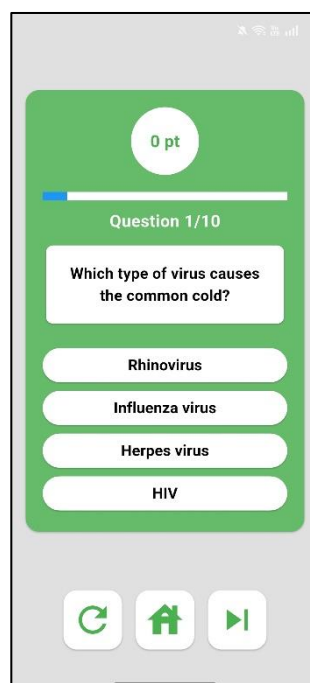


Figure 4.11 : Easy Level Question

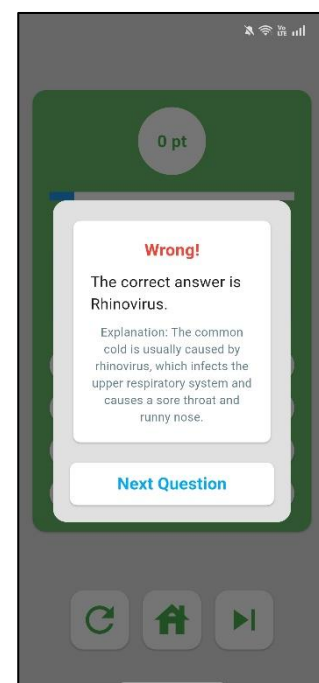


Figure 4.12 : Wrong Answer Pop-up

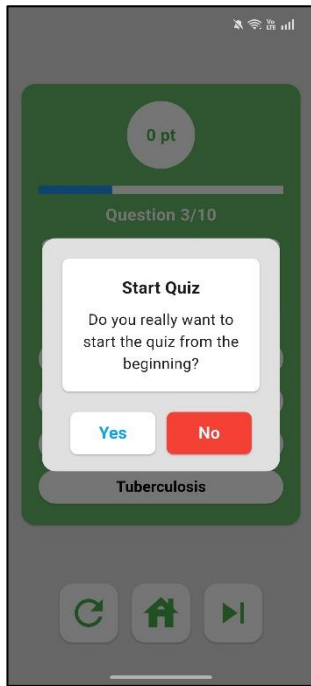


Figure 4.13 : Refresh Pop-up

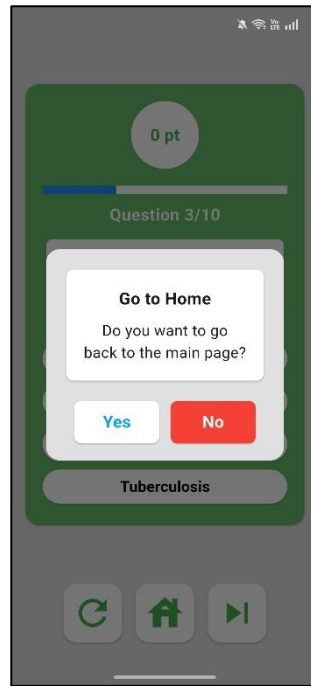


Figure 4.14 : Home Pop-up

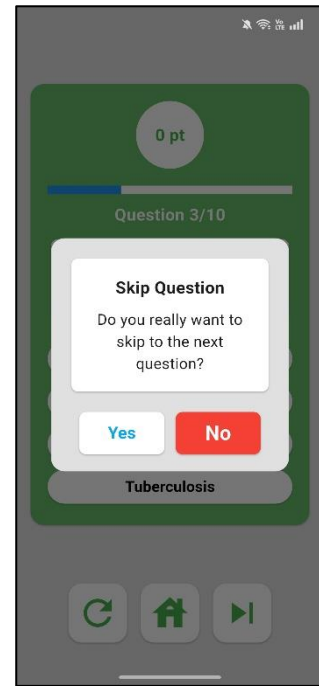


Figure 4.15 : Skip Question Pop-up

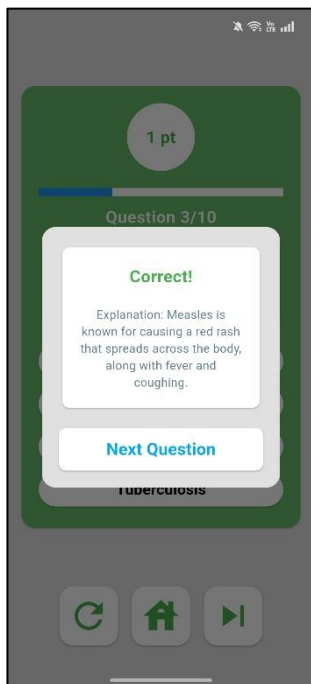


Figure 4.16 : Correct Answer Pop-up

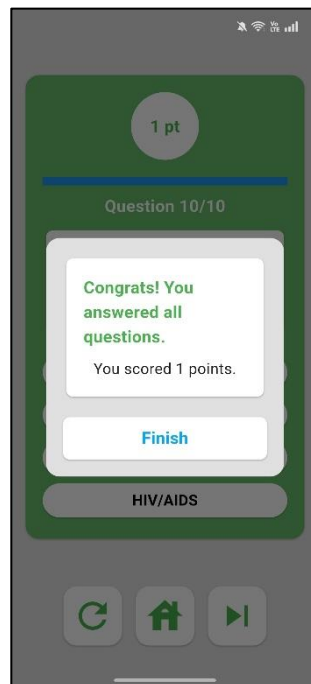


Figure 4.17 : Congratulations Pop-Up

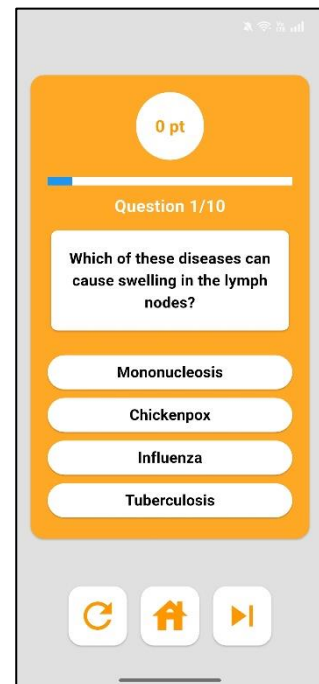


Figure 4.18 : Medium Level Question

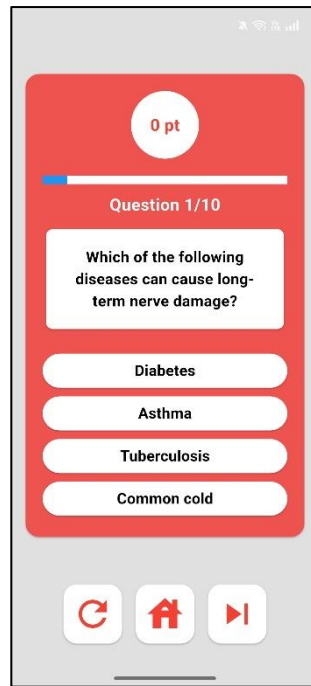


*Figure 4.19 : Hard Level
Question*

4.3.5 Mini Games Section

Figure 4.20 illustrates the Mini Games page. The user will be redirected to this page if the user decides to choose “Mini Games” section in the home screen page. In this page, it will feature three different type of mini games which are “Puzzle Word”, “Patho Sweeper” and “Patho 2048”. It also includes the “Play” button to allow the user to start the quiz game. Once the user clicks the “Play” button, it will redirect the user to the mini game.



Figure 4.20 : Mini Games

4.3.5.1 Puzzle Word

Figure 4.21 illustrates the Puzzle Word page. The user will be redirected to this page if the user decides to choose “Puzzle Word” game in the mini games page. There are three buttons at the bottom of the page. From the left side which possess the light bulb icon, it is called as “Hint” button which allows the user to receive the hint for the puzzle word. Figure 4.22 illustrates the popout with the hint for the puzzle word. On the middle side which possess the home icon, it is called as “Home” which allows the user to return to home screen page. Figure 4.23 illustrates the popout with the question to confirm the action. On the right side with possess the refresh icon, it is called as “Restart” button which allows the user to restart the quiz from the beginning. Figure 4.24 illustrates the popout with the question to confirm the action. Figure 4.25 illustrates the missing later pop-up if the user did not fully fill the blank space. Figure 4.26 illustrates the congratulations pop-up if the user already answered all the given question.



Figure 4.21 : Puzzle Word

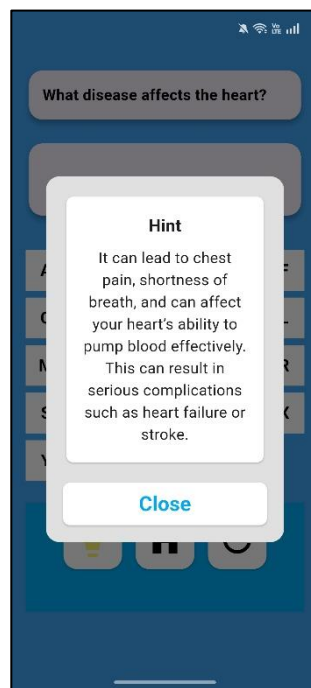


Figure 4.22 : Hint Pop-up

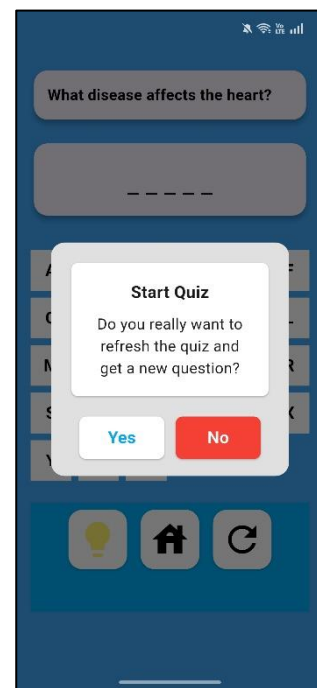


Figure 4.23 : Home Pop-up

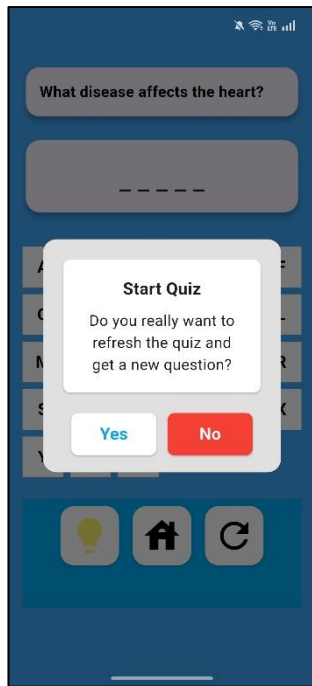


Figure 4.24 : Refresh Pop-up

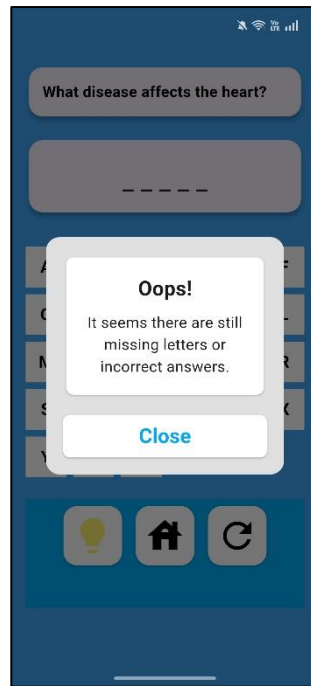


Figure 4.25 : Missing Letter Pop-up

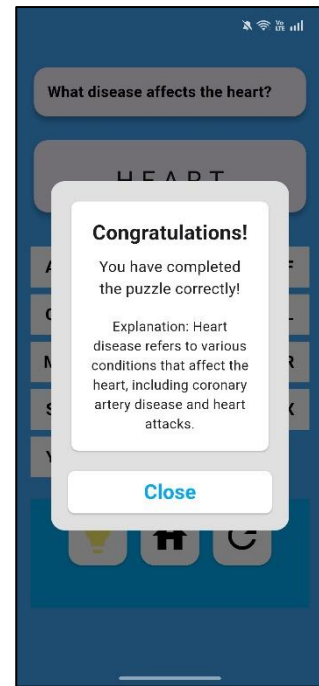


Figure 4.26 : Congratulations Pop-up

4.3.5.2 Patho Sweeper

Figure 4.27 illustrates the Patho Sweeper page. The user will be redirected to this page if the user decides to choose “Patho Sweeper” game in the mini games page. There are three buttons at the bottom of the page. From the left side with possess the refresh icon, it is called as “Restart” button which allows the user to restart the gameplay from the beginning. Figure 4.28 illustrates the popout with the question to confirm the action. On the middle side which possess the home icon, it is called as “Home” which allows the user to return to home screen page. Figure 4.29 illustrates the popout with the question to confirm the action. On the right side with possess the pause icon, it is called as “Pause” button which allows the user to restart the quiz from the beginning. Figure 4.30 illustrates the popout with the question to confirm the action. Figure 4.31 illustrates the gameplay of the Patho Sweeper. Figure 4.32 illustrates the game over if the user accidentally clicked on a mine. Figure 4.33 illustrates game over pop-up if the user accidentally clicked on a mine. It also gives the options for the user to restart the gameplay from the beginning

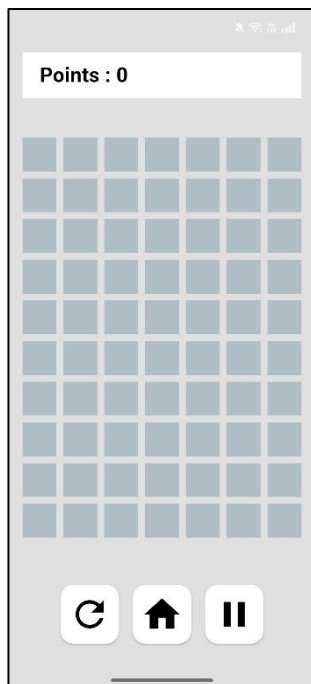


Figure 4.27 : Patho Sweeper

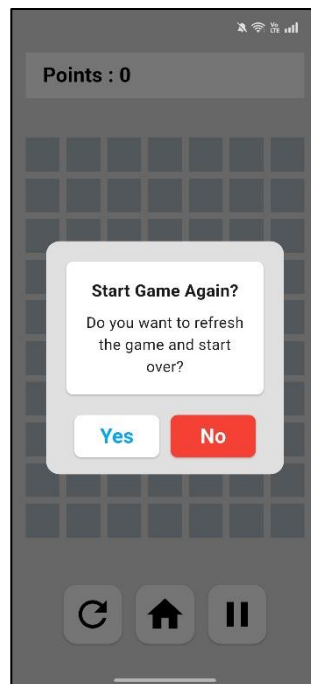


Figure 4.28 : Refresh Pop-up

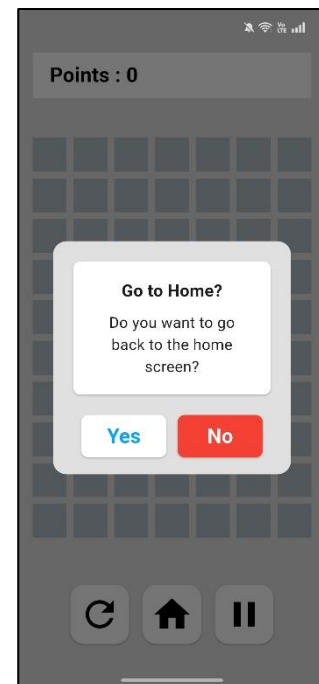


Figure 4.29 : Home Pop-up

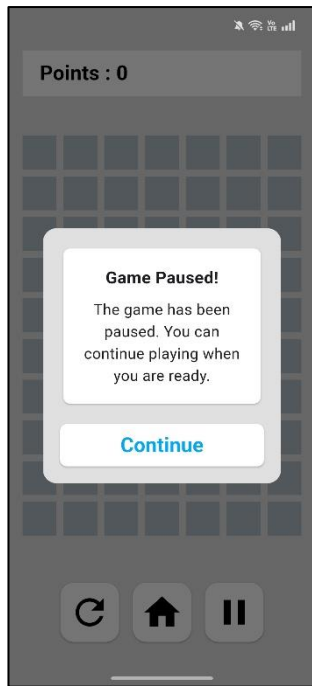


Figure 4.30 : Pause Pop-up

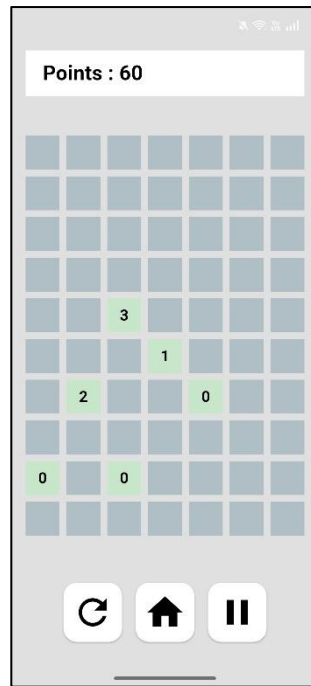


Figure 4.31 : Patho Sweeper
Gameplay

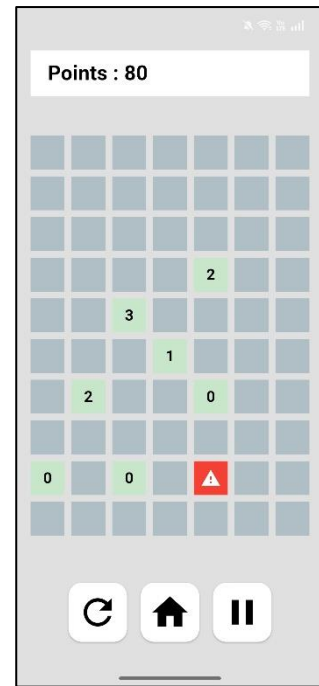


Figure 4.32 : Game Over

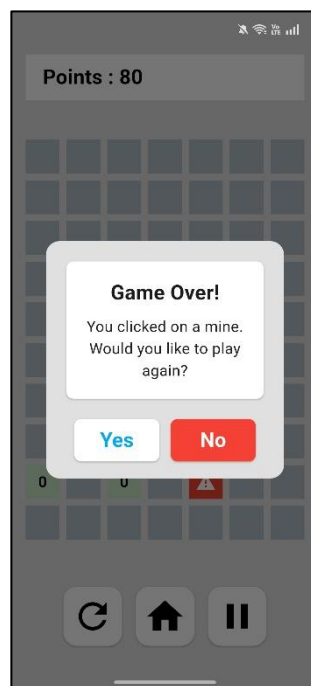


Figure 4.33 : Game Over Pop-up

4.3.5.3 Patho 2048

Figure 4.34 illustrates the Patho 2048 page. The user will be redirected to this page if the user decides to choose “Patho 2048” game in the mini games page. Figure 4.35 illustrates the gameplay of the Patho 2048. There are three buttons at the bottom of the page. From the left side with possess the refresh icon, it is called as “Restart” button which allows the user to restart the gameplay from the beginning. Figure 4.36 illustrates the popout with the question to confirm the action. On the middle side which possess the home icon, it is called as “Home” which allows the user to return to home screen page. Figure 4.37 illustrates the popout with the question to confirm the action. On the right side with possess the refresh icon, it is called as “Pause” button which allows the user to restart the quiz from the beginning. Figure 4.38 illustrates the popout with the question to confirm the action.

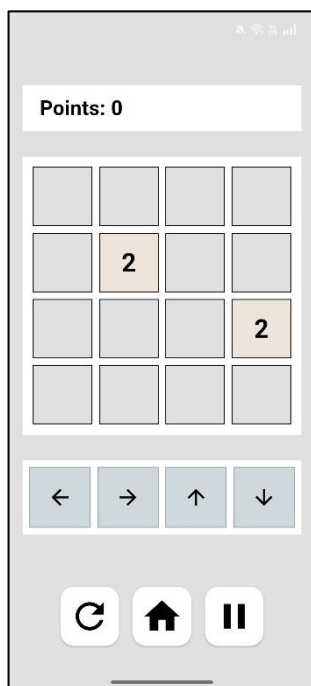


Figure 4.34 : Patho 2048

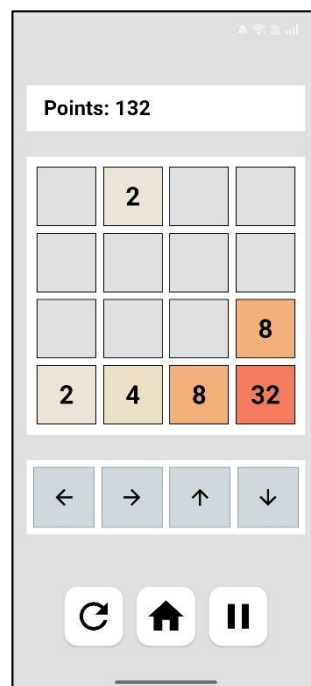


Figure 4.35 : Patho 2048
Gameplay

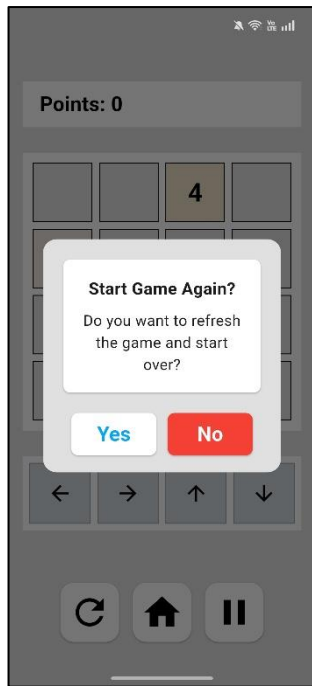


Figure 4.36 : Refresh Pop-up

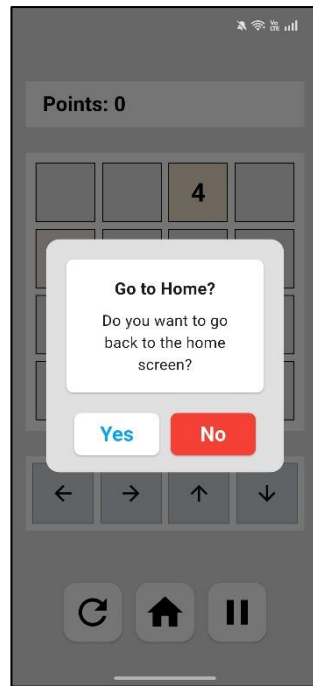


Figure 4.37 : Home Pop-up

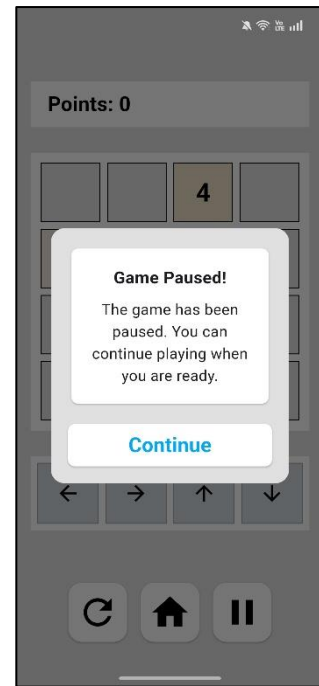


Figure 4.38 : Pause Pop-up

4.3.4 Notes Section

Figure 4.39 illustrates the Notes page. If the user decides to choose “Notes” section in the home screen page, it will redirect the user to notes page. Figure 4.40 illustrates the reading mode if the user decides to read one of the notes. The user will be redirected to the desired notes. Figure 4.41 illustrates the search function if the user decides to read specific notes. It will filter based on the user input

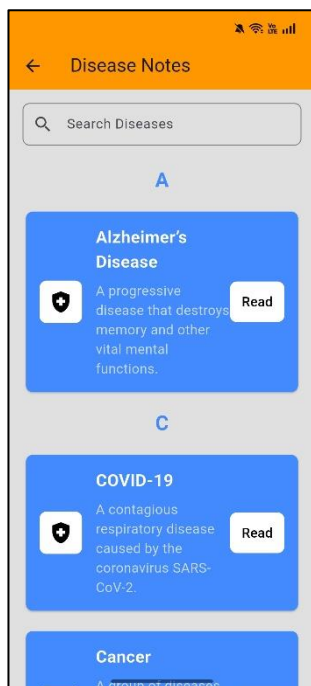


Figure 4.39 : Disease Notes

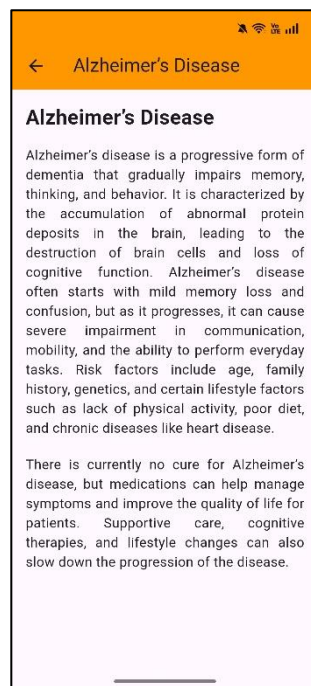


Figure 4.40 : Reading Mode

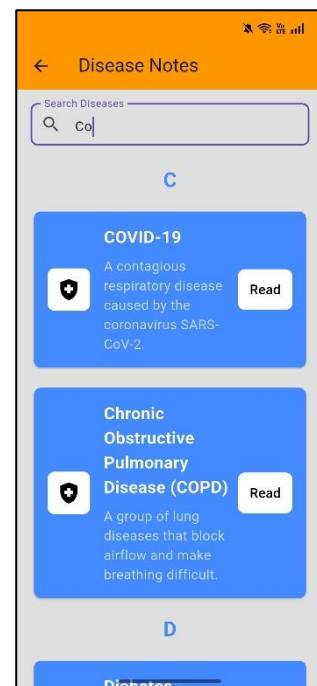


Figure 4.41 : Search Function

4.3.5 BMI Calculator Section

Figure 4.42 illustrates the BMI Calculator page. If the user decides to choose “BMI Calculator Page” section in the home screen page, it will redirect the user to BMI Calculator page. There are three buttons at the bottom of the page. From the left side with possess the calculator icon, it is called as “Restart” button which allows the user to calculate the BMI based on the input. Figure 4.43 illustrates the popout with the BMI result. If the user did not fill in all the required blank space, it will show the warning. Figure 4.44 illustrates the popout with the invalid. On the middle side which possess the home icon, it is called as “Home” which allows the user to return to home screen page. Figure 4.45 illustrates the popout with the question to confirm the action. On the right side with possess the refresh icon, it is called as “Clean” button which allows the user to clear the input.

Figure 4.42 : BMI Calculator

Figure 4.43 : BMI Result

Figure 4.44 : Invalid Input Pop-out

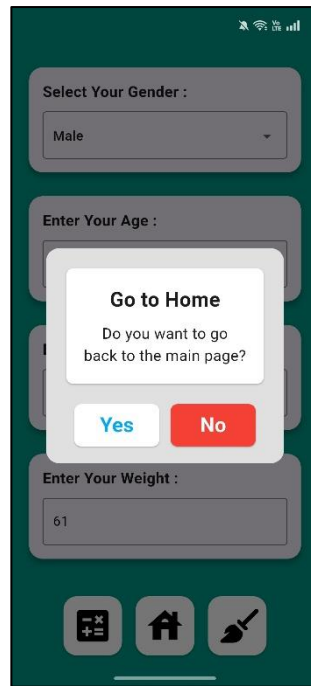


Figure 4.45 : Home Pop-out

CHAPTER 5 : TESTING

5.1 Introduction

In this chapter, it discusses on the functional testing of the PathoQuest system. Functional testing is required to make sure that the system is working as expected. It is also crucial to ensure that the system is reliable and secure. Not only that, this chapter also will focus on the user testing which involve 40 users with the range of age 13 years old until 17 years old. The target audience for this system is high school students which involving from form 1 until form 5. User testing is required as it will be used to analyse the performance PathoQuest system which are based on many variables once the user tests the system. The variables are the level of understanding and the knowledge gained after using the system, the system functionality as well as the user interface, graphic and design.

5.2 Functional Testing

In functional testing, it involves in testing all the functionality and features that are available in the PathoQuest system. There will be total of six sections that will be tested as listed in the table 5.1.

Table 5.1

The PathoQuest System Sections

Section	Page
Welcome Screen	• Welcome Screen
Home Screen	• Home Screen • Quiz Section • Mini Games Section • Notes Section • BMI Calculator Section
Quiz Section	• Easy Level • Medium Level • Hard Level
Mini Games Section	• Puzzle Word • Patho Sweeper • Patho 2048

Notes Section	• Notes Reading
BMI Calculator Section	• BMI Calculator

5.2.1 Welcome Screen Test

Table 5.2

Welcome Screen Test

Project	PathoQuest				
Designed By	Daniel Anak Mil				
Module	All				
Test Title	Welcome Page Navigation Test				
Test No	Test Case	Prerequisite	Test Procedure	Expected Result	Result
1	Navigation	The app is installed and running the latest version. The user is on the welcome page upon launching the app.	Click on “Start Quest” button at the welcome page	The user is navigated to the home screen page	Pass

5.2.2 Home Screen Test

Table 5.3

Home Screen Test

Project	PathoQuest				
Designed By	Daniel Anak Mil				
Module	All				
Test Title	Home Screen Navigation Test				
Test No	Test Case	Prerequisite	Test Procedure	Expected Result	Result
1	Navigation	The user is currently on the home page.	Choose and click one of the icons that available in the home page (Quiz, Mini Games, Notes, BMI Calculator)	The user is navigated to the page based on the selected icon (Quiz, Mini Games, Notes, BMI Calculator)	Pass
2	Confirmation Pop-up	The user is currently on the home page.	Click on “Exit” button at the home page	A pop-up will appear with the confirmation of “Yes” or “No” options	Pass
3	Confirmation Pop-up Response	The pop-up confirmation already appeared	Click on “Yes” button	The user will exit from the application	Pass
		The pop-up confirmation already appeared	Click on “No” button	The pop-up will be closed	Pass

				The user will not exit from the application The user currently in on the home page	
5	Introduction Pop-up	The user is currently on the home page.	Click on “What Is It” button at the home page	A pop-up will appear with the introduction of PathoQuest	Pass
	Close Introduction Pop-up	The introduction pop-up already appeared	Click on “Continue” button	The pop-up will be closed The user is currently on home page	Pass

5.2.3 Quiz Section Test

Table 5.4

Quiz Section Test

Project	PathoQuest				
Designed By	Daniel Anak Mil				
Module	All				
Test Title	Quiz Section Test				
Test No	Test Case	Prerequisite	Test Procedure	Expected Result	Result
1	Navigation	The user is on the quiz section page.	Choose “Easy” and click on “Play” button	The user is navigated to the quiz page with easy level difficulty	Pass
		The user is on the quiz section page.	Choose “Medium” and click on “Play” button	The user is navigated to the quiz page with medium level difficulty	Pass
		The user is on the quiz section page.	Choose “Hard” and click on “Play” button	The user is navigated to the quiz page with hard level difficulty	Pass
2	Confirmation Pop-up For “Refresh”	The user is currently on quiz page with (easy, medium or hard) level difficulty	Click on “Refresh” icon button at the quiz page	A pop-up will appear with the confirmation of “Yes” or “No” options	Pass

3	Confirmation Pop-up Response For “Refresh”	The pop-up confirmation already appeared	Click on “Yes” button	The system will refresh the question from beginning The points collected will be reset to zero point	Pass
		The pop-up confirmation already appeared	Click on “No” button	The pop-up will be closed The system will not refresh the question from beginning and current progress remained The user is currently on quiz page with (easy, medium or hard) level difficulty	Pass
4	Confirmation Pop-up For “Home”	The user is currently on quiz page with (easy, medium or hard) level difficulty	Click on “Home” icon button at the quiz page	A pop-up will appear with the confirmation of “Yes” or “No” options	Pass

5	Confirmation Pop-up Response For “Home”	The pop-up confirmation already appeared	Click on “Yes” button	The user is navigated to the home screen page	Pass
		The pop-up confirmation already appeared	Click on “No” button	The pop-up will be closed The user is currently on quiz page with (easy, medium or hard) level difficulty	Pass
6	Confirmation Pop-up For “Skip”	The user is currently on quiz page with (easy, medium or hard) level difficulty	Click on “Skip” icon button at the quiz page	A pop-up will appear with the confirmation of “Yes” or “No” options	Pass
7	Confirmation Pop-up Response For “Skip”	The pop-up confirmation already appeared	Click on “Yes” button	The system will skip the current question to the next one No changes on the point collected as skipping question means no point will be granted	Pass

		The pop-up confirmation already appeared	Click on “No” button	The pop-up will be closed The system will not skip the question and current progress remained The user is currently on quiz page with (easy, medium or hard) level difficulty	Pass
8	Feedback And Explanation Pop-up	The user is currently on quiz page with (easy, medium or hard) level difficulty	Click on one of the answer choices	A pop-up will appear with the feedback that state either the answer is “Correct” or “Wrong”. The pop-up also will contain the explanation of the answer.	Pass
9	Navigation For Next Question	The pop-up feedback and explanation already appeared	Click on “Next Question” button	The system will go to the next question with updated progress and points collected	Pass

10	Navigation For End Of Quiz Session	The user already finished answering all the questions	Click on “Next Question” button after answering the last question	A pop-up will appear with the feedback that state either the answer is “Correct” or “Wrong”. The pop-up also will contain the explanation of the answer.	Pass
----	--	--	--	--	------

5.2.4 Mini Games Section Test

Table 5.5

Mini Games Section Test

Project	PathoQuest				
Designed By	Daniel Anak Mil				
Module	All				
Test Title	Mini Games Section Test				
Test No	Test Case	Prerequisite	Test Procedure	Expected Result	Result
1	Navigation	The user is on the mini games section page.	Choose “Puzzle Word” and click on “Play” button	The user is navigated to the Puzzle Word game page	Pass
		The user is on the mini games section page.	Choose “Patho Sweeper” and click on “Play” button	The user is navigated to the Patho Sweeper game page	Pass
		The user is on the mini games section page.	Choose “Patho 2048” and click on “Play” button	The user is navigated to the Patho 2048 game page	Pass
2	Hint Pop-up	The user is currently on Puzzle Word game page	Click on “Light Bulb” icon button at Puzzle Word game page	A pop-up will appear with the hint provided for the question	Pass
3	Close Puzzle Word Game Page Hint Pop-up	The pop-up hint already appeared	Click on “Close” button	The pop-up will be closed	Pass

				The user is currently on Puzzle Word game page	
4	Confirmation Pop-up For “Home	The user is currently on Puzzle Word game page	Click on “Home” icon button at the quiz page	A pop-up will appear with the confirmation of “Yes” or “No” options	Pass
5	Confirmation Pop-up Response For “Home”	The pop-up confirmation already appeared	Click on “Yes” button	The user is navigated to the home screen page	Pass
		The pop-up confirmation already appeared	Click on “No” button	The pop-up will be closed The user is currently on Puzzle Word game page	Pass
6	Confirmation Pop-up For “Refresh”	The user is currently on (Puzzle Word, Patho Sweeper, Patho 2048) game page	Click on “Refresh” icon button at the quiz page	A pop-up will appear with the confirmation of “Yes” or “No” options	Pass
7	Confirmation Pop-up Response For “Refresh”	The pop-up confirmation already appeared	Click on “Yes” button	The system will refresh with the new question for Puzzle Word Page As for Patho Sweeper and Patho 2048 game page, it will refresh the gameplay and	Pass

				points collected become zero	
		The pop-up confirmation already appeared	Click on “No” button	The pop-up will be closed The system will not refresh the question from beginning and current progress remained The user is currently on (Puzzle Word, Patho Sweeper, Patho 2048) game page	Pass
8	User Input	The user is currently on Puzzle Word game page	The user chooses and clicks on any desired letter at the letter bank	If the letter is available in answer, the letter will appear at the blank space If the letter is not available in answer, the letter will not appear at the blank space	Pass
9	Check Answer	The user is currently on Puzzle Word game page	The user clicks on the “Tick” in the letter bank	A pop-up will appear If all blank spaces have been filled, it will state that the answer is correct and explanation will be provided	Pass

				If all blank spaces have not yet been filled, it will state that there are a few missing letters	
10	Close Puzzle Word Game Page Check Answer Pop-up	The pop-up check answer already appeared	Click on “Close” button	The pop-up will be closed The user is currently on Puzzle Word game page	Pass
11	Pause Pop-up	The user is currently on (Patho Sweeper and Patho 2048) game page	Click on “Pause” icon button at the quiz page	A pop-up will appear with the statement saying “Game Paused”	Pass
12	Close Pause Pop-up	The pause pop-up already appeared	Click on “Continue” button	The pop-up will be closed The system will not refresh the question from beginning and current progress remained The user is currently on (Patho Sweeper/Patho 2048) game page	Pass

13	Game Over Pop-up	The user is currently on Patho Sweeper game page	User clicked on tile that contain “infectious tile”	A pop-up will appear with the statement saying “Game Over” It will also include with the confirmation asking if user want to restart again provided with the options of “Yes” or “No”	Pass
14	Close Game Over Pop-up	The game over popout pop-up already appeared	Click on “Yes” button	The system will refresh the gameplay and points collected become zero	Pass
		The game over popout pop-up already appeared	Click on “No” button	The pop-up will be closed The system will not refresh the question from beginning and current progress remained The user is currently on Patho Sweeper game page	Pass
15	Click Tiles	The user is currently on Patho Sweeper game page	User clicked on tiles	Tiles with number 0 receive 0 points. Tiles with number 1 receive 10 points.	Pass

				Tiles with number 2 receive 20 points. Tiles with number 3 receive 30 points.	
16	Click Arrows	The user is currently on Patho 2048 game page	User clicked on arrows (up, down, right, left)	The tiles move according to the arrow input If there are two tiles with the exact same number, it will combine to become one tile and the number on those two tiles will be add up	Pass

5.2.5 Notes Section Test

Table 5.5

Notes Section Test

Project	PathoQuest				
Designed By	Daniel Anak Mil				
Module	All				
Test Title	Notes Section Test				
Test No	Test Case	Prerequisite	Test Procedure	Expected Result	Result
1	Navigation	The user is on the notes section page	Click on “Read” button at the available topics	The user is navigated to the page of selected topic	Pass
2	Search Function	The user is on the notes section page	User inserts the input in the search box	If the topic is available, it will filter based on user’s input If the topic is not available based on user’s input, it will not show anything	Pass

5.2.6 BMI Calculator Section Test

Table 5.6

BMI Calculator Section Test

Project	PathoQuest				
Designed By	Daniel Anak Mil				
Module	All				
Test Title	BMI Calculator Section Test				
Test No	Test Case	Prerequisite	Test Procedure	Expected Result	Result
1	Dropdown Selection	The user is on the BMI Calculator section page	User selects the options of gender in the dropdown box	The gender is selected based on user's choice	Pass
2	Calculate BMI	The user already filled in all the inputs	Click on "Calculator" icon button at the BMI calculator page	A pop-up will appear with the BMI results	Pass
3	Close BMI results Pop-up	The BMI results pop-up already appeared	Click on "OK" button	The pop-up will be closed The user is currently on BMI Calculator page	Pass
4	Invalid Result Pop-out	The user did not fill in all the inputs	Click on "Calculator" icon button at the BMI calculator page	An invalid result pop-up will appear	Pass

5	Close invalid results Pop-up	The invalid results pop-up already appeared	Click on “OK” button	The pop-up will be closed The user is currently on BMI Calculator page	Pass
6	Confirmation Pop-up For “Home	The user is currently on the BMI Calculator section page	Click on “Home” icon button at the quiz page	A pop-up will appear with the confirmation of “Yes” or “No” options	Pass
7	Confirmation Pop-up Response For “Home”	The pop-up confirmation already appeared	Click on “Yes” button	The user is navigated to the home screen page	Pass
		The pop-up confirmation already appeared	Click on “No” button	The pop-up will be closed The user is currently on the BMI Calculator section page	Pass
8	Clear Input	The user already filled in all the inputs	Click on “Broom” icon button at the BMI calculator page	It cleared all the filled in input	Pass

5.3 User Testing

User testing involved having participants test the application and provide feedback based on their experience. A total of 40 respondents participated in the testing, consisting of school students from Form 1 to Form 5, with 8 students from each form. The procedure began with students testing all the features of the application. Afterward, they were asked to provide feedback by completing a Google Form. A total of 5 Google Forms were created for this analysis, with one form for each grade level. The survey was divided into five sections: Section A: Demographic Information, Section B: Effectiveness in Learning, Section C: Score Analysis, Section D: User Interface, Graphics, and Design, and Section E: Game Functionality. A linear scale ranging from 1 to 5 was used, where 1 represented "strongly disagree" and 5 represented "strongly agree." Below are the results of the analysis

5.3.1 Form 1 Student Analysis

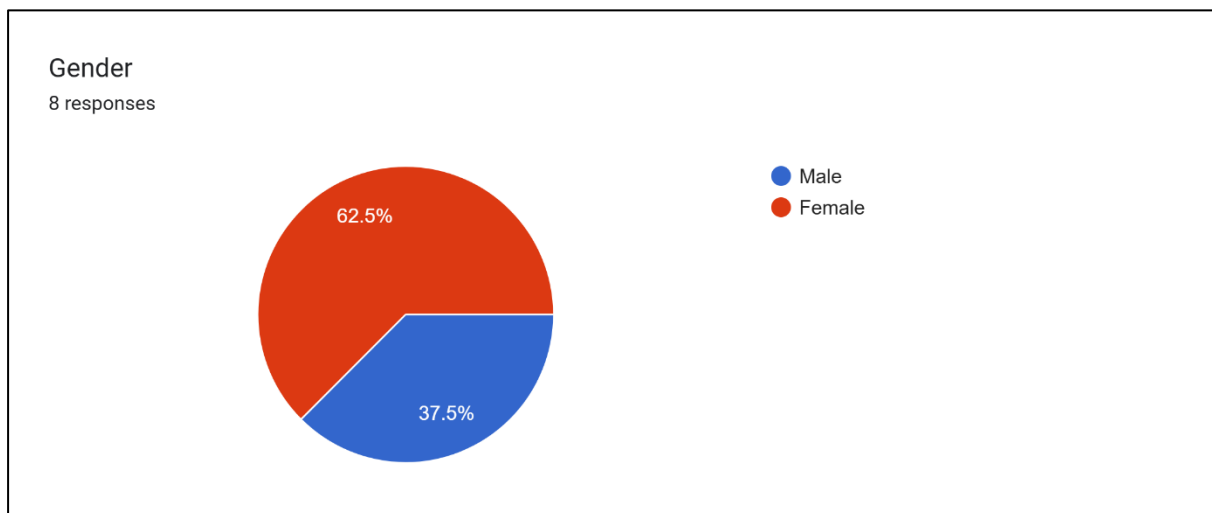


Figure 5.1 : The Gender For Form 1 Student

Figure 5.1 illustrates the gender of the respondents. Based on the figure, there were 62.5% of female students which is equivalent to 5 and 37.5% of male students which is equivalent of 3.

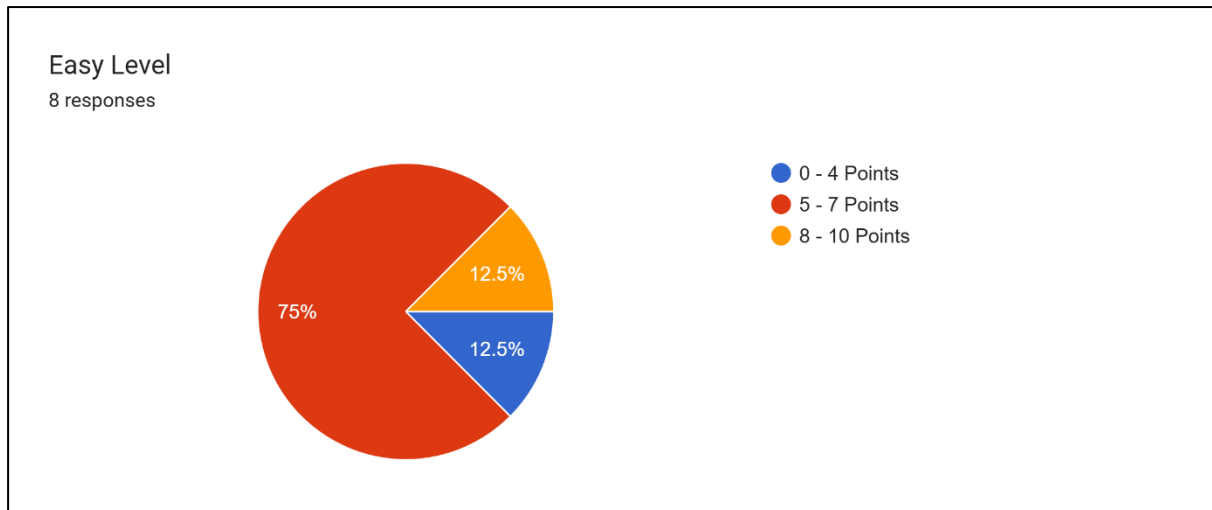


Figure 5.2 : The Easy Level For Form 1 Student

Figure 5.2 illustrates the points gained from the quiz with the easy level. Based on the figure, there are 12.5% which equivalent to 1 student that get (0 – 4 points). Next, there are 75% which is equivalent to 6 students that managed to get (5 – 7 points). Finally, there are 12% which equivalent to 1 student that get (8 – 10 points).

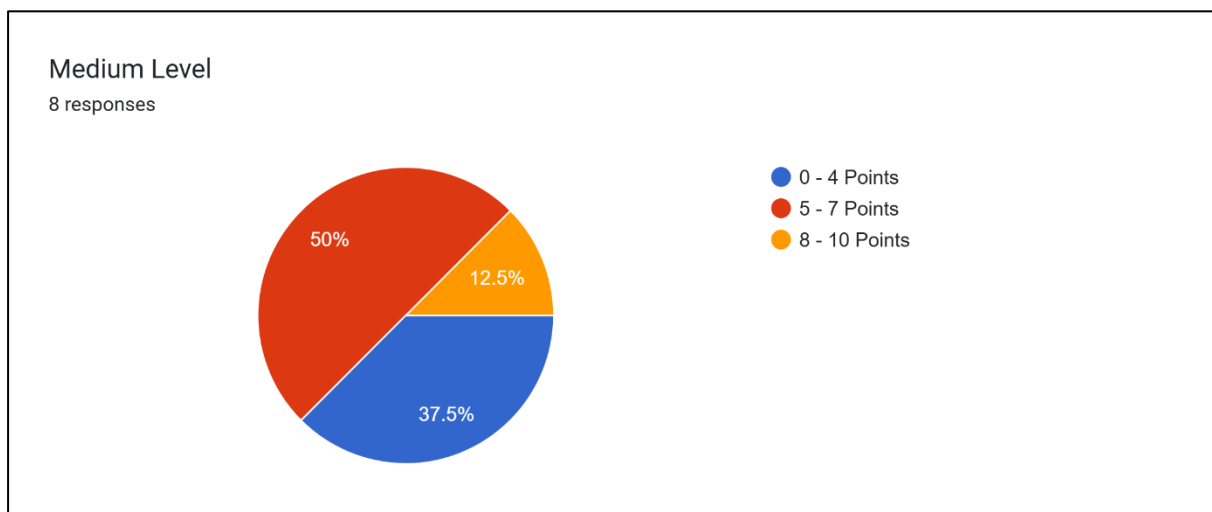


Figure 5.3 : The Medium Level For Form 1 Student

Figure 5.3 illustrates the points gained from the quiz with the medium level. Based on the figure, there are 12.5% which equivalent to 3 student that get (0 – 4 points). Next, there are 50% which is equivalent to 4 students that managed to get (5 – 7 points). Finally, there are 12% which equivalent to 1 student that get (8 – 10 points).

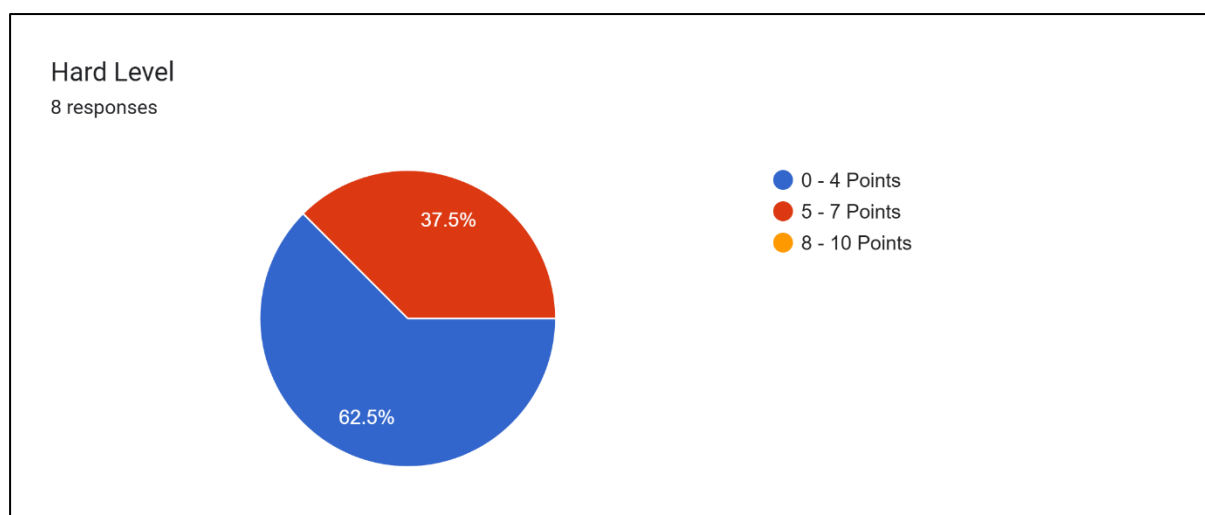


Figure 5.4 : The Hard Level For Form 1 Student

Figure 5.4 illustrates the points gained from the quiz with the hard level. Based on the figure, there are 12.5% which equivalent to 5 student that get (0 – 4 points). Next, there are 37.5% which is equivalent to 3 students that managed to get (5 – 7 points). Finally, there are 0% which equivalent to 0 student that get (8 – 10 points).

Table 5.7 presents a summary of the points earned by Form 1 students for each quiz level.

Table 5.7

Points Earned by Form 1 Students Across Quiz Levels

Performance	0-4 Points	5-7 Points	8-10 Points
Easy	1	6	1
Medium	3	4	1
Hard	5	3	0

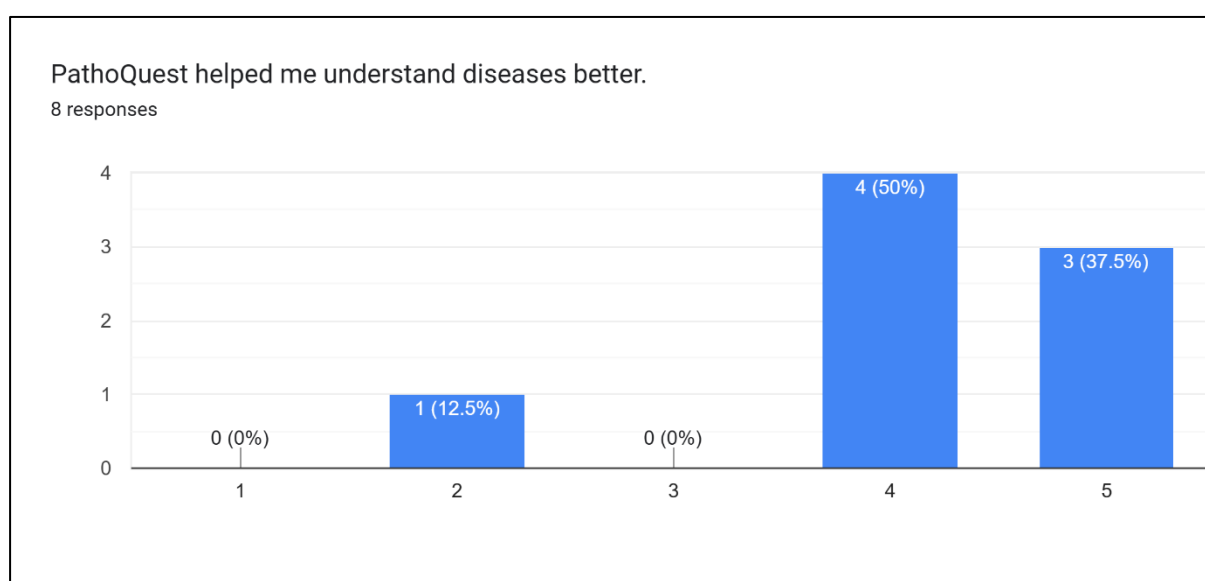


Figure 5.5 : Diseases Understanding Among Form 1 Student

Figure 5.5 illustrates the diseases understanding among form 1 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose disagree. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

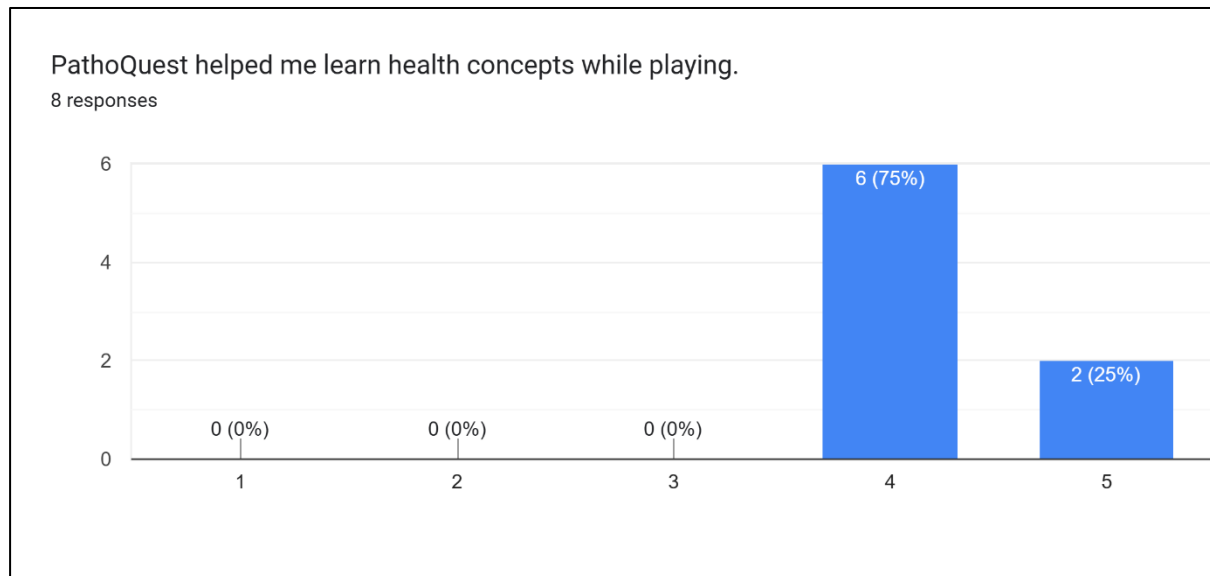


Figure 5.6 : Health Concept Understanding Among Form 1 Student

Figure 5.6 illustrates the health concept understanding among form 1 student. Based on the figure, the least are 75% which equivalent to 6 students that choose agree. Next, the majority there are 25% which equivalent to 2 students that choose strongly agree.

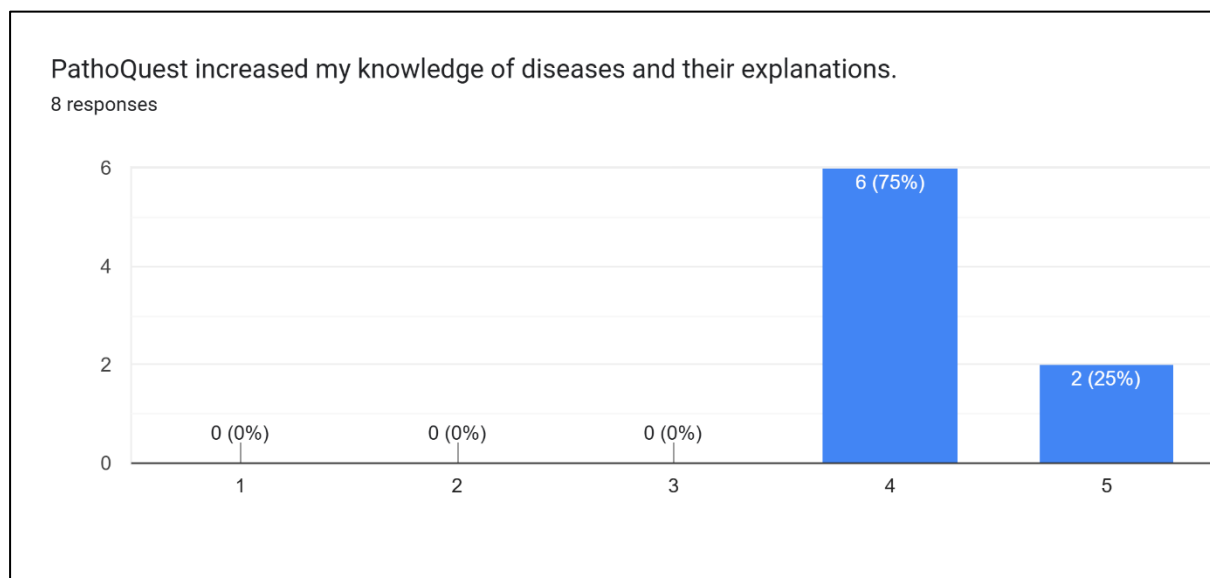


Figure 5.7 : Disease Knowledge Gaining Among Form 1 Student

Figure 5.7 illustrates the disease knowledge gaining among form 1 student. Based on the figure, the majority are 75% which equivalent to 6 students that choose agree. Next, the least are 25% which equivalent to 2 students that choose strongly agree.

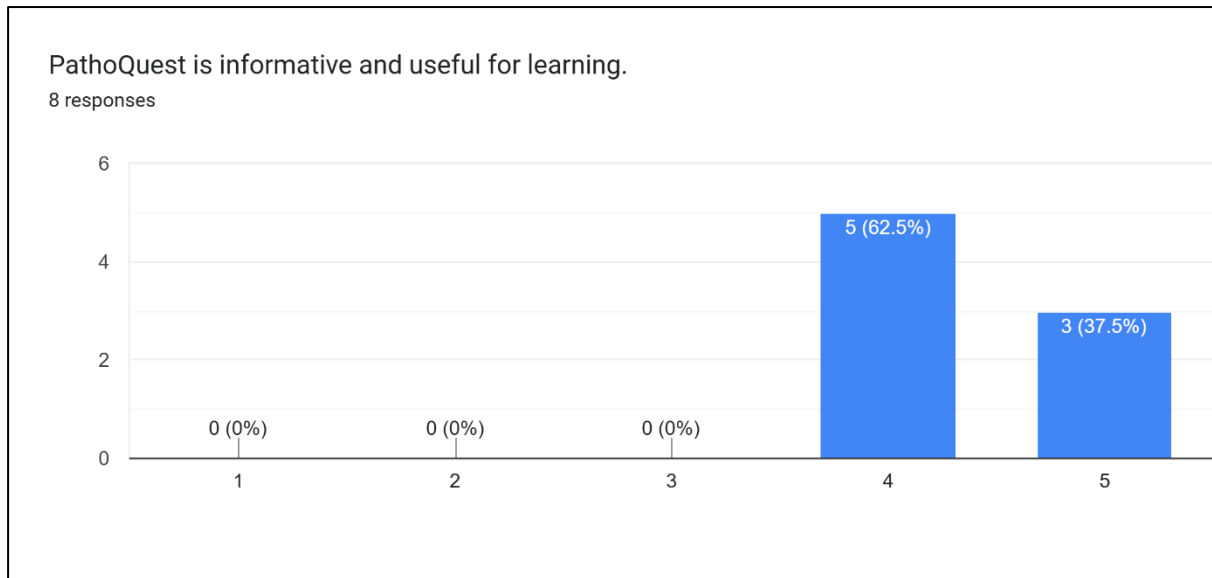


Figure 5.8 : Informative And Useful Acceptance Among Form 1 Student

Figure 5.8 illustrates the informative and useful acceptance among form 1 student. Based on the figure, the majority are 62.5% which equivalent to 5 students that choose agree. Next, the least are 37.5% which equivalent to 3 students that choose strongly agree.

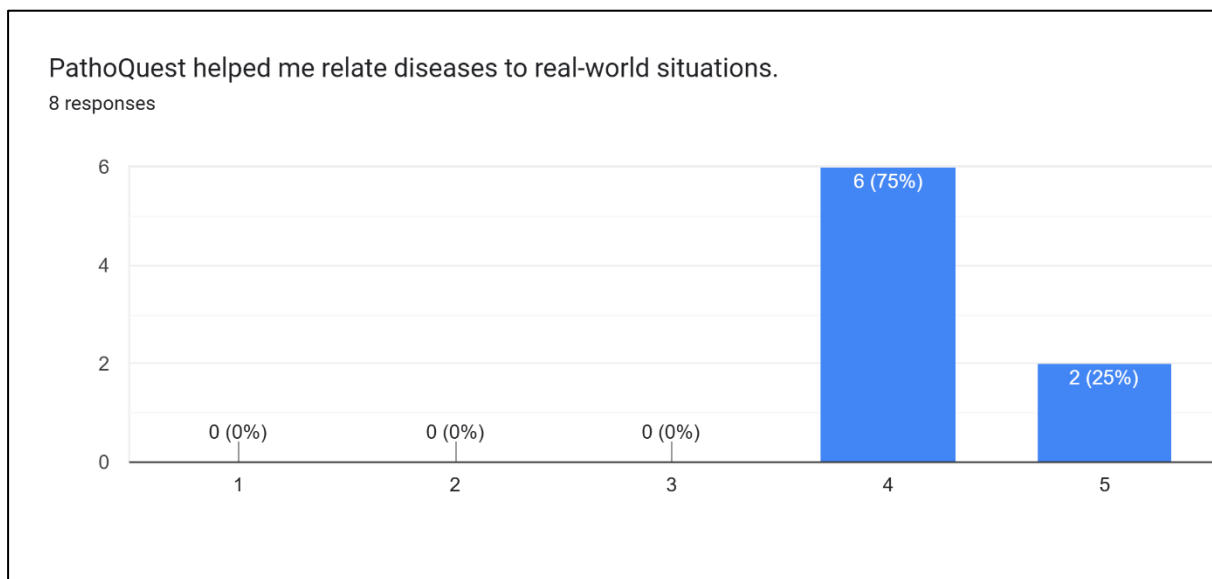


Figure 5.9 : Relation With Real-World Situations Among Form 1 Student

Figure 5.9 illustrates the relation with real-world situations among form 1 student. Based on the figure, the majority are 75% which equivalent to 6 students that choose agree. Next, the least are 25% which equivalent to 2 students that choose strongly agree.

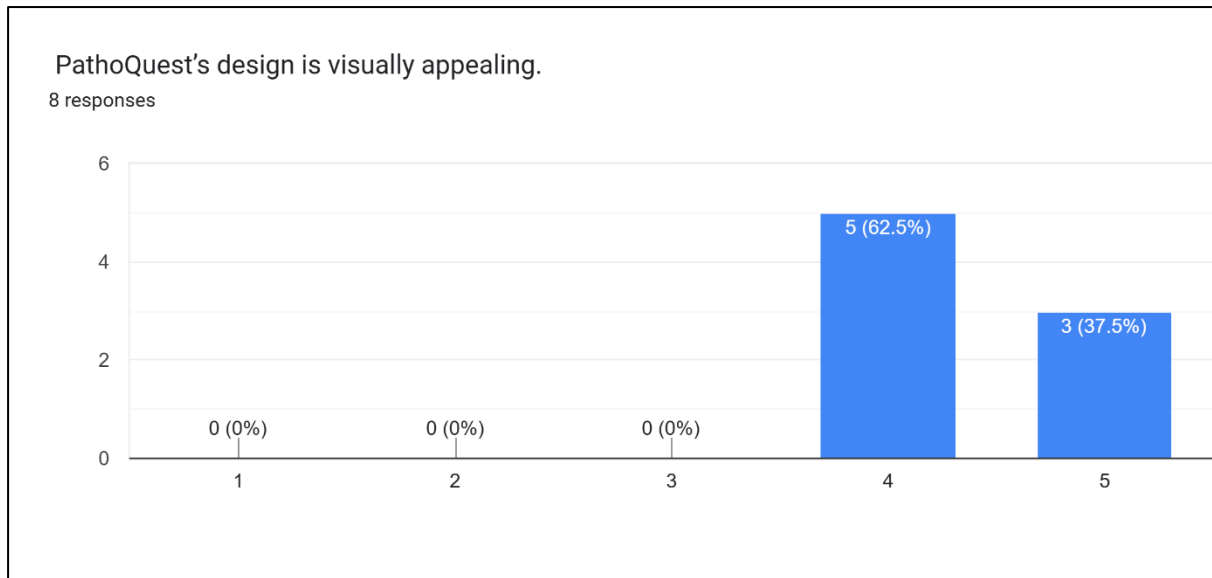


Figure 5.10 : Visual Acceptance Among Form 1 Student

Figure 5.10 illustrates the visual acceptance among form 1 student. Based on the figure, the majority are 62.5% which equivalent to 5 students that choose agree. Next, the least are 37.5% which equivalent to 3 students that choose strongly agree.

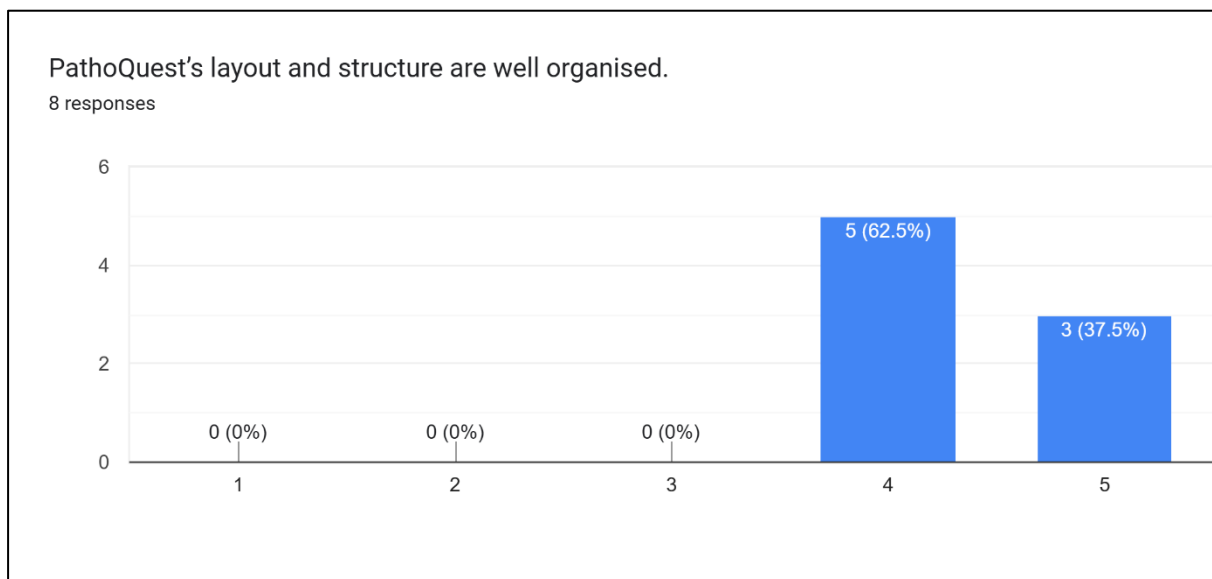


Figure 5.11 : Layout And Structure Acceptance Among Form 1 Student

Figure 5.11 illustrates the layout and structure acceptance among form 1 student. Based on the figure, the majority are 75% which equivalent to 6 students that choose agree. Next, the least are 25% which equivalent to 2 students that choose strongly agree.

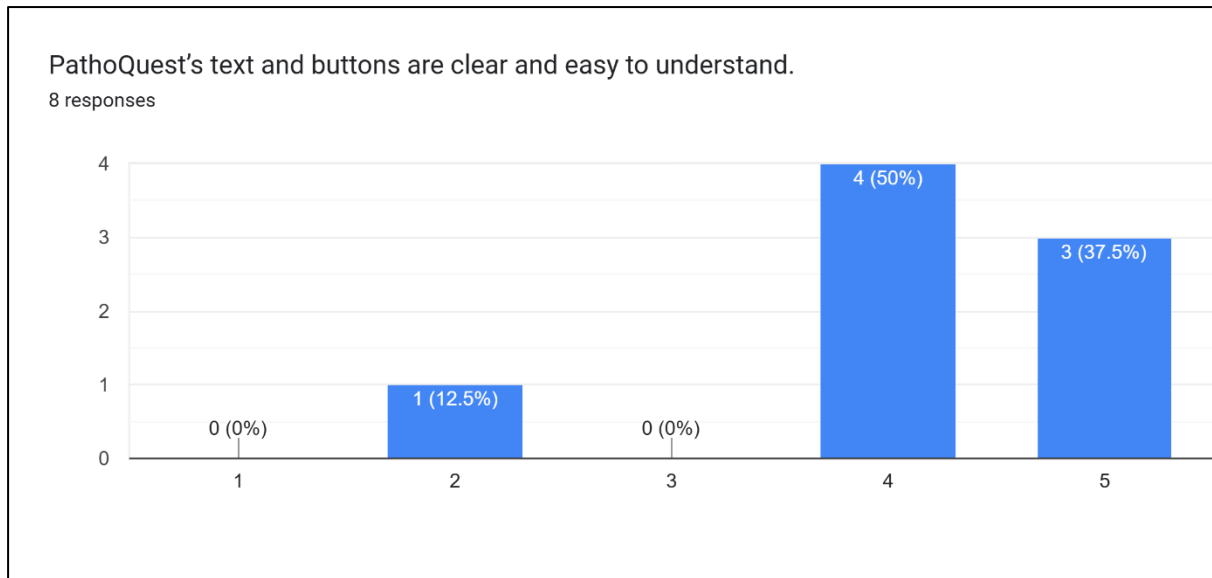


Figure 5.12 : Text And Button Acceptance Among Form 1 Student

Figure 5.12 illustrates the text and button acceptance among form 1 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose disagree. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

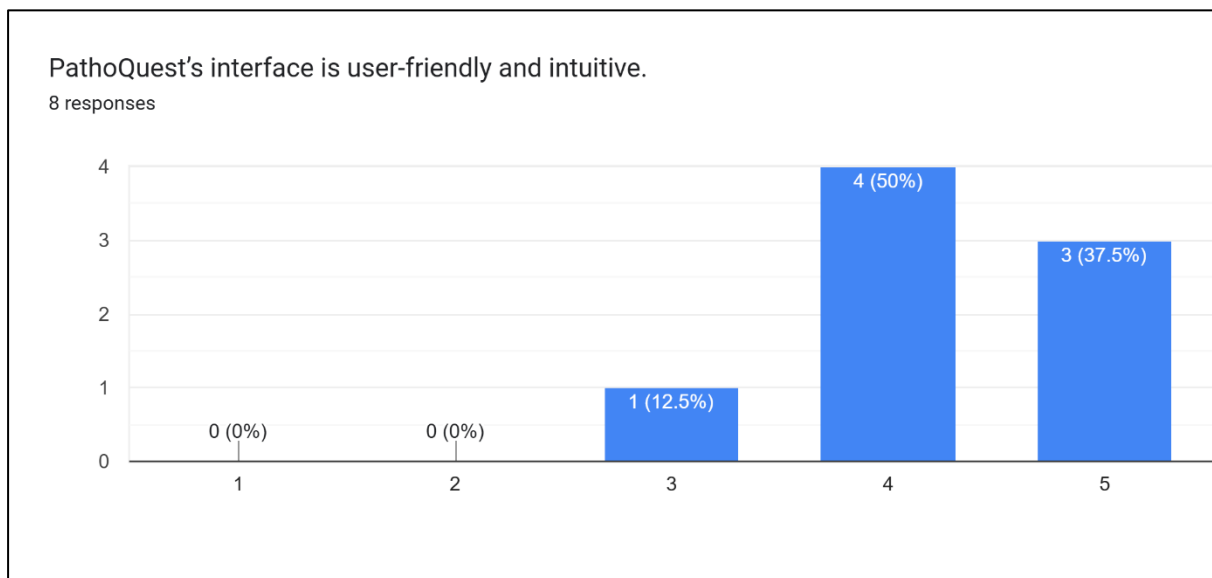


Figure 5.13: Interface Among Form 1 Student

Figure 5.13 illustrates the interface acceptance among form 1 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

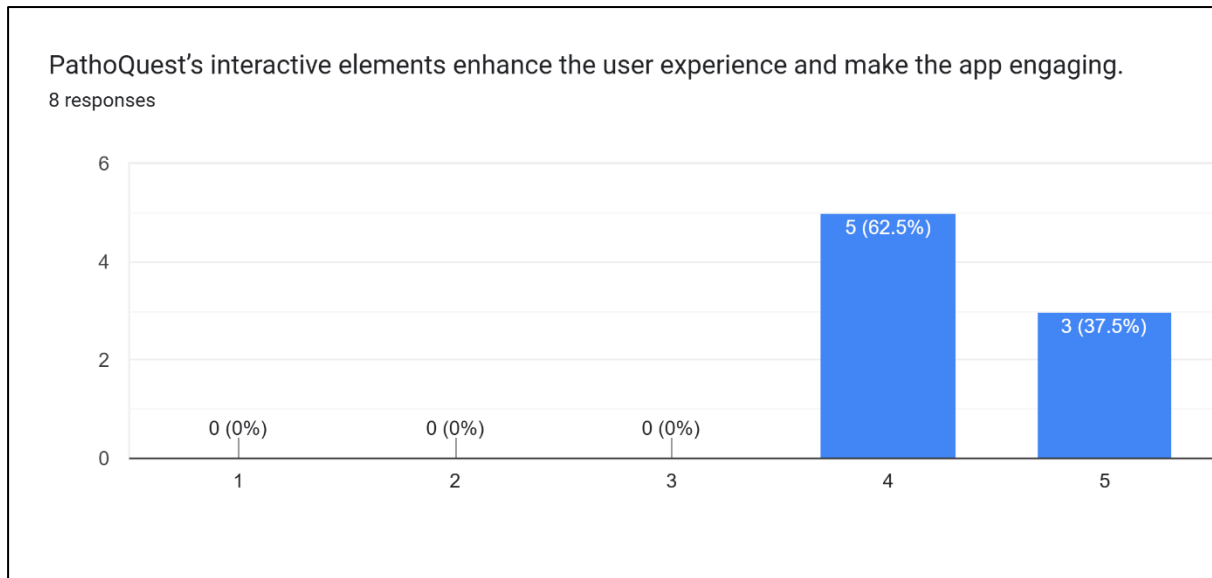


Figure 5.14 : Interactive Elements Acceptance Among Form 1 Student

Figure 5.14 illustrates the interactive elements acceptance among form 1 student. Based on the figure, the majority are 62.5% which equivalent to 5 students that choose agree. Next, the least are 37.5% which equivalent to 3 students that choose strongly agree.

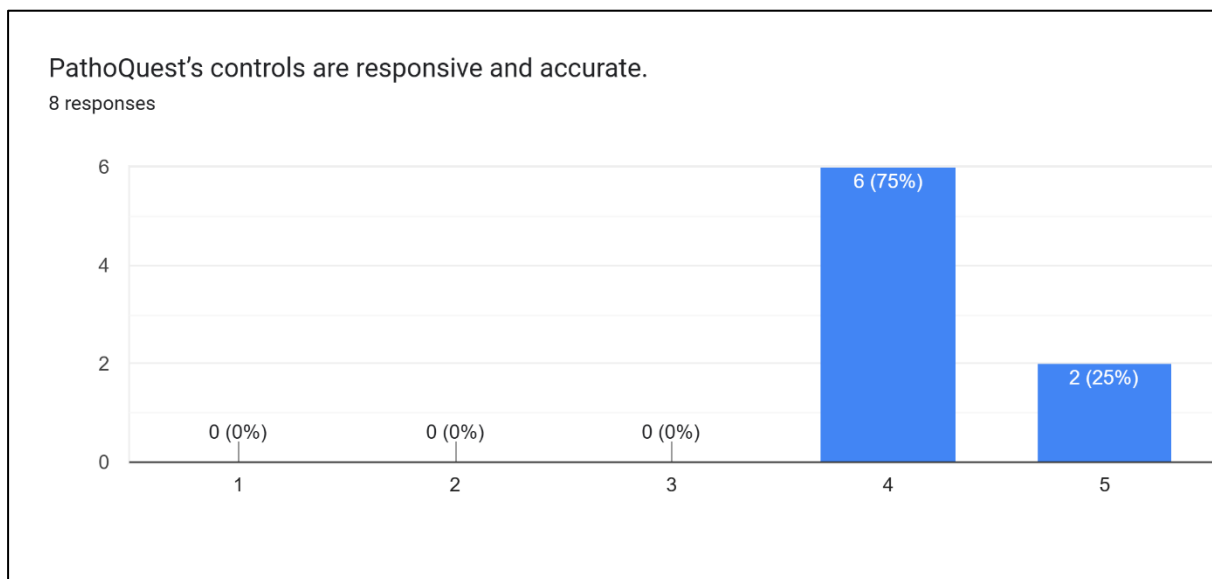


Figure 5.15 : Control Acceptance Among Form 1 Student

Figure 5.15 illustrates the control acceptance among form 1 student. Based on the figure, the majority are 75% which equivalent to 6 students that choose agree. Next, the least are 25% which equivalent to 2 students that choose strongly agree.

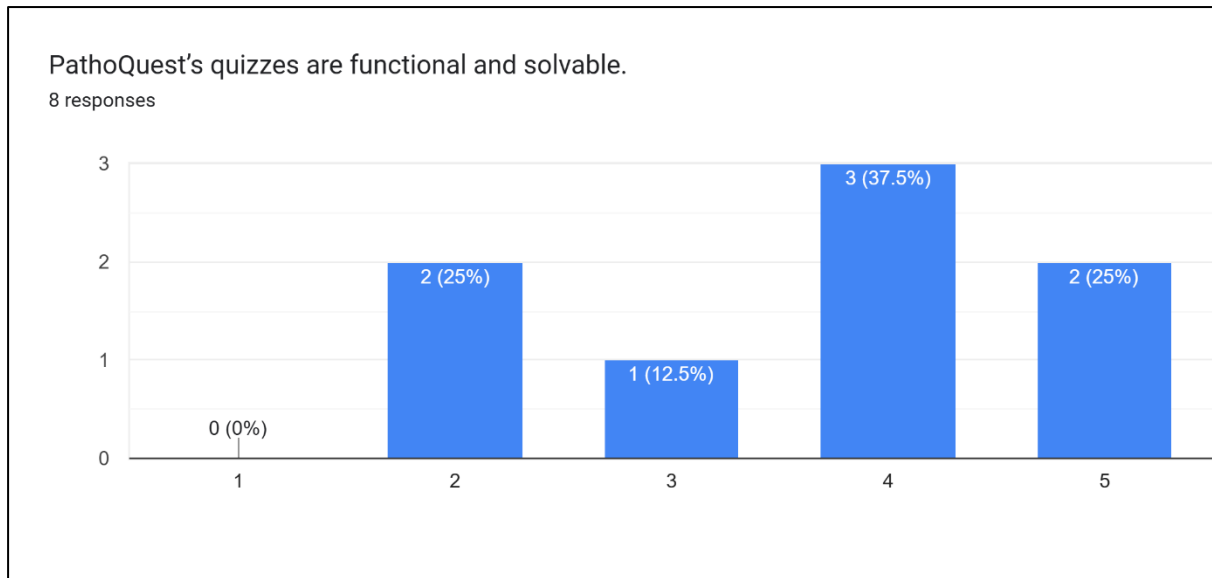


Figure 5.16 : Quiz Acceptance Among Form 1 Student

Figure 5.16 illustrates the quiz acceptance among form 1 student. Based on the figure, there are 25% which equivalent to 2 students that choose disagree. Next, the least are 12.5% which equivalent to 1 student that choose neutral. After that, the majority are 37.5% which equivalent to 3 students that choose agree. Finally, there are there are 25% which equivalent to 2 students that choose strongly agree.

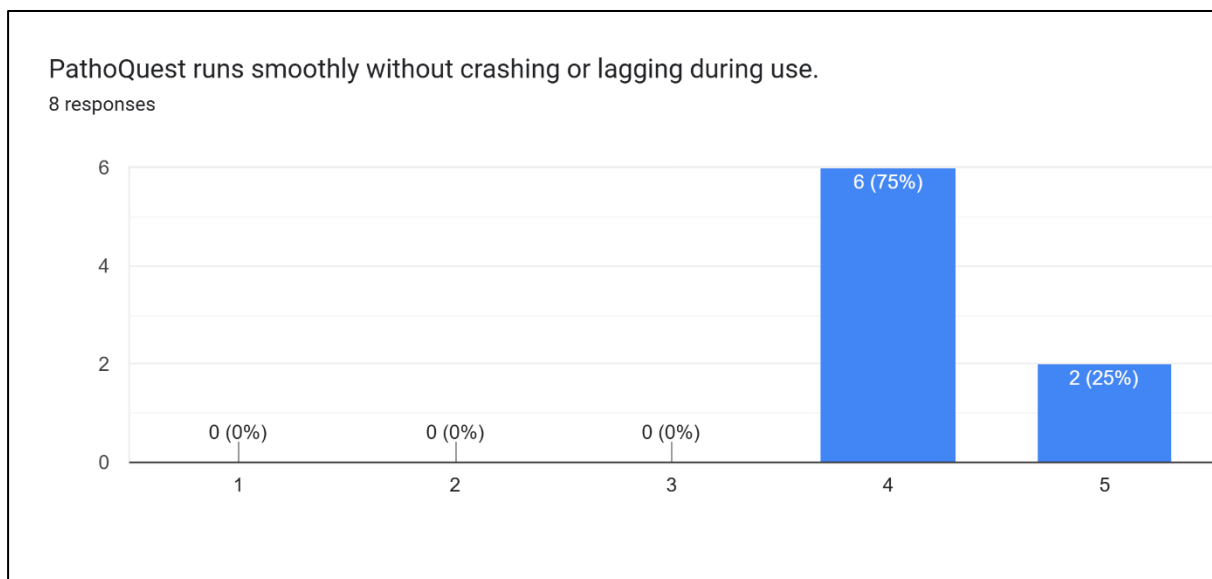


Figure 5.17 : Application Performance Among Form 1 Student

Figure 5.17 illustrates the application performance among form 1 student. Based on the figure, the majority are 75% which equivalent to 6 students that choose agree. Next, the least are 25% which equivalent to 2 students that choose strongly agree.

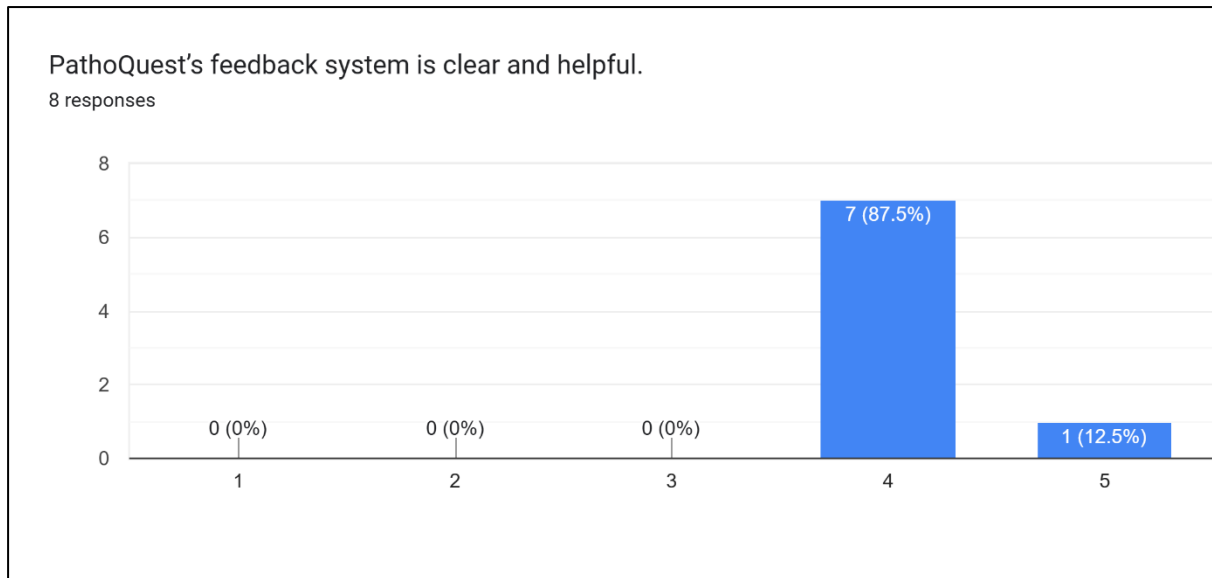


Figure 5.18 : Feedback System Acceptance Among Form 1 Student

Figure 5.18 illustrates the feedback system acceptance among form 1 student. Based on the figure, the majority are 87.5% which equivalent to 7 students that choose agree. Next, the least are 12.5% which equivalent to 1 student that choose strongly agree.

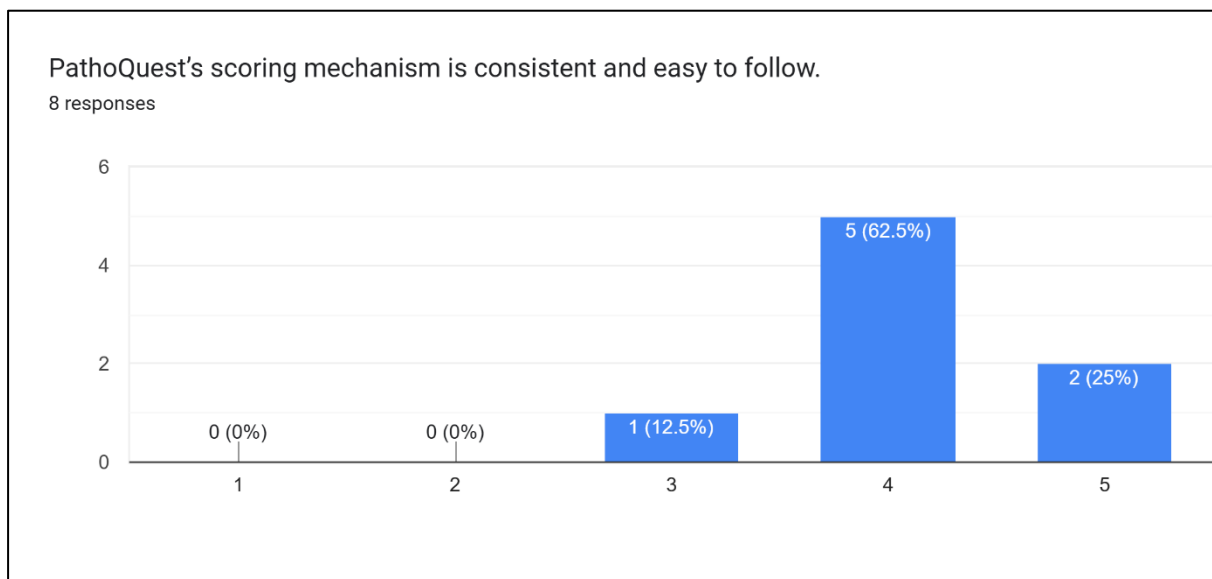


Figure 5.19 : Scoring Mechanism Acceptance Among Form 1 Student

Figure 5.19 illustrates the scoring mechanism acceptance among form 1 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

5.3.2 Form 2 Student Analysis

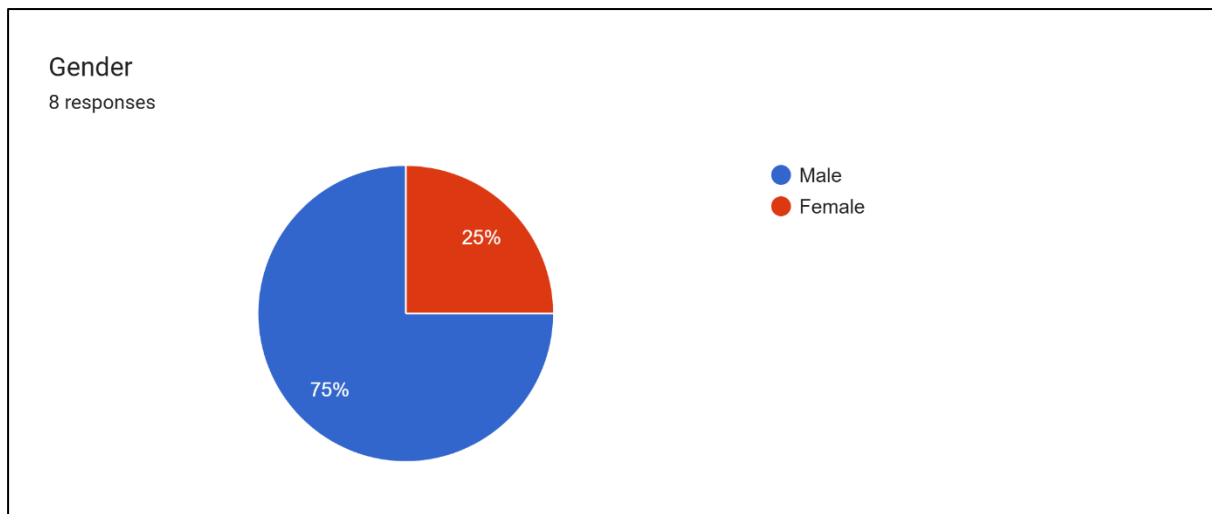


Figure 5.20 : The Gender For Form 2 Student

Figure 5.20 illustrates the gender of the respondents. Based on the figure, there were 75% of male students which is equivalent to 6 and 25% of female students which is equivalent of 2.

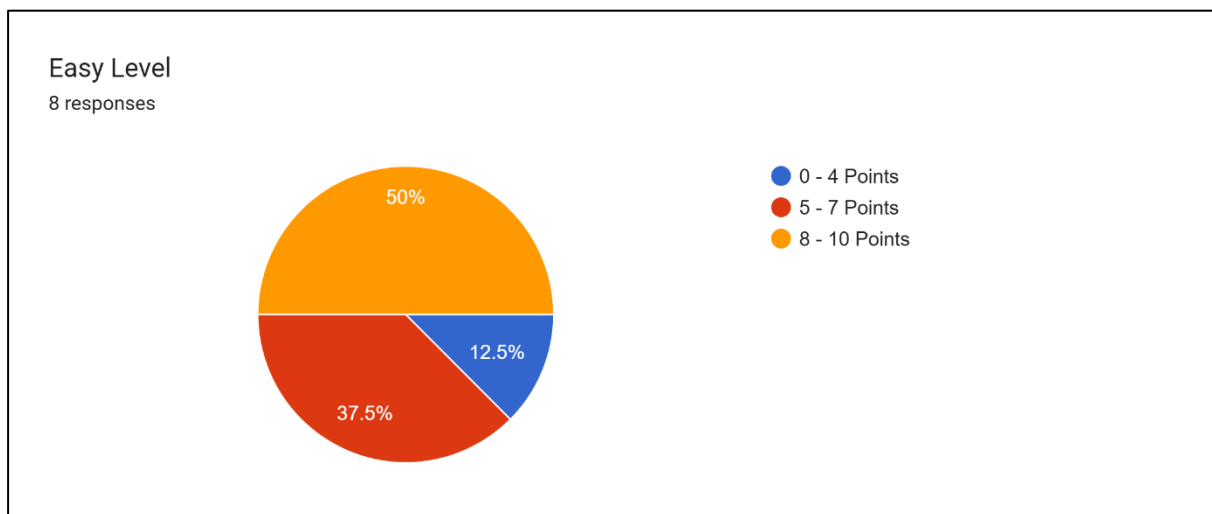


Figure 5.21 : The Easy Level For Form 2 Student

Figure 5.21 illustrates the points gained from the quiz with the easy level. Based on the figure, there are 12.5% which equivalent to 1 student that get (0 – 4 points). Next, there are 37.5% which is equivalent to 3 students that managed to get (5 – 7 points). Finally, there are 50% which equivalent to 4 student that get (8 – 10 points).

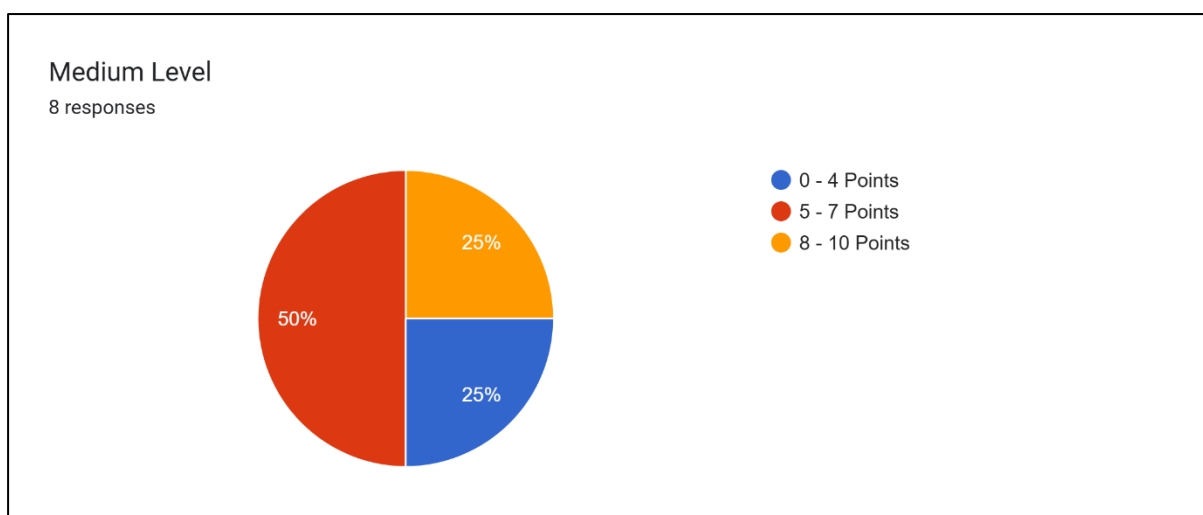


Figure 5.22 : The Medium Level For Form 2 Student

Figure 5.22 illustrates the points gained from the quiz with the medium level. Based on the figure, there are 25% which equivalent to 2 student that get (0 – 4 points). Next, there are 50% which is equivalent to 4 students that managed to get (5 – 7 points). Finally, there are 25% which equivalent to 2 student that get (8 – 10 points).

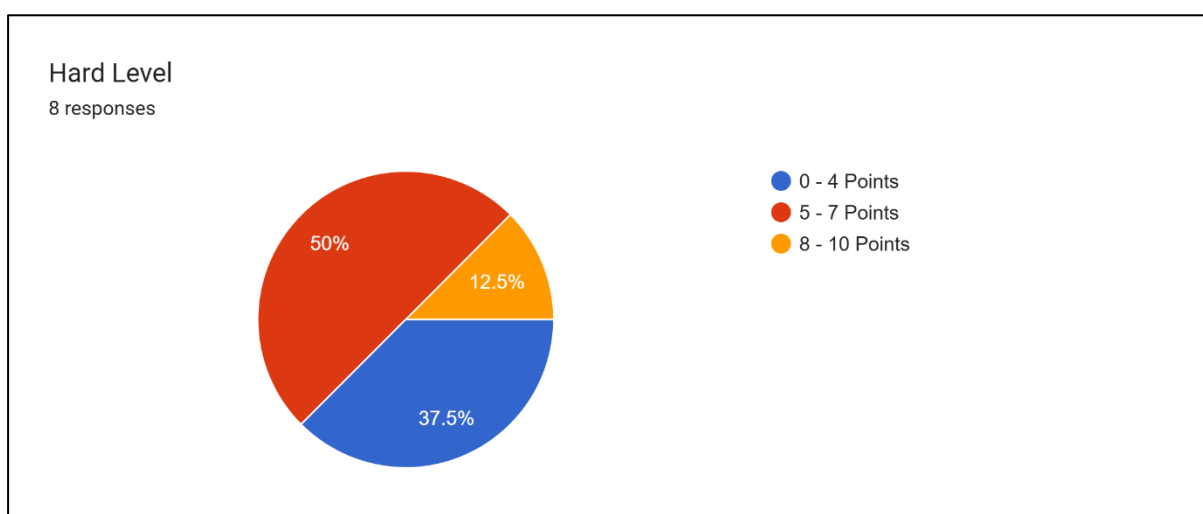


Figure 5.23 : The Hard Level For Form 2 Student

Figure 5.23 illustrates the points gained from the quiz with the medium level. Based on the figure, there are 37.5% which equivalent to 3 student that get (0 – 4 points). Next, there are 50% which is equivalent to 4 students that managed to get (5 – 7 points). Finally, there are 12.5% which equivalent to 1 student that get (8 – 10 points).

Table 5.8 presents a summary of the points earned by Form 2 students for each quiz level.

Table 5.8

Points Earned by Form 2 Students Across Quiz Levels

Performance	0-4 Points	5-7 Points	8-10 Points
Easy	1	3	4
Medium	2	4	2
Hard	3	4	1

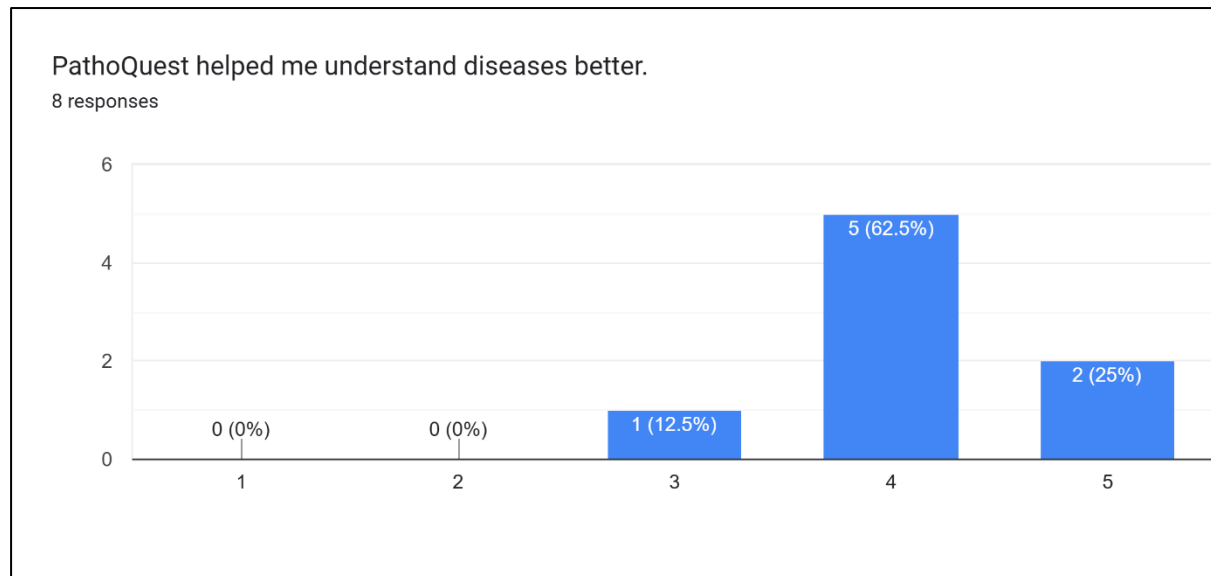


Figure 5.24 : Diseases Understanding Among Form 2 Student

Figure 5.24 illustrates the diseases understanding among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 62.5% which equivalent to 5 students that choose agree. Finally, there are 25% which equivalent to 2 students that choose strongly agree.

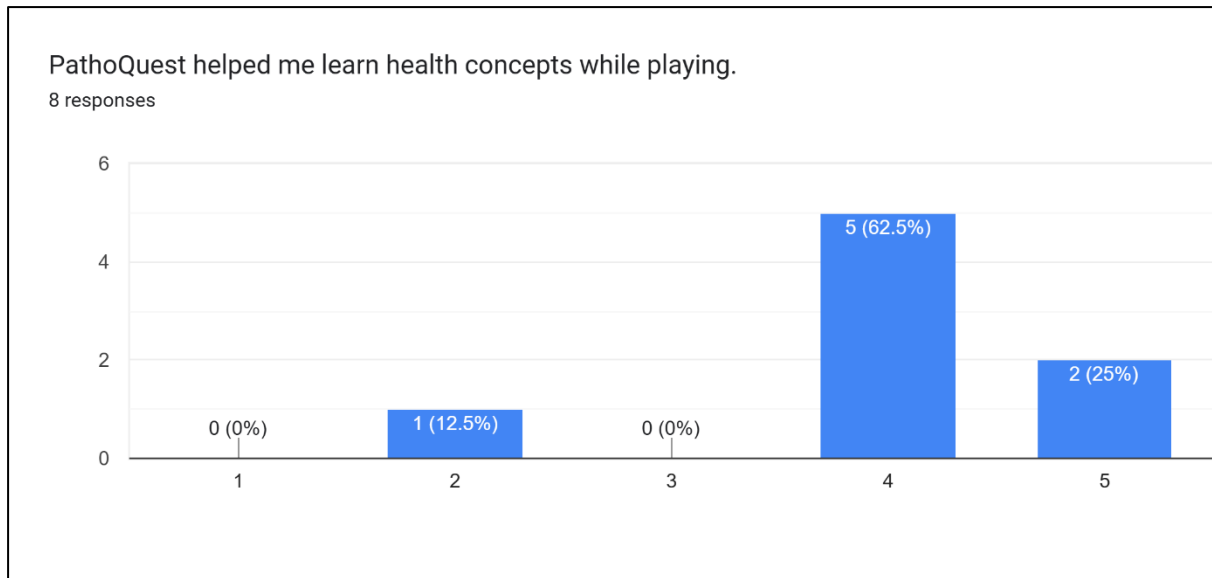


Figure 5.25 : Health Concept Understanding Among Form 2 Student

Figure 5.25 illustrates the health concept understanding among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose disagree. Next, the majority are 62.5% which equivalent to 5 students that choose agree. Finally, there are 25% which equivalent to 2 students that choose strongly agree.

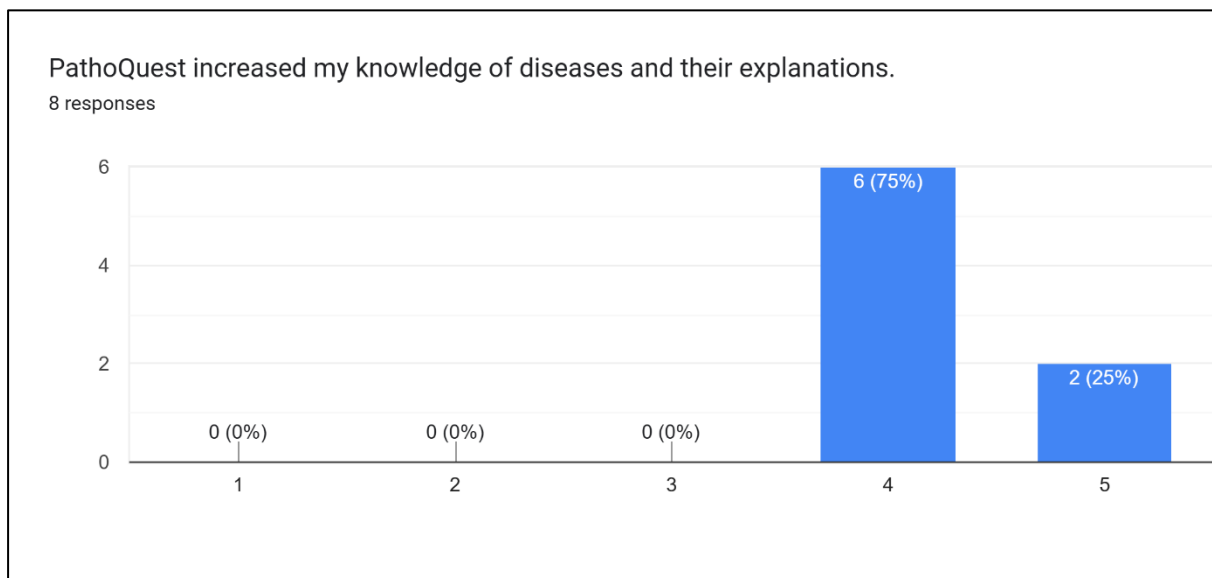


Figure 5.26 : Disease Knowledge Gaining Among Form 1 Student

Figure 5.26 illustrates the disease knowledge gaining among form 2 student. Based on the figure, the majority are 75% which equivalent to 6 students that choose agree. Next, the least are 25% which equivalent to 2 students that choose strongly agree.

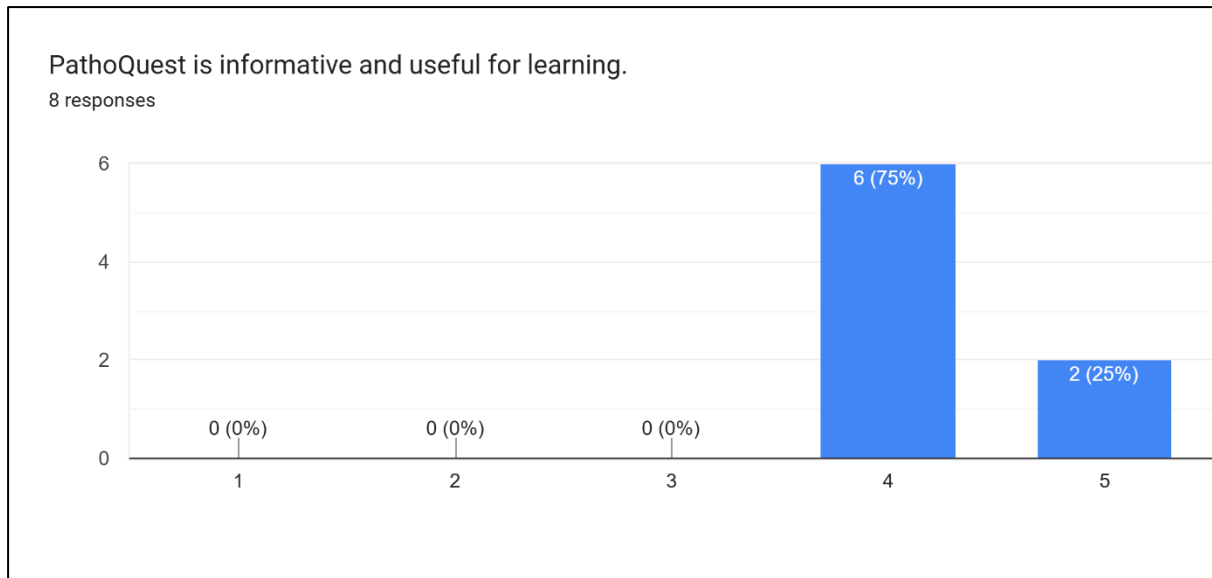


Figure 5.27 : Informative And Useful Acceptance Among Form 2 Student

Figure 5.27 illustrates the informative and useful acceptance among form 2 student. Based on the figure, the majority are 75% which equivalent to 6 students that choose agree. Next, the least are 25% which equivalent to 2 students that choose strongly agree.

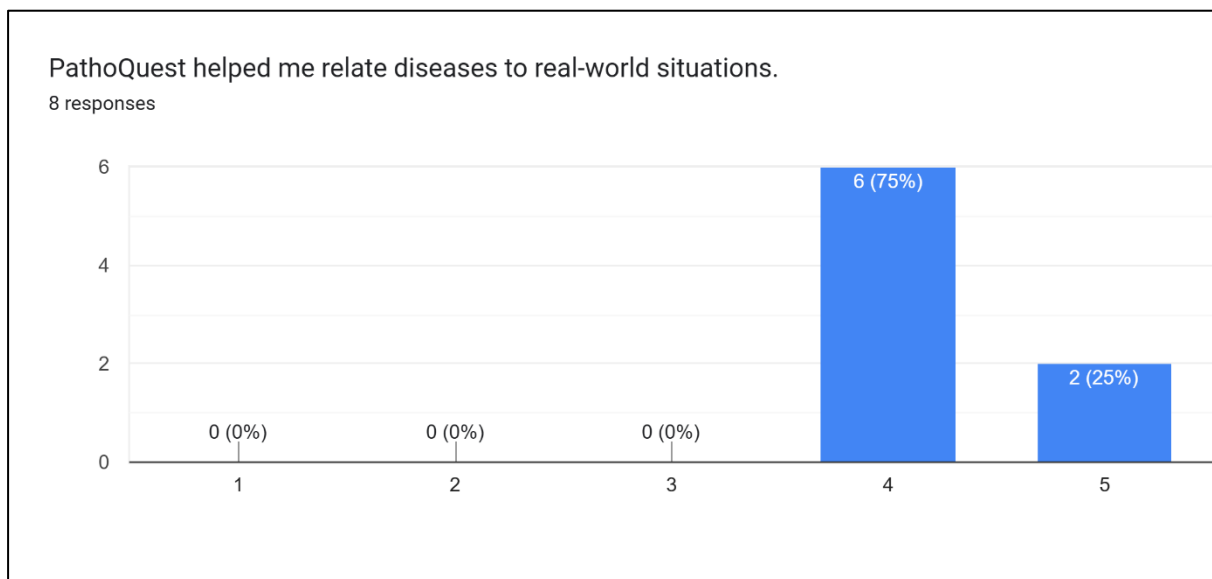


Figure 5.29 : Relation With Real-World Situations Among Form 2 Student

Figure 5.29 illustrates the relation with real-world situations among form 2 student. Based on the figure, the majority are 75% which equivalent to 6 students that choose agree. Next, the least are 25% which equivalent to 2 students that choose strongly agree.

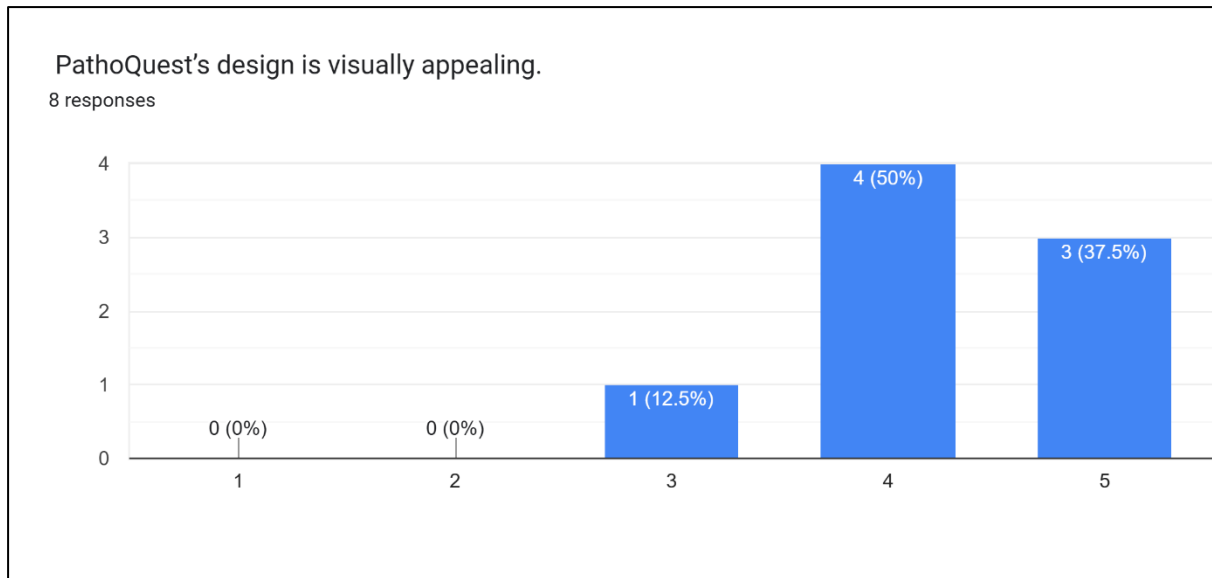


Figure 5.30 : Visual Acceptance Among Form 2 Student

Figure 5.30 illustrates the visual acceptance among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

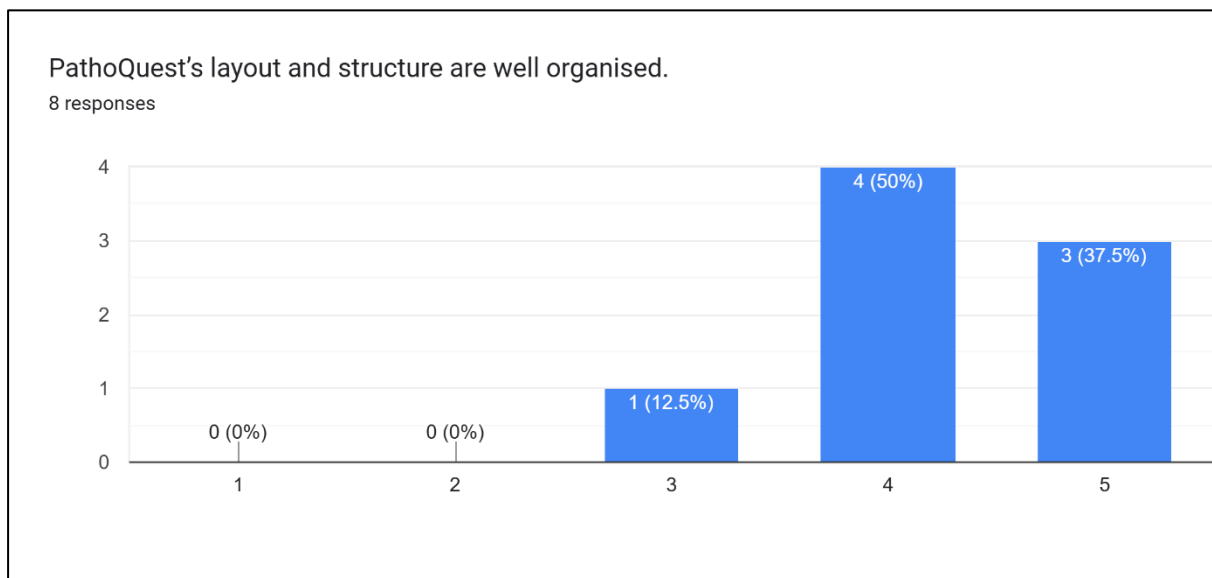


Figure 5.31 : Layout And Structure Acceptance Among Form 2 Student

Figure 5.31 illustrates the layout and structure acceptance among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

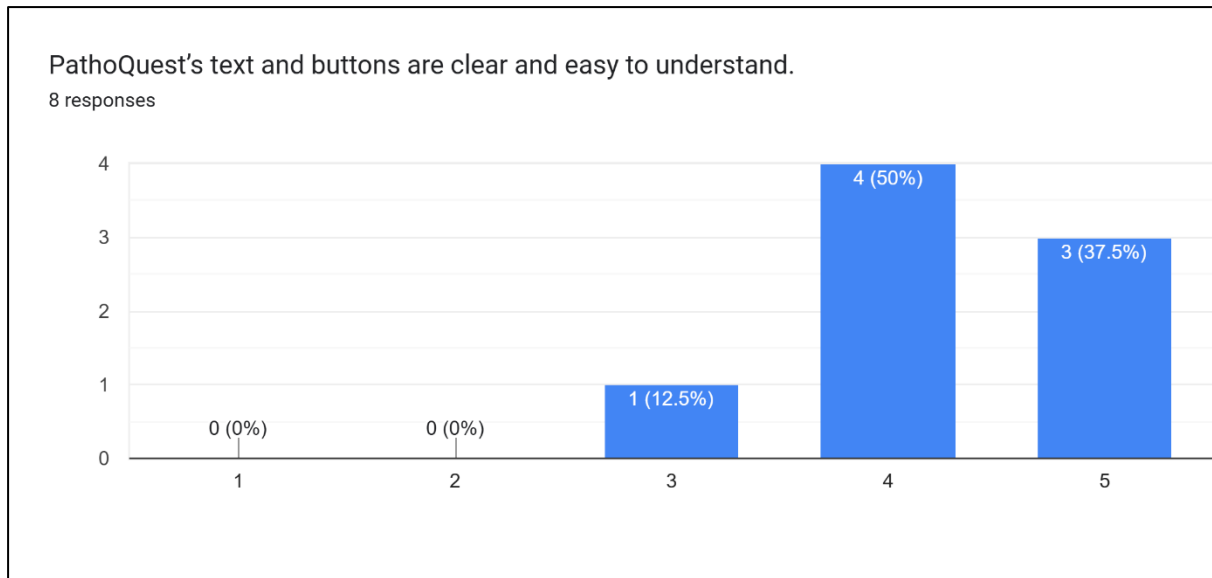


Figure 5.32 : Text And Button Acceptance Among Form 2 Student

Figure 5.32 illustrates the text and button acceptance among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

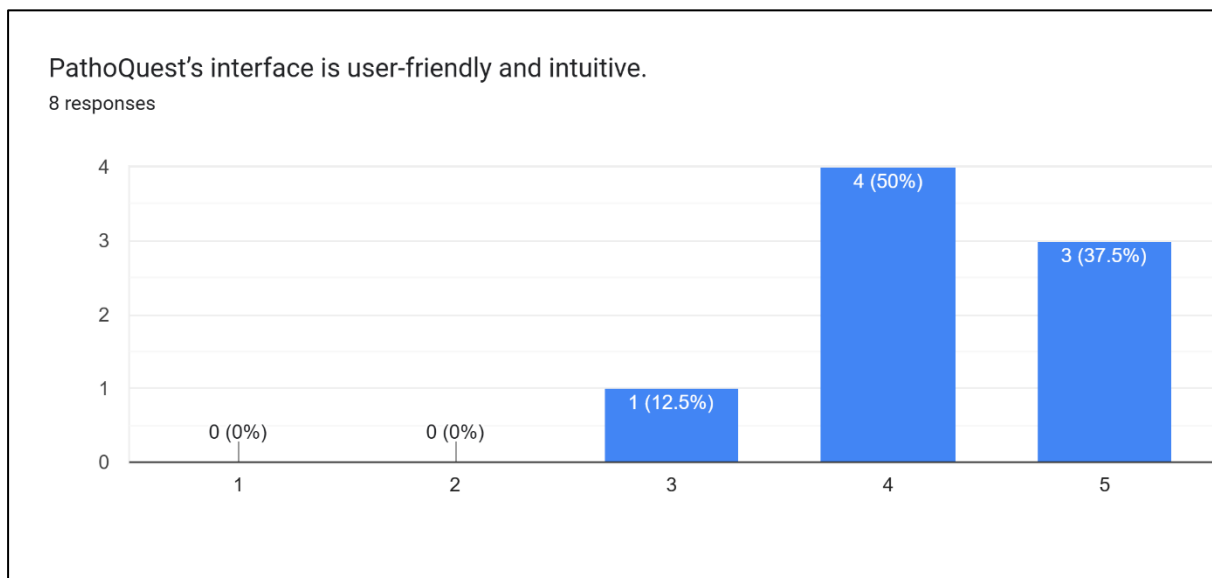


Figure 5.33 : Interface Among Form 2 Student

Figure 5.33 illustrates the interface acceptance among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

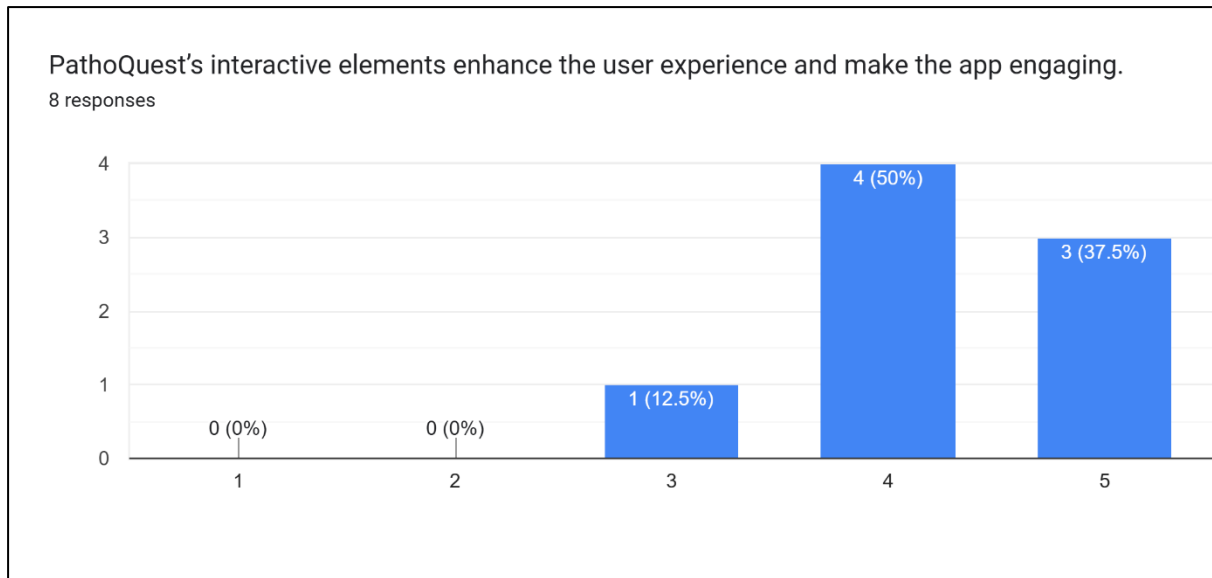


Figure 5.34 : Interactive Elements Acceptance Among Form 2 Student

Figure 5.34 illustrates the interactive elements acceptance among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

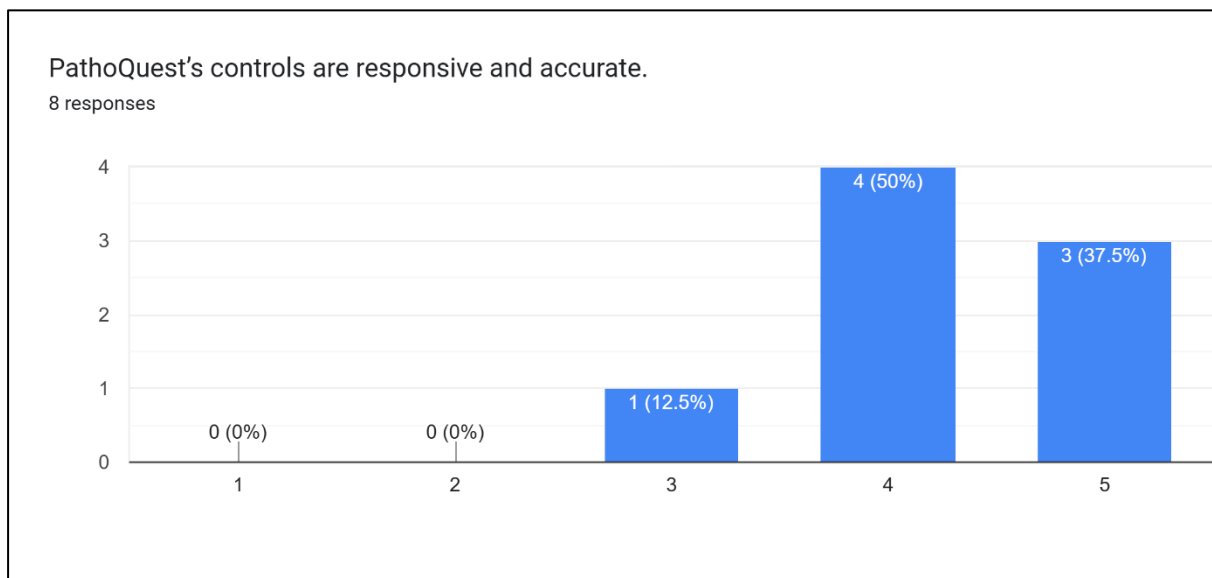


Figure 5.35 : Control Acceptance Among Form 2 Student

Figure 5.35 illustrates the control acceptance among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

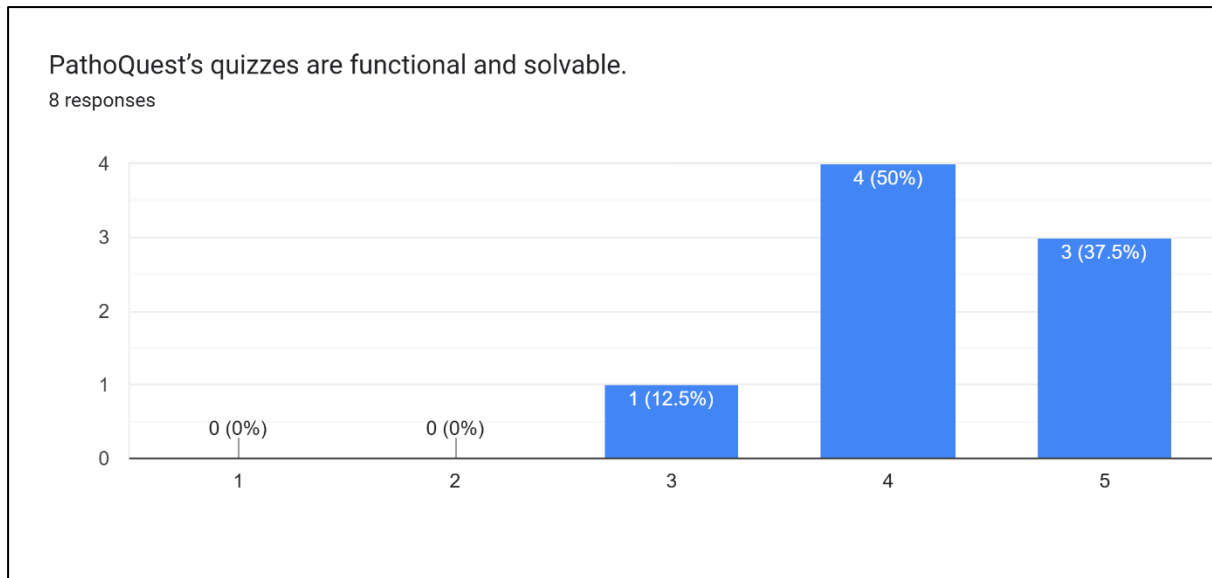


Figure 5.36 : Quiz Acceptance Among Form 2 Student

Figure 5.36 illustrates the quiz acceptance among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

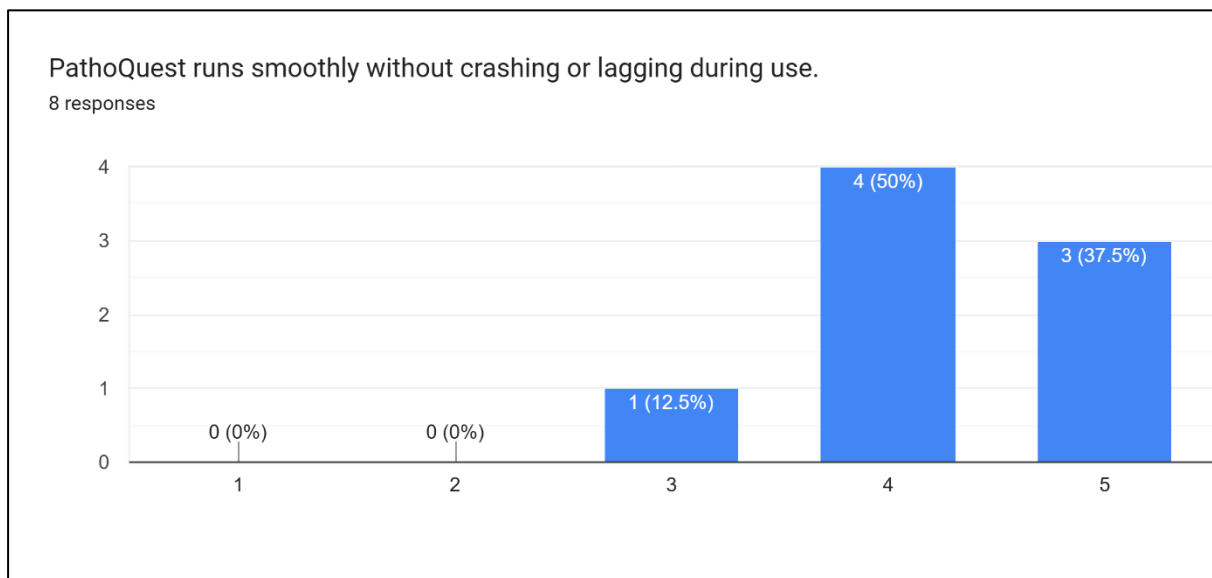


Figure 5.37 : Application Performance Among Form 2 Student

Figure 5.37 illustrates the application performance among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

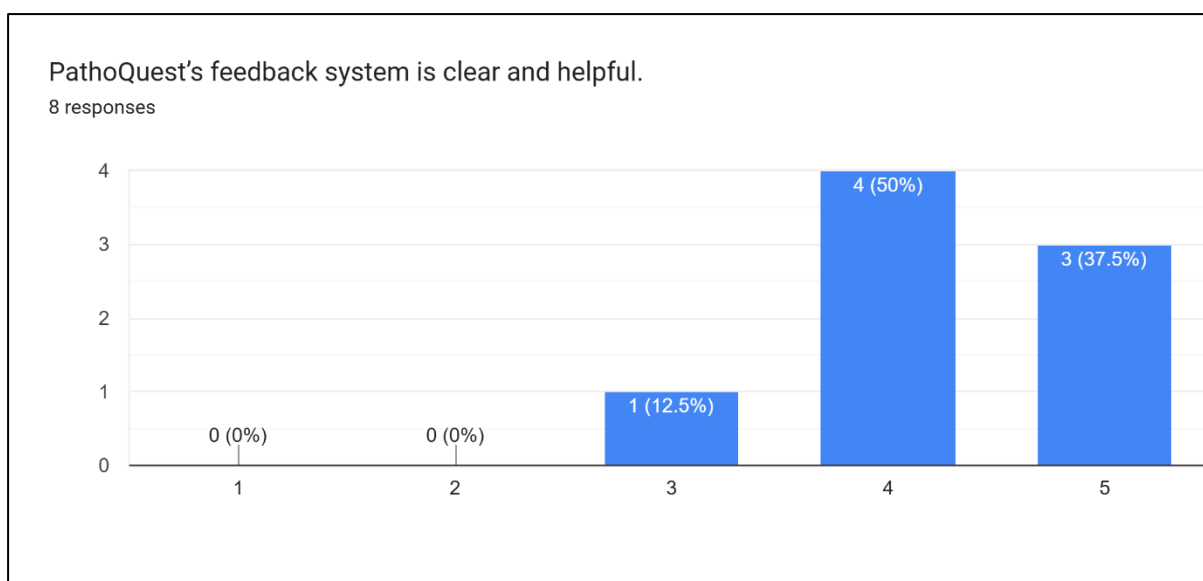


Figure 5.38 : Feedback System Acceptance Among Form 2 Student

Figure 5.38 illustrates the feedback system acceptance among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

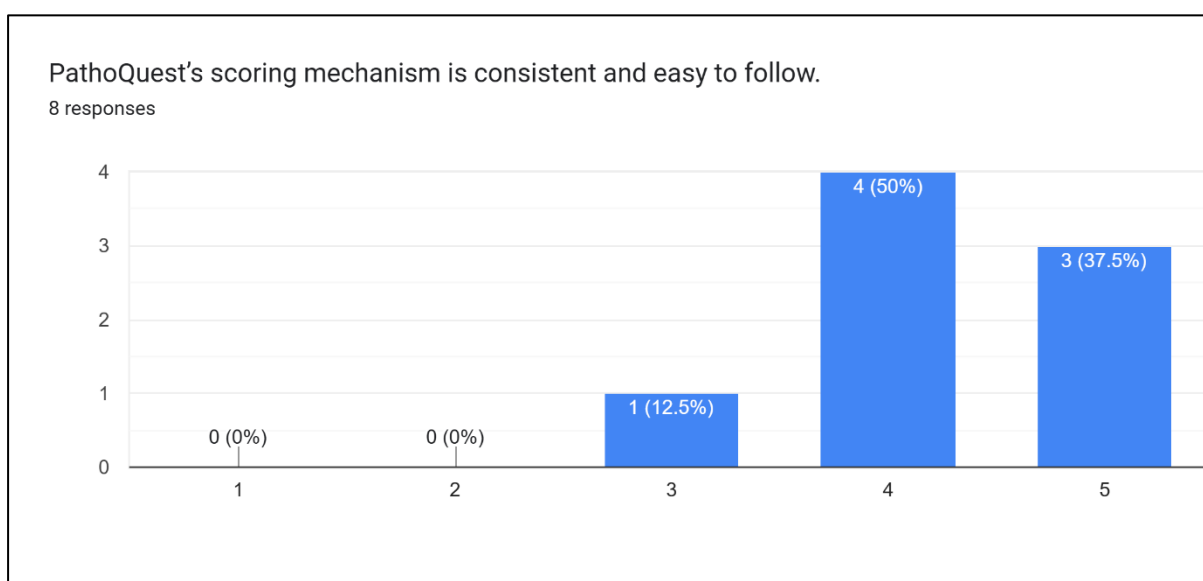


Figure 5.39 : Scoring Mechanism Acceptance Among Form 2 Student

Figure 5.39 illustrates the scoring mechanism acceptance among form 2 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

5.3.3 Form 3 Student Analysis

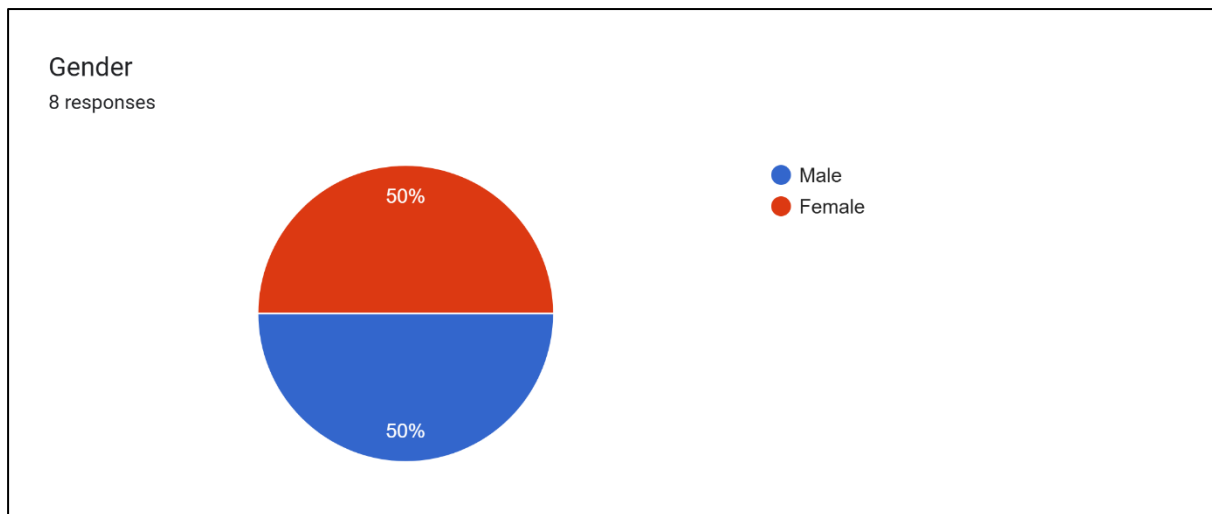


Figure 5.40 : The Gender For Form 3 Student

Figure 5.40 illustrates the gender of the respondents. Based on the figure, there were 50% of male students which is equivalent to 4 and 50% of female students which is equivalent of 4.

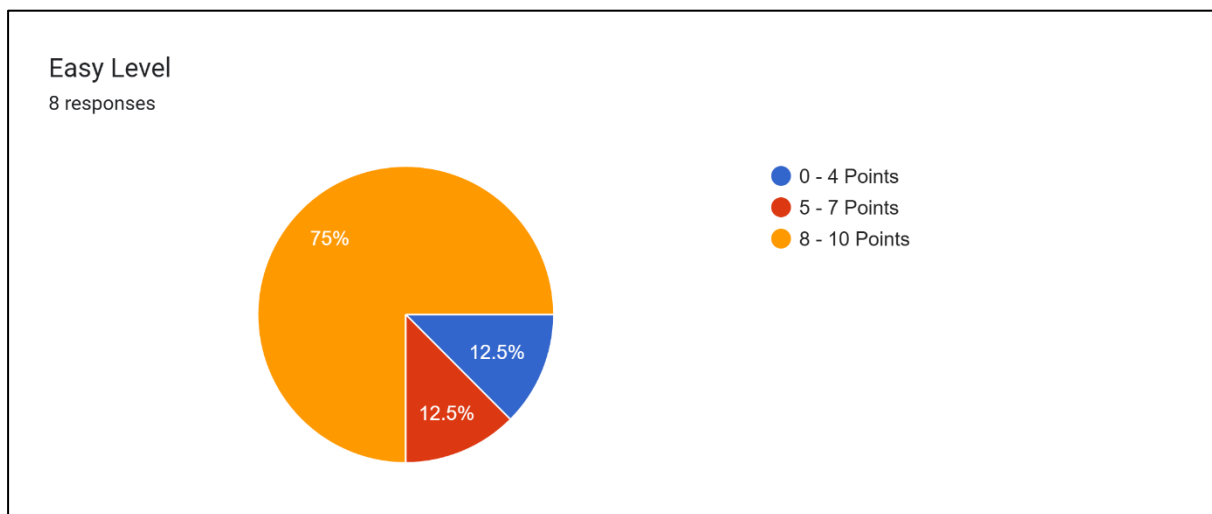


Figure 5.41 : The Easy Level For Form 3 Student

Figure 5.41 illustrates the points gained from the quiz with the easy level. Based on the figure, there are 12.5% which equivalent to 1 student that get (0 – 4 points). Next, there are 37.5% which is equivalent to 3 students that managed to get (5 – 7 points). Finally, there are 50% which equivalent to 4 student that get (8 – 10 points).

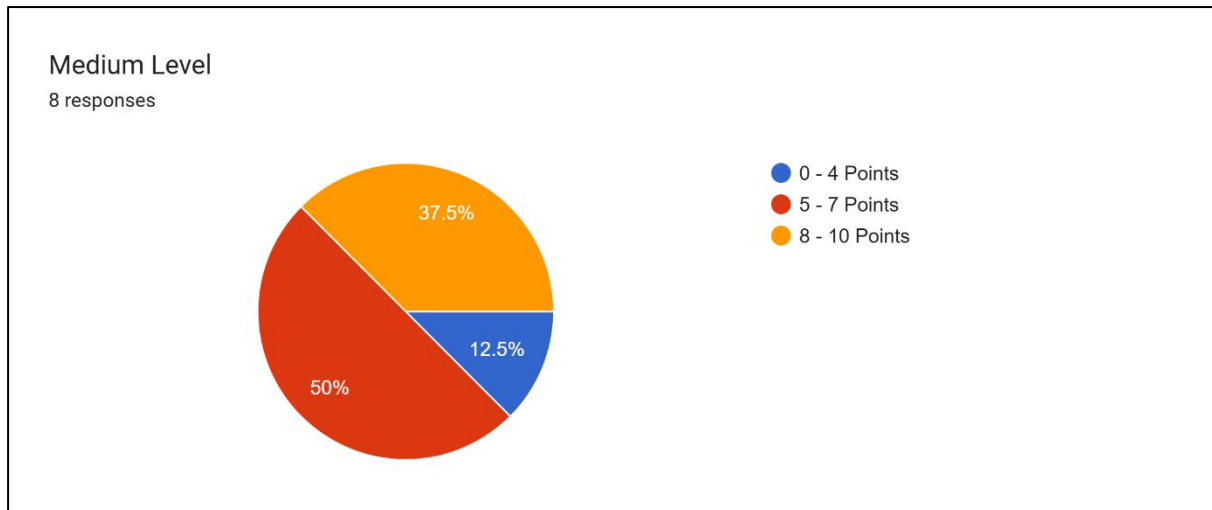


Figure 5.42 : The Medium Level For Form 3 Student

Figure 5.42 illustrates the points gained from the quiz with the easy level. Based on the figure, there are 12.5% which equivalent to 1 student that get (0 – 4 points). Next, there are 50% which is equivalent to 4 students that managed to get (5 – 7 points). Finally, there are 37.5% which equivalent to 3 student that get (8 – 10 points).

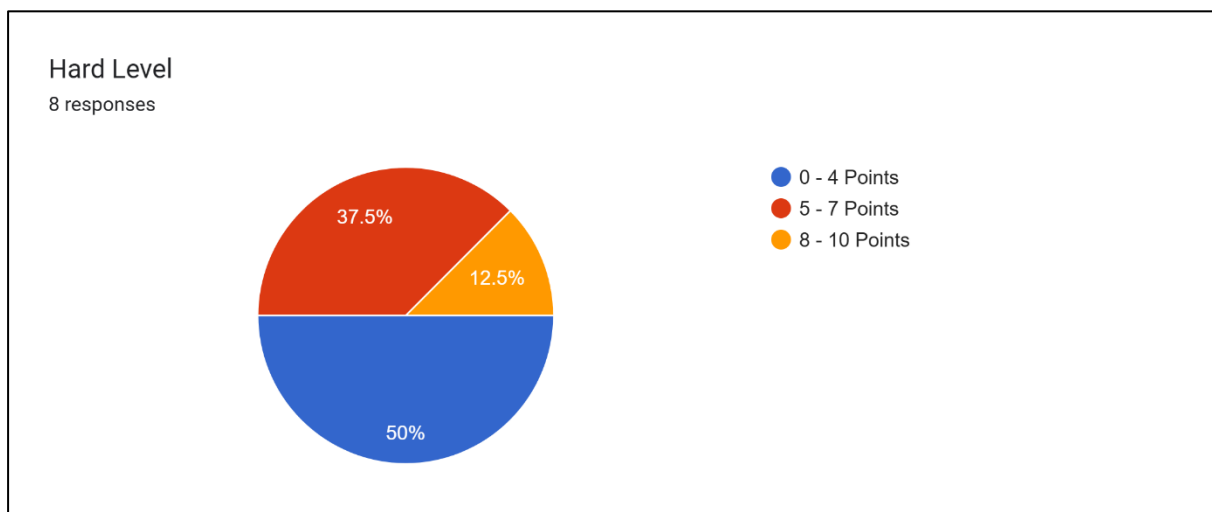


Figure 5.43 : The Hard Level For Form 3 Student

Figure 5.43 illustrates the points gained from the quiz with the easy level. Based on the figure, there are 50% which equivalent to 4 student that get (0 – 4 points). Next, there are 37.5% which is equivalent to 3 students that managed to get (5 – 7 points). Finally, there are 12.5% which equivalent to 1 student that get (8 – 10 points).

Table 5.9 presents a summary of the points earned by Form 3 students for each quiz level.

Table 5.9

Points Earned by Form 3 Students Across Quiz Levels

Performance	0-4 Points	5-7 Points	8-10 Points
Easy	1	3	4
Medium	1	4	3
Hard	4	3	1

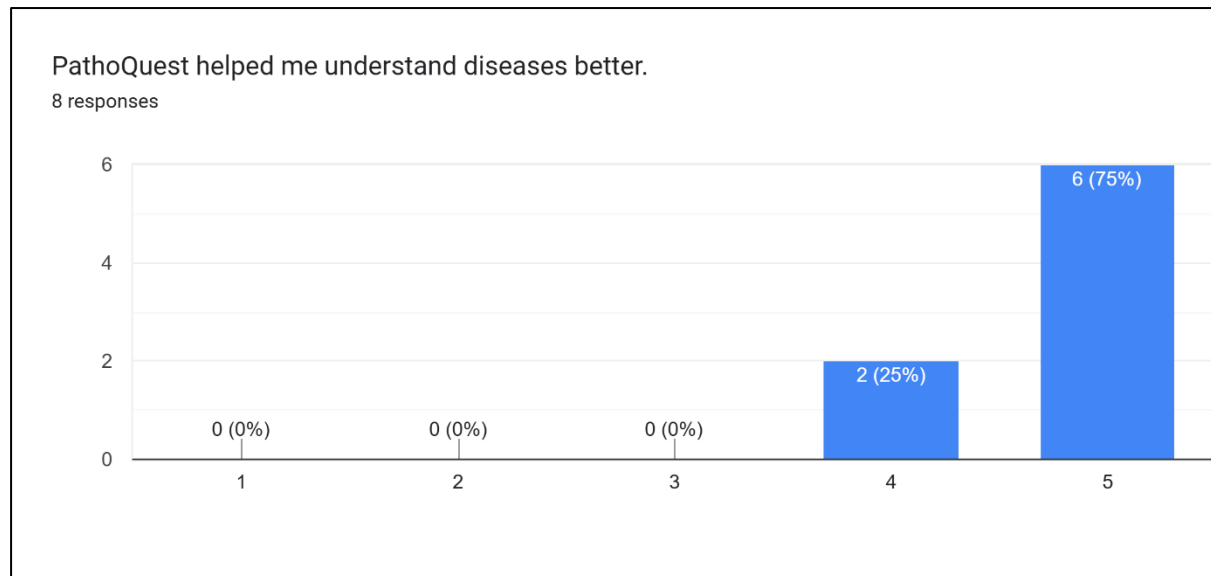


Figure 5.44 : Diseases Understanding Among Form 3 Student

Figure 5.44 illustrates the diseases understanding among form 3 student. Based on the figure, the least are 25% which equivalent to 2 students that choose agree. Next, the majority are 75% which equivalent to 6 students that choose strongly agree.

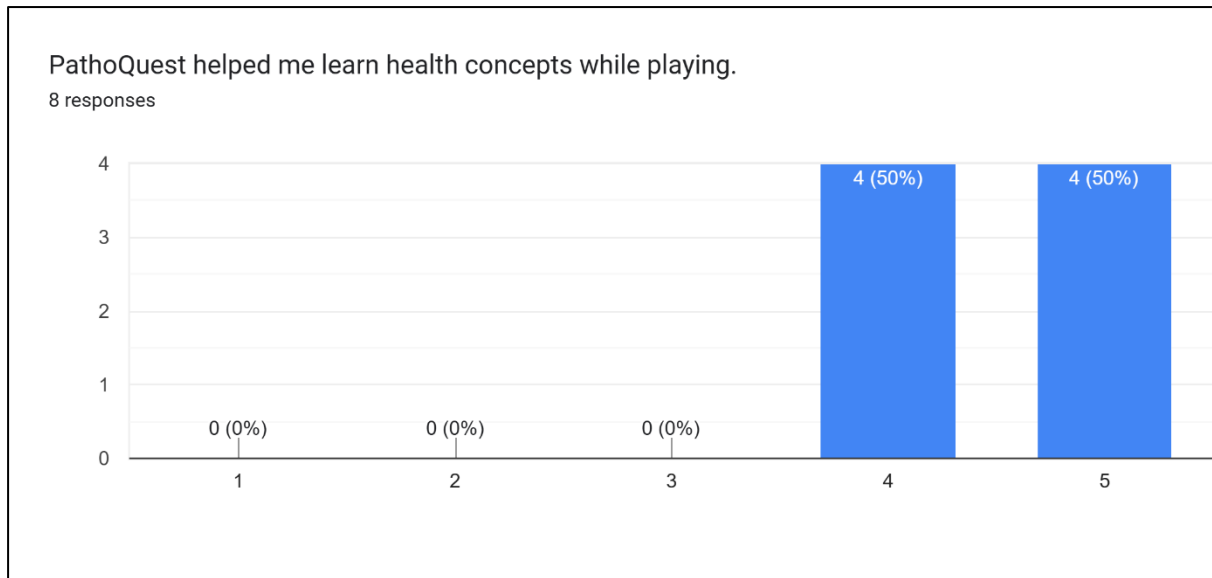


Figure 5.45 : Health Concept Understanding Among Form 3 Student

Figure 5.45 illustrates the health concept understanding among form 3 student. Based on the figure, there are 50% which equivalent to 4 students that choose agree. Next, there are 50% which equivalent to 4 students that choose strongly agree. Both have the same amount number of majority.

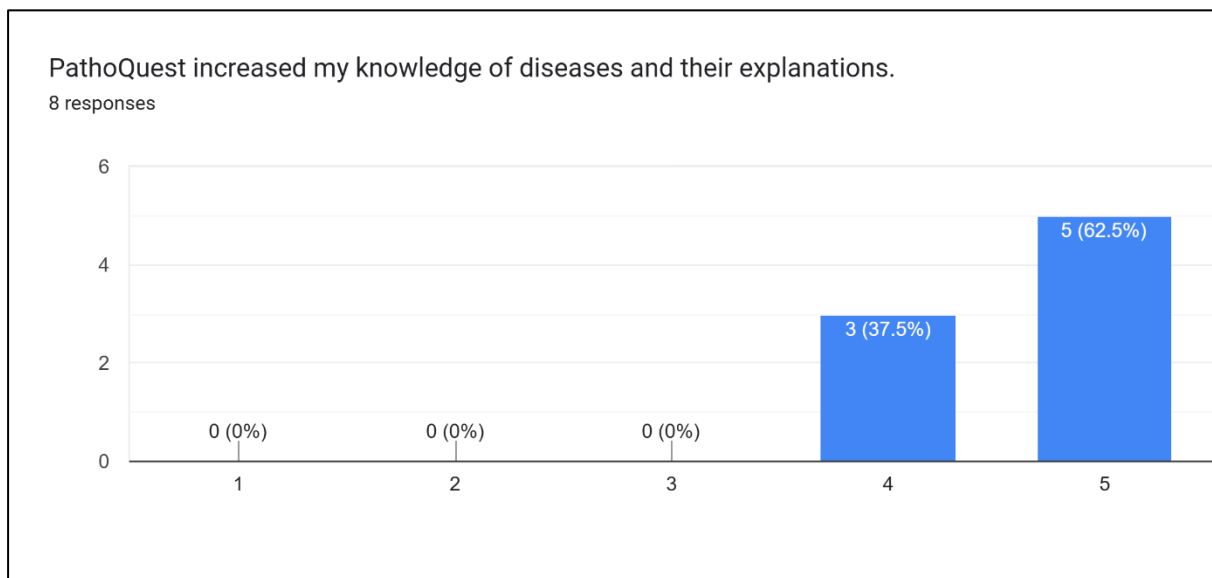


Figure 5.46 : Disease Knowledge Gaining Among Form 3 Student

Figure 5.46 illustrates the disease knowledge gaining among form 3 student. Based on the figure, the least are 37.5% which equivalent to 3 students that choose agree. Next, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

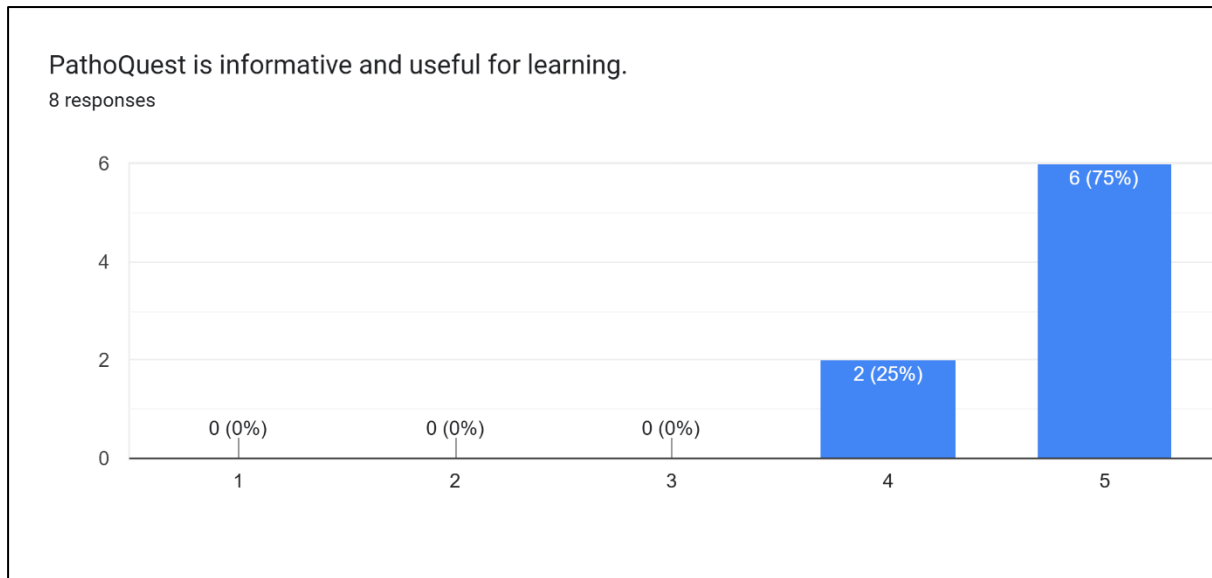


Figure 5.47 : Informative And Useful Acceptance Among Form 3 Student

Figure 5.47 illustrates the informative and useful acceptance among form 3 student. Based on the figure, the least are 25% which equivalent to 2 students that choose agree. Next, the majority are 75% which equivalent to 6 students that choose strongly agree.

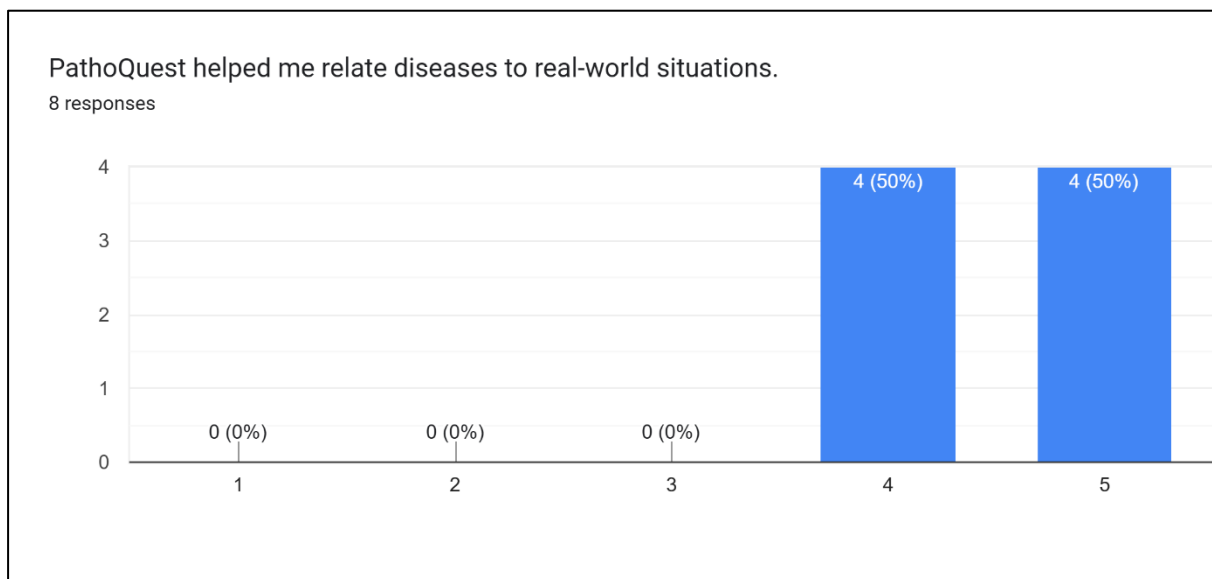


Figure 5.48 : Relation With Real-World Situations Among Form 3 Student

Figure 5.48 illustrates the relation with real-world situations among form 3 student. Based on the figure, there are 50% which equivalent to 4 students that choose agree. Next, there are 50% which equivalent to 4 students that choose strongly agree. Both have the same amount number of majority.

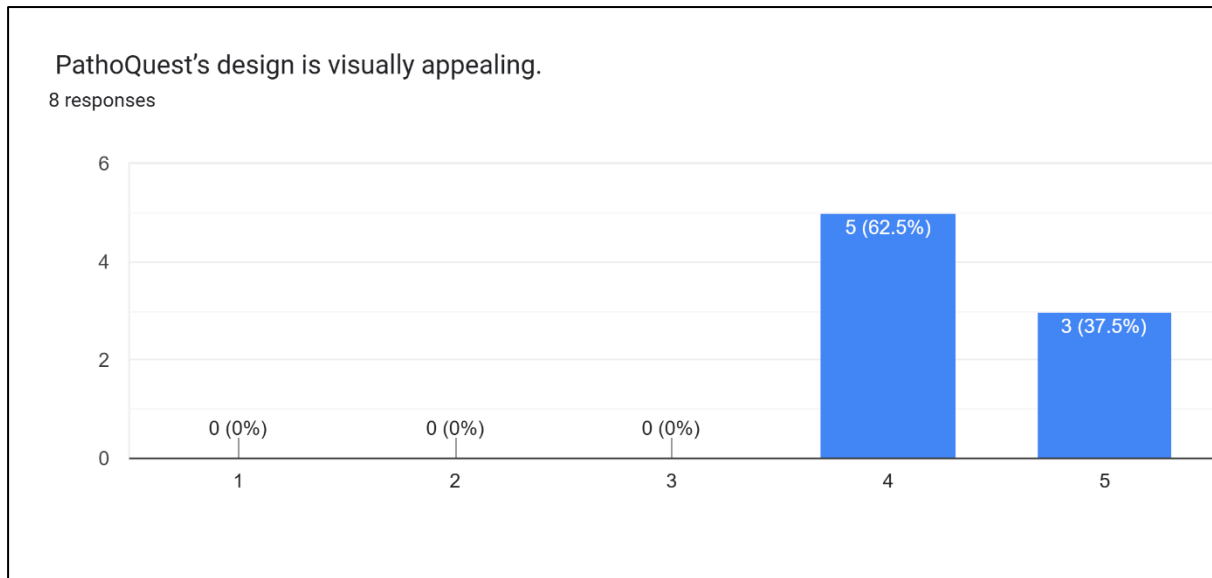


Figure 5.49 : Visual Acceptance Among Form 3 Student

Figure 5.49 illustrates the visual acceptance among form 3 student. Based on the figure, the least are 62.5% which equivalent to 5 students that choose agree. Next, the majority are 37.5% which equivalent to 3 students that choose strongly agree.

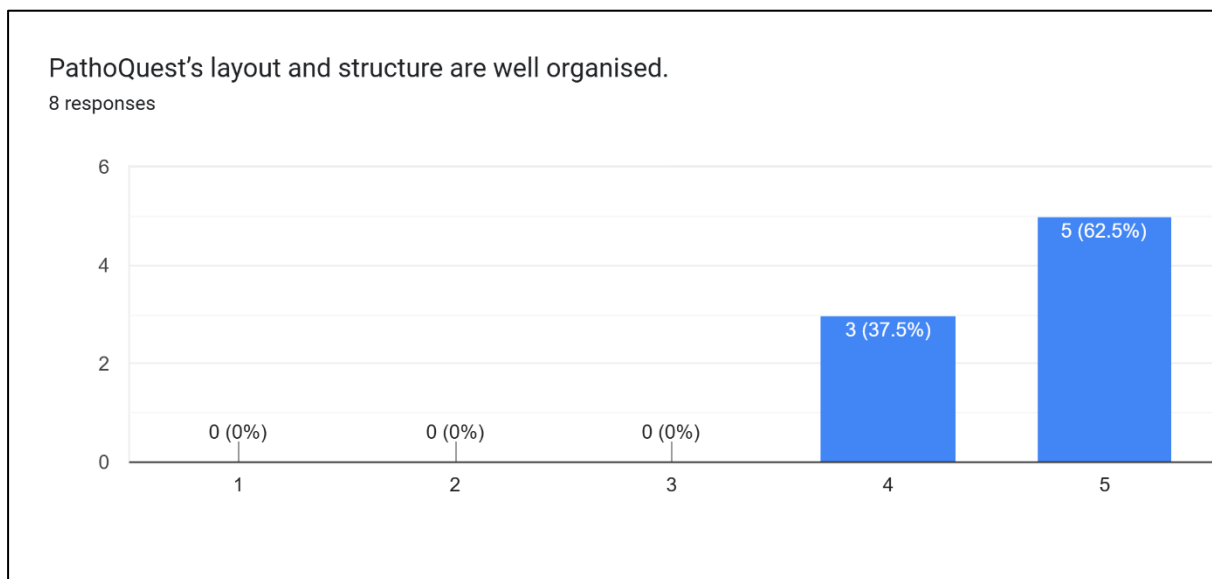


Figure 5.50 : Layout And Structure Acceptance Among Form 3 Student

Figure 5.50 illustrates the layout and structure acceptance among form 3 student. Based on the figure, the least are 37.5% which equivalent to 3 students that choose agree. Next, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

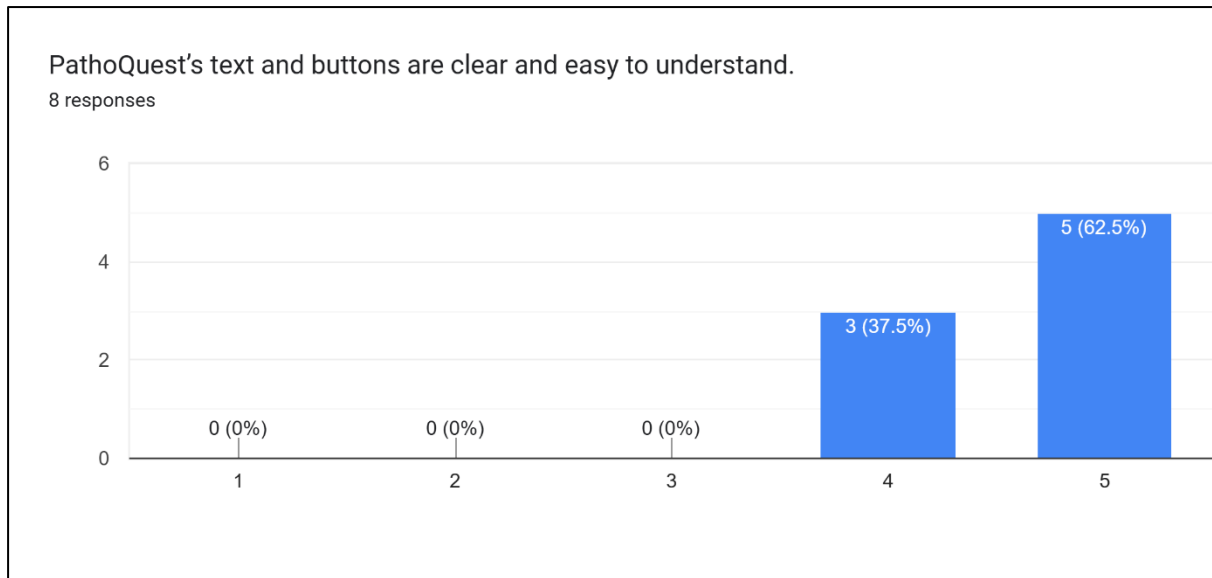


Figure 5.51 : Text And Button Acceptance Among Form 3 Student

Figure 5.51 illustrates the text and button acceptance among form 3 student. Based on the figure, the least are 37.5% which equivalent to 3 students that choose agree. Next, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

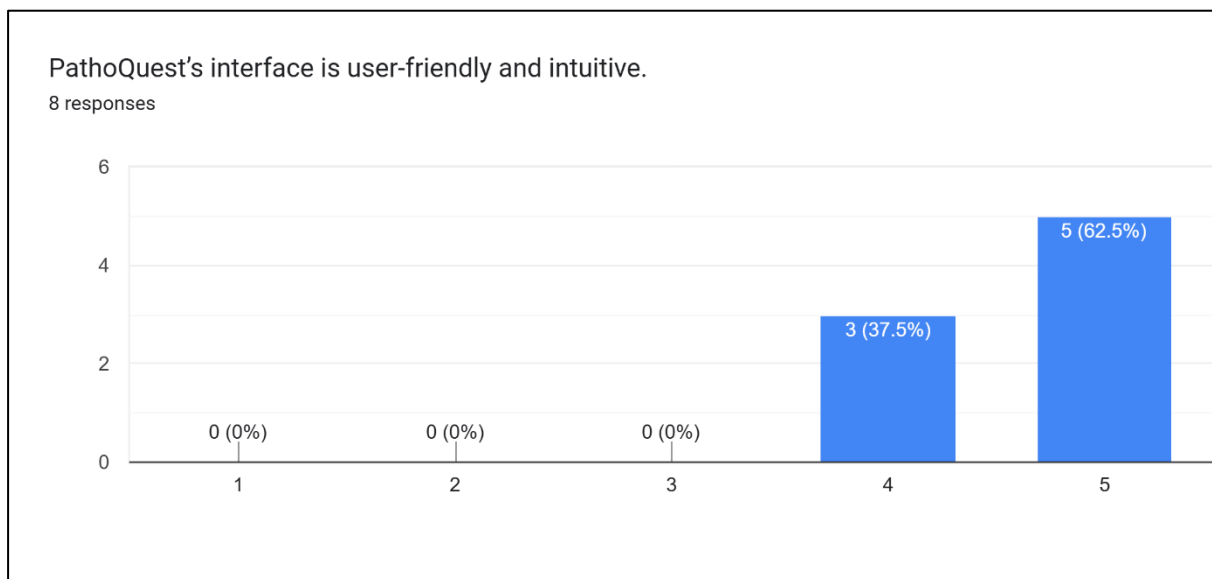


Figure 5.52 : Interface Among Form 3 Student

Figure 5.52 illustrates the interface acceptance among form 3 student. Based on the figure, the least are 37.5% which equivalent to 3 students that choose agree. Next, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

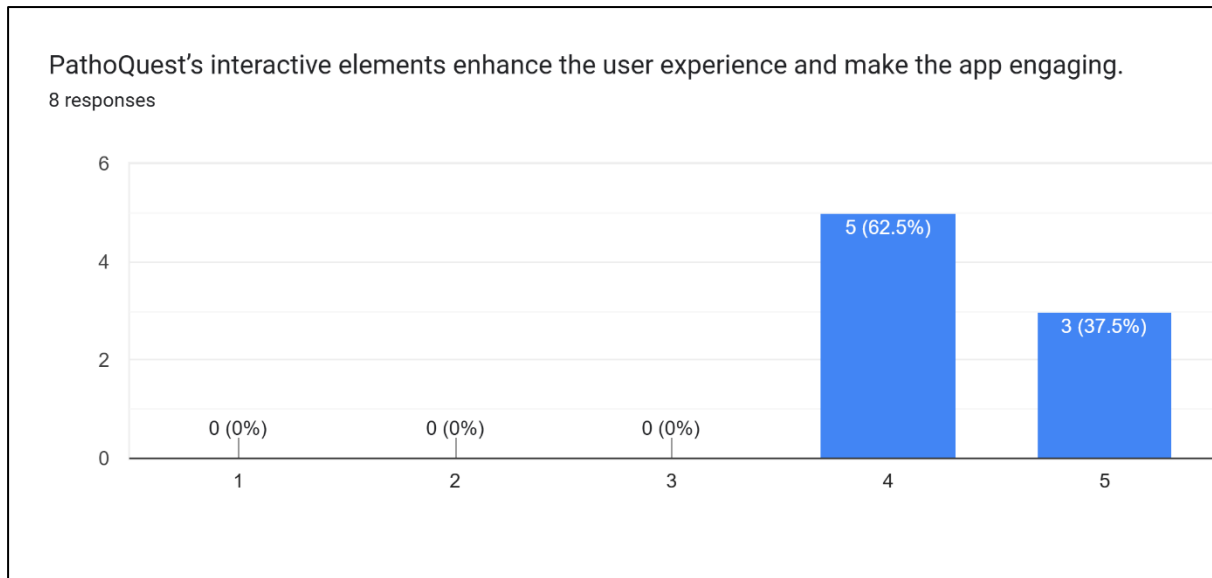


Figure 5.53 : Interactive Elements Acceptance Among Form 3 Student

Figure 5.53 illustrates the interactive elements acceptance among form 3 student. Based on the figure, the majority are 62.5% which equivalent to 5 students that choose agree. Next, the least are 37.5% which equivalent to 3 students that choose strongly agree.

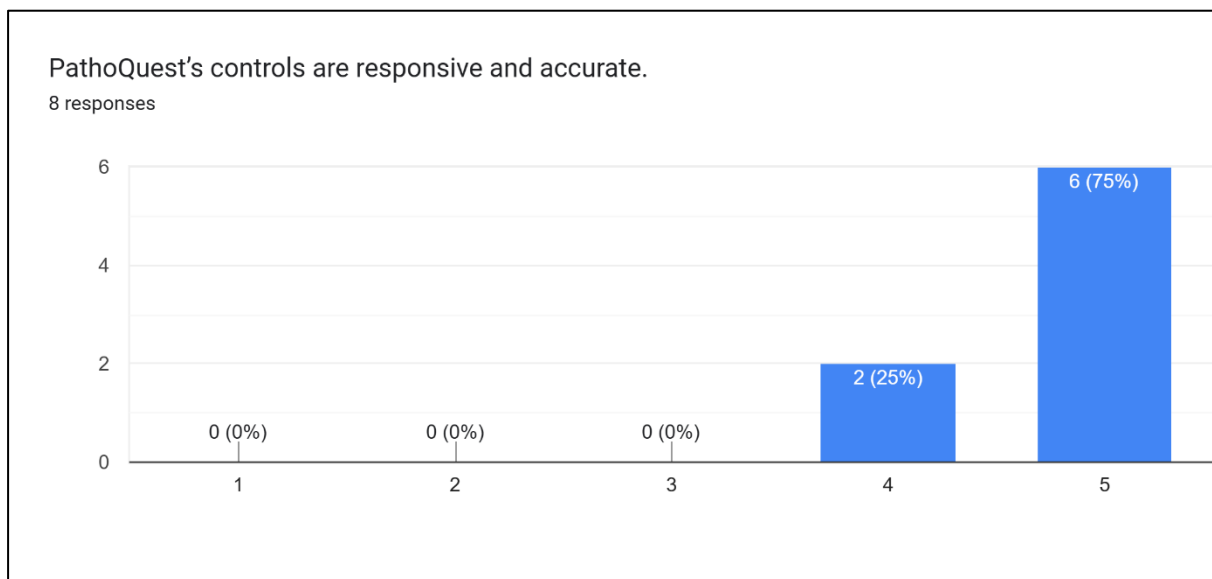


Figure 5.54 : Control Acceptance Among Form 3 Student

Figure 5.54 illustrates the control acceptance among form 3 student. Based on the figure, the least are 25% which equivalent to 2 students that choose agree. Next, the majority are 75% which equivalent to 6 students that choose strongly agree.

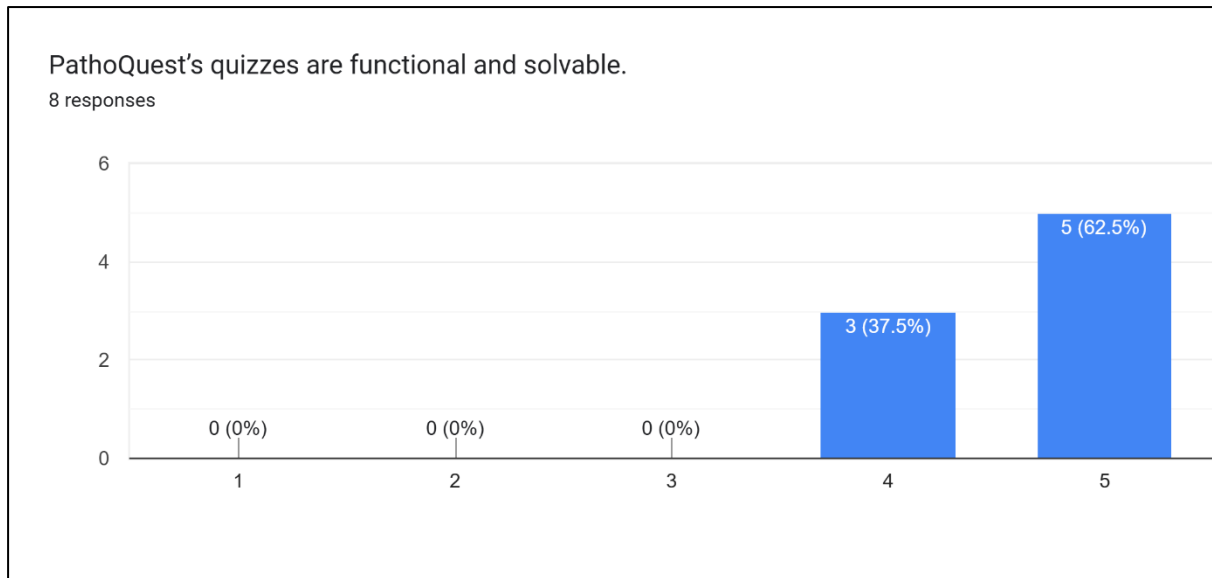


Figure 5.55 : Quiz Acceptance Among Form 3 Student

Figure 5.55 illustrates the quiz acceptance among form 3 student. Based on the figure, the least are 37.5% which equivalent to 3 students that choose agree. Next, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

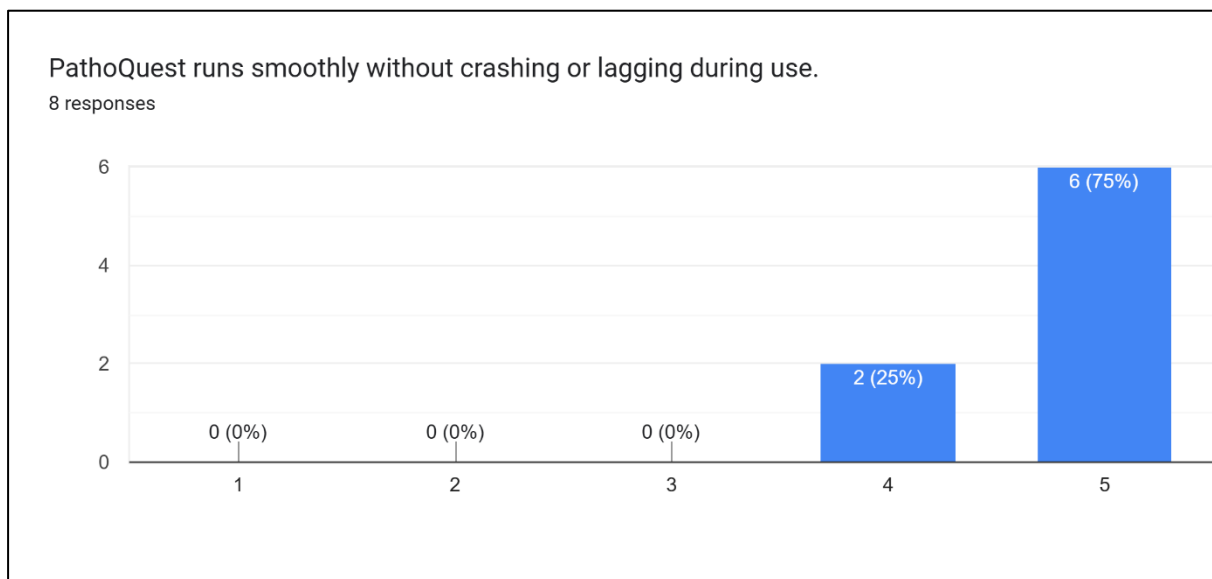


Figure 5.56 : Application Performance Among Form 3 Student

Figure 5.56 illustrates the application performance among form 3 student. Based on the figure, the least are 25% which equivalent to 2 students that choose agree. Next, the majority are 75% which equivalent to 6 students that choose strongly agree.

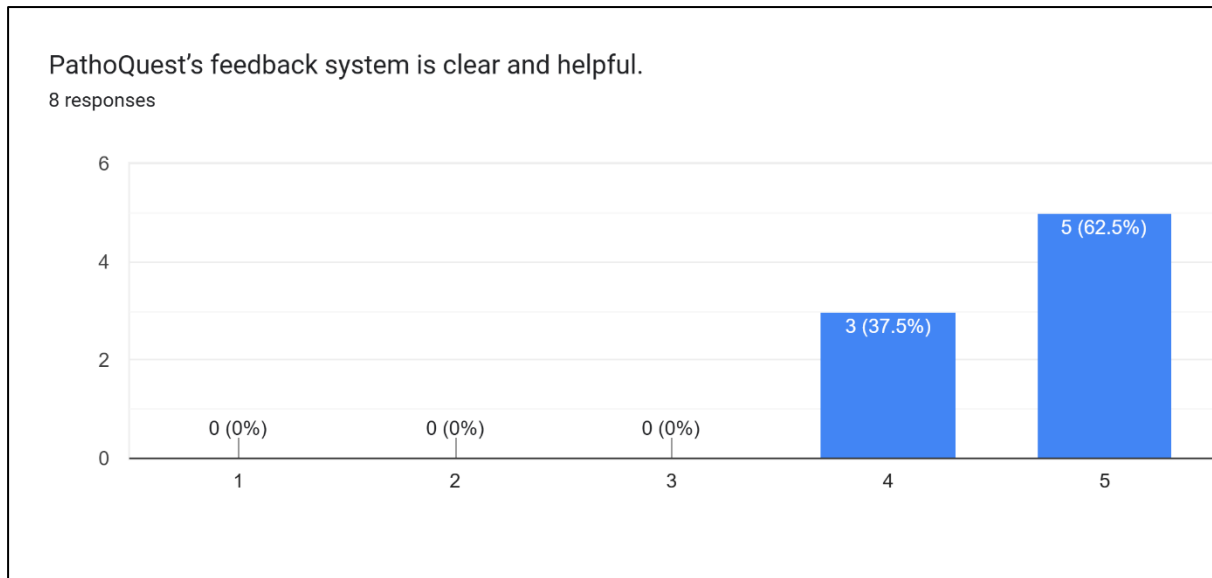


Figure 5.57 : Feedback System Acceptance Among Form 3 Student

Figure 5.57 illustrates the feedback system acceptance among form 3 student. Based on the figure, the least are 37.5% which equivalent to 3 students that choose agree. Next, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

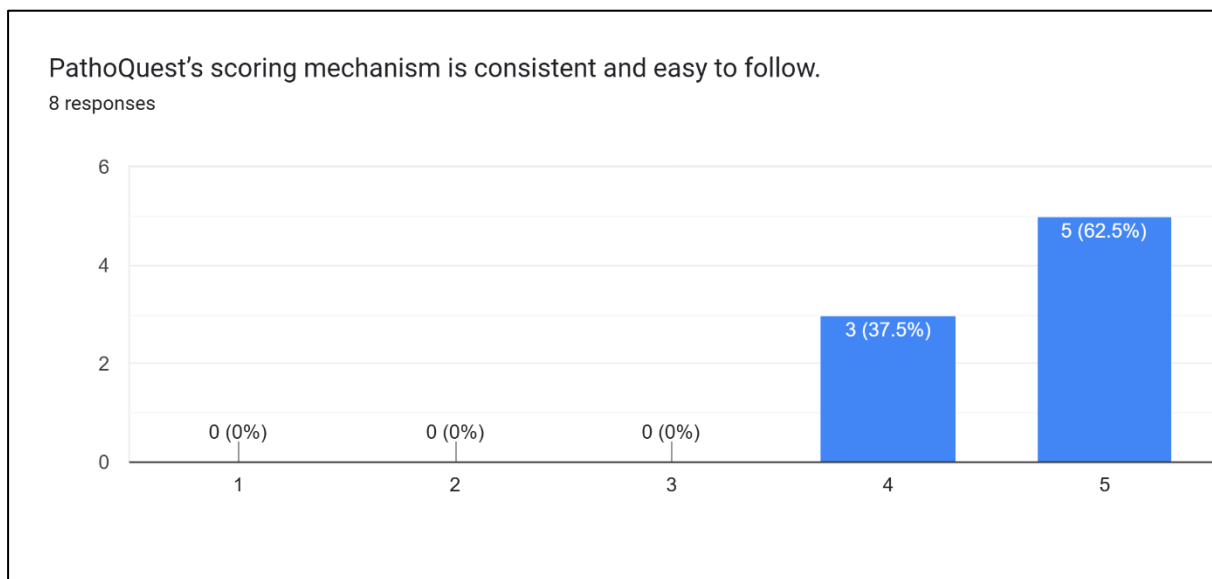


Figure 5.58 : Scoring Mechanism Acceptance Among Form 3 Student

Figure 5.58 illustrates the scoring mechanism acceptance among form 3 student. Based on the figure, the least are 37.5% which equivalent to 3 students that choose agree. Next, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

5.3.4 Form 4 Student Analysis

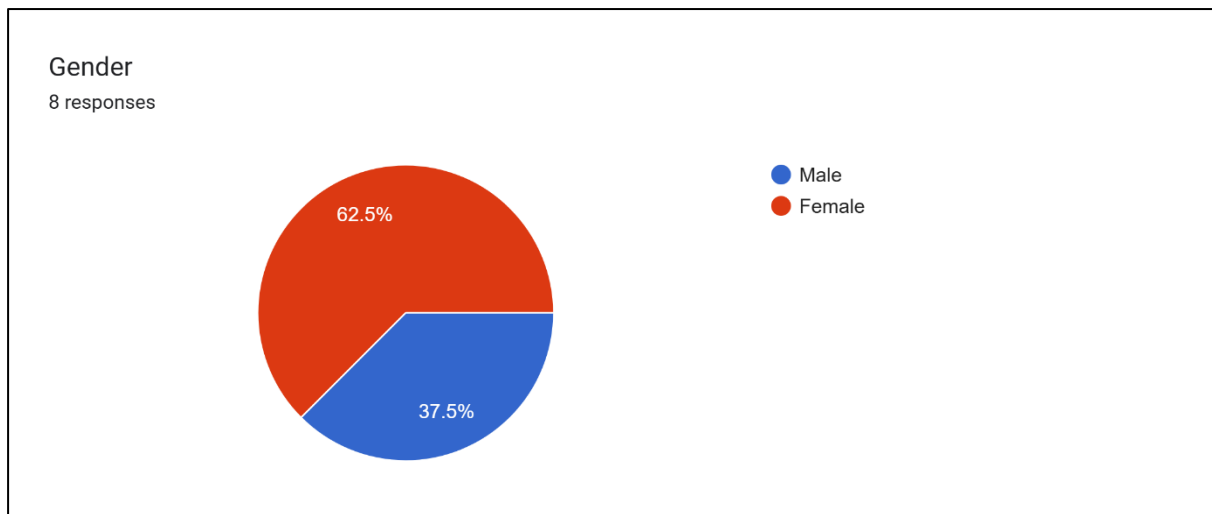


Figure 5.59 : The Gender For Form 4 Student

Figure 5.59 illustrates the gender of the respondents. Based on the figure, there were 37.5% of male students which is equivalent to 3 and 62.5% of female students which is equivalent of 5.

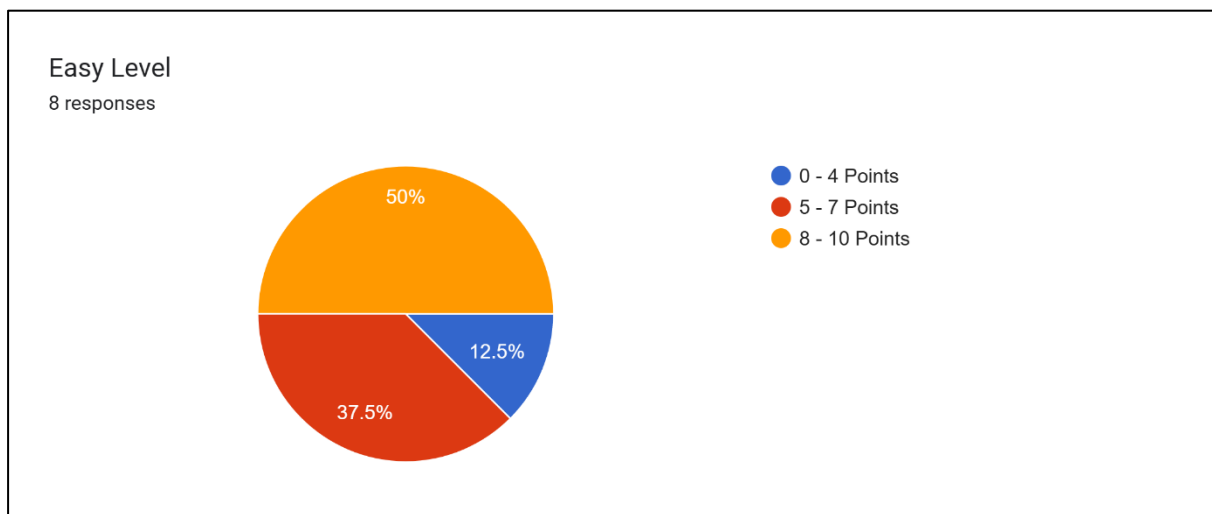


Figure 5.60 : The Easy Level For Form 4 Student

Figure 5.60 illustrates the points gained from the quiz with the easy level. Based on the figure, there are 12.5% which equivalent to 1 student that get (0 – 4 points). Next, there are 37.5% which is equivalent to 3 students that managed to get (5 – 7 points). Finally, there are 50% which equivalent to 4 student that get (8 – 10 points).

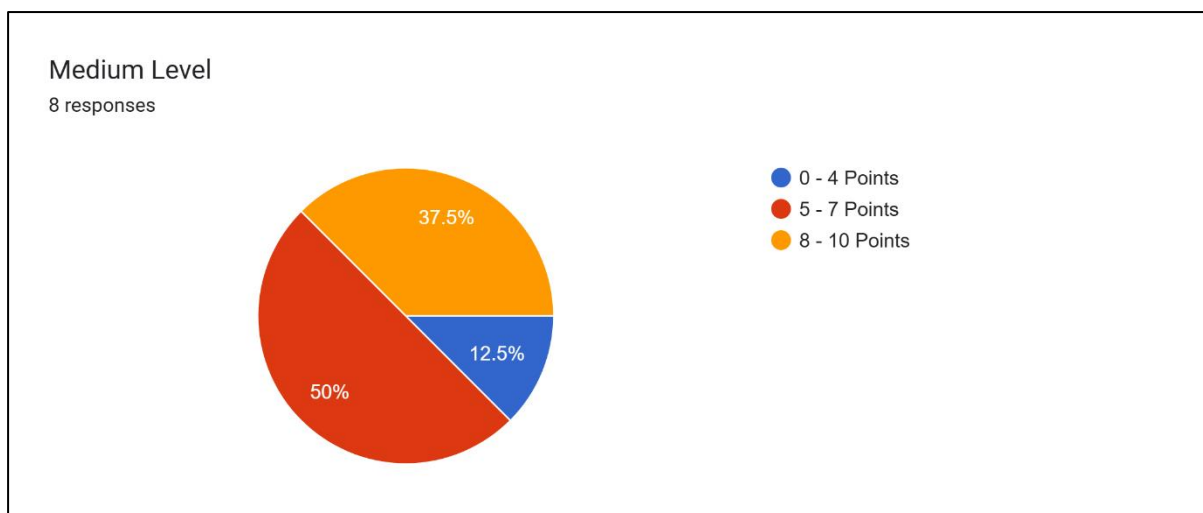


Figure 5.61 : The Medium Level For Form 4 Student

Figure 5.61 illustrates the points gained from the quiz with the medium level. Based on the figure, there are 12.5% which equivalent to 1 student that get (0 – 4 points). Next, there are 50% which is equivalent to 4 students that managed to get (5 – 7 points). Finally, there are 37.5% which equivalent to 3 student that get (8 – 10 points).

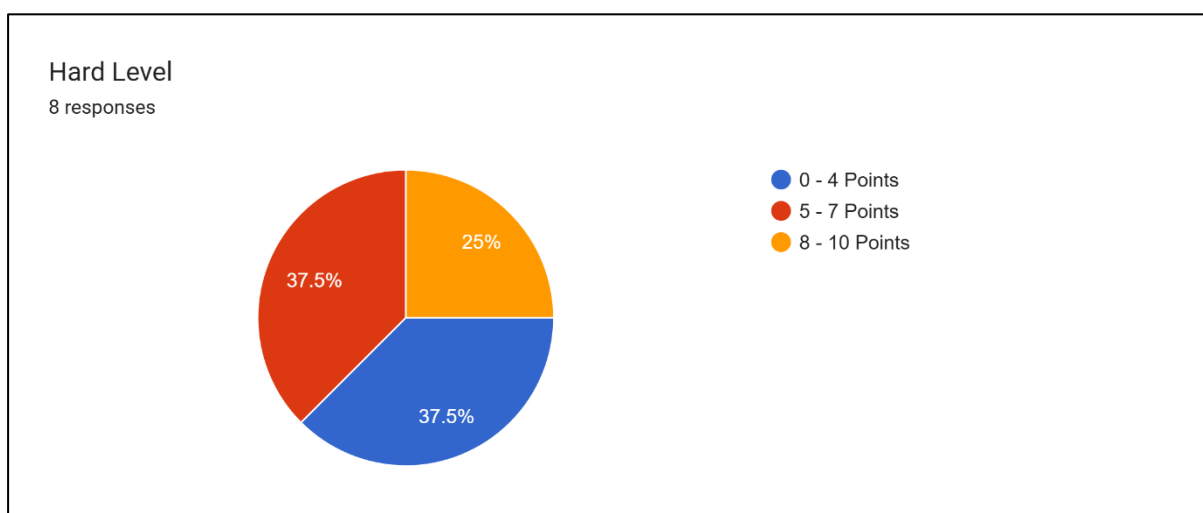


Figure 5.62 : The Hard Level For Form 4 Student

Figure 5.62 illustrates the points gained from the quiz with the medium level. Based on the figure, there are 37.5% which equivalent to 3 student that get (0 – 4 points). Next, there are 37.5% which is equivalent to 3 students that managed to get (5 – 7 points). Finally, there are 25% which equivalent to 2 student that get (8 – 10 points).

Table 5.10 presents a summary of the points earned by Form 4 students for each quiz level.

Table 5.10

Points Earned by Form 4 Students Across Quiz Levels

Performance	0-4 Points	5-7 Points	8-10 Points
Easy	1	3	4
Medium	1	4	3
Hard	3	3	2

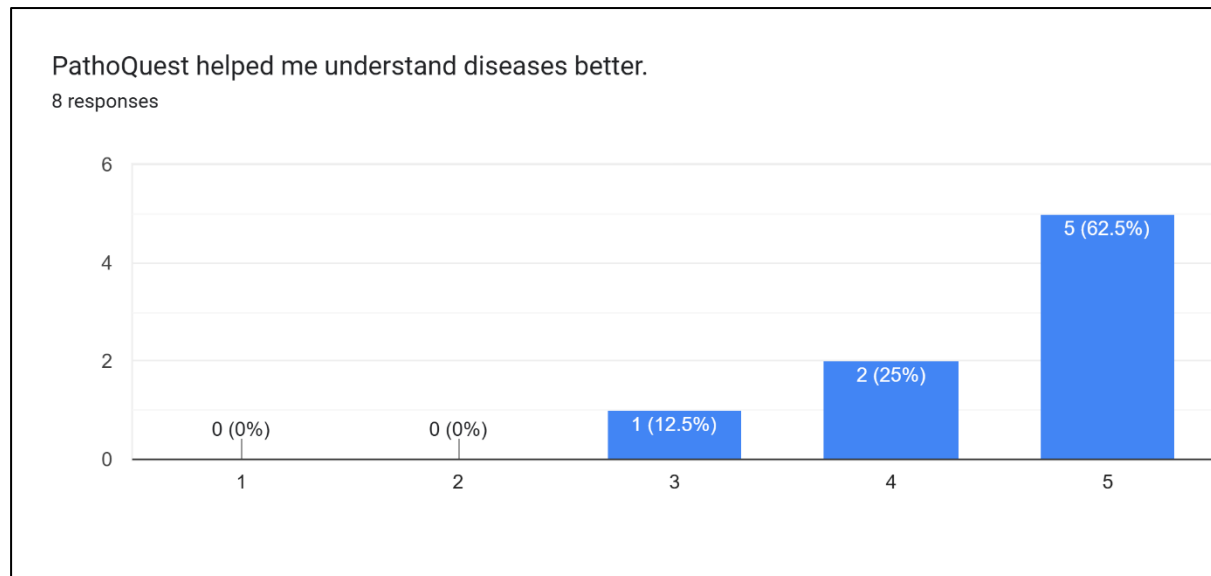


Figure 5.63 : Diseases Understanding Among Form 4 Student

Figure 5.63 illustrates the diseases understanding among form 4 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, there are 25% which equivalent to 2 students that choose agree. Finally, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

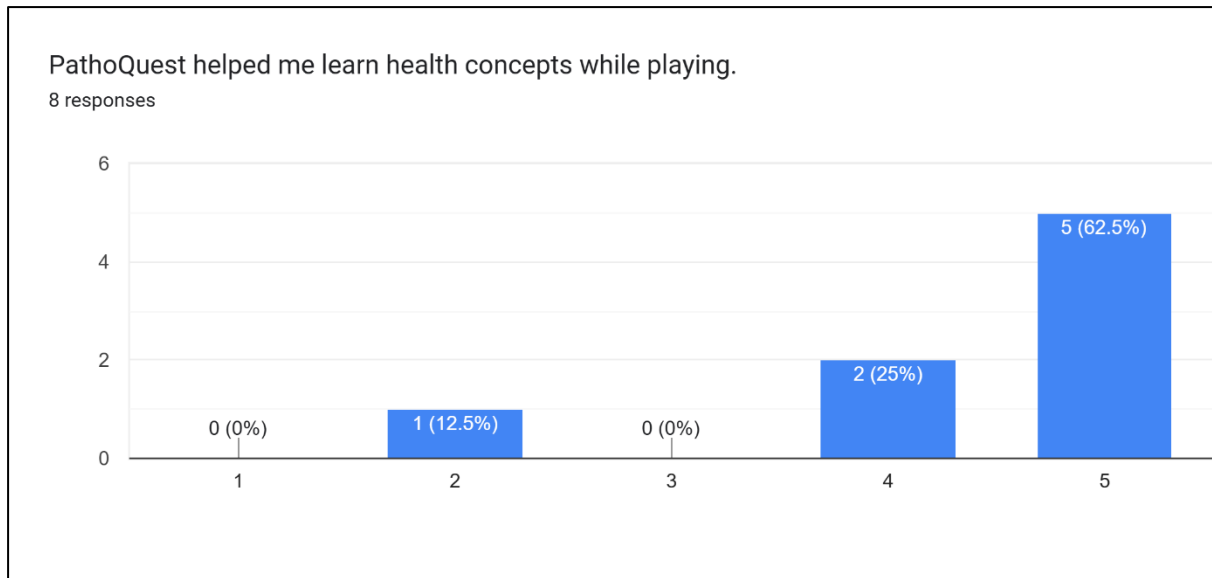


Figure 5.64 : Health Concept Understanding Among Form 4 Student

Figure 5.64 illustrates the health concept understanding among form 4 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose disagree. Next, there are 25% which equivalent to 2 students that choose agree. Finally, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

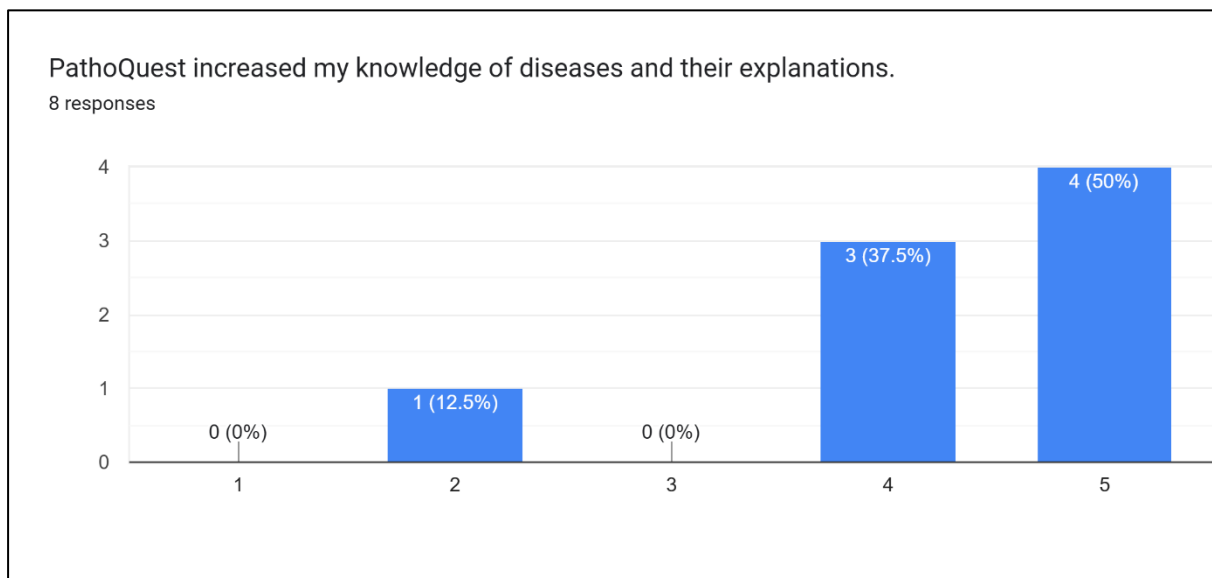


Figure 5.65 : Disease Knowledge Gaining Among Form 4 Student

Figure 5.65 illustrates the disease knowledge gaining among form 4 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose disagree. Next, there are 37.5% which equivalent to 3 students that choose agree. Finally, the majority are 50% which equivalent to 4 students that choose strongly agree.

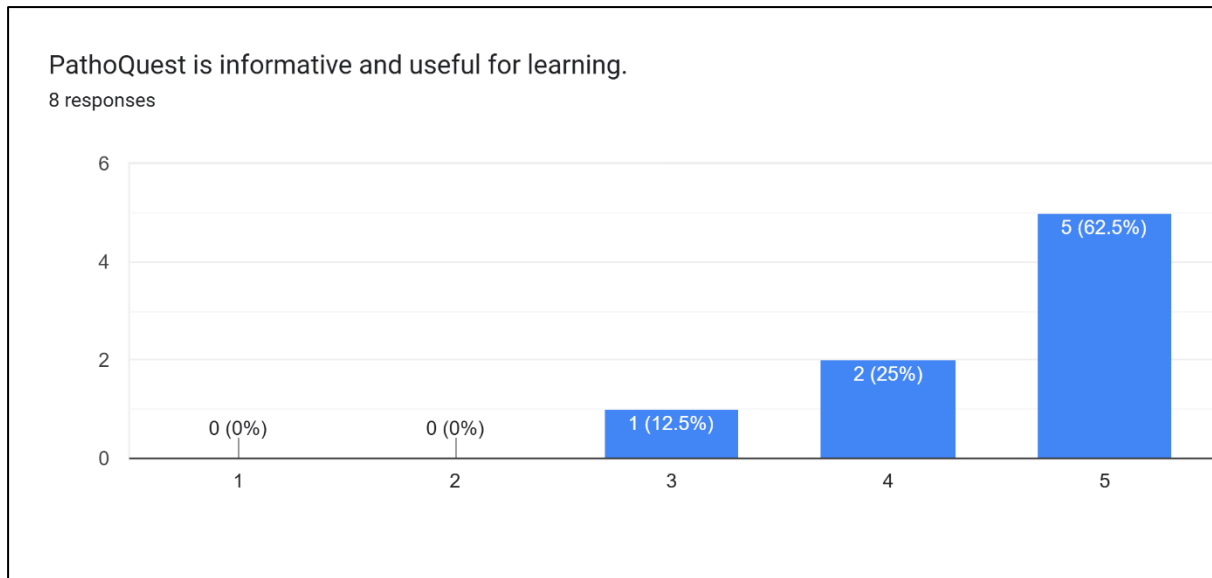


Figure 5.66 : Informative And Useful Acceptance Among Form 4 Student

Figure 5.66 illustrates the informative and useful acceptance among form 4 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, there are 25% which equivalent to 2 students that choose agree. Finally, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

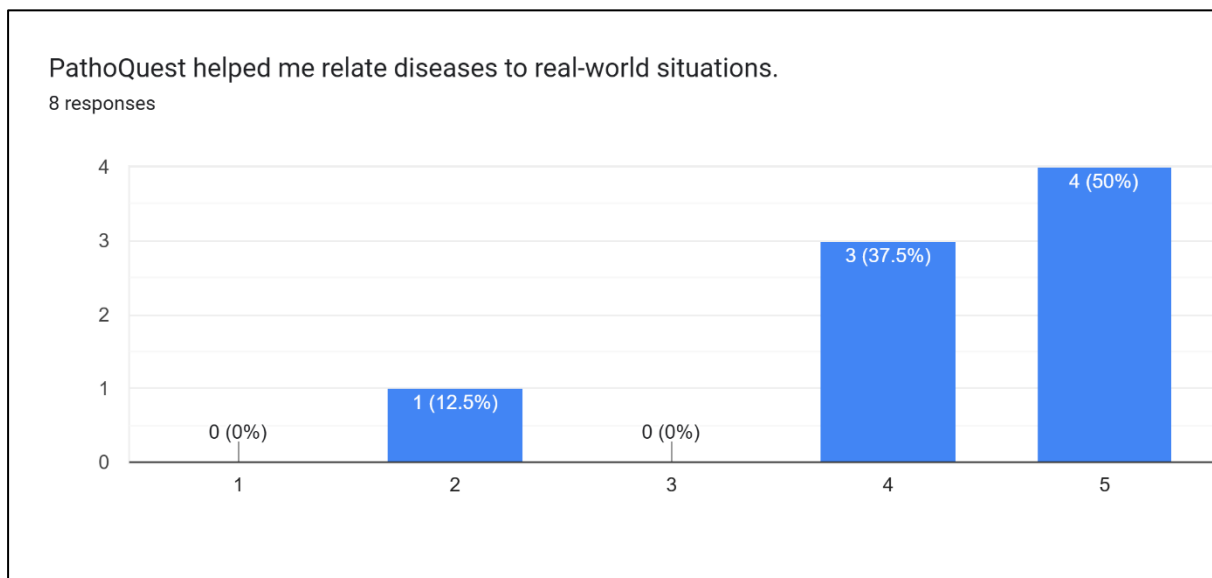


Figure 5.67 : Relation With Real-World Situations Among Form 4 Student

Figure 5.67 illustrates the relation with real-world situations among form 4 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose disagree. Next, there are 37.5% which equivalent to 3 students that choose agree. Finally, the majority are 50% which equivalent to 4 students that choose strongly agree.

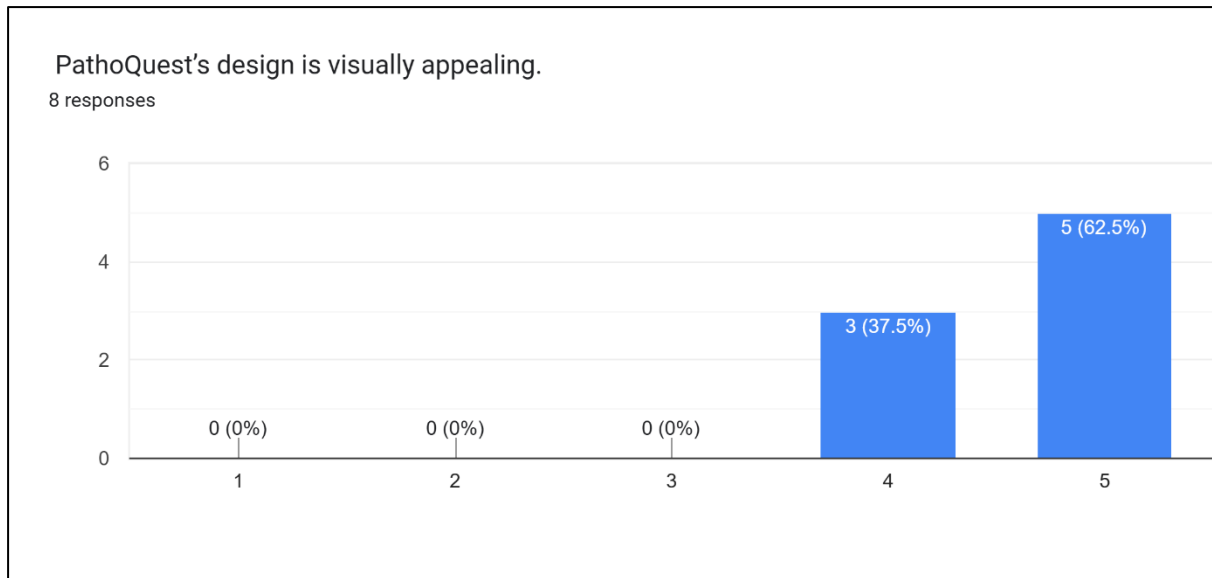


Figure 5.68 : Visual Acceptance Among Form 4 Student

Figure 5.68 illustrates the visual acceptance among form 4 student. Based on the figure, the least are 37.5% which equivalent to 3 students that choose agree. Next, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

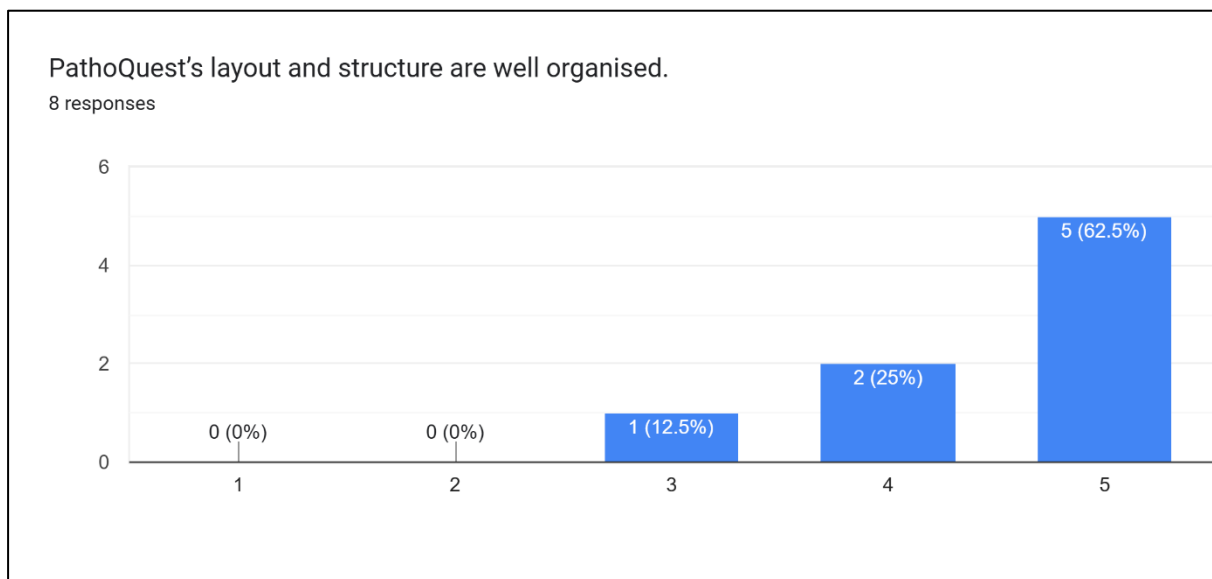


Figure 5.69 : Layout And Structure Acceptance Among Form 4 Student

Figure 5.69 illustrates the layout and structure acceptance among form 4 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose disagree. Next, there are 25% which equivalent to 2 students that choose agree. Finally, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

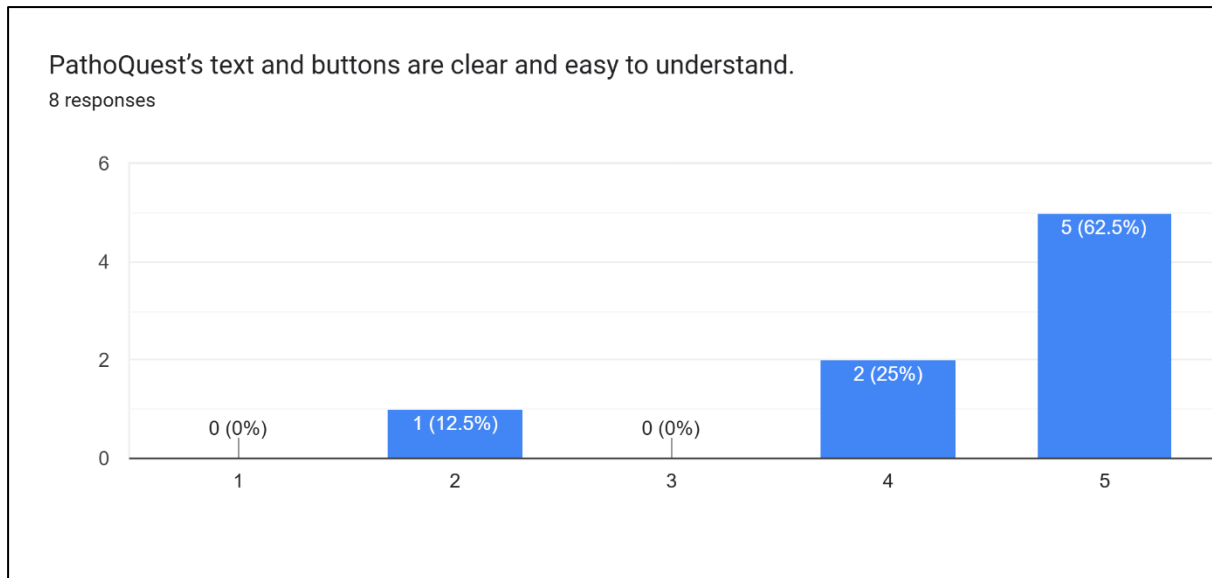


Figure 5.70 : Text And Button Acceptance Among Form 4 Student

Figure 5.70 illustrates the text and button acceptance among form 4 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose disagree. Next, there are 25% which equivalent to 2 students that choose agree. Finally, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

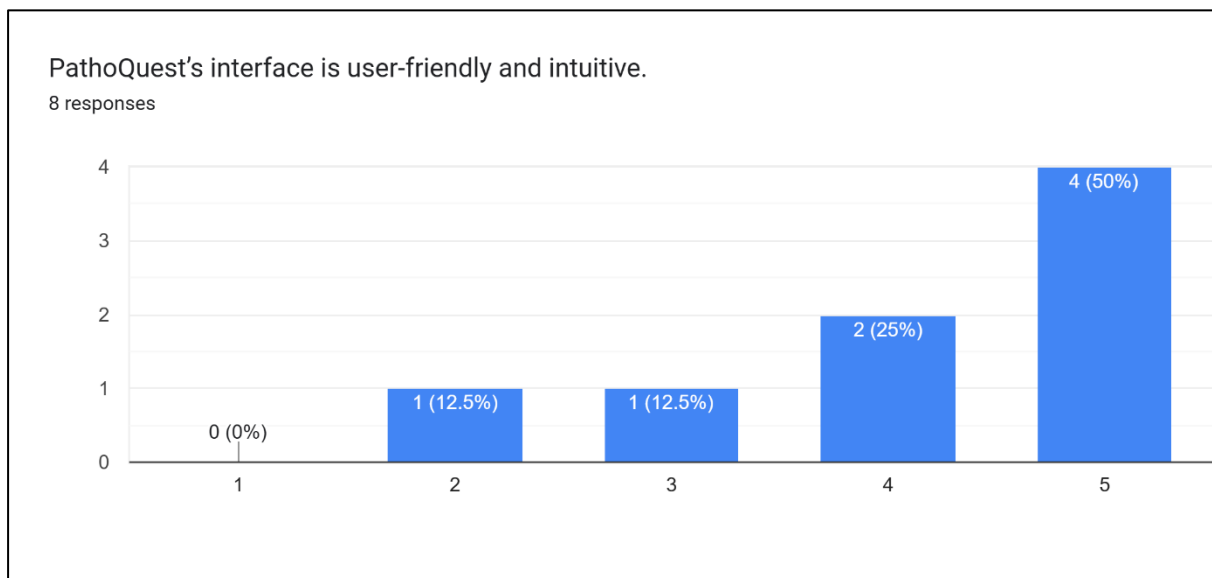


Figure 5.71 : Interface Among Form 4 Student

Figure 5.71 illustrates the interface acceptance among form 4 student. Based on the figure, there are 12.5% which equivalent to 1 student that choose disagree. Next, there are 12.5% which equivalent to 1 student that choose neutral. Both of it have the same least amount. After that, there are 25% which equivalent to 2 students that choose agree. Finally, the majority are 50% which equivalent to 4 students that choose strongly agree.

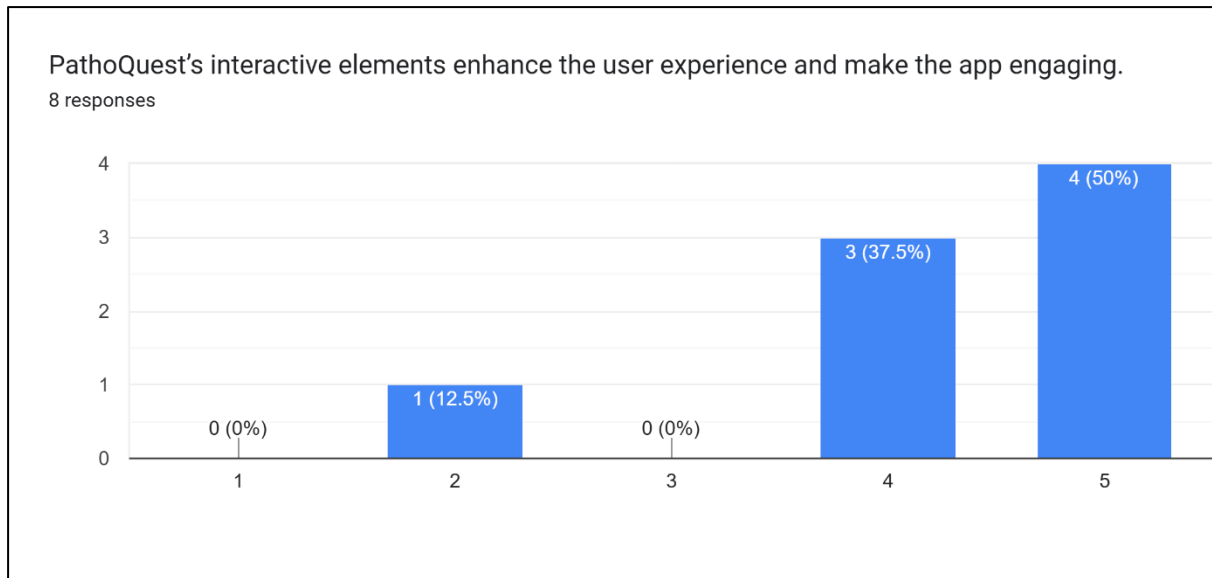


Figure 5.72 : Interactive Elements Acceptance Among Form 4 Student

Figure 5.72 illustrates the interactive elements acceptance among form 4 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose disagree. Next, there are 37.5% which equivalent to 3 students that choose agree. Finally, the majority are 50% which equivalent to 4 students that choose strongly agree.

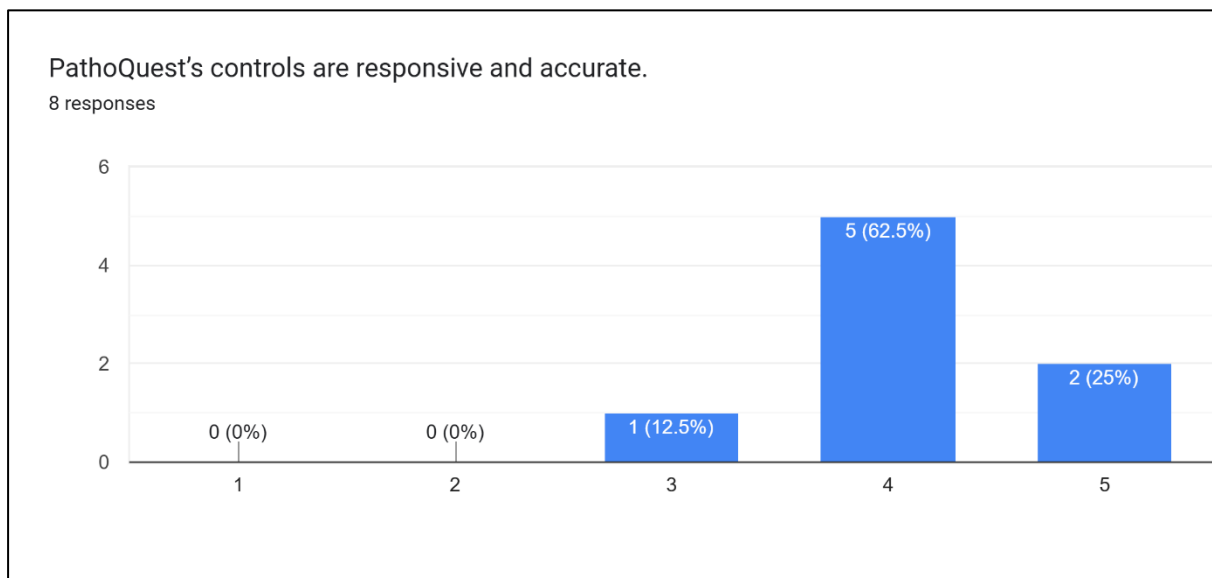


Figure 5.73 : Control Acceptance Among Form 4 Student

Figure 5.73 illustrates the control acceptance among form 4 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 62.5% which equivalent to 5 students that choose agree. Finally, there are 25% which equivalent to 2 students that choose strongly agree.

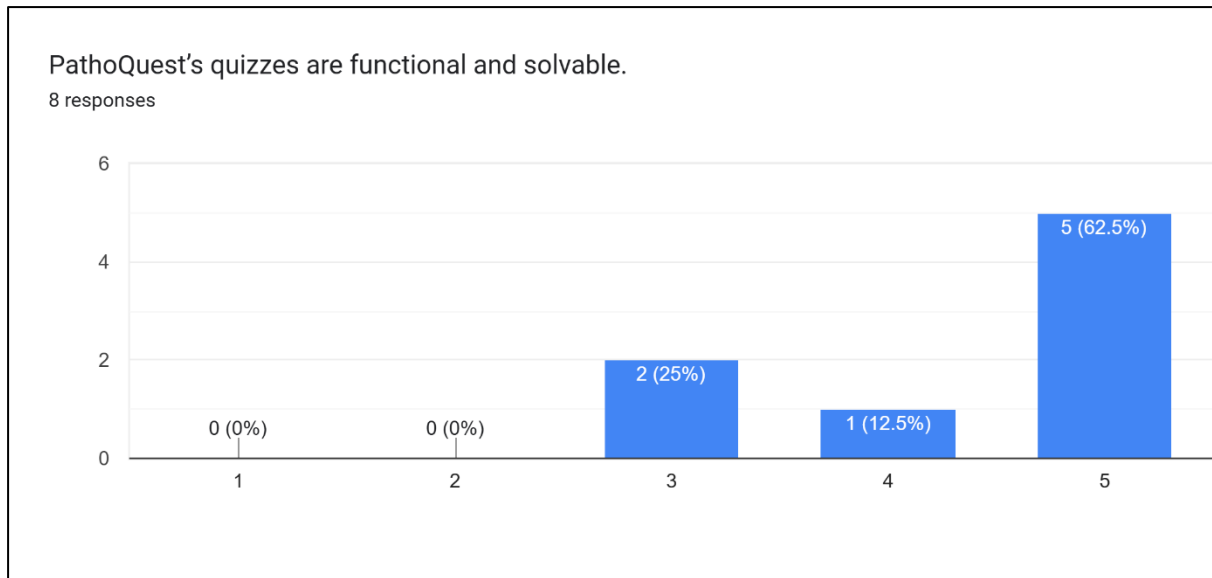


Figure 5.74 : Quiz Acceptance Among Form 4 Student

Figure 5.74 illustrates the quiz acceptance among form 4 student. Based on the figure, there are 25% which equivalent to 2 students that choose neutral. Next, the least are 12.5% which equivalent to 1 student that choose agree. Finally, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

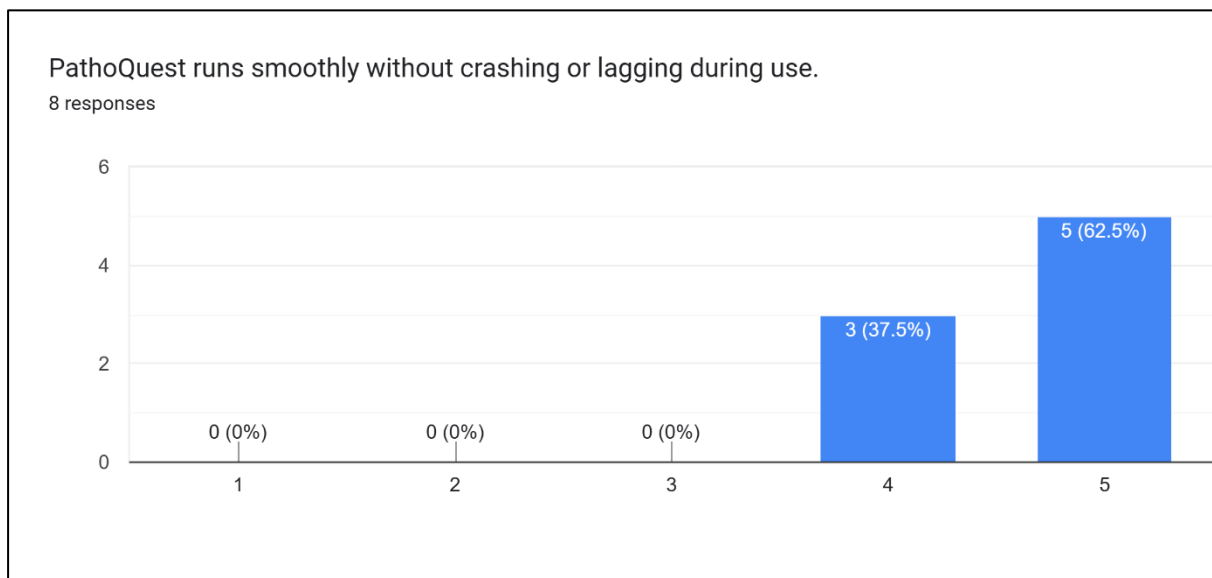


Figure 5.75 : Application Performance Among Form 4 Student

Figure 5.75 illustrates the application performance among form 4 student. Based on the figure, the least are 37.5% which equivalent to 3 students that choose agree. Next, the majority are 62.5% which equivalent to 5 students that choose strongly agree.

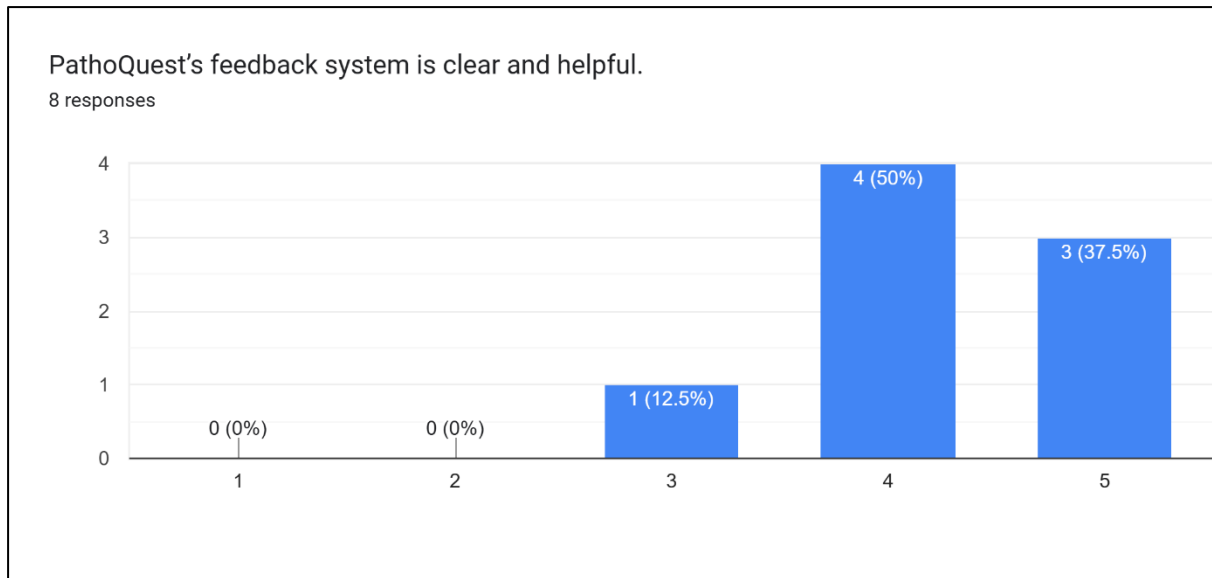


Figure 5.76 : Feedback System Acceptance Among Form 4 Student

Figure 5.76 illustrates the feedback system acceptance among form 4 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

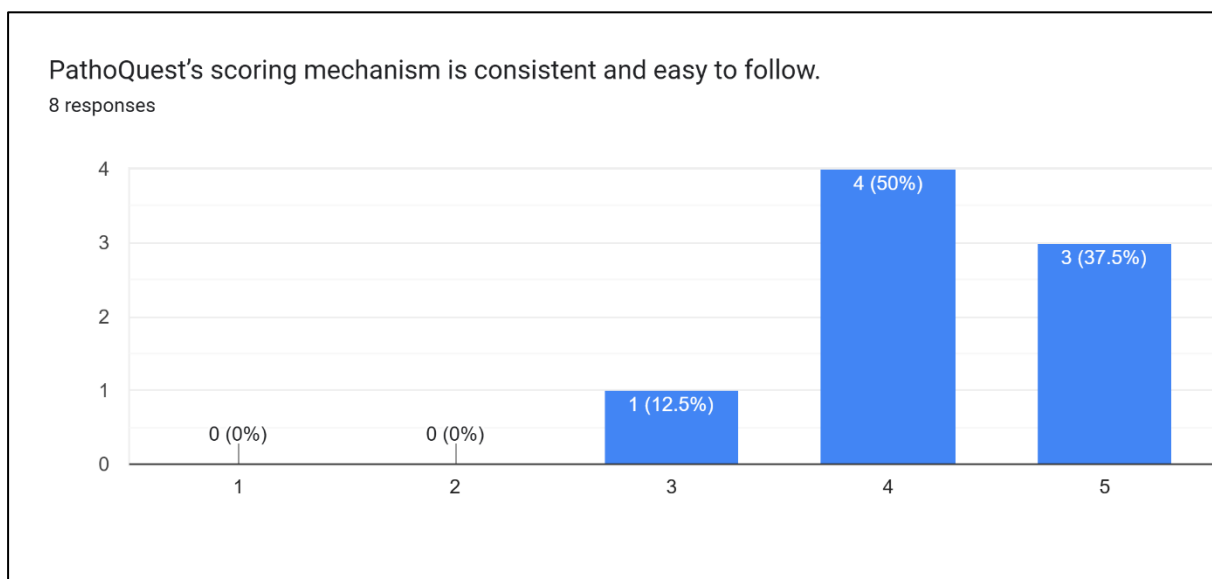


Figure 5.77 : Scoring Mechanism Acceptance Among Form 4 Student

Figure 5.77 illustrates the scoring mechanism acceptance among form 4 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 50% which equivalent to 4 students that choose agree. Finally, there are 37.5% which equivalent to 3 students that choose strongly agree.

5.3.5 Form 5 Student Analysis

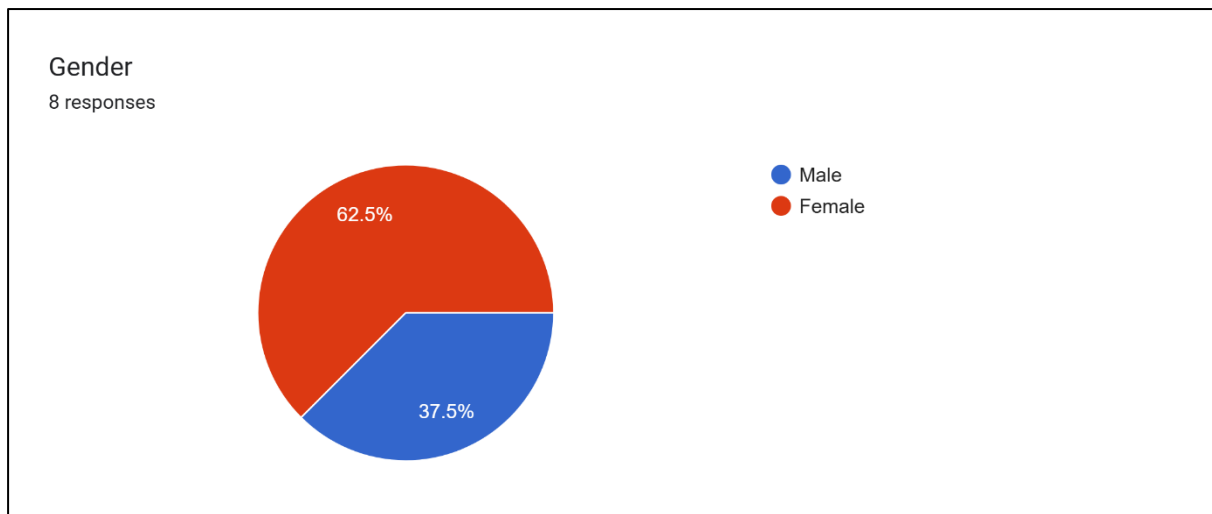


Figure 5.78 : The Gender For Form 5 Student

Figure 5.78 illustrates the gender of the respondents. Based on the figure, there were 37.5% of male students which is equivalent to 3 and 62.5% of female students which is equivalent of 5.

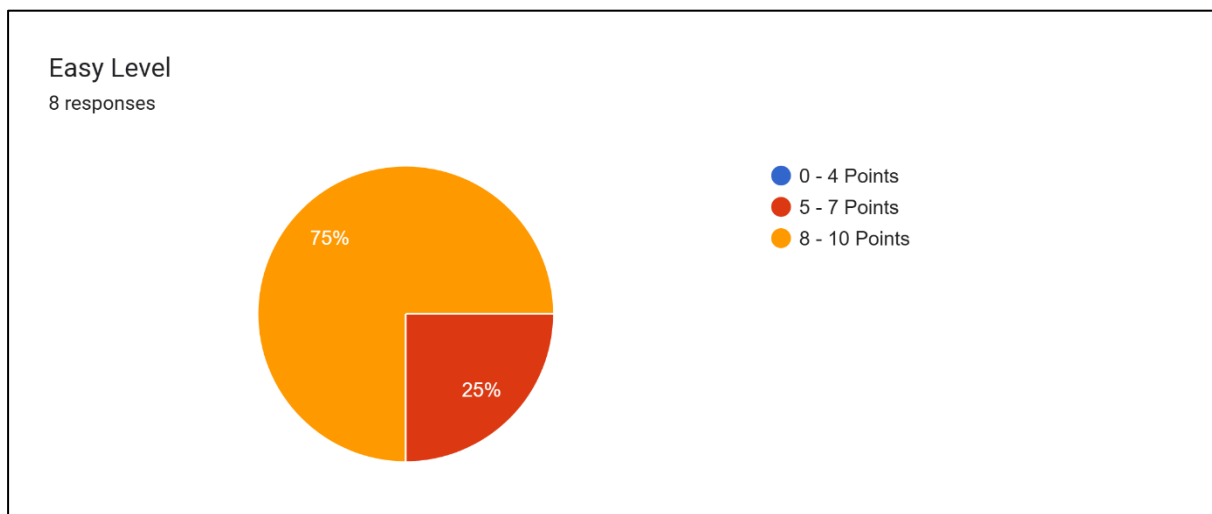


Figure 5.79 : The Easy Level For Form 5 Student

Figure 5.79 illustrates the points gained from the quiz with the easy level. Based on the figure, there are 0% which equivalent to 0 student that get (0 – 4 points). Next, there are 25% which is equivalent to 2 students that managed to get (5 – 7 points). Finally, there are 75% which equivalent to 6 student that get (8 – 10 points).

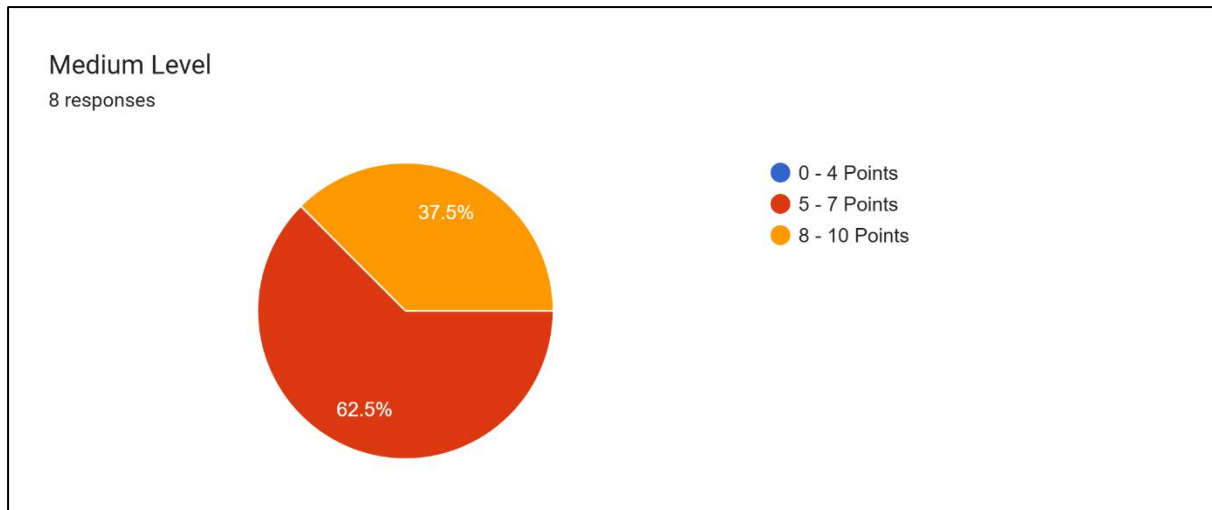


Figure 5.80 : The Medium Level For Form 5 Student

Figure 5.80 illustrates the points gained from the quiz with the medium level. Based on the figure, there are 0% which equivalent to 0 student that get (0 – 4 points). Next, there are 62.5% which is equivalent to 5 students that managed to get (5 – 7 points). Finally, there are 37.5% which equivalent to 3 student that get (8 – 10 points).

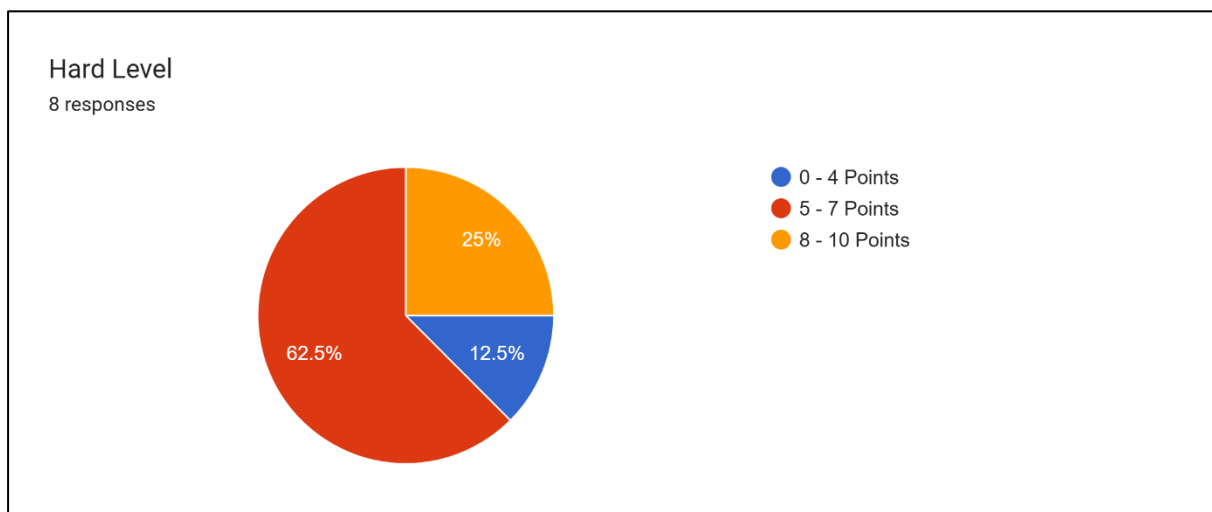


Figure 5.81 : The Hard Level For Form 5 Student

Figure 5.81 illustrates the points gained from the quiz with the hard level. Based on the figure, there are 12.5% which equivalent to 1 student that get (0 – 4 points). Next, there are 62.5% which is equivalent to 5 students that managed to get (5 – 7 points). Finally, there are 25% which equivalent to 2 students that get (8 – 10 points).

Table 5.11 presents a summary of the points earned by Form 5 students for each quiz level.

Table 5.11

Points Earned by Form 5 Students Across Quiz Levels

Performance	0-4 Points	5-7 Points	8-10 Points
Easy	0	2	6
Medium	0	5	3
Hard	1	5	2

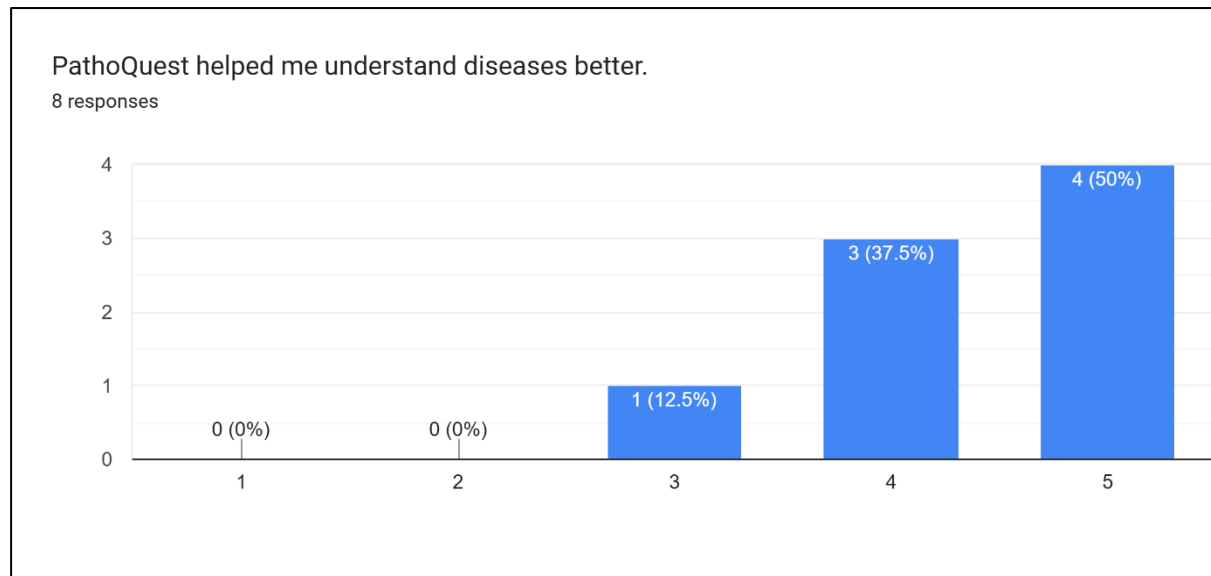


Figure 5.82 : Diseases Understanding Among Form 5 Student

Figure 5.82 illustrates the diseases understanding among form 5 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, there are 37.5% which equivalent to 3 students that choose agree. Finally, the majority are 50% which equivalent to 4 students that choose strongly agree.

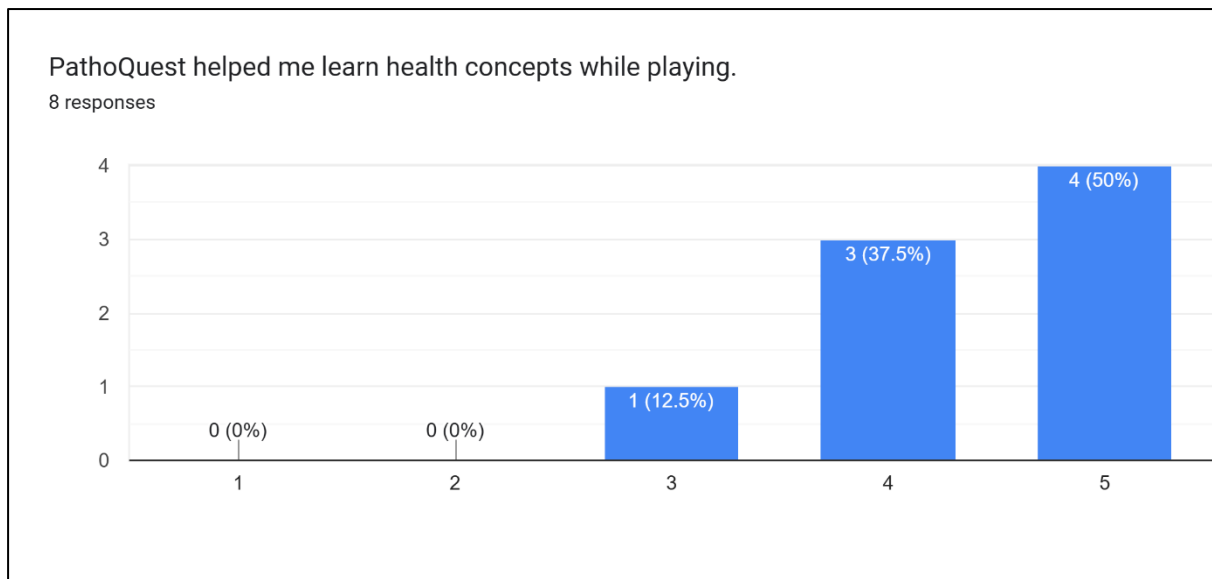


Figure 5.83 : Health Concept Understanding Among Form 5 Student

Figure 5.83 illustrates the health concept understanding among form 5 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, there are 37.5% which equivalent to 3 students that choose agree. Finally, the majority are 50% which equivalent to 4 students that choose strongly agree.

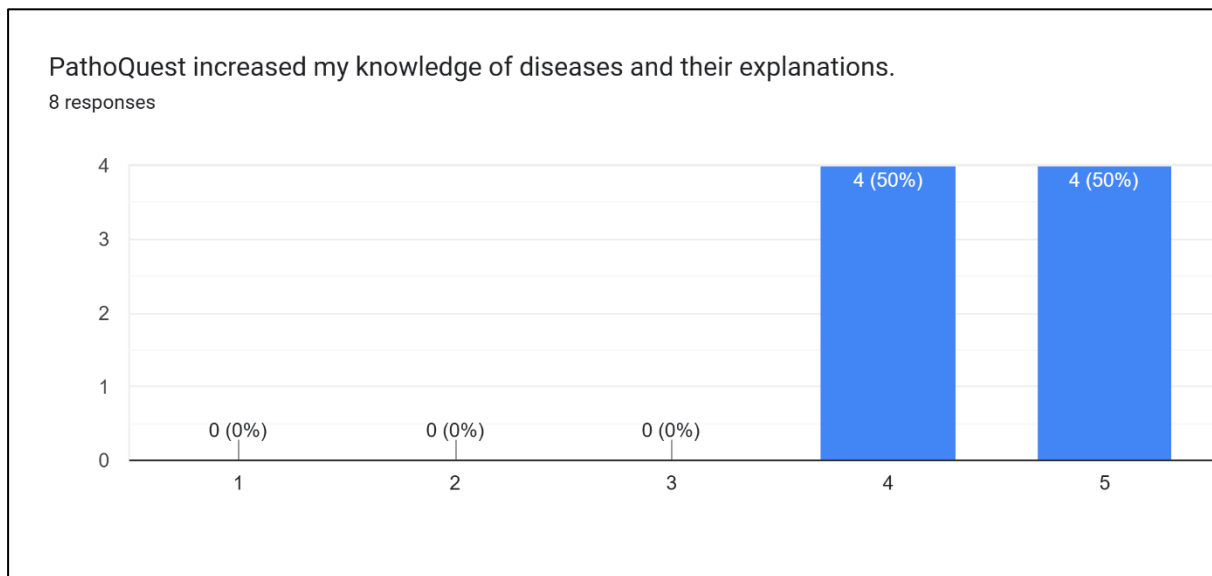


Figure 5.84 : Disease Knowledge Gaining Among Form 5 Student

Figure 5.84 illustrates the disease knowledge gaining among form 5 student. Based on the figure, there are 50% which equivalent to 4 students that choose agree. Next, there are 50% which equivalent to 4 students that choose strongly agree. Both have the same amount number of majority.

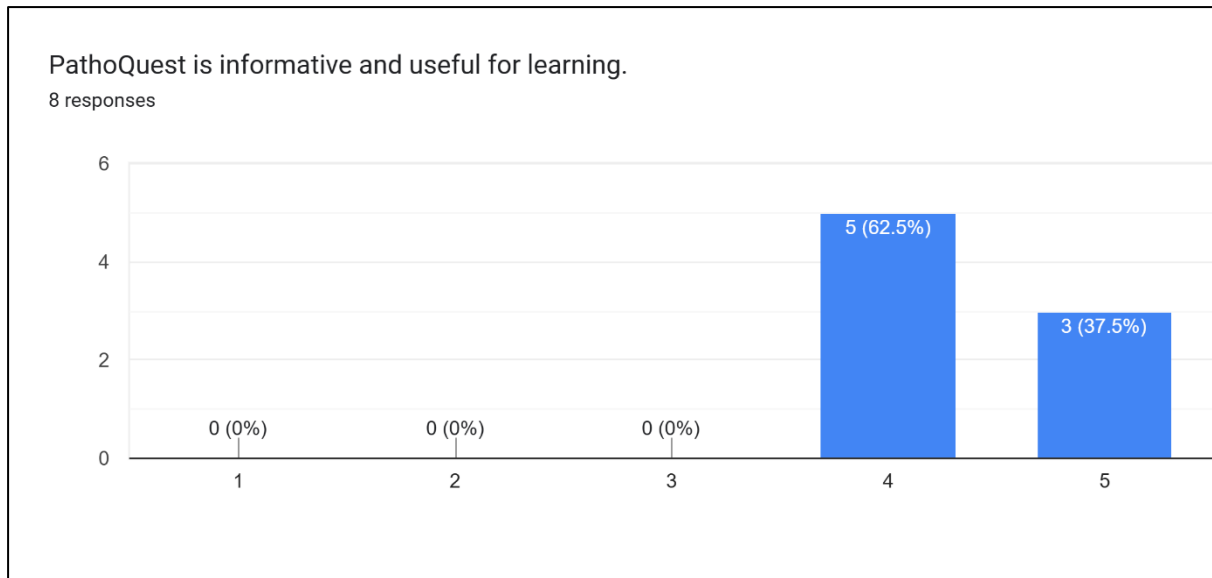


Figure 5.85 : Informative And Useful Acceptance Among Form 5 Student

Figure 5.85 illustrates the informative and useful acceptance among form 5 student. Based on the figure, the majority are 62.5% which equivalent to 5 students that choose agree. Next, the least are 37.5% which equivalent to 3 students that choose strongly agree.

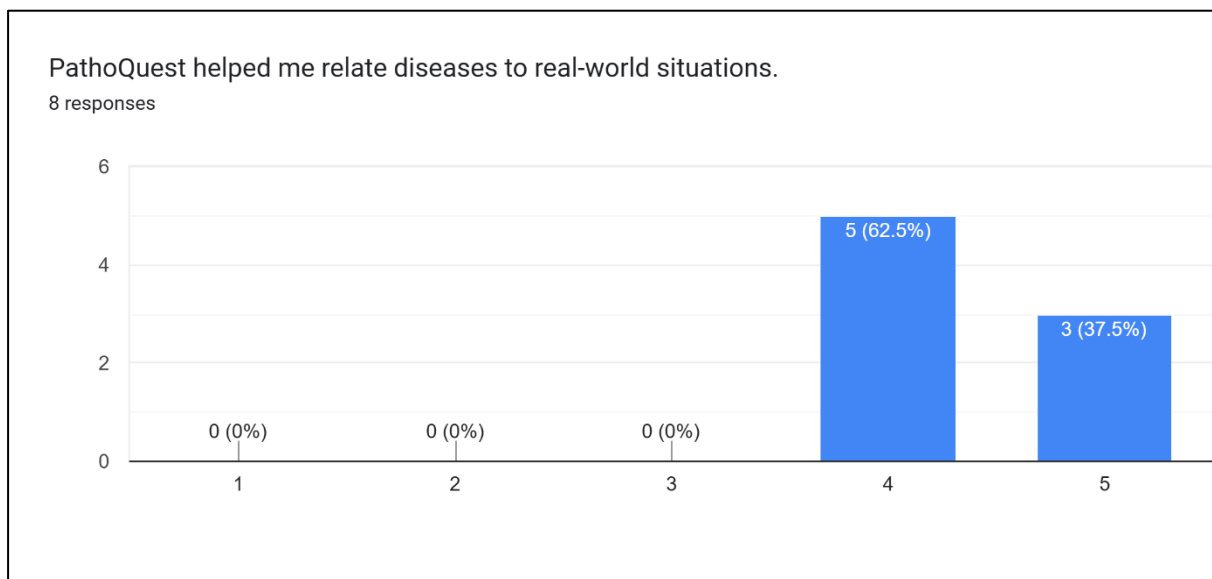


Figure 5.86 : Relation With Real-World Situations Among Form 5 Student

Figure 5.86 illustrates the relation with real-world situations among form 5 student. Based on the figure, the majority are 62.5% which equivalent to 5 students that choose agree. Next, the least are 37.5% which equivalent to 3 students that choose strongly agree.

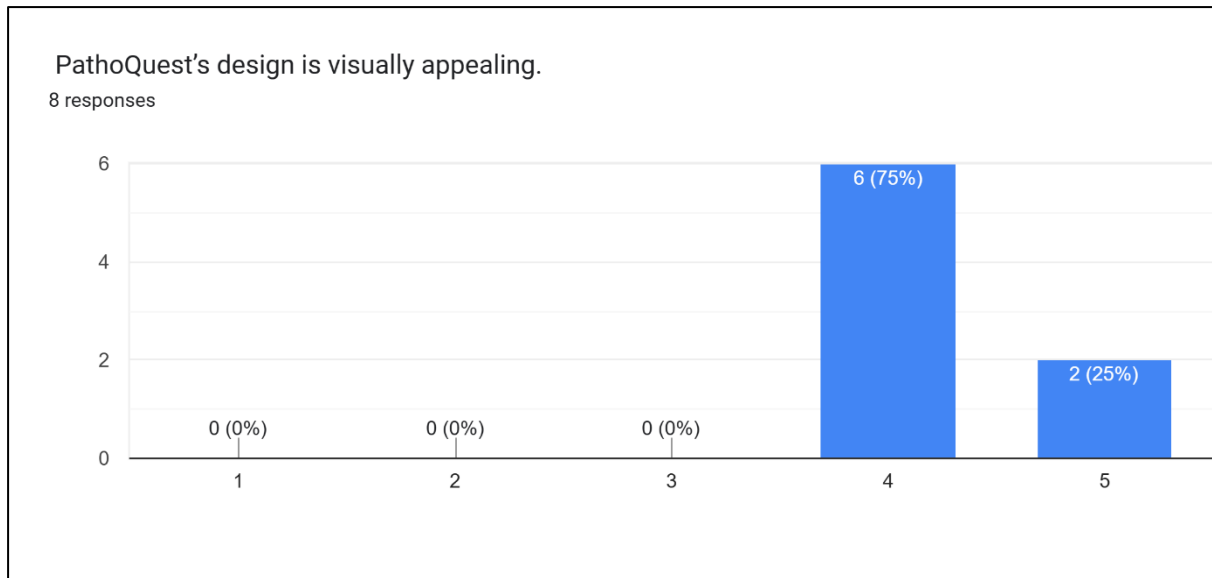


Figure 5.87 : Visual Acceptance Among Form 5 Student

Figure 5.87 illustrates the visual acceptance among form 5 student. Based on the figure, the majority are 75% which equivalent to 6 students that choose agree. Next, the least are 25% which equivalent to 2 students that choose strongly agree.

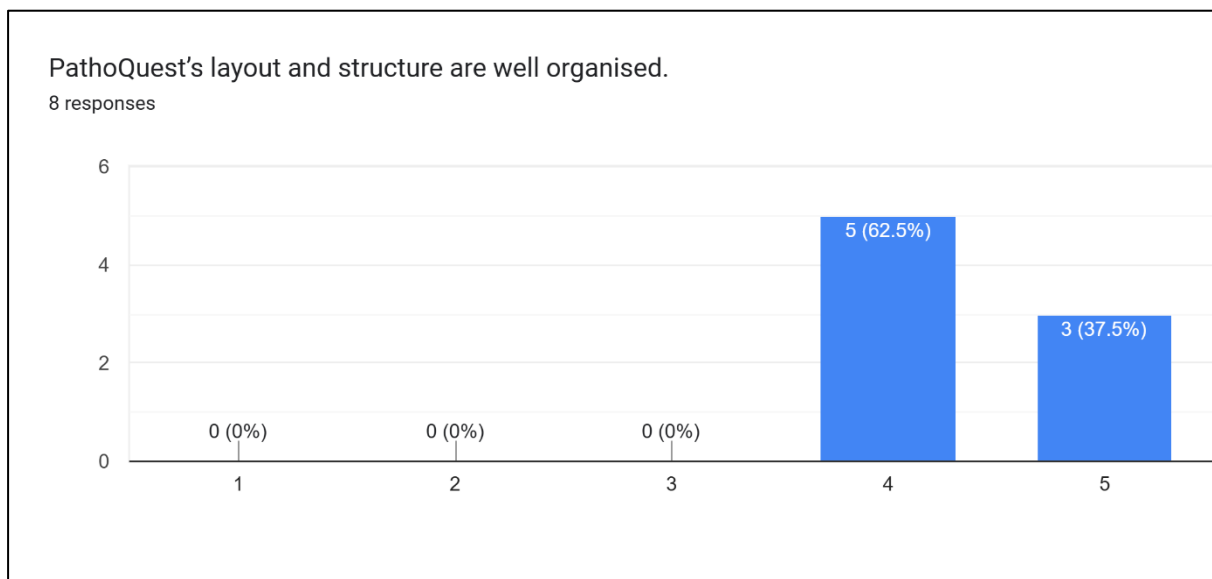


Figure 5.88 : Layout And Structure Acceptance Among Form 5 Student

Figure 5.88 illustrates the layout and structure acceptance among form 5 student. Figure 5.68 illustrates the visual acceptance among form 4 student. Based on the figure, the majority are 62.5% which equivalent to 5 students that choose agree. Next, the least are 37.5% which equivalent to 3 students that choose strongly agree.

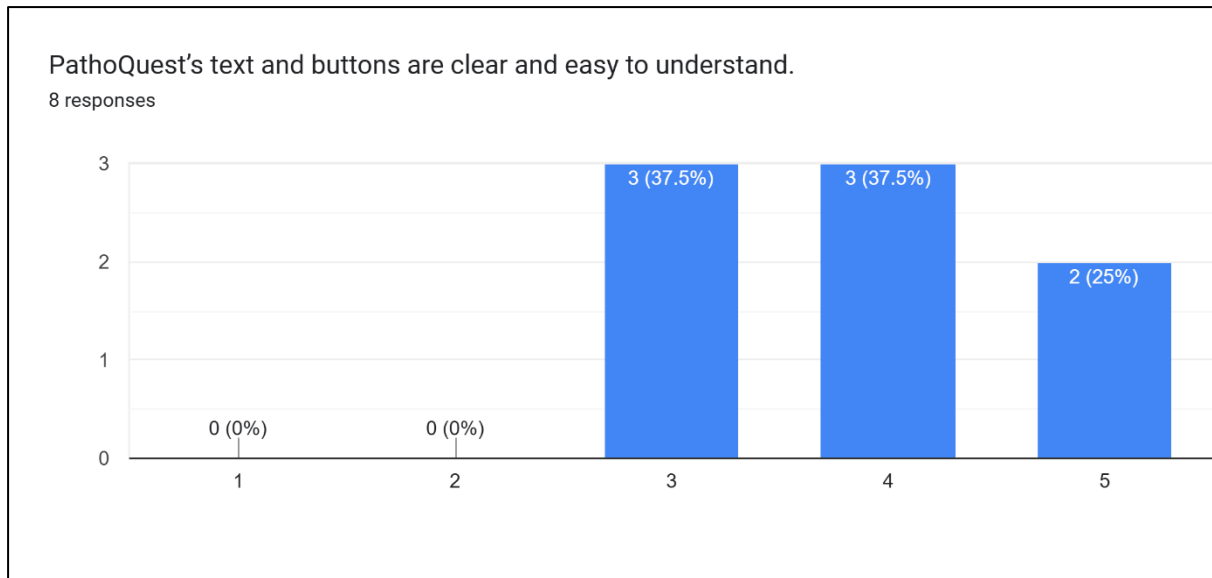


Figure 5.89 : Text And Button Acceptance Among Form 5 Student

Figure 5.89 illustrates the text and button acceptance among form 5 student. Based on the figure, there are 37.5% which equivalent to 3 students that choose neutral. Next, there are 37.5% which equivalent to 3 students that choose agree. Both have the same amount number of majority. Finally, the least are 25% which equivalent to 2 students that choose strongly agree.

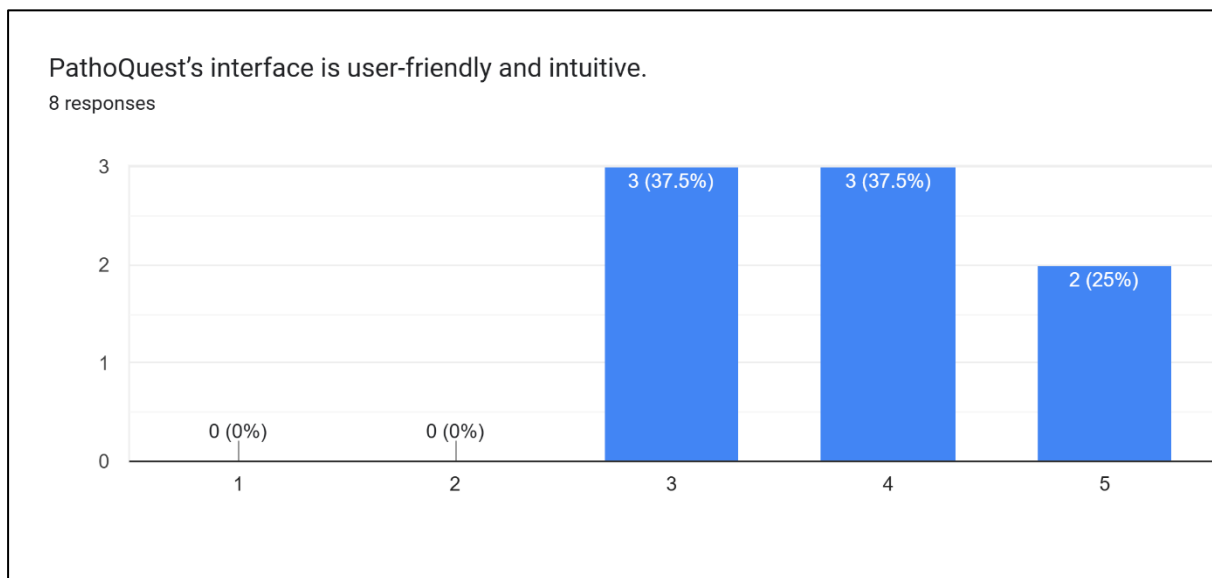


Figure 5.90 : Interface Among Form 5 Student

Figure 5.90 illustrates the interface acceptance among form 5 student. Based on the figure, there are 37.5% which equivalent to 3 students that choose neutral. Next, there are 37.5% which equivalent to 3 students that choose agree. Both have the same amount number of majority. Finally, the least are 25% which equivalent to 2 students that choose strongly agree.

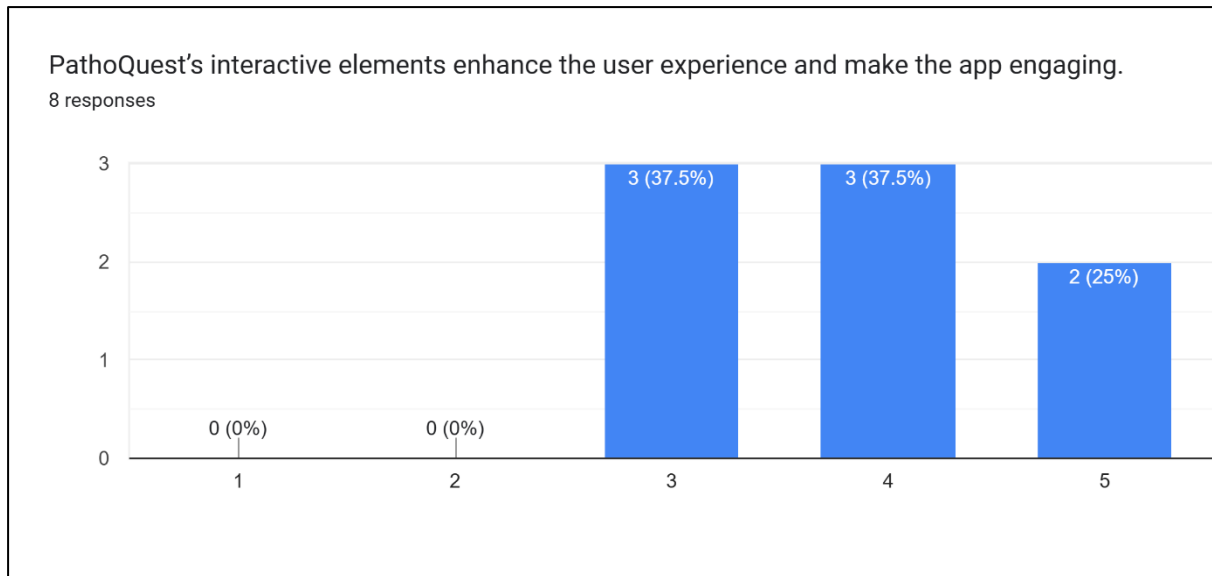


Figure 5.91 : Interactive Elements Acceptance Among Form 5 Student

Figure 5.91 illustrates the interactive elements acceptance among form 1 student. Based on the figure, there are 37.5% which equivalent to 3 students that choose neutral. Next, there are 37.5% which equivalent to 3 students that choose agree. Both have the same amount number of majority. Finally, the least are 25% which equivalent to 2 students that choose strongly agree.

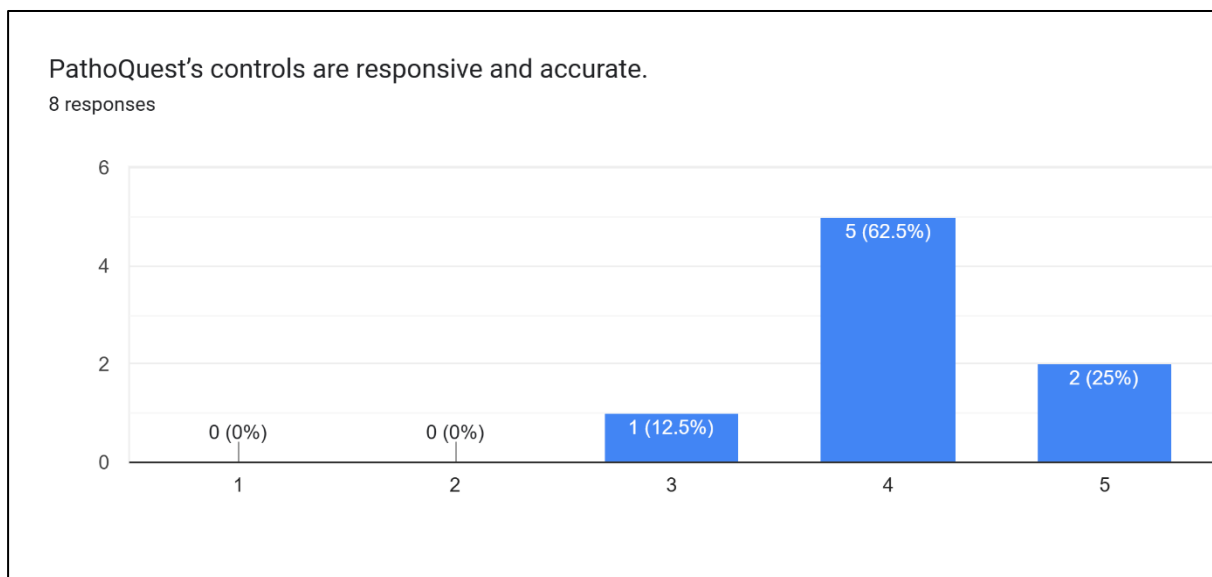


Figure 5.92 : Control Acceptance Among Form 5 Student

Figure 5.92 illustrates the control acceptance among form 5 student. Based on the figure, the least are 12.5% which equivalent to 1 student that choose neutral. Next, the majority are 62.5% which equivalent to 5 students that choose agree. Finally, there are 25% which equivalent to 2 students that choose strongly agree.

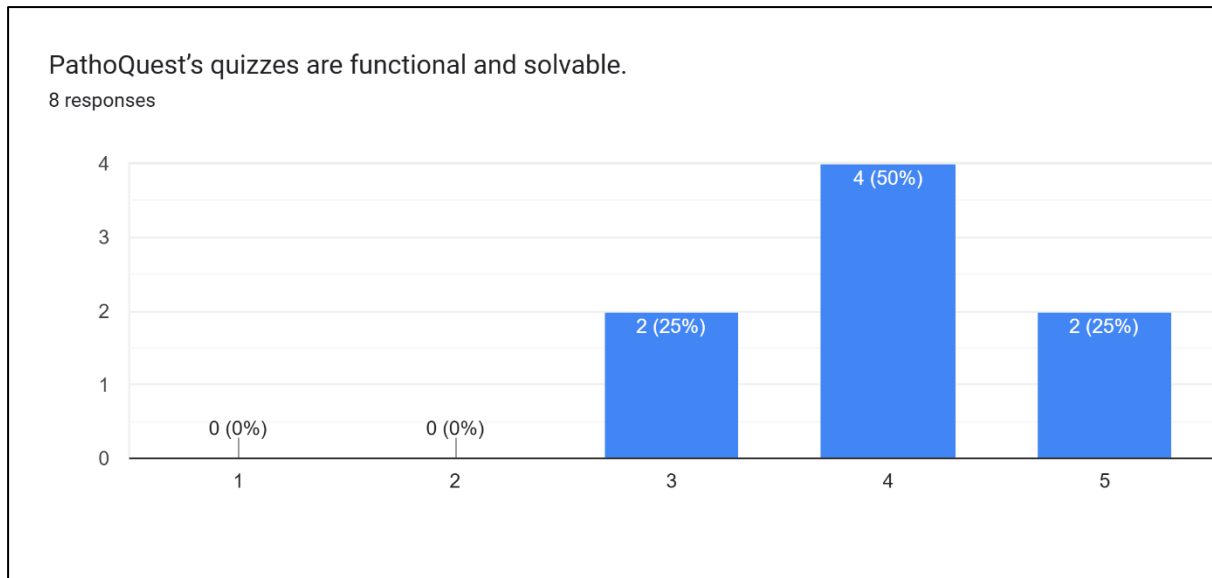


Figure 5.93 : Quiz Acceptance Among Form 5 Student

Figure 5.93 illustrates the quiz acceptance among form 5 student. Based on the figure, the least are 25% which equivalent to 2 students that choose neutral. Next, the least are 25% which equivalent to 2 students that choose strongly agree. Both have the same amount number of least. Finally, the majority are 50% which equivalent to 4 students that choose agree.

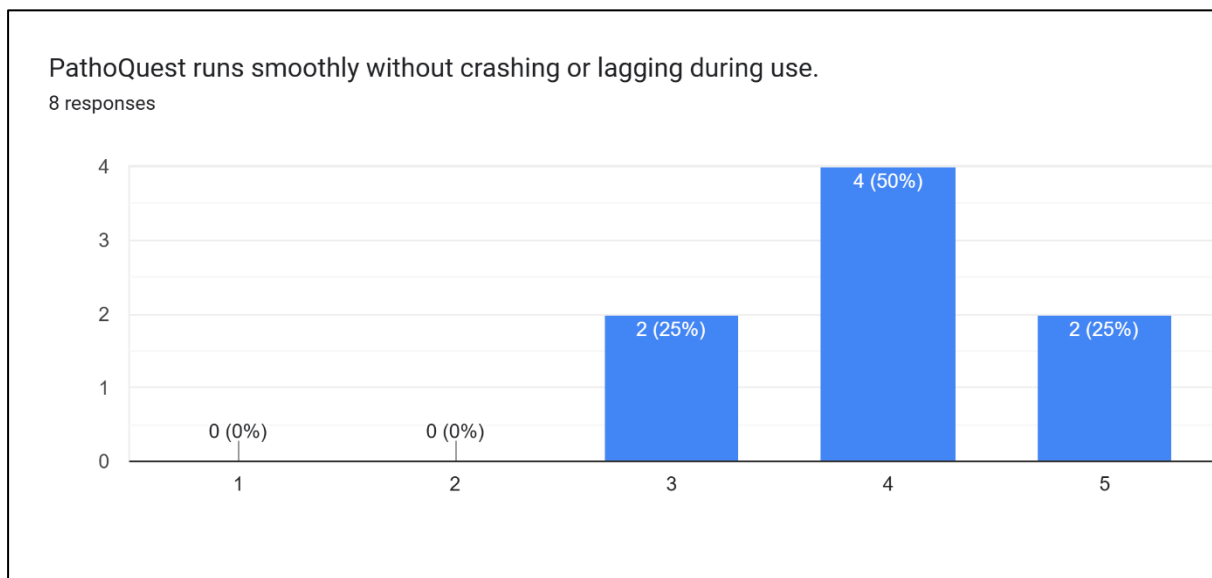


Figure 5.94 : Application Performance Among Form 5 Student

Figure 5.94 illustrates the application performance among form 5 student. Based on the figure, the least are 25% which equivalent to 2 students that choose neutral. Next, the least are 25% which equivalent to 2 students that choose strongly agree. Both have the same amount number of least. Finally, the majority are 50% which equivalent to 4 students that choose agree.

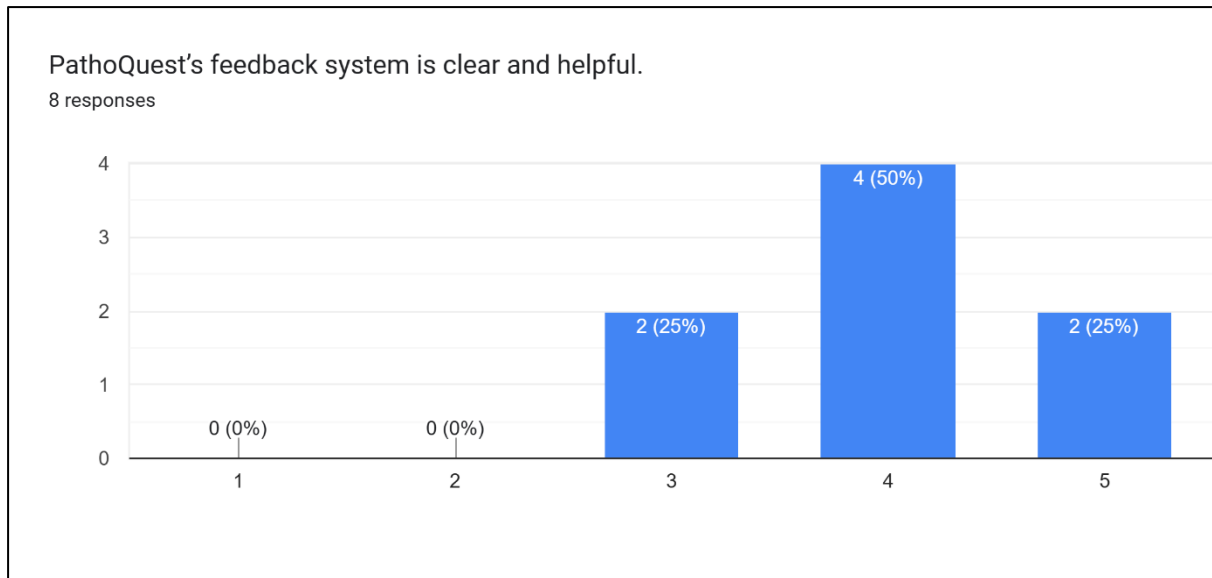


Figure 5.95 : Feedback System Acceptance Among Form 5 Student

Figure 5.95 illustrates the feedback system acceptance among form 5 student. Based on the figure, the least are 25% which equivalent to 2 students that choose neutral. Next, the least are 25% which equivalent to 2 students that choose strongly agree. Both have the same amount number of least. Finally, the majority are 50% which equivalent to 4 students that choose agree.

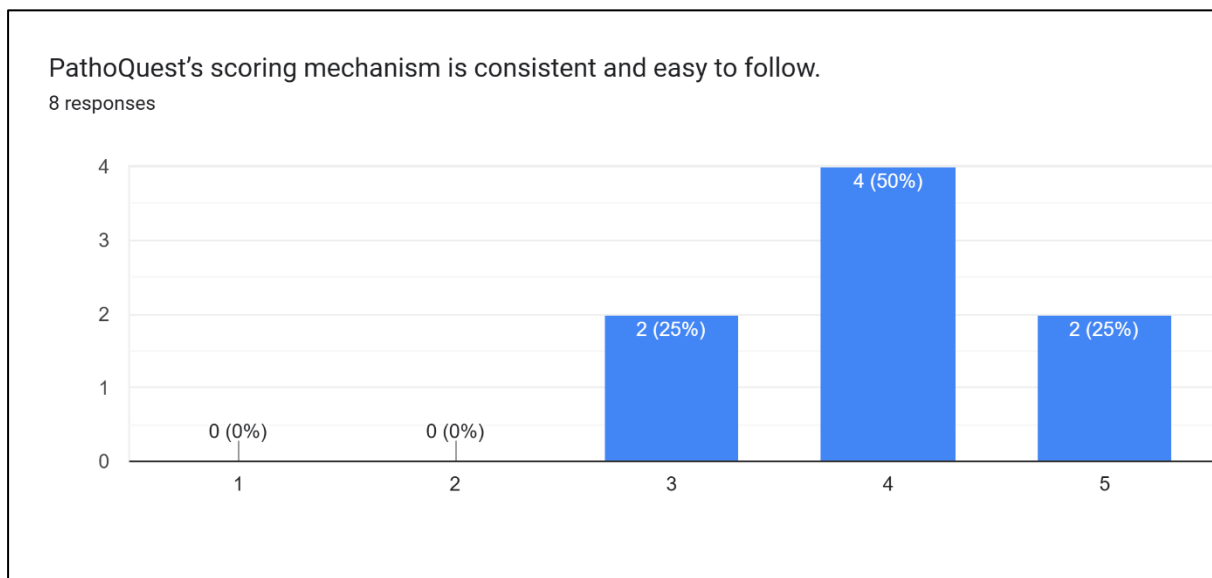


Figure 5.96 : Scoring Mechanism Acceptance Among Form 5 Student

Figure 5.96 illustrates the scoring mechanism acceptance among form 5 student. Based on the figure, the least are 25% which equivalent to 2 students that choose neutral. Next, the least are 25% which equivalent to 2 students that choose strongly agree. Both have the same amount number of least. Finally, the majority are 50% which equivalent to 4 students that choose agree.

5.4 Conclusion

The testing phase of the PathoQuest app concluded by emphasizing the dual importance of verification and validation to ensure the application's functionality and user satisfaction. Functional testing verified that features like quiz mechanics and score tracking operated as intended, confirming the app met its original specifications. Concurrently, user testing was crucial for validating that the app aligned with user needs and expectations, providing feedback to identify and resolve issues related to usability, engagement, and overall functionality. This comprehensive testing approach guarantees that PathoQuest is both technically robust and user-friendly, setting it up for successful deployment and future enhancements.

CHAPTER 6 : CONCLUSION

6.1 Introduction

In this chapter, it discusses on the achievements based on the objectives that has been have been presented in the development of the PathoQuest system. It will also be focusing on the discussion of possibility of the future work for the PathoQuest system.

6.2 Achievements

Table 6.1

Objectives And Achievements Of The System

Objectives	Achievement
To develop an innovative mobile application aimed at enhancing public awareness and understanding of various diseases through educational content	• The user able to access to the quiz section to test their understanding about diseases and health education • The user able to access to the notes section to gain knowledge which offers a wide range of disease information
To design an engaging mobile app featuring a quiz game with multiple difficulty levels which promoting interactive learning	• The user was given the choice to choose the level difficulty of the quiz session which are Easy, Medium and Hard
To create a mobile app that effectively tracks and displays users' quiz performance which providing insightful feedback at the end of each session	• The user able to track how many points that had been collected throughout the quiz session to measure the performance • The user received feedback either the answer they submit is correct or wrong and received the explanation for the question every time when they finished answer the question

6.3 Future Works

There are few things that can be discussed for the future work of the system. Firstly, the availability of the system in IOS. Since PathoQuest is currently only available for Android system, thus PathoQuest development team aims to be available for IOS system as well. This will allow the system to become much more flexible where it is not limited to the android user only. This is given the fact that not everyone is using the android thus this is one of the aims for the system in the future work. After finishing in developing for IOS system, the PathoQuest development team also aims to slowly making the PathoQuest to be available in all operating systems.

Secondly, the availability of the system in website. Since PathoQuest has currently only existed as application, thus PathoQuest development team aims to be available as website as well. This will allow the system to become much more flexible where it is not limited to the application only. The user will no longer necessarily required to install the application if they want to play. Instead, they will be able to access PathoQuest system through website. This is due to the possible issue that might arise such as there might be people that do not have enough storage in their phone to install the application. Thus, the development of website will be a good approach to tackle this issue.

Thirdly, the multiplayer mode. Since PathoQuest is currently available in offline mode, thus PathoQuest development team aims to develop the multiplayer mode. Currently, the PathoQuest system only available in offline mode and does not offering the multiplayer mode. By developing this new feature, it will enable the user to participate in the player vs player mode and test their knowledge skills with other players. This feature will also require the user to set up their account for the PathoQuest. Despite having multiplayer mode, but the user also can still be able to use the PathoQuest for the offline mode.

Finally, the multi-language availability. Since the language for the PathoQuest is currently only available in English, thus the PathoQuest development team aims to have a variety of languages. This will offer the flexibility to the user who are not fluent in English to also be able to use the PathoQuest system. By allowing the user to change their desired language, it will be able to help the user to understand more about of all the facts and questions that are featured in the PathoQuest system. Since the age of targeted audience for the PathoQuest in the range of 13 years old until 17 years old, thus the PathoQuest development

team believes that this feature is necessary as they are in still in the age of learning English language other than their native language.

6.4 Summary

In summary, chapter 6 discussed about the what the objectives presented has achieved throughout the process of user testing and evaluation. It also discussed about what are the possible of the future works that can be done to make the PathoQuest system stay relevant and can attract more of the new users to try and use the PathoQuest system. This process is necessary so that the PathoQuest system can always become reliable in the future and becoming part of the system that can offer lots of benefits to the public.

Reference

- Al-Fedaghi, S. (2021). UML Sequence Diagram: an Alternative Model. arXiv (Cornell University). <https://doi.org/10.48550/arxiv.2105.15152>
- Anwyl-Irvine, A., Dalmaijer, E. S., Hodges, N., & Evershed, J. K. (2021). Realistic precision and accuracy of online experiment platforms, web browsers, and devices. *Behavior Research Methods*, 53, 1407–1425. <https://doi.org/10.3758/s13428-020-01501-5>
- Basuki, Y., & Hidayati, Y. (2019). Kahoot! or quizizz: The Students' Perspectives. 10.4108/eai.27-4-2019.2285331. <https://doi.org/10.4108/eai.27-4-2019.2285331>
- Centers for Disease Control and Prevention. (2024). CDC. <https://www.cdc.gov>
- Damaševičius, R., Maskeliūnas, R., & Blažauskas, T. (2023). Serious Games and Gamification in Healthcare: A Meta-Review. *Information*, 14(2), 105. <https://doi.org/10.3390/info14020105>
- DeSalvo, K., Hughes, B., Bassett, M., Benjamin, G., Fraser, M., Galea, S., Gracia, J. N., & Howard, J. (2021). Public health COVID-19 impact assessment: Lessons learned and compelling needs. *NAM Perspectives. Discussion Paper*, National Academy of Medicine. <https://doi.org/10.31478/202104c>
- Duarte, Armando. (2019). Factors Affecting Quizlet Usage Among Students. 10 - 17. https://www.researchgate.net/publication/352478268_Factors_Affecting_Quizlet_Usage_Among_Students
- Gafney, K. P., Prammer, M., Brasfeld, L., Hipp, D. R., Kennedy, D., & Patel, J. M. (2022). SQLite: Past, Present, and Future. *PVLDB*, 15(12), 3535-3547. doi:10.14778/3554821.3554842
- Gencer, S. (2023). Development and use of flowchart for preservice chemistry teachers' problem solving on the First Law of Thermodynamics. *Journal of Chemical Education*, 100(9), 3393–3401. <https://doi.org/10.1021/acs.jchemed.3c00224>
- Hendrawan, E., Meisel, M., & Sari, D. N. (2022). Analysis and implementation of computer network systems using software Draw.io. *Asia Information System Journal*, 2(1), 9-15. <http://ejournal.radenintan.ac.id/index.php/AISJ/index>

- Huang, Tianyi. (2024). FEAD: Figma-Enhanced App Design Framework for Improving UI/UX in Educational App Development. 10.48550/arXiv.2412.06793.
- Hussain, H., Khan, K., Farooqui, F., Arain, Q. A., & Siddiqui, I. F. (2021). Comparative study of Android native and Flutter app development. In *The 13th International Conference on Internet (ICONI)*, 99-101. <https://www.researchgate.net/publication/361208165>
- Plainer, M. (2021). Practical study of Visual Studio Code: Practical course—Contributing to an open-source project. <https://www21.in.tum.de/teaching/osp/WS20/assets/fr-plainer-vscode.pdf>
- Qodirov, F. E., Sirojev, N. G., & Negmatova, S. E. (2022). Features of the Android Studio software package. *Academic Research in Modern Science, International scientific-online conference*, 130-146. <https://doi.org/10.5281/zenodo.8050543>
- Sage, K., Krebs, B., & Grove, R. (2019). Flip, Slide, or Swipe? Learning Outcomes from Paper, Computer, and Tablet Flashcards. *Technology Knowledge and Learning*, 24(3), 461–482. <https://doi.org/10.1007/s10758-017-9345-9>
- Santos, T. T. D., Ríos, M. P., De Medeiros, G. C. B. S., De Sousa Mata, Á. N., Silva, D. D. N., Junior, Guillen, D. M., & Piuvezam, G. (2023). Gamification as a health education strategy of adolescents at school: Protocol for a systematic review and meta-analysis. *PLoS ONE*, 18(11), e0294894. <https://doi.org/10.1371/journal.pone.0294894>
- Sehrawat, R., & Mathur, A. (2020). Effectiveness of concept mapping as e-learning strategy for secondary school science students. *Wesleyan Journal of Research*, 3(4), 9-15. Retrieved from <http://ejournal.radenintan.ac.id/index.php/AISJ/index>
- Seidl, M., Scholz, M., Huemer, C., & Kappel, G. (2015). The use case diagram. In *Undergraduate topics in computer science* (pp. 23–47). https://doi.org/10.1007/978-3-319-12742-2_3
- Senarath, U. S. (2021). Waterfall methodology, prototyping and agile development. ResearchGate. https://www.researchgate.net/publication/353324450_Waterfall_Methodology_Prototyping_and_Agile_Development

- Setyawati, R., Astuti, A., Utami, T. P., Adiwijaya, S., & Hasyim, D. M. (2024). The importance of early detection in disease management. *Journal of World Future Medicine, Health and Nursing*, 2(1), 51-63. <https://doi.org/10.55849/health.v2i1.692>
- Sutipitakwong, S., & Jamsri, P. (2020). Pros and cons of tangible and digital wireframes. 2021 IEEE Frontiers in Education Conference (FIE), 1–5. <https://doi.org/10.1109/fie44824.2020.9274234>
- Urathal, U., Vinodhini, P., & Sasikala, V. (2022). An interpretation of Dart programming language. *Dogo Rangsang Research Journal*, 11(10), 144-149. <https://doi.org/10.5281/zenodo.8050543>

Appendices

Appendix A : Questionnaire for Final Year Project (FYP): PathoQuest - A Mobile Game App For Disease Identification And Health Education

Questionnaire for Final Year Project (FYP): PathoQuest - A mobile game app for disease identification and health education

Introduction :

My name is Daniel Anak Mil. I am a final-year Bachelor of Computer Science with Honours (Information Systems) student at the Faculty of Computer Science and Information Technology (FCSIT), Universiti Malaysia Sarawak (UNIMAS). For my final year project, I am developing **PathoQuest** : A mobile game app for disease identification and health education.

Project Description :

PathoQuest is designed as an accessible and enjoyable learning tool for everyone. It features a mobile quiz game with a user-friendly interface that caters to all age groups. Players will encounter questions in the form of riddles, paired with multiple-choice answers, where they select the correct answer based on clues provided in the questions. The game's goal is to introduce the public to a variety of diseases and make learning about health more approachable.

Project Aim And Objectives :

The primary aim of PathoQuest is to educate and engage users about various diseases through an interactive mobile quiz game. By providing a fun and accessible platform, the app seeks to enhance public knowledge of health issues, enabling users to recognize symptoms and take proactive measures in their health management. The objectives are :

1. To create a mobile app to educate public about disease
2. To create a mobile app with quiz game that include various difficulty levels in the quiz
3. To create a mobile app that count and displays users' answers at the end of the quiz

Sections :

The survey is divided into five sections :

- **Section A** : Demographic Information
- **Section B** : Knowledge And Interest In Health Education
- **Section C** : Concerns in Understanding Health Topics
- **Section D** : App Features
- **Section E** : PathoQuest Interest

The survey will take approximately 3-5 minutes to complete, and all responses will remain confidential.

Your feedback is greatly appreciated and will contribute significantly to the success of this project. Should you have any questions or need further clarification, please feel free to contact me at 79155@siswa.unimas.my.

* Indicates required question

Section A : Demographic Information

This section is to collect basic details about the respondents. Kindly provide information about your gender, age, occupation. Participation is entirely voluntary, and all responses will be kept strictly confidential.

1. Gender *

Mark only one oval.

☐ Male

☐ Female

2. Select Your Form *

Mark only one oval.

☐ Form 1

☐ Form 2

☐ Form 3

☐ Form 4

☐ Form 5

Section B : Knowledge And Interest In Health Education

This section is to explore the respondents' current understanding of health topics and their interest in learning through gamified methods.

3. Have you played any quiz or educational games on mobile apps before? *

Mark only one oval.

☐ Yes

☐ No

4. How would you rate your knowledge about diseases and public health? *

Mark only one oval.

1 2 3 4 5

Poor ☐ ☐ ☐ ☐ ☐ Very Good

5. How interested are you in learning about diseases and public health through a quiz game? *

Mark only one oval.

1 2 3 4 5

Not ☐ ☐ ☐ ☐ ☐ Very Interested

6. What type of information do you find most useful in health education apps? (Select all that apply) *

Check all that apply.

☐ Symptoms and recognition of diseases

☐ Prevention tips and strategies

☐ Treatment and recovery

☐ Fun facts about diseases

☐ Other: _____

Section C : Concerns in Understanding Health Topics

This section is to identify challenges and worries respondents face when studying or engaging with health-related content.

7. What challenges do you face when learning about health and diseases? (Select all that apply) *

Check all that apply.

- ☐ Difficulty understanding medical terms and concepts
- ☐ Lack of engaging or simplified learning materials
- ☐ Overwhelming amount of information
- ☐ Unreliable or conflicting sources of information
- ☐ Other: _____

8. What concerns do you have about studying health and diseases? (Select all that apply) *

Check all that apply.

- ☐ Fear of misinformation or myths
- ☐ Sensitivity of certain health topics such as mental health and terminal illnesses
- ☐ Difficulty retaining complex information
- ☐ Feeling unmotivated or uninterested in the topic
- ☐ Other: _____

Section D : App Features

This section is to gather input on proposed app features.

9. What features would you want in the PathoQuest app to enhance your learning experience about health and diseases? (Select all that apply) *

Check all that apply.

- ☐ Accessibility to play without an account and offline
- ☐ Different levels of quiz difficulty
- ☐ Feedback mechanism that provides feedback after answering questions
- ☐ Gamification quiz formats
- ☐ Mini games as additional games beyond quizzes
- ☐ Reading material that provides brief notes about diseases
- ☐ Track and display user answers

Section E : PathoQuest Interest

This section is to assess the respondent's interest in using the app and its potential appeal to the target audience.

10. On a scale of 1 to 5, how interested would you be in using the PathoQuest app to learn about health and diseases? *

Mark only one oval.

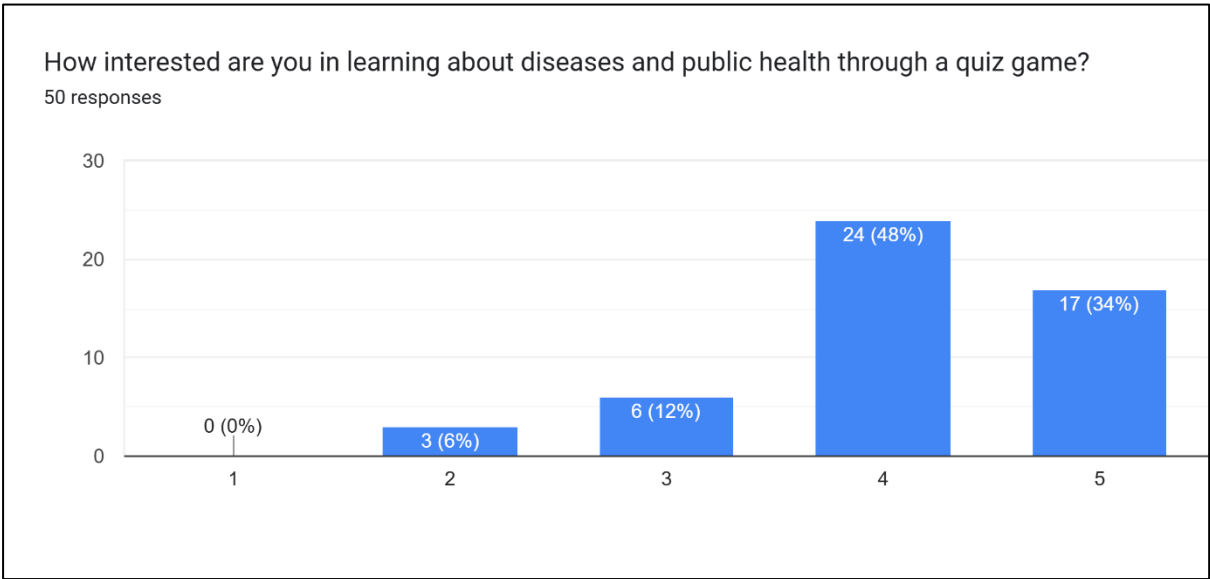
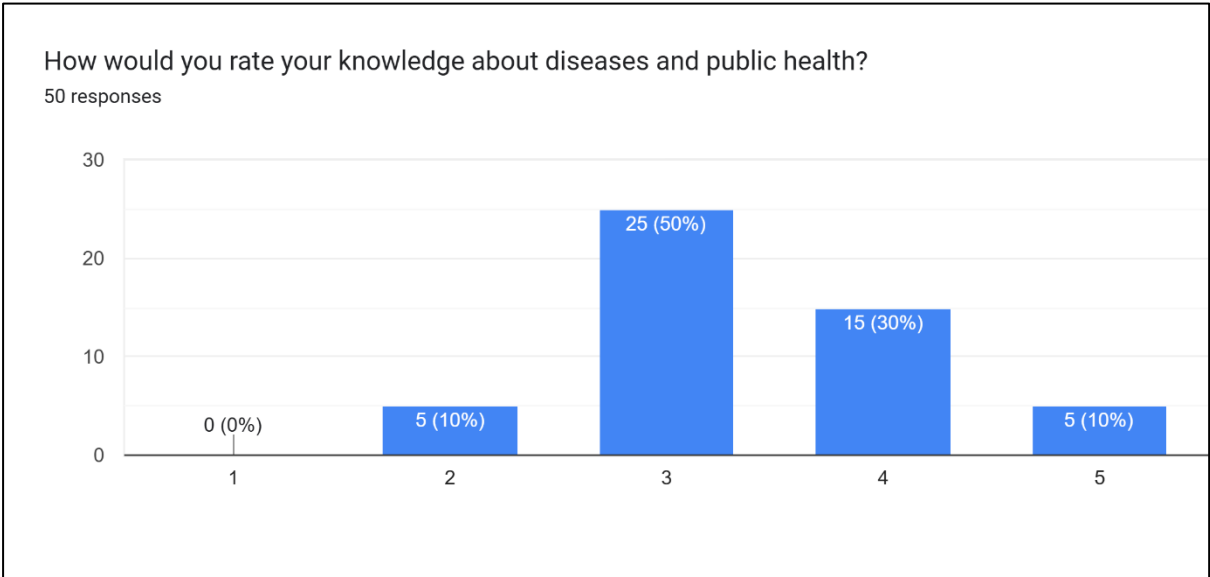
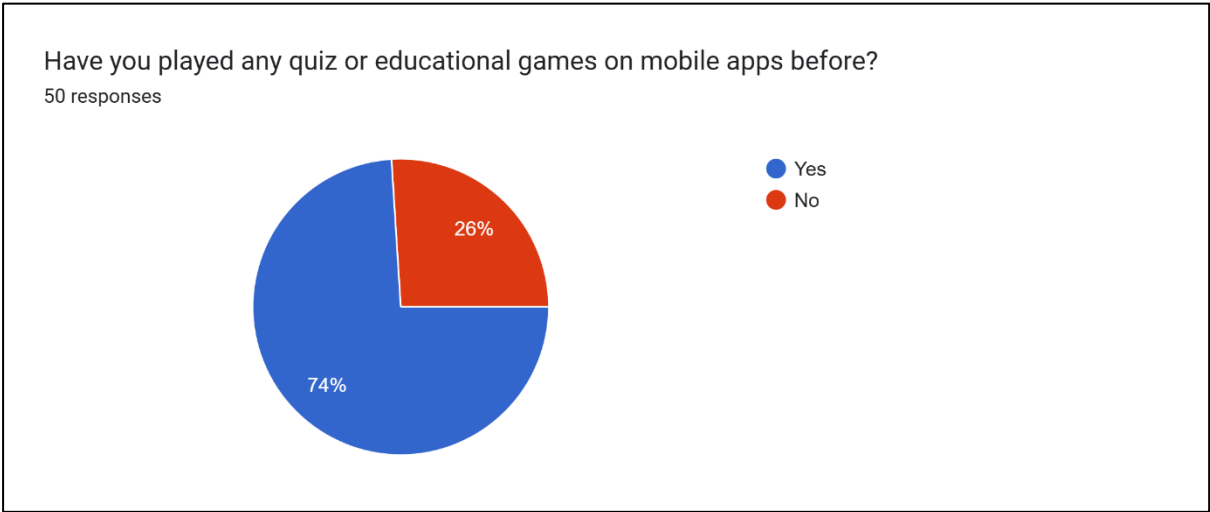
1 2 3 4 5

Not ☐ ☐ ☐ ☐ ☐ Very Interested

This content is neither created nor endorsed by Google.

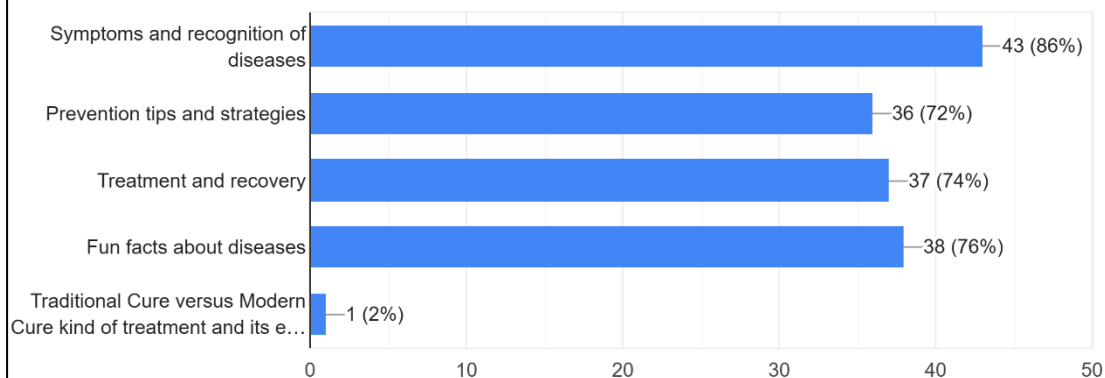
Google Forms

Appendix B : Response For Questionnaire



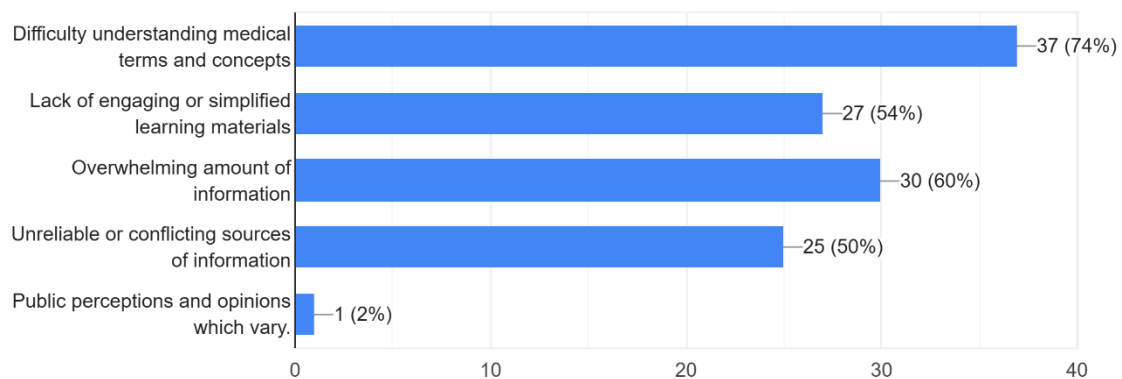
What type of information do you find most useful in health education apps? (Select all that apply)

50 responses



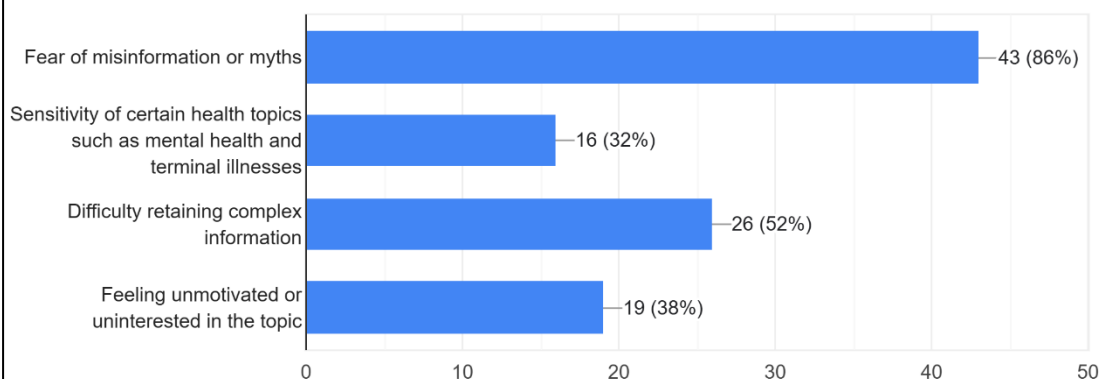
What challenges do you face when learning about health and diseases? (Select all that apply)

50 responses



What concerns do you have about studying health and diseases? (Select all that apply)

50 responses



On a scale of 1 to 5, how interested would you be in using the PathoQuest app to learn about health and diseases?

50 responses

