IMPLEMENTING FIRST-IN FIRST-OUT(FIFO) QUEUE ALGORITHM FOR TASK SCHEDULING OF WISP: AN ASSISTIVE APPLICATION

An Undergraduate Thesis

Presented to the Faculty of the

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West Visayas State University

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In Partial Fulfillment

of the Requirements for the Degree

Bachelor of Science in Information Technology

by

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COLLEGE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
La Paz, Iloilo City, Philippines

Approval Sheet

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Abstract

Excessive screen times and unmoderated use of smartphones among children became a huge concern for parents especially in this pandemic. This study aims to assist parents to help their children engage in physical activities with the help of Wisp: an assistive application. In this study, a total of 47 respondents were randomly selected. A group of 20 parents and 27 children with an age range of 7-12 years old, took part in testing the application. The overall computed mean of the children's correspondence was 4.64 which was ruled as a strongly agreed rate or had positive feedback and the overall computed mean of the parent's feedback was 4.39 which indicates that it was strongly agreed with the application. The assistive application achieved an overall "Good" rating based on the ISO 25010 standard garnering an overall mean of 3.85. Furthermore, the system was able to meet the needs and requirements of the end users and IT experts.

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CHAPTER 1

Background of the Study and Theoretical Framework

Using smartphones is one of the routines of children nowadays, making them busy and occupied during this pandemic. However, excessive and unnecessary screen time leads to addiction and will likely result in inactivity and laziness on a daily basis (World Health Organization: WHO, 2019). In this state, self-control applications are popular given that they are using to help people stay-focused in every activity and keep them away from distractions. Needless to say, unmoderated screen time, which is mainly the concern of parents out there and highly wanted to enforce limits in their usage is unhealthy for the well-being of the children. Most of the time, children are wasting their time in using phones which is ineffective in contributing to an individual's physical activities on a regular basis. This study will help address a person's issues of lack of self-control and aid them to work on more productive activities. The concept of this study introduces features to help parents manage their child's addiction as assistive technology.

The data gathered by Hiniker et al. (2016) states that eleven parents believe that creating a pattern around screen use facilitated transitions from taking a break with their devices. Some parents had stated that their kid were easily able to depart from scheduled screen-time intervals that occur at predictable times, but would oppose stopping the essential screen-time periods. Alternatively, the experiment conducted by Lindström (2017) showed that the "Forest: Stay Focused" mobile application gamification can motivate students to be more focused on their studies. With this concept, the Wisp: Assistive Application could as well help children to lessen the usage of their gadgets every time they perform the given tasks. The concept of this study will assist parents who are having a hard time disciplining their children especially on the too much screen-time spent using gadgets.

The inspiration behind the name of the application is from the Disney movie Brave where the wisp served as a guide to Princess Merida. Just like with the proposed idea of the researchers, Wisp also serves as a guide to children to become healthier in a way of engaging them in physical activity and to lessen their screen time.

The features of the proposed application are account generation where you could create an account and choose a role whether the user is a parent or a child a task management tool that implements a first in first out (FIFO) queue algorithm that would enable parents to add tasks to a specific child and give a corresponding reward through experience that could help the virtual wisp of the child to level up. The researchers applied gamification, wherein the child will have a virtual pet in the form of Wisp that could gain experience every time the child accomplished a certain task.

In order to proceed with the study, a consultation with a child psychologist was conducted to evaluate the graphical user interface of the child's screen, analyzing the application's approach towards the psychological effect of the children. As suggested, the researchers were able to conduct consultation with Dr. Aimee Chua a child psychologist. The discussions included the validation of the application if it was able to meet the child-centered approach, the prioritization of the intrinsic motivation in terms of the incentive system, and removal of the leaderboard as it would create psychological conflict

within the children in the household and would likely result to cheating. Suggestions made by the said expert were highly taken into consideration in the prior implementation of the application.

Theoretical Framework

Alongside with the aim of this study, this section provides the structure that holds and supports the theory of this research. The theory used in this study supports and correlates the intrinsic and extrinsic motivation with the use of game design theory, mechanics and factors of motivations involved in the study.

Extrinsic and Intrinsic motivation

In relation to the study, the researchers applied intrinsic motivation through in-game experience in which it supported the incentive system of the application. According to Malone's theory of intrinsic motivation, good computer games or any other intrinsic circumstance contain three key categories: challenge, fantasy, and curiosity. A framework was developed from these categories, which is further detailed in the section below.

a) Challenge

Every game must have a challenge, which involves the use of an uncertain target. Goals should be self-evident or readily created. Goals that are either practical or based on imagination are frequently the finest. It is critical that the player get some type of performance feedback in order to determine whether or not they are moving closer to the destination.

b) Fantasy

According to Malone 91981), fantasies are frequently used to make games more exciting. Fantasies can range in severity and can be both social and physical impossibilities. Fantasies should also be based on the player's requirements for fulfillment. Despite the fact that Malone points out that if it were feasible to build fantasies that met the demands of all types of individuals, games would have a wider audience.

c) Curiosity

By designing surroundings that are neither overly intricate nor overly simple in comparison to the player's experience and knowledge, the environment can attain an appropriate degree of informational complexity, which can

excite and inspire player interest. Games may pique one's interest in a variety of ways and across a range of sensory and cognitive categories. The utilization of audio or visual effects can be used to pique the sensory interest of the audience. These effects can be used as decorations, to increase creativity, as incentives, and as representation systems, among other things (represent information more easily than using words and numbers).

d) Flow

Csikszentmihalyi (1990) conducted significant studies on what makes activities and experiences pleasant in the 1990s. He characterized flow as "so rewarding that individuals are eager to do it for the sake of doing it, with little regard for what they will gain out of it, even when it is difficult or risky," connecting parallels to the previously mentioned intrinsic drive. Csikszentmihalyi (1990) defined a flow experience as having eight components:

1. A task that can be finished.
2. The capacity to focus on a task.
3. The work has specific goals, so level of attention is achievable.

4. The work delivers rapid feedback, that level of attention is achievable.
5. The capacity to exert control over one's activities.
6. A profound yet easy commitment that eliminates awareness of life's problems.
7. Concern for oneself fades, but one's sense of self grows stronger as a result.
8. The perception of time's duration is affected.

Csikszentmihalyi (1990) meant that by combining these factors, a person would experience such deep satisfaction that the effort required to obtain it would be rewarded.

e) The GameFlow model

Kartevoll M. (2017) research contained the GameFlow model's hypothesis of eight aspects, focus, challenge, skills, control, clear objectives, feedback, immersion, and social interaction, which Csikszentmihalyi (1990) described in his book Flow and the Psychology of Discovery and Invention. This model calls for a game that maintains the player's attention and focus during a high workload

while enjoying the difficulties and tasks at hand that correspond to the player's perceived skill level. Regardless of the conditions, the player may experience entire immersion into the work and the game itself, allowing the player to be less concerned about time, their normal life, and themselves.

f) Skinner’s box

Related to behaviorism, B.F. Skinner was an American psychologist and behaviorist who utilized reinforcement to increase what he called operant conditioning, and he saw the rate of reaction as the most effective metric of response. The operant conditioning, often known as Skinner's box, was used to examine reinforcement schedules in operant conditioning. Skinner utilized a leveled box to provide food to the animal through a breach in the wall. The animal was paid according to three distinct schedules: fixed interval, fixed-ratio, and random ratio. The Fixed ratio schedule was shown to be the most successful since the animal could not estimate how many times it needed to press the lever in order to be rewarded.

g) Self-determination

Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being, developed by Richard M Ryan and Edward L Deci in 2000, delves into the examination of self-determination on how factors impact intrinsic motivation, both strengthening and diminishing it. Their findings support the idea of three psychological demands that people have: competence, autonomy, and relatedness. When these demands are addressed, self-motivation and mental health improve, however when they are not met, motivation and human well-being suffer. This self-determination hypothesis explains human desire to do a job or activity as being inwardly directed. Competence indicates that humans must have a sense of mastery over a situation or topic, with mastery obtained via the achievement of clear and visible goals. The sensation of being free and in control of one's own activities is referred to as autonomy. Finally, relatedness conveys the impression of being linked to people in many ways, such as through family or acquaintances.

Conceptual Framework

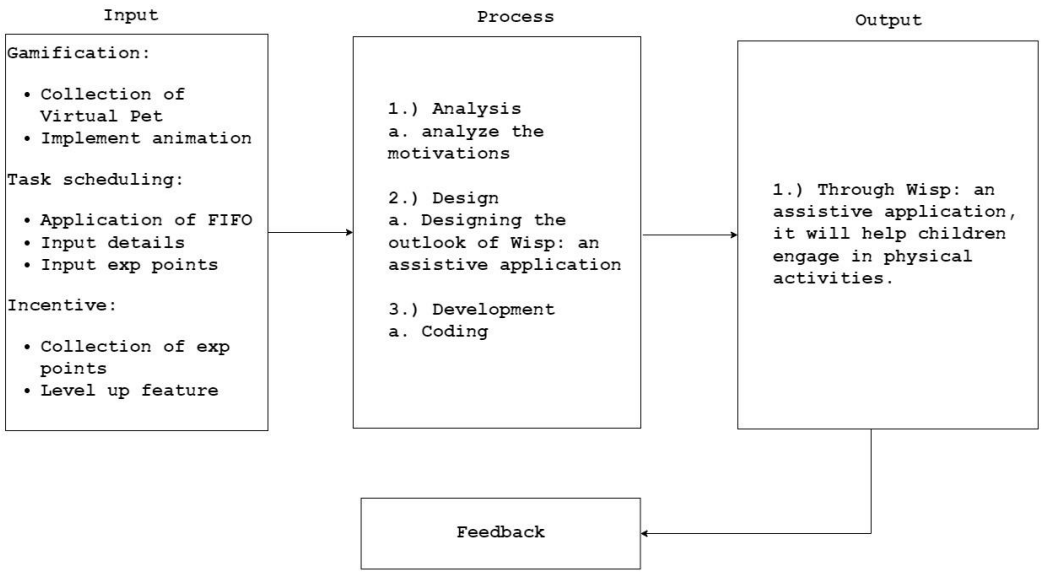

Figure 1. Conceptual Framework

The figure above illustrates the conceptual framework of the study wherein the first input will be the gathering of necessary data such as first name, last name, email, and password.

The next box illustrates the processes undergone by the researcher in developing the assistive application. This process comprises analyzing the motivations to stimulate children in doing physical tasks, designing the outlook of the application, and the developing the Wisp

that includes coding. The final output of this study will be a working assistive technology which is Wisp: an Assistive Application. The process will be a cycle in which the researchers will gather feedback after the development or implementation for further improvement of the application.

Objectives of the Study

To develop an assistive application that incorporates gamification and aims to utilize the screen time of children to productivity and could help contribute to engaging in physical activities.

Specifically, it aims to:

1. develop a task management module that implements a first in first out queue algorithm.
2. develop a virtual pet game system that highlights parent-led and child-centered game approaches.
3. create an in-game incentive system to motivate children in doing the tasks assigned.
4. evaluate the application using ISO-IEC 25010 and questionnaires to verify if it helps children to engage in physical activities.

Significance of the Study

Parents are particularly concerned about the negative impact smartphones can have on children, particularly in terms of their ability to learn interpersonal skills. The generalization of this study would be of great contribution to the vast knowledge in relation to children's screen time usage which could be motivated in physical activities engagement. Vital results of this study could be highly significant and beneficial primarily to both parents and children not only encouraging kids with physical activities but building a solid foundation between parent and children relationship.

Children

The direct recipient of the output of this study is the children with excessive use of smartphones. Through the assistive application, children are engaged in household chores to promote physical activity and can motivate them through intrinsic rewards.

Parents

The research study benefits the parents of the children through being able to manage in minimizing their

child's usage of smartphones without compromising the parent-child relationship.

Software Developers

This study will serve as a basis for other software developers for future references regarding the first-in-first-out (FIFO) algorithm used in this assistive application that developers might incorporate in their application as well.

Future Researchers

This study will act as their foundation, guidance, and reference for future research. As a result of the observations and analyses conducted in this study, future research may be tempted to do further investigations in this area.

Definition of Terms

For better understanding, the following terms were defined conceptually and operationally:

Children. Are the ones who will execute tasks, level up their virtual pet, and build better habits to improve household responsibilities. The target age of children in this study ranges from 7-12.

A son or daughter of human parents (Merriam Webster, 1828).

Experience. is a progression point of children in completing tasks and also their wisp will level up once they meet the limit of the progression.

Direct observation of or involvement in events or a specific activity results in practical knowledge, expertise, or practice. (Merriam Webster, 1828).

FIFO algorithm. Is used for task scheduling of parents to their children. Indeed, the task process comes on a first-come, first-served basis.

FIFO is an acronym meaning first in, first out. It is a data structure processing approach in which the first element is treated first and the latest element is processed last.

Gamification. Is a game design feature and game mechanism that is used to increase engagement, solve issues, change behavior, or provide better experiences in applications. It is the act of incorporating games or game-like aspects into anything (such as a chore) in order to increase engagement. (Merriam Webster, 1828).

Parent. Are the ones who give tasks to the children and they also reward their children upon completing tasks. A person who brings up and cares for another (Merriam Webster, 1828).

Pet. Refers to the gamified Wisps as a virtual pet designated for a specific child in which the said pet will accumulate experience whenever the child finishes a task.
A domesticated animal kept for enjoyment rather than function that is kept as a pet or is kept as a pet. (Merriam Webster, 1828).

Rewards. Provided through in-game experience.
Something provided in exchange for good or evil done or received, or something promised or given in exchange for some service or achievement (Merriam Webster, 1828).

Screen Time. Time spent by children in using their smartphones or tablets.

It is the amount of time spent watching television, playing video games, or utilizing a screen-equipped electronic gadget (such as a smartphone or tablet) (Merriam Webster, 1828).

Smartphone. As a portable device used by children in this study with an age range of 7-12 that often leads to excessive screen time usage.

A mobile phone with extra software features such as email or an Internet browser. (Merriam Webster, 1828).

Wisp. Is a virtual pet of the children in the application in which they can level up through obtaining experience in completing tasks.

At night, a phosphorescent light hovers or flits over marshy land, presumably created by spontaneous combustion of gases released by decomposing organic debris. Also known as a friar's lantern, a jack-o'-lantern, a will-o'-the-wisp, or a wisp. (American Heritage® Dictionary of the English Language, Fifth Edition, 2011).

Delimitation of the Study

This study aims to develop an assistive application that utilizes gamification and reduce the screen time of children and could help contribute to engaging in physical activities.

Scope of the study centralized to children with an age range of 7-12 years who primarily engage in smartphone usage and parents mostly stay-at-home individuals that cater household responsibilities.

The application which implements the FIFO(first-in-first-out) algorithm in the task management module, is a virtual pet gaming environment that focuses on both parent-led and child-centered game approaches and incentive system to motivate children in doing tasks.

The proposed assistive mobile application will run on the operating system version starting Android (6.0). The application is internet-based since the functionality of the system is dependent on the internet.

CHAPTER 2

Review of Existing and Related Studies

Screen Time

Screen time in children and adolescents: is there evidence to guide parents and policy?

Unquestionably, the digital environment is on the increase. Children and young people in wealthy countries are now growing up with computers, tablets, and mobile phones intermingled with their development. There is no doubt that far more time has been spent online in comparison to previous generations. There is a lot of interest in the effects of screen time, social media, and electronic entertainment on several current concerns including child development, weight, and mental health. The general public and healthcare professionals frequently see increased screen time as undesirable, with frequent media reporting on the detrimental effects on sleep, nutrition, social contact, and family life. In any event, the data underpinning this distinction is limited and usually muddled by confounding factors such as socioeconomic classification and unfavorable related

habits (eg, snacking and decreased workout). As a result, they recommended that the amount of time a child or young person spends on gadgets be tailored to the individual, with special consideration when introducing technology to younger infants or toddlers, and practical methods for sound and sensible techniques for how to best manage screen time (Ashton et.al, 2019).

Screen time and sleep among school-aged children and adolescents: A systematic literature review

The researchers meticulously reviewed and updated the scientific literature on the relationship between screen time (e.g., television, computers, video games, and gadgets) and sleep outcomes in school-aged children and adolescents. From 1999 through early 2014, the researchers examined 67 distribution theories. In 90% of the investigations, the researchers discovered that screen time is negatively associated to rest results (fundamentally shorter length and delayed timing). Some of the results changed depending on the type of screen display, the member's age, gender, and the day of the week (Hale, 2015).

Screen Time Tantrums: How Families Manage Screen Media Experiences for Toddlers and Preschoolers

According to Hineker et al. (2016), parents establish boundaries depending on what technology makes it simpler to implement. Indeed, when parents need a scapegoat, they blame technology for transitions, and they have constantly stated that technology may also serve to assist them when they declare screen time is done. Families face aspects that are beneficial and offer potential boundaries, as well as features that are misleading and stressful. Furthermore, the findings of this study indicate that families value screen media for young children but want these experiences to be limited. They demonstrate that technology can be an ally or a foe, giving future researchers the opportunity to develop design decisions that are not the cause but the solution to tantrums. (Hiniker et.al, 2016).

Beyond the Classroom: Do smartphones make us lazy?

According to Futterman (2015), screen usage should be limited to two hours per day for children aged three to eighteen. And none at all for two-year-olds and younger adults. Research shows that prolonged frequent screen time can also encourage childhood obesity as well as irregular

sleep habits, in addition to social and behavioral problems. Indeed, there is an issue when kids spend more time texting friends rather than getting together. Face-to-face interaction is a human need that starts and never goes away in infancy. Although these devices can provide great opportunities for learning, their use must be balanced with an equal amount of social interaction face-to-face.

Parental Control

Parental controls: advice for parents, researchers, and industry

The study of Zaman and Nouwen (2016) reveals that, parental controls will aid parents in the offline rule-setting and interactions between parent and kid throughout this process. Parenting problems will not be solved simply because 'there is an app for it.' Indeed, when baking a cake, parental controls are like timers. It's not going to substitute the actions of parents as amateur chefs, but it's just going to help them prevent the cake from burning. Furthermore, it functions as an assistive technology, providing assistance to parents and children while

utilizing the tools in the context of their daily activities, child-parent connection, and family values.

This study advocates for a more comprehensive approach to permissions that goes beyond a single emphasis on child safety in order to prevent over-control and overly protective parenthood, which has been found to have a detrimental influence on child development. Second, it outlines potential avenues for parental mediation research by emphasizing the need to refine current technological mediation evaluation tools, to focus more on where and when parents use parental controls, and how these tools can work (rather than simply asking if what parents use them and if they are effective), and to move beyond the simplistic notion of the parent as an instructor. (Zaman et.al. , 2016).

User Interface Design Model for Parental Control Application On Mobile Smartphone Using User-Centered Design Method

The study of Whardana, et.al. (2017) presents the use of a content management framework on smartphones that can enhance children's and parents' collaboration. The importance of parents' roles is to grasp the application's

content so that kids could engage successfully with their parents. The analysis and implementation methods, including the parental control user interfaces, can be used to conclude the user-centered design research framework of the UI design parental control system, which offers solutions to parent users' needs to teach children about the application's content. Parents and children should explore this material in a discussion. Indeed, the results of the study with an average of 94% percent were obtained at this level of usability testing for parents. This suggests that the user experience is well-designed, and that the parents have parental control over their children based on their requirements. The user interfaces then give answers to children's user needs in selecting an application and provide parents with an awareness of the content of the program that will be utilized. Usability testing yielded an average score of 90.4 percent. This demonstrates that the user interface is well-designed for children.

Gamification

Forest App: Stay Focused

In the paper of Lindstrom and Nilsson (2017) the result shows that the participants' focus did not deteriorate on the game-playing elements was removed. The researchers expected the results from participant group B would deteriorate upon removal of these elements. Although many participants did not find the application helpful for those to stay more focused, 80% of participants expressed that they felt more satisfied with their studies when they used the application than with the timer. However, this is difficult to assess then it is the participants themselves who have had to evaluate what they thought of their focus which can vary from person to person. It could be difficult to express what they think on a scale and it can be easier to describe it in text. Therefore, this study placed more emphasis on the participants' reasoning and analyzed their own formulated answers to a greater extent than looking at the mean of their perceived focus.

Indeed, the majority of participants were positive about the use of the application, one participant replied that he did not understand the idea with the application

researchers used and that it was not special motivating. This may be because some may be more susceptible to game-determining elements than others which would be able to be investigated more in future research in the field. In this state, this study does not indicate any adverse effects on the user focus on whether they stop using gameplay in their studies, which is contrary to the results of previous studies. In addition to this suggests not the study that the application has motivated the user to study more.

Gamification and Family Housework Applications

The study of Bjering, A. et.al (2018) states that building on the concept of gamification, a new trend in applications is to target housekeeping, with the goal of turning monotonous duties into enjoyable pastimes. One reason for this is because many parents want their children to grasp the responsibilities that come with being a family member. Another aspect to consider is that many children and their parents use apps on a regular basis to play, learn, and maintain social engagement. As a consequence of the recognition that both housekeeping and gaming are common in many modern households, applications that attempt to integrate the two have been developed.

Furthermore, the study's findings imply that instead of focusing on the individual, game designers should focus on collaboration and the entire family. Include methods that allow both parents and children to participate in activities together. Encourage families to talk about and decide on a set of family values. Examine how hybrid manipulable/constructive or constructive pedagogical designs can encourage positive and joyful chore-doing behaviors in this scenario. Allow the family to function as a team of "explorers," motivating them to think of new and better methods to solve difficulties, or even new jobs that may be accomplished.

Designing Gamification in the Right Way

According to the research study of Kim, B. (2015), game designers must evaluate who the gamification is aimed at and what the characteristics of the target group are Kim, B. (2015). In gamification, there are two types of people: those who are willing to play for extrinsic incentives and those who are not. Extrinsic incentives motivate people who are classed as "players," and Bartle's player kinds have served as a broad foundation for other game researchers and a guideline for game designers. In

comparison, internal motivations like social interactions, self-expression and exploration, personal success and mastery, and a sense of purpose motivate the "socializer," "free spirit" (similar to Bartle's "explorer"), "achiever," and "philanthropist" to play. These user kinds are, without a doubt, theoretical abstractions, and persons in the actual world will display characteristics of numerous user types to varied degrees.

According to the researchers' findings, giving external rewards, such as a prize or a gift voucher, is likely to improve user involvement and engagement for the "player" type. In this stage, children's cooperation and participation in task completion will rise, and they will be motivated each time they finish a job. Furthermore, game designers must keep in mind that gamification does not provide incentive or engagement on its own. People must buy-in for any gamification to thrive because they must be interested enough to engage. As a result, the closer a gamification's aim is to a player's goal, the more successful the gamification. Furthermore, game designers must employ gamification cautiously, wisely, and judiciously, with a clear purpose in mind, a deep

understanding of the target audience, the nature of the target activity, appropriate and efficient incentives for the intended environment.

Improving User Experience with Gamification and Reward Systems

According to the thesis of Kartevoll, M. (2017), children in Norway are increasingly likely to play video games, with 77 percent of children aged 9 to 15 playing at least one or more video game on an average day in 2015. Kartevoll M. (2017). Statistics also show that children lack the incentive to do jobs, with less than half of children aged 9 to 15 helping with everyday housework in Norway in 2010. The research attempts to leverage the growing use of smartphones and tablets to empower and encourage more children to assist with housework through the use of gamification. However, the features of gamification are often poorly implemented, which weakens its purpose by having the opposite effect.

On the motivational side, the study suggests that every game must have a challenge, which necessitates the use of an unclear goal. Goals should be self-evident or readily produced. Goals that are either realistic or based

on fantasy are often the best. It is critical that the player provides some form of performance feedback in order to determine whether or not they are coming closer to the goal. Another one is curiosity by designing environments that are neither too complicated nor too easy in relation to the player's experience and knowledge, the environment can attain an ideal level of informative complexity, which can foster and generate player curiosity.

On the reward side, as experience is often tied to a single avatar, it can also be the level of the player's account. Experience is rarely used to express skill; instead, it suggests the player's time and effort. Experience and level are often associated with one another, with one's level increasing after a certain number of experience points are accumulated. In connection with the researchers' study, experience points are gained by finishing a task and it will increase the children’s virtual pet level as it progresses.

On the social side, an application's social components could have a big influence on user motivation. In general, the components of competing, cooperating, and connecting with other players may elicit a desire to play games only

for social connection. The ability to use these social aspects is to build a dependence between the applications and then what happens on a daily basis can improve the application's engagement and pleasure.

The result of the study states that the more general question which was asked in the final part of the questionnaire had a high degree of participants agreeing to the statements Kartevoll, M. (2017). With 91% of the participants agreeing that they would have used the application at home if they had the chance, concluded with the experiment as a success. Especially, in relationship to the extension enhancing motivation, enjoyment, and engagement towards doing chores. As 82% of the participants additionally agreed with chores would have been more fun if they had used the application, and only 5% disagreed the statistics give an indication of the application working as intended.

Furthermore, the results from the user tests gave an indication of how effective gamification can be, hence contributing to the positive use of gamification to motivate, engage, and create enjoying content for children. Manage Extended application illustrates that chores can be

motivating, engaging, and enjoyable for children by the use of a gamified reward model. Furthermore, the expansion contributes to the idea that for gamification to operate correctly, the design must be carefully thought out.

Using Gamification to Increase Adherence to Daily Living Routines

According to the findings of the study of Kadison (2015), HabitRPG improves children's adherence to daily regular duties without the need for parental intervention. These findings support the use of HabitRPG for youngsters who like video games but have difficulty completing everyday regular chores. According to the social validity measures, both children and parents enjoyed using this program and agreed that it was helpful in boosting children's task completion. This study implies that games like HabitRPG may be useful strategies for motivating youngsters to participate in previously ignored ordinary everyday tasks. Furthermore, future research should investigate how the game influences parent-child relationships to determine if it minimizes coercive interactions while boosting kid self-management.

Furthermore, gamification applications that employ behavior analytic ideas for example, self-monitoring and in-game incentives for target behavior completion may be successful in enhancing desirable target behaviors.

FIFO Algorithm

Management Information Systems Development for Veterinary Hospital Patient Registration Using First In First Out Algorithm

The study of Fauziati (2016) focuses on the patient registration system, which necessitated the development of algorithms that are compatible with the service workflow in which they want to implement a queuing system. The usage of information technologies in a hospital is intended to deliver speedier service and reduce patient waiting time. Based on the study's challenge, the authors chose to employ the algorithm First In First Out (FIFO) in the creation of a registration information system in which the patient who arrived first at the hospital is the one who enrolled first.

According to the study, the proceedings of the national conference on research and PKM health explained that the line model that can increase effectiveness and

reduce waiting time at the counter is a queue theory with the First In First Out (FIFO) principle, where the first line queue will receive the service first. It is also stated in a queue theory research that FIFO queue theory is one of the finest to employ. The test results show that the software's quality has been approved and that it meets the minimum requirements of the registration system in RSH Prof. Soeparwi, with a total vote of 75.28 percent, which is considered very helpful and in a way that they can reduce the time when processing the patient data. However, there are certain problems, such as the fact that the sub-system registration information is still unable to provide precedence to patients with emergency cases. The employment of FIFO algorithms in the (Fauziati, S. et. al 2016). According to (Fauziati, S. et. al 2016), adopting the FIFO algorithm can boost the efficacy of faster queuing by ensuring that the first job is serviced first without skipping and is completed progressively in line with the queue sequence.

Application of FIFO algorithm (first in first out) to simulation queue

According to the journal article of Manurung (2019), most activities may be found in everyday life. One of them is waiting in line. Queuing is a time-consuming action. Furthermore, the lineups are uncoordinated, and the officers are unconcerned with who is the first to queue. As a result, to deal with difficulties in the queue, the simulation adopts the first in first out approach. This algorithm will help determine who gets serviced first. Simulation is a strategy for implementing more precise device estimate. In this scenario, the researchers employ the first in, first out method. The first in, first out algorithm, often known as first in, first out, is employed. In this case, the person who is first in line will be served and finished first. It is intended that this will help determine who will be served first.

CHAPTER 3

Description of the Proposed Study

This study in general is directed to both the parents and especially to the children that waste a huge amount of time on their smartphones and gadgets that has led to an unhealthy habit and passive lifestyle. Children lounge for hours and they are unmotivated to do physical work as well as they lack of engagement in doing household chores. This is where the study was put into action through an assistive application that allows children to be encouraged and motivated to engage in physical activities while utilizing their screen time in a productive way. Parents, on the other hand, would be able to direct and manage the screen time of their children in a creative way at which point the application serves as an intermediary to their children such as giving the task through the application and children would gain motivation to do so.

This study aims to develop a task management module that implements a First-in First out (FIFO) queue algorithm along with integrating gamification in the form of a virtual pet game system, and incentive system to stimulate

engagement and motivation to children. The researchers have implemented the FIFO queueing algorithm in order to manage tasks' arrival to children's interface. Researchers included the development of a virtual pet game system that highlights parent-led and child-centered game approaches. Along with this, an incentive system was established to help motivate children in doing assigned tasks through the virtual pet of the child that gains experiences and advances its level. The researchers have used a labeled scaled-response questionnaire for feedback, a prototyping tool, and a programming language that is suited for the development of the proposed application.

Prior to the recommendation of the panelists to consult a child psychologist, the researchers applied in-game experience as intrinsic motivation in which Dr. Aimee Chua suggested. The in-game experience will support the virtual pet in increasing its level. As well as adding animations to the virtual pet to create excitement to child users.

Assumptions and Preconditions

1. The questionnaire should be answered honestly and candidly by the participants.
2. The application shall provide parents to generate their own account for the application.
3. The application should provide the parent user the ability to add tasks for the child.
4. The application should provide the end-user the ability to display the tasks given to the child.

Methods and Proposed Enhancements

Formal methods in computing science deal with using computers to aid in the intellectual tasks of designing, defining, and constructing software and hardware. Using formal logic to write specifications and prove that programs and processes implement them is one aspect of that work in which formal methodologies are mostly used to prove facts about algorithms and systems. Precision, abstraction, conciseness, and manipulability are all advantages of formalism. Manipulation may involve testing for consistency and creating prototypes.

In this study, a formal method was applied to derive the correspondence of the application and specification to show that the application does what it is specified to do. The adoption of formal approaches, particularly during the requirements phase, has added gamification to the benefits of the assistive application's completeness and consistency. To emphasize that precision is a property of formal methods, it is designed with the intention of precisely matching the aforementioned specifications above and meeting the requirements, particularly with the

implementation of the First-in-First-Out (FIFO) algorithm in the application's task management.

The first-in-first-out (FIFO) algorithm is a data structure management approach in which the oldest element is handled first and the newest element is treated last. FIFOs are often implemented when extracting data from an array or buffer. The researchers implemented the FIFO algorithm particularly for the queuing of tasks in the application where the first entry of the task allocated for a certain child is served first. FIFO is also used to provide efficient handling of the task management tool to determine the order.

The virtual pet system in this study is for the companionship of the child as he/she is doing the task assigned by their parent. The application highlights child-centered design which provides excitement as it includes pleasant colors and movements that make the virtual pet interactive to child users. Indeed, the virtual pet system will create a mindset to child users that they’re taking care of a real pet. The researchers used Rive as an animation tool in creating the effects and actions of the

virtual pet. The virtual pet designs are bought from Freepik which is licensed for commercial use and projects.

The incentive system of the study is the experience points. The incentive system will create progression for the child users as they complete the task assigned by their parents. This will create intrinsic motivation for them as they accumulate experience per task. This intrinsic reward will create eagerness as they do their task and attain their goal of leveling up their virtual pet. The incentive system is paired with the task created by the parent. Consequently, the experience points will go in the progress bar as the child finishes each task and if the experience points will reach the needed maximum points it will proceed to the next level.

The ISO-IEC 25010 standard, on which a product quality evaluation method is based, is among the expected data to be collected. The quality model describes which quality attributes will be used when evaluating a software product's properties. Certainly, efficiency is defined as the degree to which a system fulfills the declared and implicit requirements of its many stakeholders and hence

creates value. The quality model, which categorizes product quality into characteristics and sub-characteristics, reflects the demands of those stakeholders (functionality, performance, compatibility, usability, dependability, security, maintainability, and portability). The criteria are rated as "Very Good," "Good," "Fair," "Poor," and "Very Poor."

Components and Design

Software Architecture

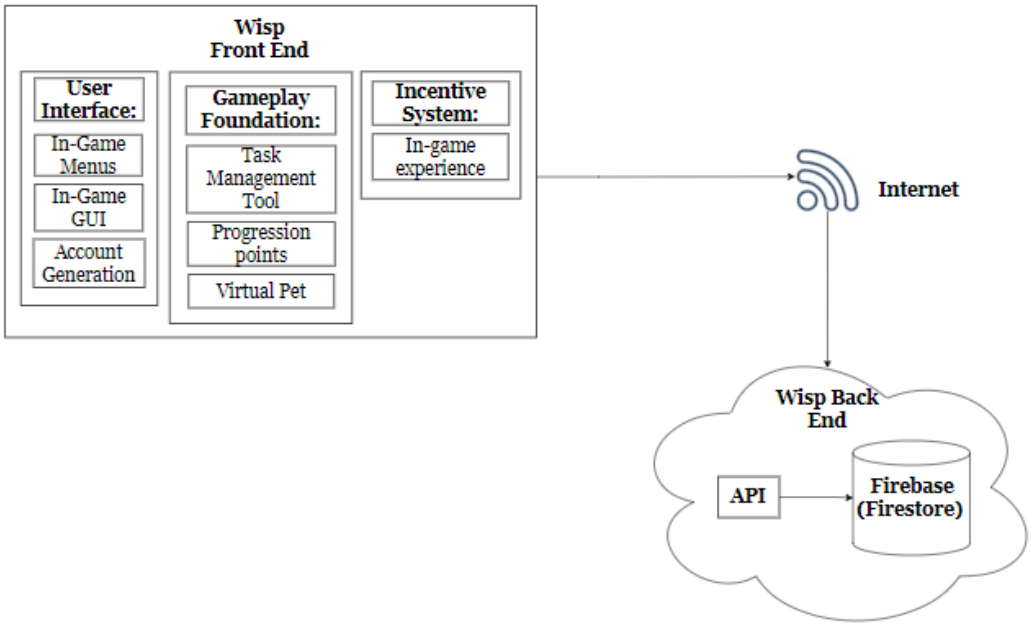

Figure 2. Software Architecture

Figure 2 shows the software architecture of the mobile application. The application's front end was developed using Flutter. On the user interface side, it is composed of in-game menus, in-game GUI, and account generation. The gameplay foundation is composed of the task management tool, progression points, and virtual pet. On the Incentive System, it is an in-game reward which is through gaming experience for the virtual pet to level up. On the other

hand, the application's back end will be supported by an API and Firebase (Firestore) as the cloud database.

System Architecture

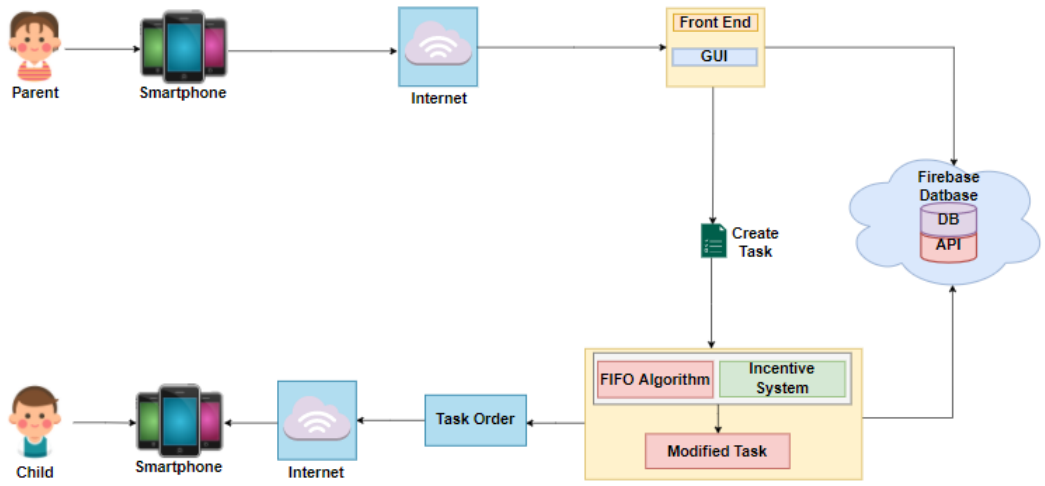

Figure 3. System Architecture

Figure 3 depicts the bird's eye view of the application. The process initiates when a parent uses the mobile application on a smartphone, connects to an internet either through Wifi or data services, and redirects the said user to the application's graphical user interface. Next in line, the parent proceeds on a page on creating tasks for his/her designated child. In the process of creating, the FIFO algorithm takes place in establishing

the tasks and a corresponding incentive for each and will result in a modified task. Then, the child connects to the internet and login to the application to view the task created by their parent. For each data created, this will be stored through the Firebase Database.

Database Design

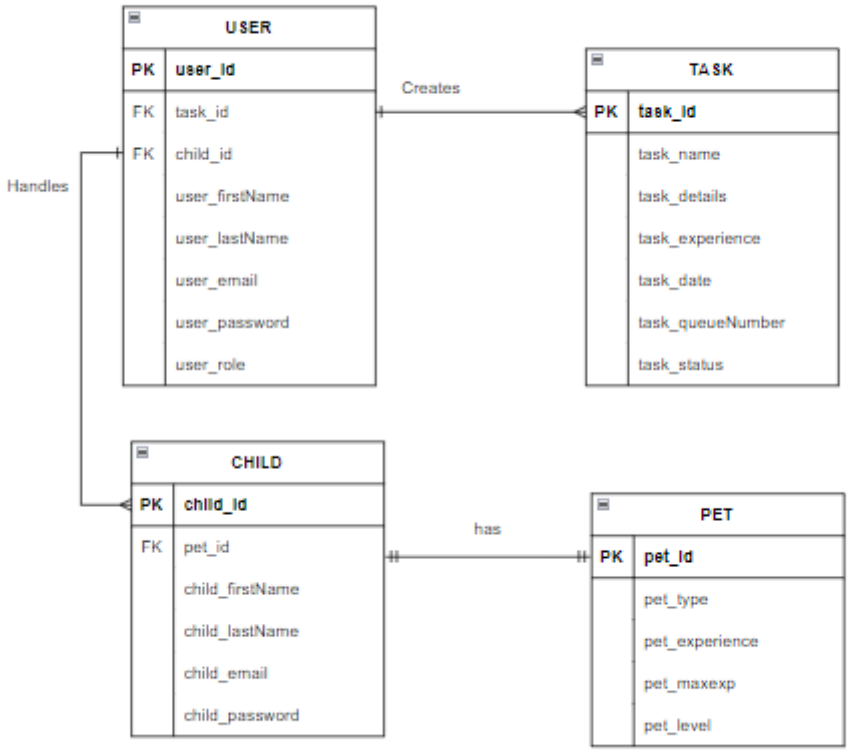

Figure 4. Entity Relationship Diagram

Figure 4 shows the Databased design or entity relationship diagram (ERD) of the mobile application, the user creates tasks and handles each child. The USER table has its primary key of user_id and consists of the user's first name, last name, email, password and the role of the user. It also has two foreign keys of task_id and child_id coming from the TASK and CHILD table respectively. The TASK table contains the primary key of task_id with other attributes like the task name, task details, task experience, task date, task queue number and the task status.

On the other hand, every child must have a pet wherein the child table has the foreign key of pet_id. The CHILD table consists of the primary key of child_id and attributes of child first name, last name, email and password.

Procedural and Object-Oriented Design

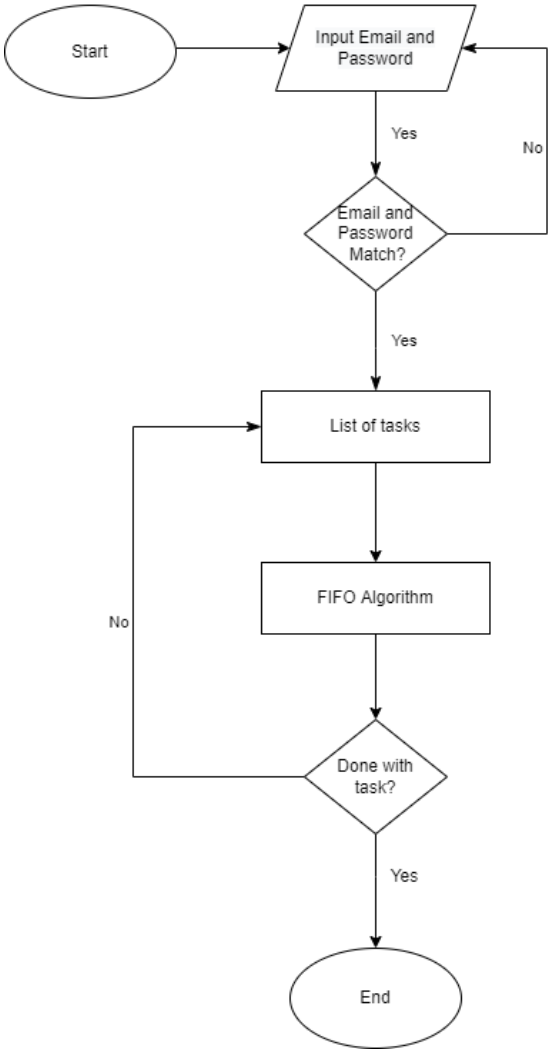

Figure 5. Procedural Design for the Child

Figure 5 shows the sequence of processes from the children's point of view in accessing the mobile

application. The order starts with also prompting the child with the logging in form where the child user is asked to input email and password details if he was already registered by his parent, considering that parents are the one to create the child's account. If email does not match, child users have to reenter the details once again through checking if there is misspelled information that causes failure to access the account. On the other hand, if login details are matched, the user can access the account and will be prompted with the list of tasks created by the parents. These lists of tasks are next to be processed by the FIFO algorithm where the first task created is being served first on the list. This would also restrict children from skipping the first task. If the child user is done with the first task he may exit the application and end the process.

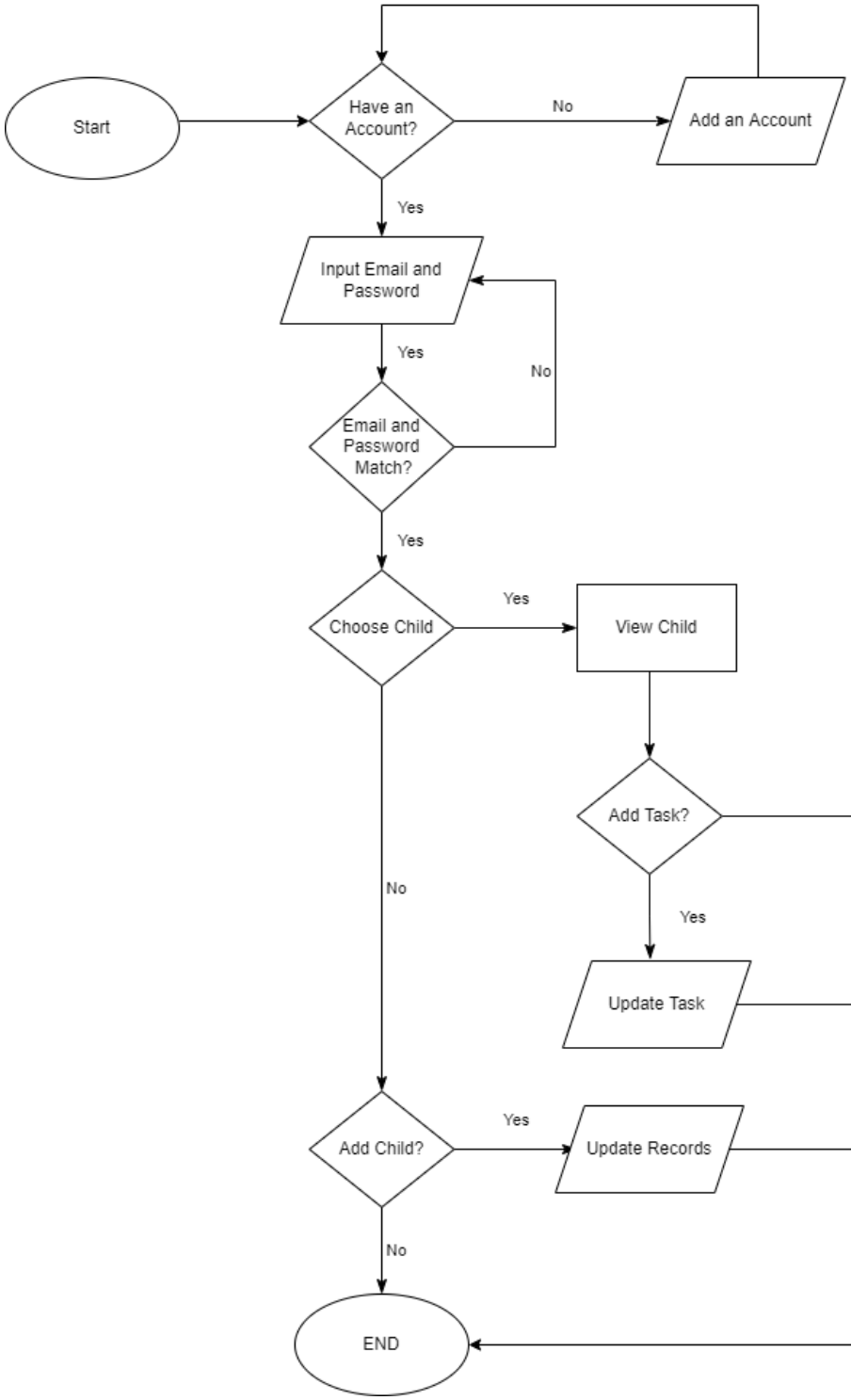

Figure 6. Procedural Design for the Parent

Figure 6 illustrates the procedural design of the Parent's process in prompting the assistive mobile application. Parent user in upon starting the application, will be prompted with the logging in page wherein this will display the sign-in form for existing users to access their account through the input of their email and password, otherwise will be redirected to a new page if the user is new to the application and would have to add an account. For the said existing users, if the typed-in details do not match the registered email and password in the database, an error message is displayed where users need to re-enter correctly the details once again. Although, if it matches, the user gains access and will proceed to the home screen. Next flow where a parent will have to choose a child. If he does have a child, he will have to view then choose from the existing list of children he has and would have the option to add tasks or not to a child. However, if the parent user does not have an existing child, the user will be redirected to the interface of adding a child. With this, the application will register the child to the database and updates the record and this is where the process ends.

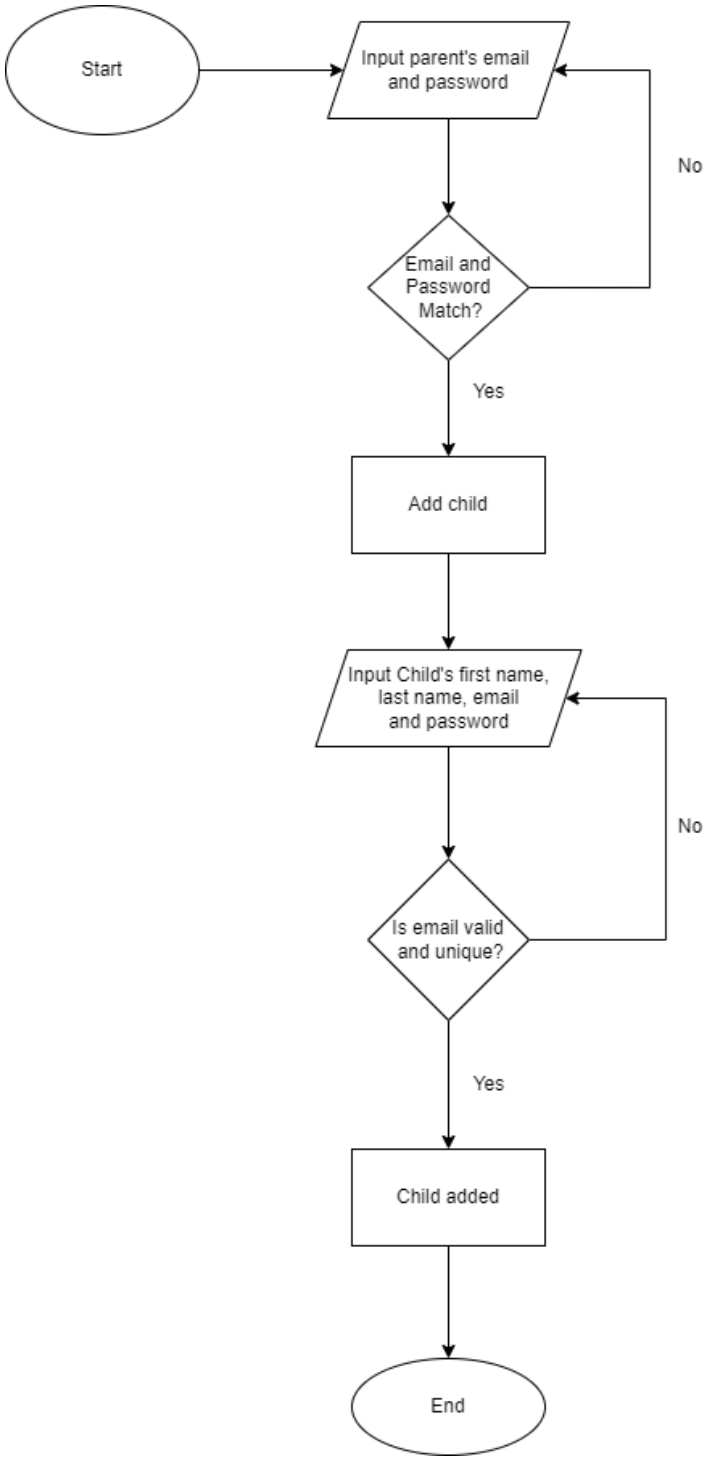

Figure 7. Procedural Design for Add Child

Figure 7 explains the sequence process for adding a child in the records. Upon starting, the parent user is prompted with the log-in information which is then processed by the application to match the registered account from the database. If sign-in details do not match, login error will be shown, however, if details match, the user will now be able to access the application and will be able to add a child of his choice. On the interface of adding a child, information needed are the child's first name, last name, email and password. The mobile application would then check if the email is valid and distinct. If email is invalid, the parent user would have to re-enter again the correct details with a unique email. If it matches, the account will be immediately added to the record and end the process.

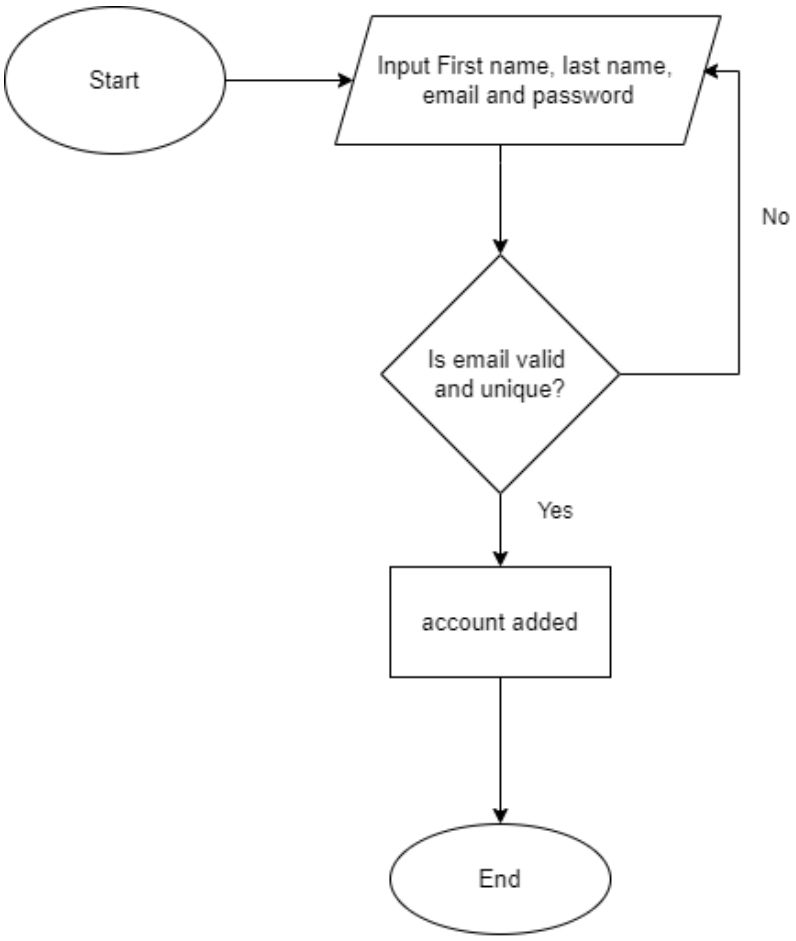

Figure 8. Procedural Design for Creating Account for Parent

Figure 8 presents the initiating of the application that needs to be always logged in first, filling up the needed information for accessing such as the user's first name, last name, email and the password. If the entered email is valid and unique, the account will be immediately

added successfully to the application's database. However, if the email is inappropriate or invalid, the user will be prompted with the login error. With this, the user will have to fill in the details again correctly.

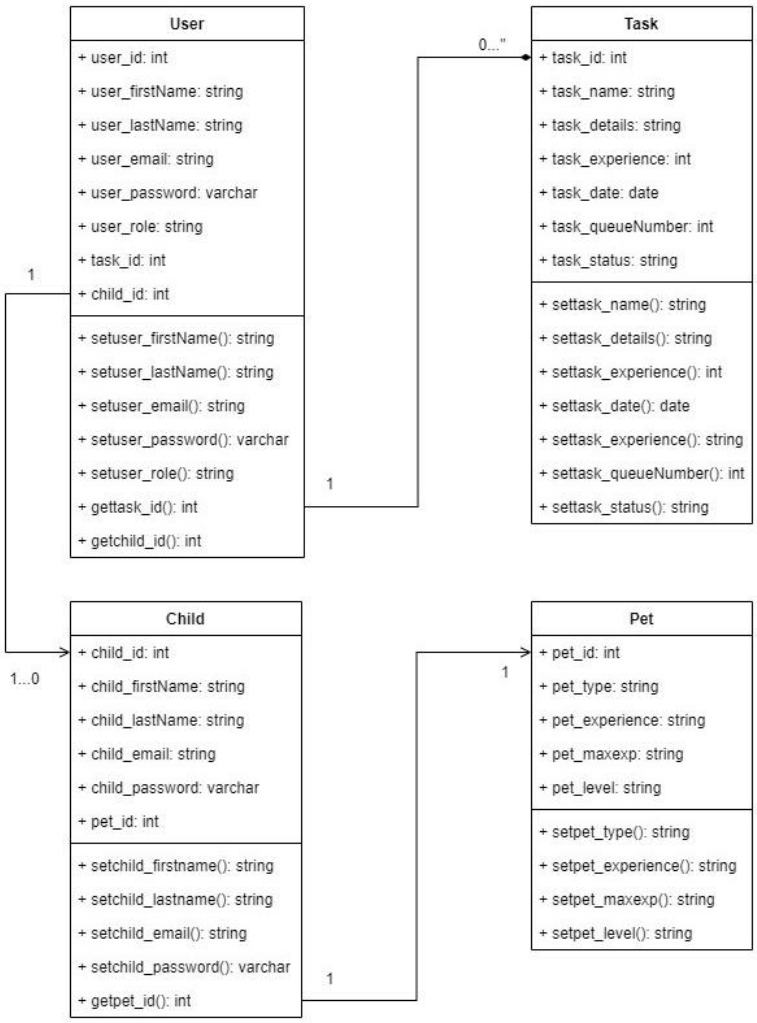

Figure 9. UML Class design of the System

Figure 9 shows a single user has a composition of multiple assigned tasks and associates of multiple children while a single child associates a single pet.

Process Design

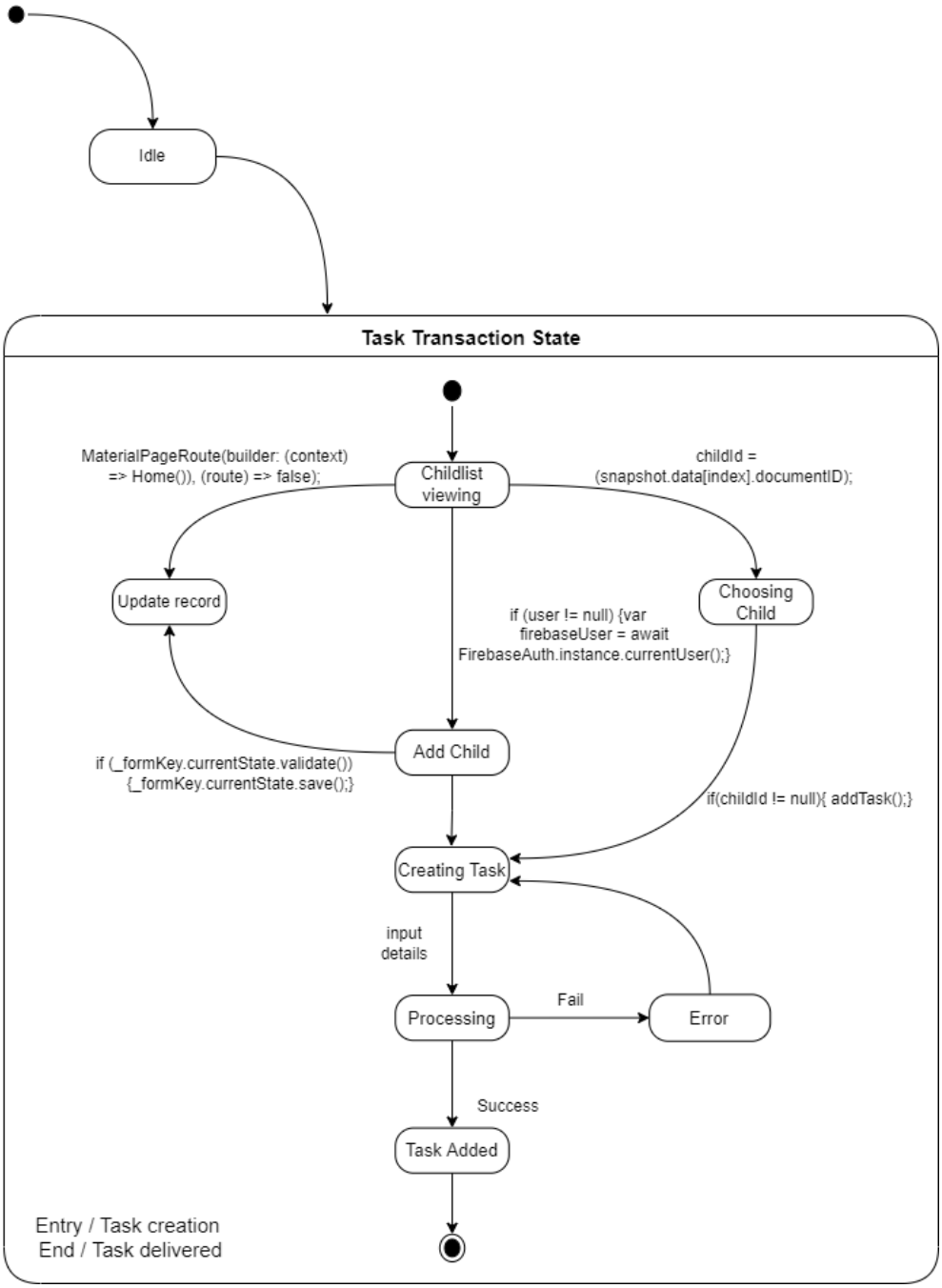

Figure 10. State Diagram of the System

Figure 10 shows the parent creating tasks for the child. Each task includes task name, description, and an incentive experience. After the tasks are created, they will appear on the child's screen and they will do the tasks assigned. If a task has been completed, the virtual pet would gain experience. If the experience reaches the maximum points the virtual pet will level up.

System Development Life Cycle

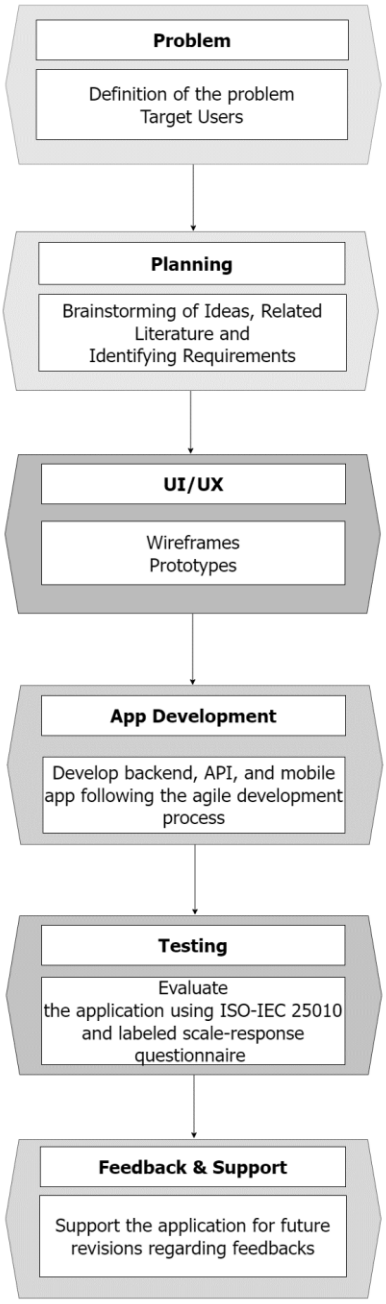

Figure 11. SDLC Model of the proposed System

The method of developing an assistive application can be separated into various life cycle stages, much like traditional software development. This can be accomplished using the methods that was used in the study.

The Software Development Life Cycle (SDLC) is a mechanism for rapidly generating high-quality, low-cost software. SDLC is a well-structured flow of stages that enables developers to deliver high-quality software that has been properly tested and is ready for production in an expedient manner. The SDLC process strives to guarantee that software satisfies the expectations of users.

In this study, Wisp assistive application used Agile Model SDLC. Iterative and gradual process models are combined in the Agile Model through delivering a working software product effectively that focuses on process adaptability and customer satisfaction. In addition, the Agile model has a flexible change process. Each iteration of agile SDLC consists of a development phase that moves from requirement gathering and analysis, designing the requirements, development, testing, deployment, and feedback.

CHAPTER 4

Implementation

The assistive application was implemented to make use of gamification that aims to utilize the screen time of children through assigning them various tasks, thus, engaging them in physical activities. Also, an implementation of gamification is in the form of a virtual pet game system that highlights a parent-led and child-centered game approach. The virtual pet includes eight characters and the design was made originally by the researchers.

The mobile application implementation was deployed with the minimum requirements using the Android 6.0 version, CPU type of Quad-Core (or more), with at least CPU speed of Quad-core 1.2GHz, and 2.0 GB RAM. During the implementation, the highest device specification that run the application testing is the Samsung a55 5g model which has a processor of Qualcomm Snapdragon 765G, operating system of Android 12 One UI 4.0, GPU of Adreno 620 and a CPU of Octa-core (1×2.4 GHz Kryo 475 Prime & 1×2.2 GHz Kryo 475 Gold & 6×1.8 GHz Kryo 475 Silver). In terms of the

user's device connection, it should be able to work with a requirement of internet connection in either of the device's Wi-Fi or 4G data services as the mobile application is online-dependent.

The development process was performed using Flutter API and Android Studio version 4.2.2. The implementation of the application's database is synced in real-time with the use of the Firebase Database. On the other hand, the implementation of Wisp gamification is through Rive, which is an interactive animation tool.

The preceding figures are the collection of user interfaces of the application. These interfaces served as the front-end design of the application and intermediary communication to the user. The screenshots are as follows:

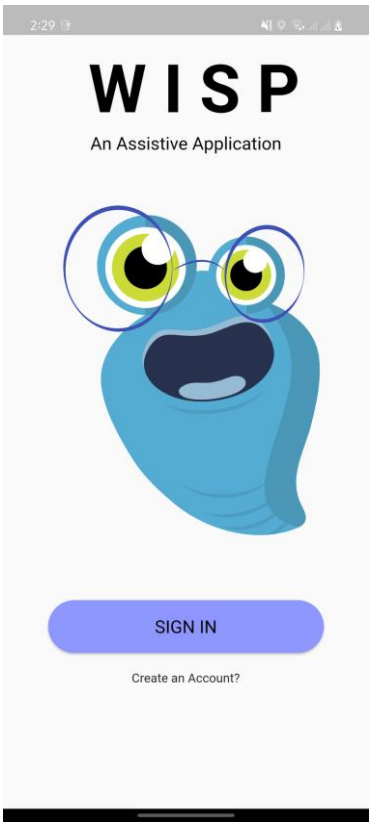

Figure 12. Start Screen Interface

Figure 12 exhibits the starting screen, having the initial preview and impression for its users. The start screen flaunts its major logo and the signature blue wisp character placed in the center of the page. Below the logo is the sign-in button prompting the user for the next step it will take.

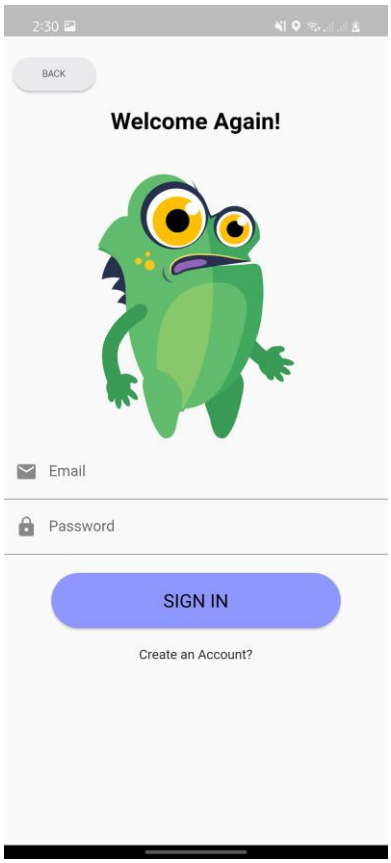

Figure 13. Log-in Screen Interface

Figure 13 displays the sign-in screen of the assistive application. In this form, the user is required to fill up necessary details by providing a previously agreed-upon username and password in order to gain access. The log-in interface welcomes the user with one of the animated wisps of the application adding more emphasis with a clean white

background. A back option button is also visible if the user wishes to go back to the previous screen page.

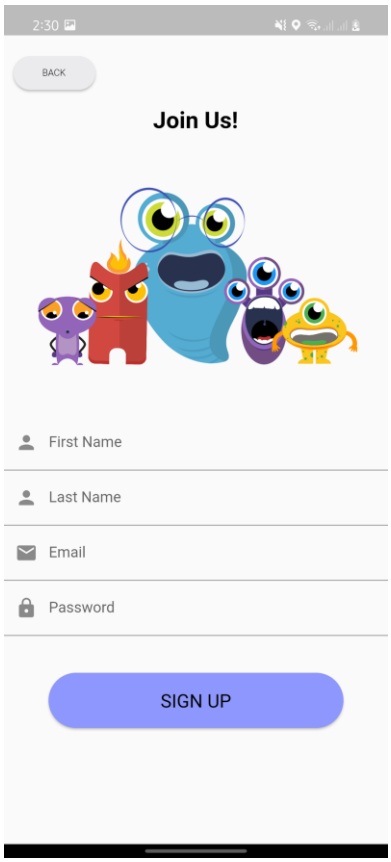

Figure 14. Sign-up Screen Interface

Figure 14 sets forth the sign-up page along with 5 of its different wisp characters. Below the characters are short fill-out form details for users that will join the application. This will allow the user to create an account by initially filling out his first and last name, email

address, and password for authentication purposes. All these details will be directed to the application's database — the Firebase database.

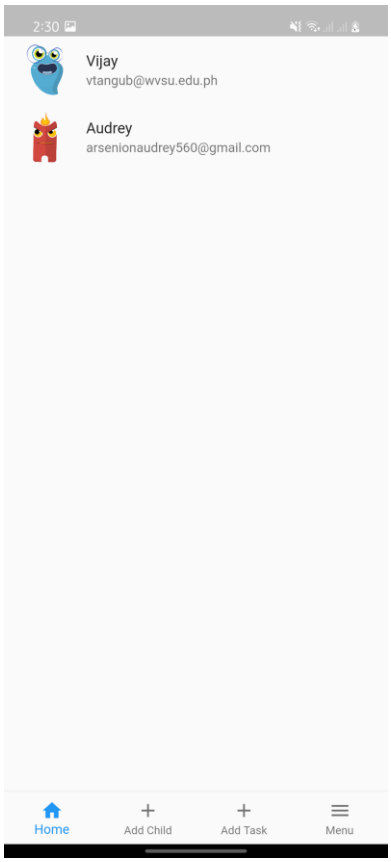

Figure 15. Home Screen Interface of Parent

Figure 15 shows the home screen interface of the parent after logging in to the assistive application as you can see there are two wisps that correspond to the

children of the parent which later be discussed in the next figure.

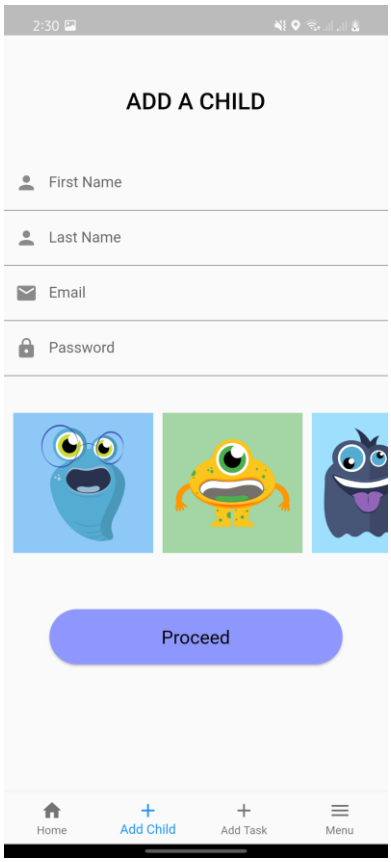

Figure 16. Add Child Interface of Parent

Figure 16 shows the add child interface of a parent in the assistive application wherein the parent will add the first name, last name, email, and password. After that, the parent will ask the child which wisp would he/she

prefer. Then, after clicking proceed the child wisp will appear on the home screen.

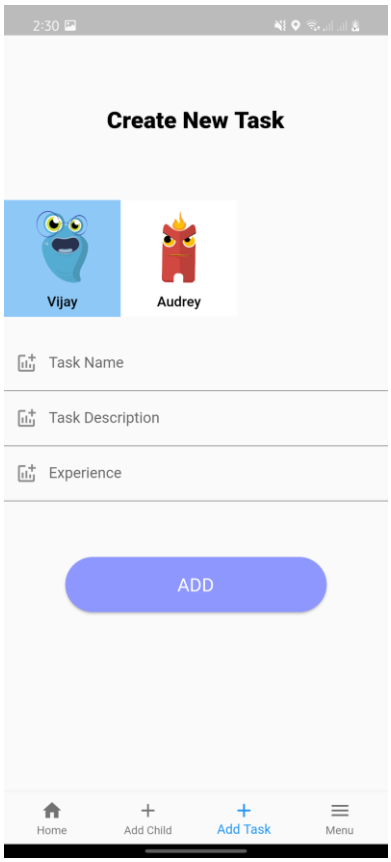

Figure 17. Add Task Interface of Parent

Figure 17 shows the add task interface of the parent in the assistive application wherein the parent will choose a specific child and add the following details: task name, task details, and task experience.

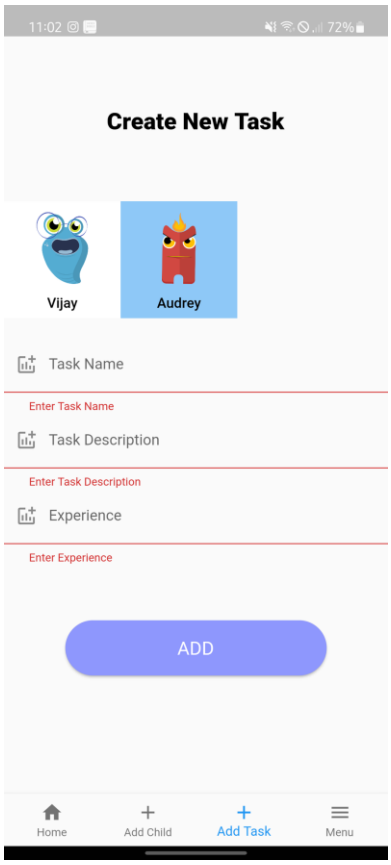

Figure 18. Input Validation for Missing Details in Add Task Interface of Parent

Figure 18 shows the validator in the add task interface to inform the parent every time there's a blank text field in the form.

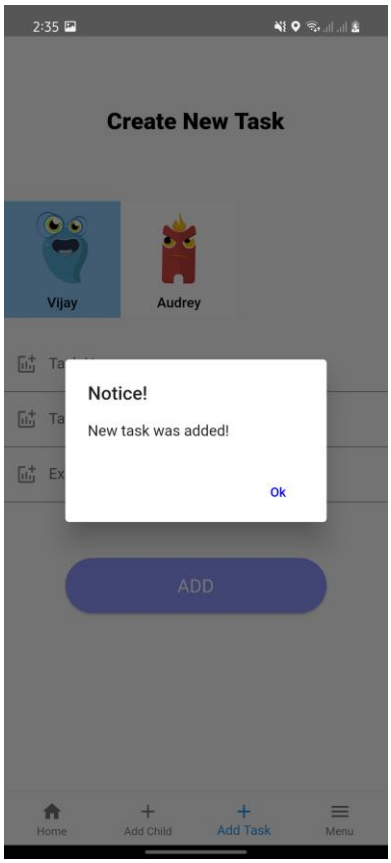

Figure 19. Pop-up Dialog for Add Task Interface of Parent

Figure 19 shows a pop-up dialog for adding a task interface to inform the parent that the task was successfully added.

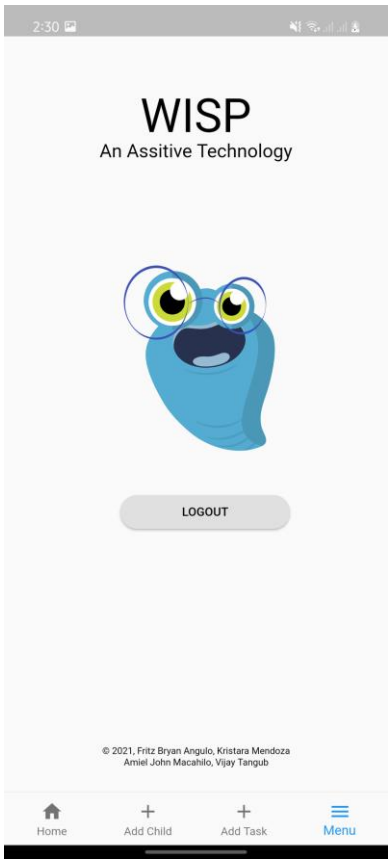

Figure 20. Menu Screen Interface of Parent

Figure 20 displays the parent's menu screen interface intended for the user if he or she chooses to logout of his or her account.

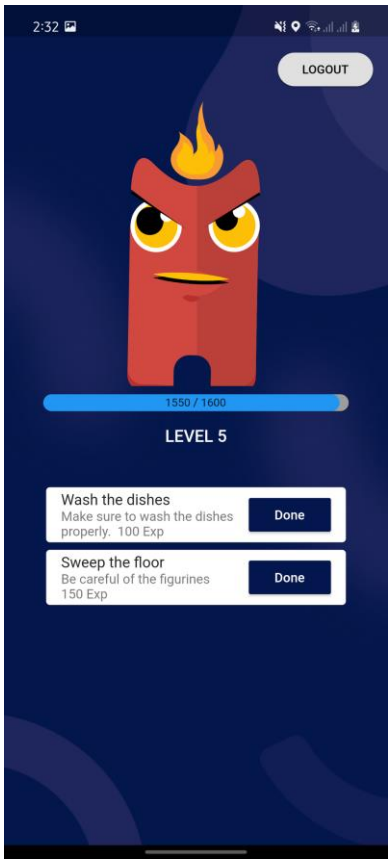

Figure 21. Home Screen Interface of Child

Figure 21 shows the interface of the child's home screen. On this page, the child is able to see the wisp pet he initially picked along with the pet's progress and level. This is also where the child's tasks are being displayed along with the task details.

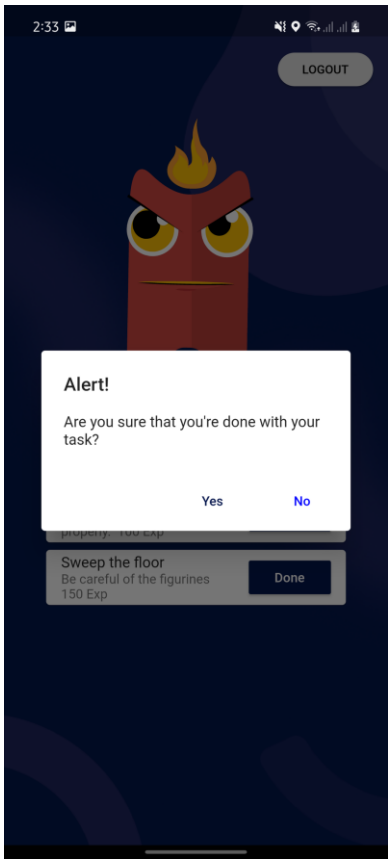

Figure 22. Pop-up Dialog for First Task Interface of Child

Figure 22 presents pop-up dialog details. This confirmation message is intended for children when they click the "done" button on the first task from the list. This is to confirm if they have actually done the first task.

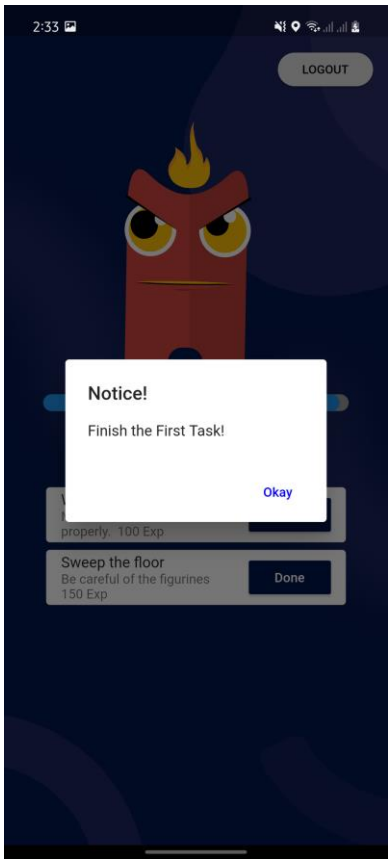

Figure 23. Pop-up Dialog for Second and Remaining Tasks

Interface of Child

Figure 23 depicts the pop-up dialog for the second and remaining tasks. If a child does not complete the first task, he or she cannot move on to the second task. As a result, FIFO algorithm is being used in this process.

Results Interpretation and Analysis

In this study, a total of 47 respondents were randomly selected. A group of 20 parents and 27 children with an age range of 7-12 years old, took part in testing the application. To obtain the feedback of both parents and children, a questionnaire was made through google forms that consists of 10 questions for the child and 9 questions for the parents.

In addition, the only personal data that were collected are the sex, the name of the respondent which is optional, and their age since they are important for the implementation of the application which should be suitable for the age group.

The children and their parents were fully informed about the study's objective, the scope of its use of the results, and the purpose of its future usage. All questionnaires were completed at their respective homes when the child is in a calm emotional state. This is done to prevent results from being skewed by any anxiety or concern that children may have had.

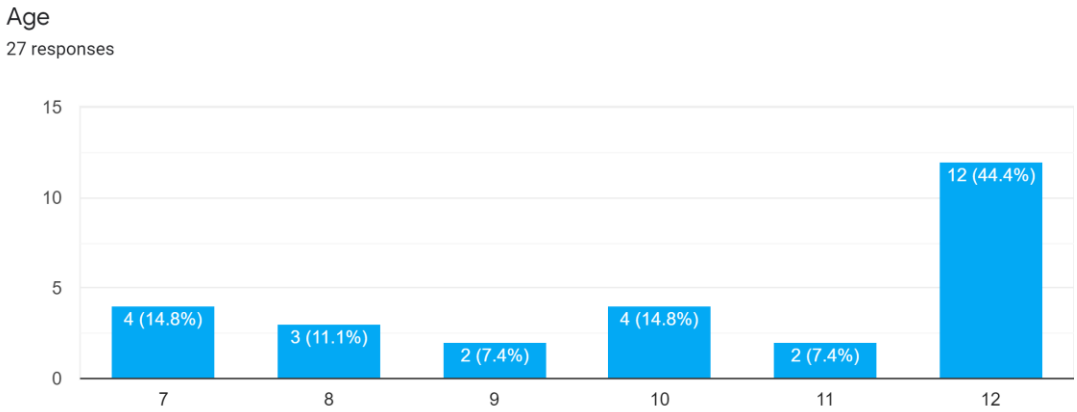

Figure 24. Age range of the children

This figure shows that 14.8% are seven years old, 11.1% are eight years old, 7.4% are nine years old, 14.8% are 10 years old, 7.4% are eleven years old, and 44.4% are twelve years old. Correspondence of Children towards the Wisp: Assistive Application When Taken as a Whole Group

Table 1

Children Questionnaire Results

Questions	SD	D	U	A	SA	Mean	Description
I felt capable of doing	0	0	0	8	19	4.70	Strongly

tasks.							Agree
The application motivates me in doing chores at home.	0	0	1	11	15	4.52	Strongly Agree
The application characters are good for me	0	0	0	5	22	4.81	Strongly Agree
I was motivated to achieve the goals I had in the application	0	0	2	9	16	4.52	Strongly Agree
The application is fun to use	0	0	1	8	18	4.63	Strongly Agree
The application is cool and entertaining	0	0	1	9	17	4.59	Strongly Agree
I feel motivated when my pet is gaining experience	0	0	1	4	22	4.78	Strongly Agree
The application is easy to use and navigate	0	0	1	9	17	4.59	Strongly Agree

I was motivated to use the application because of the visual aid.	0	0	0	10	17	4.63	Strongly Agree
Chores would have been more fun if I had used the application	0	0	1	9	17	4.59	Strongly Agree

Legend:

Scales of Mean	Description
5 - 4.1	Strongly Agree
4 - 3.1	Agree
3 - 2.1	Undecided
2 - 1.1	Disagree
1	Strongly Disagree

The correspondence of the children, age 7-12 years, towards the Wisp: an assistive application was determined by using the mean. The overall computed mean of the children's correspondence was 4.64 which is ruled as a strongly agreed rate or has positive feedback. This

concludes that the children are favorable with the entirety of the application and have a positive response with its potential. In addition, responses from questions do not have strongly disagree or disagree options from children indicating that none of them are dissatisfied with the application when taken as a whole group.

Specifically, findings show that out of the 10 questions, children had an overall correspondence of strongly agree in all items. Item no. 3 "The application characters are good for me." had the highest mean of 4.81 which conveys that children are fascinated by the wisp characters and their animations, therefore, the results have satisfied the second objective of developing a virtual pet game system that is centralized in a child-centered approach. Impact to the children have been visible upon observations to them by the researchers during the feedback gathering, wherein the kid respondents commend the appearance of the pet characters. Children were able to choose from the 8 characters that best piques their interest and became fond of their chosen pet in the application and were even motivated to do tasks.

The second highest mean value of 4.78 on item no. 7 "I feel motivated when my pet is gaining experience." which denotes that children were stimulated to get their tasks done as their pet continues to gain experience. This result reflected the 3rd objective of the study which is to create an in-game incentive system to motivate children in doing the tasks assigned and thus, efficiently fulfill them. Children were able to accomplish their tasks efficiently because they were engrossed with the thought that their pet is gaining more experience and advancing levels if they did more tasks. They attain that sense of accomplishment when they see their progress bar increasing which serves as their in-game incentive system.

Item no. 2 "The application motivates me in doing chores at home." and item no. 4 "I was motivated to achieve the goals I had in the application" had both the lowest mean value of 4.52 but still falls under the strongly agreed range. This implies that the lower percentage of children are undecided if the application has motivated them, but on the contrary, other majority of children are highly motivated or encouraged to do the tasks given to them through the application garnering higher scores on

the agreeing options — agree and strongly agree. Table 1 shows the data. Correspondence of Parents towards the Wisp: Assistive Application When Taken as a Whole Group

Table 2

Parent Questionnaire Results

Questions	SD	D	U	A	SA	Mean	Description
My child/children is/are doing the chores when they use the application	0	0	1	8	11	4.75	Strongly Agree
The functionality or features of the application is easy to understand.	0	0	3	12	5	4.1	Strongly Agree
The application helps my relationship towards my child	0	0	4	7	9	4.25	Strongly Agree
The application runs	0	0	0	8	12	4.6	Strongly

smoothly on my device.							Agree
Creating or adding tasks for my child is easy.	0	0	0	4	16	4.8	Strongly Agree
The first-in-first-out (FIFO) feature makes it easy for me to prioritize tasks that should come first.	0	0	1	2	17	4.8	Strongly Agree
I was easily taught how the application worked	0	0	6	10	4	3.9	Agree
I felt in control of what I was doing in the application	0	0	6	6	8	4.1	Strongly Agree
Generating my account and for my child is easy to understand and create.	0	1	4	5	10	4.2	Strongly Agree

Legend:

Scales of Mean Description

5 - 4.1	Strongly Agree
4 - 3.1	Agree
3 - 2.1	Undecided
2 - 1.1	Disagree
1	Strongly Disagree

The response of the parents towards the Wisp: Assistive application was calculated using mean. The overall computed mean of the parent's feedback was 4.39 which indicates that it is strongly agreed with the application. As a result, parents admired the application and had a favorable response in its capability. Moreover, the findings in the study show that two out of the nine questions are item no.5 "Creating or adding tasks for my child is easy", and item no.6 "The first-in-first-out (FIFO) feature makes it easy for me to prioritize tasks that should come first" had the highest mean of 4.8 which indicates that the objective 1 task management module that implements a first in first out queue algorithm is in line fulfilled and strongly agreed by the respondents. The results showed the impact towards the parents where they

were able to list the tasks they wanted to hand over to their children efficiently and were satisfied that prioritized tasks can be done first by their child, given that kids would not be able to skip to the next tasks without completing the first one. Thus, item no.7 “I was easily taught how the application worked” was the lowest with 3.9 but falls under the agreed range, indicating that some of the parents have learnability issues with technology and some are not tech-savvy for the reason of the generation gap.

System Evaluation Results

The system evaluation was conducted to the two experts. The researchers sent a letter with them and the data was collected through ISO 25010 evaluation form with the attached application.

Table 3

ISO 25010 - Functional Stability

Indicators		**VG**	**G**	**F**	**P**	**VP**	**Mean**
Completeness	The set of instructions all the specified task and user objectives.	0	1	1	0	0	3.5
Correctness	The system provides correct results with the needed degree of precision.	2	0	0	0	0	5

Appropriateness	The system provides the accomplishment of specified tasks and objectives.	1	1	0	0	0	4.5

Functional Stability. The results as shown in Table 3, concluded that assistive application has an overall functional stability mean value of 4.33. "Good" Completeness with 3.5 mean, "Very Good" correctness with 5.0 mean, and "Very Good" appropriateness with mean value of 4.5. Results indicate that the application is capable of offering functions that meet the implied needs.

Table 4

ISO 25010 - Reliability

Indicators		**VG**	**G**	**F**	**P**	**VP**	**Mean**
Maturity	A system, product or component meets for	1	1	0	0	0	4.5

	reliability under normal operation.						
Availability	A product or system is operational and accessible when required for use.	0	2	0	0	0	4.0
Fault tolerance	A system, product or component operates as intended despite the presence of hardware or software results.	0	2	0	0	0	4.0
Recoverability	In the event of an interruption or a failure, a product or system can recover the data and	0	0	2	0	0	3.0

	establish the desired state of the system.						

Reliability. The results shown in table 4 revealed that the system has "Good" reliability based on its overall mean value of 3.88. "Very Good" Maturity with 4.5 mean, "Good" availability with 4.0 mean, "Good" fault tolerance with 4.0 mean, and "Fair" recoverability with 3.0 mean. This indicates that it meets the reliability indicators and the quality of performing consistently well.

Table 5

ISO 25010 - Portability

Indicators		**VG**	**G**	**F**	**P**	**VP**	**Mean**
Adaptability	A product or system can effectively and efficiently be	2	0	0	0	0	5.0

	adapted for different or evolving hardware, software or other operational or usage environments						
Durability	A product or system can withstand technology evolution and changes without costly redesign, reconfiguration or recoding.	0	1	1	0	0	3.5
Installability	A product or system can be successfully installed and/or uninstalled in a specified environment.	0	2	0	0	0	4.0

Replaceability	A product can replace another specified software product for the same purpose in the same environment.	0	0	2	0	0	3.0
Affordability	A product or system can increase efficiency and productivity by reducing the time and costs involved in delivering instruction.	1	1	0	0	0	4.5

Portability. The above table illustrates the result that the application has an overall portability mean of 4.0. “Very Good” adaptability with 5.0 mean, “Good” durability with 3.5 mean, “Very Good” installability of 4.0, “Good”

replicability with 3.0 mean, and "Very Good" affordability with 4.5 mean value. This means that the application is capable of being transferred from one environment to another.

Table 6

ISO 25010 – Usability

Indicators		**VG**	**G**	**F**	**P**	**VP**	**Mean**
Appropriate-ness Recognizabi-lity	Users can recognize whether a product or the system is appropriate for their needs.	1	1	0	0	0	4.5
Learnability	A product or system enables the user to learn how to use it with effectiveness, efficiency in	0	1	1	0	0	3.5

	emergency situations.						
Operability	A product or system is easy to operate, control and appropriate to use.	1	1	0	0	0	4.5
User error protection	A product or system protects users against making errors.	0	0	2	0	0	3.0
User interface aesthetics	A user interface enables pleasing and satisfying interactions for the user.	0	0	2	0	0	3.0
Accessibility	A product or system can be used by people with the widest range of characteristics and capabilities to achieve a specified	0	2	0	0	0	4.0

	goal in a specified context of use.						

Usability. The results shown in table 6 displays that the system has "Good" usability based on its overall mean value of 3.75. "Very Good" appropriateness recognizability with 4.5 mean, "Good" learnability with 4.0 mean, "Very Good" Operability with 4.5 mean, "Fair" user error protection with 3.0 mean, "Fair" user interface aesthetics with 3.0 mean, "Good" accessibility with 4.0 mean. This means that the system achieved a defined goal effectively, efficiently, and satisfactorily.

Table 7

ISO 25010 - Performance Efficiency

Indicators		**VG**	**G**	**F**	**P**	**VP**	**Mean**
Time-behavior	The response and	0	0	2	0	0	3.0

	processing times and throughput rates of a product or system, when performing its functions, meet requirements.						
Resource utilization	The amounts and types of resources used by a product or system, when performing its functions meet requirements.	0	2	0	0	0	4.0
Capacity	The maximum limits of the product or system parameters meet requirements.	2	0	0	0	0	5.0

Performance Efficiency. Results above have accumulated with an overall performance efficiency mean of 4.0. "Good" Time behavior of 3.0, "Very Good" resource utilization of 4.0, and capacity mean of 5.0. This means that the application has satisfied the required performance related to the number of resources used.

Table 8

ISO 25010 - Security

Indicators		**VG**	**G**	**F**	**P**	**VP**	**Mean**
Confidentiality	The prototype ensures that data are accessible only to those authorized to have access.	0	1	1	0	0	3.5
Integrity	A system, product, or component prevents unauthorized access	0	2	0	0	0	4.0

	to, or modification of, computer programs or data.						
Non-repudiation	Actions or events can be proven to have taken place so that the events or actions cannot be repudiated later.	0	2	0	0	0	4.0
Accountability	The actions of an entity can be traced uniquely to the entity.	0	1	1	0	0	3.5
Authenticity	The identity of a subject or resources can be proved to be the one claimed.	0	0	2	0	0	3.0

Security. Table 8 has an overall mean security value of 3.5 categorized as "Good". "Good" confidentiality 3.5,

"Very Good" integrity of 4.0, "Very good" non-repudiation with 4.0 mean, "Good" accountability of 3.5, and "Fair" authenticity mean value of 3.0. This generally means that the application is somehow able to protect information and data from security vulnerabilities.

Table 9

ISO 25010 - Compatibility

Indicators		**VG**	**G**	**F**	**P**	**VP**	**Mean**
Co-existence	A product can perform its required functions efficiently while sharing a common environment and resources with other products, without	1	0	1	0	0	3.0

	detrimental impact on any other product						
Interoperability	Two or more systems, products or components can exchange information and use the information that has been exchanged.	1	1	0	0	0	4.5

Compatibility. The results shown in table 9 revealed that the system has "Good" compatibility based on its overall mean value of 3.75. "Fair" co-existence with 3.0 mean, and "Very Good" availability with 4.0 mean. This means that the system or component can share data with other goods, systems, or components and/or execute its needed functions while sharing the same hardware or software environment.

Table 10

ISO 25010 - Maintainability

Indicators		VG	G	F	P	VP	Mean
Modularity	The application is composed of discrete components such that a change to one component has minimal impact on other components.	0	0	2	0	0	3.0
Reusability	An asset can be used in more than one system, or in building other assets.	0	0	2	0	0	3.0
Analyzability	It is possible to assess the impact on a product or system	1	1	0	0	0	4.5

	of an intended change to one or more of its parts, or to diagnose a product for deficiencies or causes of failures, or to identify parts to be modified.						
Modifiability	The application can be effectively and efficiently modified without introducing defects or degrading existing product quality.	0	0	2	0	0	3.0
Testability	Test criteria can be established for an application, product or component and tests	0	2	0	0	0	4.0

	can be performed to determine whether those criteria have been met.						

Maintainability. The results shown in table 10 displayed that the system has "Good" maintainability based on its overall mean value of 3.5. "Fair" modularity with 3.0 mean, "Fair" reusability with 3.0 mean, "Very Good" analyzability with 4.5 mean, "Fair" modifiability with 3.0 mean, and "Good" testability with 4.0 mean. This signifies that the system has attained the level of effectiveness and efficiency at which a product or system may be adjusted to improve, rectify, or adapt to changes in the environment and needs.

Table 11

Summary of ISO 25010

ISO 25010	Overall Mean	Interpretation
Functional Stability	4.33	Very Good
Reliability	3.88	Good
Portability	4.0	Good
Usability	3.75	Good
Performance Efficiency	4.0	Good
Security	3.6	Good
Compatibility	3.75	Good
Maintainability	3.5	Good

Legend:

Scales of Mean	Description
5 - 4.1	Very Good
4 - 3.1	Good

3 - 2.1	Fair
2 - 1.1	Poor
1	Very Poor

The results as shown in table 11 indicate that the assistive application achieved an overall “Good” rating based on the ISO 25010 standard garnering an overall mean of 3.85. Precisely, among the eight quality requirements, Functional Stability has the highest mean value of 4.33 conforming within the range of the “very good” rating. The rest of the requirements which are reliability, portability, usability, performance efficiency, security, compatibility, and maintainability have attained a “Good” rating.

Results have satisfied the conducted quality evaluation and therefore attest to the application’s quality for providing implied needs to its users.

CHAPTER 5

Summary, Conclusions, and Recommendations

Summary of the Proposed Study Design and Implementation

This study developed an assistive technology by implementing the First-in-first-out (FIFO) queue algorithm for the task management module and incorporating gamification in the form of animated characters, enabling them to engage in physical activities in which tasks are provided in the application.

Wisp assistive application was able to operate in full functionality, able to create an account for the parent, adding of child, as well as choosing which wisp characters their child desires and adding tasks with the implementation of the FIFO algorithm. The FIFO algorithm in the application had shown to queue efficiently the tasks provided for the children's interface. The first task in the application when created by their parents will queue in first on the list, followed by the next tasks they created. If the child refuses to do the first task and opt to do the next one, the application will prompt a message indicating they need to finish the first task created. With

this set up using the method of FIFO algorithm, the first task will be done first and will be removed from the list allowing for the next one to take over. Every task completed has a corresponding reward in the form of gaining experience for their wisp pet allowing them to level up.

The development process of the implementation of the Wisp: assistive application was carried out through making use of the Flutter API as well as utilizing Android Studio version 4.2.2. Storing and syncing in real-time of the application's data between the users are done through Firebase Database. Gamification of the 8 wisp characters was animated with the use of Rive—interactive design and animation tool

The research will be of great help to engage children in doing physical activities by making use of their screen times into a productive task and motivating them with the child-centered approach of the application. Moreover, the assistive application can be utilized efficiently at home to also introduce children to productive household tasks promoting independence and instilling responsibility even at a young age and be able to recognize priorities that should be done first.

Conclusions

After implementation and testing, the results of the proposed system have shown and it was able to meet its objectives as follows:

1. The task management module that implements a first in first out queue algorithm performed well and the child finished the task on an order basis.
2. The virtual pet game system that highlights parent-led and child-centered game approaches were indeed excellent to the child users. The animated wisp characters were able to stimulate the child's motivation to finish each task given to them.
3. The in-game incentive system which is the in-game experience, was able to provide motivation to child users when doing the task provided by their parents.
4. The overall performance of the system evaluated based on feedback was 4.64 overall mean for child users and 4.39 overall mean for parent users which indicates "Strongly Agree". On the other hand, the overall performance of the system evaluated based on ISO 25010 Standard was 3.85 which indicates "Good".

Furthermore, the system was able to meet the needs and requirements of the end-users and IT experts.

Recommendations

The following recommendations are suggested based on the observations and conclusions presented:

1. To include mini-games in the application for supplementary intrinsic motivation and for added chances for the wisp pet to gain experience.
2. To include a timer system for tasks to finish on a designated time limit.
3. To include a mood bar for virtual pets if the child does not complete his/her tasks.
4. To add the option of viewing history for the previous tasks completed.
5. To add a sharing option in which the user's wisp account is able to connect with other social media accounts.

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APPENDICES

Appendix A

Letter to the Adviser

	INVITATION LETTER FOR ADVISER	Document No.	WVSU-ICT-SOI-03-F03
		Issue No.	1
		Revision No.	0
	WEST VISAYAS STATE UNIVERSITY	Date of Effectivity:	April 27, 2018
		Issued by:	CICT
		Page No.	Page 1 of 1

March 2, 2021

DOFITAS, CYRENE JR. S.
Associate Professor I
College on ICT – West Visayas State University
St. Luna, La Paz, Iloilo City

Dear Prof. Dofitas,

The undersigned are BS Information Technology Research 1/Thesis 1 students of CICT, this university. Our thesis/capstone project title is *"Implementing First-in-First-Out (FIFO) Queue Algorithm for Task Scheduling of Wisp: An Anti-Lazy Application"*.

Knowing of your expertise in research and on the subject matter, we would like to request you to be our **ADVISER**.

We are positively hoping for your acceptance. Kindly check the corresponding box and affix your signature in the space provided. Thank you very much.

Respectfully yours,

1. Angulo, Fritz Bryan N.,
2. Mendoza, Kristara C.,
3. Tangub, Vijay,

PS:

Advisers, are task to work with the students in providing direction and assistance as needed in their thesis/capstone project. They shall meet with the students weekly or as needed to provide direction, check on progress and assist in resolving problems until such a time that the students passed their defenses and submit their final requirements, as well as, preparing their evaluations and grades.

Action Taken:
● I Accept.
❍ Sorry. I don't accept.

CYRENEO DOFITAS JR.
Signature over printed name of the Adviser

CC:

CICT Dean
Research Coordinator
Group
**To be accomplished in 4 copies*

Appendix B

Letter to the Co-Adviser

March 2, 2021

SOLIDARIOS, MARK JOSEPH J.
Part-time Instructor
College on ICT – West Visayas State University
St. Luna, La Paz, Iloilo City

Dear Prof. Solidarios,

The undersigned are BS Information Technology Research 1/Thesis 1 students of CICT, this university. Our thesis/capstone project title is "Implementing First-in-First-Out (FIFO) Queue Algorithm for Task Scheduling of Wisp: An Assistive Application".

Knowing of your expertise in research and on the subject matter, we would like to request you to be our **CO-ADVISER**.

We are positively hoping for your acceptance. Kindly check the corresponding box and affix your signature in the space provided. Thank you very much.
Respectfully yours,

1. Angulo, Fritz Bryan N.,
2. Macahilo, Amiel John B.
3. Mendoza, Kristara C. ,
4. Tangub, Vijay,

PS:
Advisers are tasked to work with the students in providing direction and assistance as needed in their thesis/capstone project. They shall meet with the students weekly or as needed to provide direction, check on progress and assist in resolving problems until such a time that the students pass their defenses and submit their final requirements, as well as, preparing their evaluations and grades.

Action Taken:	
❍ I Accept.	
❍ Sorry. I don't accept.	Signature over printed name of the Adviser

Appendix C

Letter to the Child Psychologist

April 20, 2021

Dr. Aimee G. Chua
Faculty, College of Medicine
West Visayas State University
La Paz, Iloilo City

Dear Dr. Chua,

Good day!

We are third year BSIT students of College of Information and Communications Technology at West Visayas State University. We sincerely ask for your assistance from your good office for the validation of our thesis entitled: "Implementing First-in-First-Out (FIFO) Queue Algorithm for Task Scheduling of Wisp: An Assistive Application".

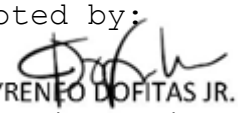
The purpose is to clarify if our User Interface is child-friendly and to validate if our idea could help children to lessen their screen time.

We are looking forward to your positive response about this matter. Thank you so much.

Sincerely yours,

Vijay Tangub
Leader – Group 2
09212686059
vtangub@wvsu.edu.ph

Noted by:



Thesis Adviser

Appendix D

Letter to the ISO Evaluator

November 17, 2021

Vicente, Celesamae T.
Assistant Professor, College of Computer Studies
Mindanao State University - Iligan Institute of Technology
Iligan City, Philippines

Dear Prof Vicente,

We, the researchers of the College of Information and Communications Technology, would like to request you of your time for the ISO 25010 standard to evaluate our proposed system for our undergraduate thesis entitled "Implementing First-In-First-Out (FIFO) Queue Algorithm for Task Scheduling of Wisp: An Assistive Application". We will provide you with the evaluation form with the attached application along with our thesis documents from chapters 1-3.

A great pleasure of having you as our evaluator for our undergraduate thesis. If you have any questions please feel free to contact us in this email, it will be much appreciated.

Thank you very much

Respectfully yours,

Fritz Bryan N. Angulo
Amiel John Macahilo
Kristara Mendoza
Vijay Tangub

Appendix E

Letter to the ISO Evaluator

November 17, 2021

Tidula, Jenel T.
CEO,
JT Sparks
Nanga, Guimbal, Iloilo

Dear Mr. Jenel,

We, the researchers of the College of Information and Communications Technology, would like to request you of your time for the ISO 25010 standard to evaluate our proposed system for our undergraduate thesis entitled "Implementing First-In-First-Out (FIFO) Queue Algorithm for Task Scheduling of Wisp: An Assistive Application". We will provide you with the evaluation form with the attached application along with our thesis documents from chapters 1-3.

A great pleasure of having you as our evaluator for our undergraduate thesis. If you have any questions please feel free to contact us in this email, it will be much appreciated.

Thank you very much

Respectfully yours,

Fritz Bryan N. Angulo
Amiel John Macahilo
Kristara Mendoza
Vijay Tangub

Appendix F

Letter to the English Editor

March 1, 2022

Padilla, Simoun Omar Dylan
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West Visayas State University
La Paz, Iloilo City

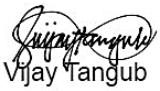
Dear Mr. Padilla,

We, the researchers of the College of Information and Communications Technology, would like to request you of your time as our English Editor for our undergraduate thesis entitled “Implementing First-In-First-Out (FIFO) Queue Algorithm for Task Scheduling of Wisp: An Assistive Application”. We will provide you with a complete thesis document prior to the evaluation.

A great pleasure of having you as our english editor for our undergraduate thesis. If you have any questions please feel free to contact us on the contact details below, it will be much appreciated.

Thank you very much

Respectfully yours,



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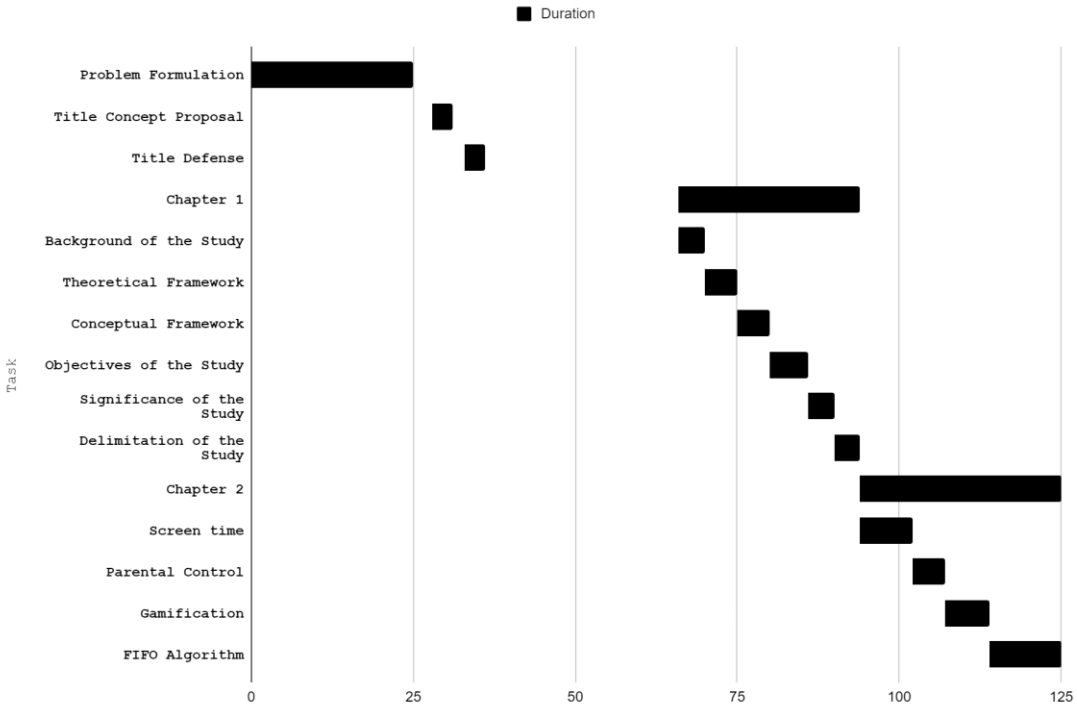
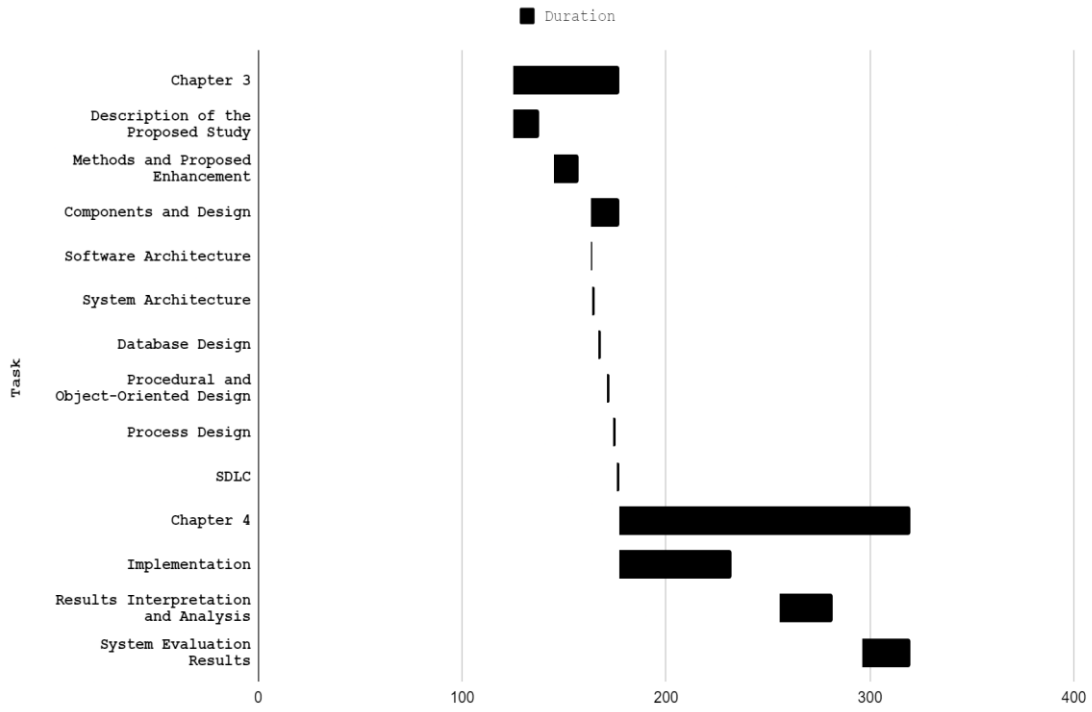
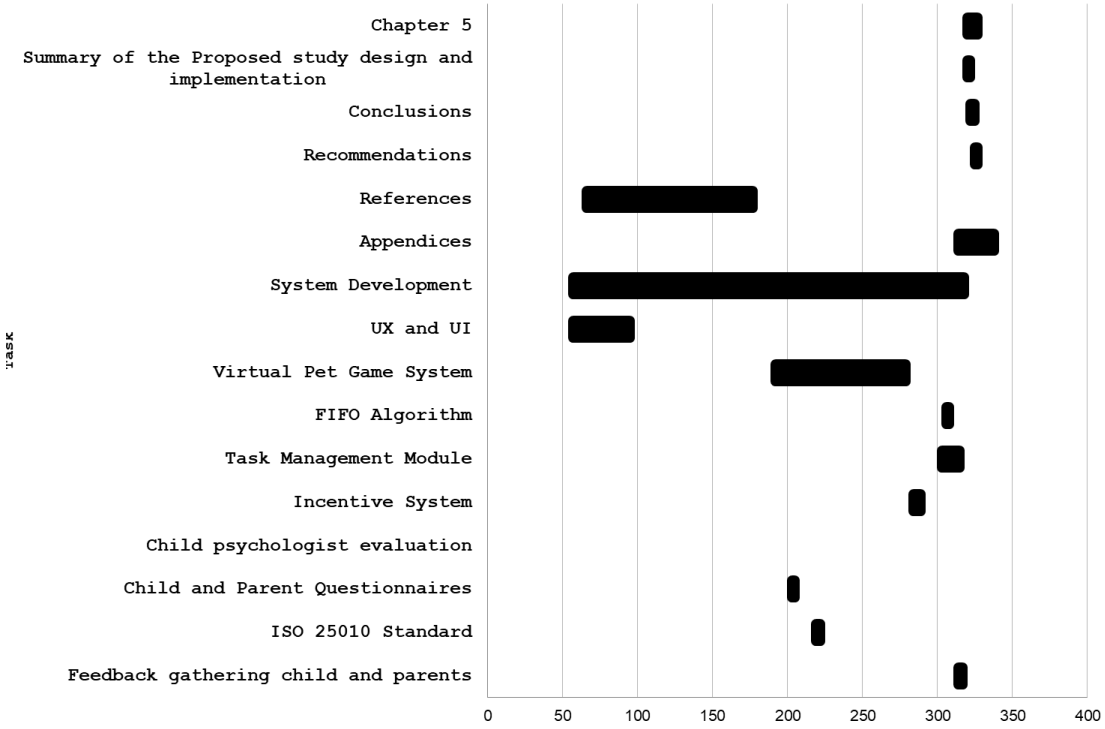
Thesis Adviser

Appendix G

Gantt Chart




Duration
Task
Chapter 3
Description of the Proposed Study
Methods and Proposed Enhancement
Components and Design
Software Architecture
System Architecture
Database Design
Procedural and Object-Oriented Design
Process Design
SDLC
Chapter 4
Implementation
Results Interpretation and Analysis
System Evaluation Results
0
100
200
300
400


Chapter 5
Summary of the Proposed study design and implementation
Conclusions
Recommendations
References
Appendices
System Development
UX and UI
Virtual Pet Game System
FIFO Algorithm
Task Management Module
Incentive System
Child psychologist evaluation
Child and Parent Questionnaires
ISO 25010 Standard
Feedback gathering child and parents
Task
0
50
100
150
200
250
300
350
400

Appendix H

Data Dictionary

User					
Field Name	**Data type**	**Field Length**	**Constraint**	**Description**	**Required**
user_id	int	50	Primary key	user id, Auto generated	Yes
user_firstName	string	20	not null	user first name	Yes
user_lastName	string	20	not null	user last name	Yes
user_email	string	30	not null	user email	Yes
user_password	varchar	30	not null	user password	Yes
user_role	string	20	not null	user role	Yes
task_id	int	50	Foreign key	task id, Auto generated	Yes
child_id	int	20	Foreign key	child id, Auto generated	Yes

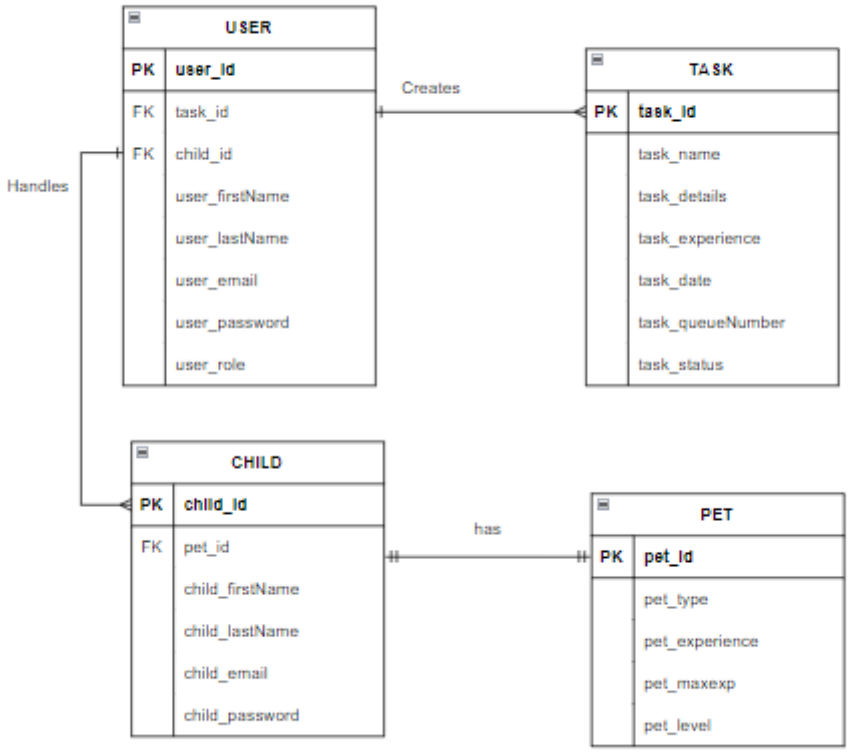
Pet					
Field Name	**Data type**	**Field Length**	**Constraint**	**Description**	**Required**
pet_id	int	50	Primary key	pet id, Auto generated	Yes
pet_type	string	20	not null	wisp type	Yes
pet_experience	int	5	not null	wisp current experience	Yes
pet_level	int	5	not null	wisp current level	Yes
pet_maxexp	int	20	not null	wisp maximum experience	Yes

Task					
Field Name	**Data type**	**Field Length**	**Constraint**	**Description**	**Required**
task_id	int	50	Primary key	task id, Auto generated	Yes
task_name	varchar	50	Not null	Name title of task	Yes
task_details	varchar	100	Not null	Description of task	Yes
task_experience	int	3	Not null	experience amount	Yes
child_id	varchar	10	Foreign key	child id, Auto generated	Yes
task_date	date	50	Not null	date of task	Yes
task_queueNumber	int	3	Not null	sequence of tasks	Yes
task_status	varchar	10	Not null	current stature of task	Yes

Child					
Field Name	**Data type**	**Field Length**	**Constraint**	**Description**	**Required**
child_id	int	50	Primary key	pet id, Auto generated	Yes
child_firstName	string	20	not null	child first name	Yes
child_lastName	string	20	not null	child last name	Yes
child_email	string	30	not null	child email name	Yes
child_password	varchar	30	Foreign key	child password	Yes
pet_id	int	50	Foreign key	pet id, Auto generated	Yes

Appendix I

Entity Relationship Diagram



Appendix J

Source Code

```
StreamBuilder(
     stream: firestore_task.where("child_id", isEqualTo:
             userId).where( "task_status", isEqualTo:"in
             progress").orderBy("task_queueNumber",descen
             ding: false).snapshots(),
     builder: (context, snapshot){
       if(snapshot.hasError){
          return Text("Error");
          }
       if(snapshot.connectionState ==
          ConnectionState.waiting){
          return Text("Loading ...");
       }
       if(snapshot.hasData){
          return Container(
            height: deviceHeight * 0.40,
            width: deviceWidth * 0.80,
            child: ListView.builder(shrinkWrap: true,
                itemCount:snapshot.data.documents.length,
                 itemBuilder: (_, index) {
                    _buildPopupDialog(BuildContext
                    context) {
                      return AlertDialog(
                         title: const Text('Alert!'),
                         content: new Column(
                           mainAxisSize:
                           MainAxisSize.min,
                           crossAxisAlignment:
                           CrossAxisAlignment.start,
                           children: <Widget>[
                              Text("Are you sure that
                              you're done with your
                              task?"),],),
                         actions: <Widget>[
                           new FlatButton(
                              onPressed: () {
```

```
                deletetask(snapshot.data.
                documents[index].referenc
                e.documentID);
                updatedExp = petExp +
                int.parse("${snapshot.dat
                a.documents[index].data["
                task_experience"]}");

                petExp = updatedExp;
                print(petExp);
            if(petExp < max){
              updatePetExperience(petExp,
              userId);
              Navigator.of(context).pop();}
            else{
              updatePetExperience(petExp,
              userId);
              updatedMax = max*2;
              max = updatedMax;
              petLevel++;

              while(max<petExp){
                updatedMax = max*2;
                max = updatedMax;
                petLevel++;}

              updatePetLevel(petLevel,max
              ,userId);
             Navigator.of(context).pop();},

            textColor: Color(0xFF03164d),
                child: const Text('Yes'),),
             new FlatButton(
                onPressed: () {
                  Navigator.of(context).pop
                  ();},
                textColor:
                Color(0xFF0000Ff),
                child: const
                Text('No'),)],);}

        _buildPopupDialog_Fifo(BuildContext
        context) {
```

```
  return AlertDialog(
     title: const Text('Notice!'),
     content: new
     Column(mainAxisSize:
     MainAxisSize.min,crossAxisAlignm
     ent: CrossAxisAlignment.start,
       children: <Widget>[
           Text("Finish the First
           Task!"),],),

        actions: <Widget>[new
           FlatButton(onPressed: ()
           {Navigator.of(context).pop
           ();}, textColor:
           Color(0xFF0000Ff),child:
           const Text('Okay'),),],);}
return Padding(padding:
EdgeInsets.only(top: 0.0),
child: Card(
     child: ListTile(
          title:
             Text(snapshot.data.docum
             ents[index].data["task_n
             ame"]),

          subtitle:
             Text("${snapshot.data.do
             cuments[index].data["tas
             k_details"]}${snapshot.d
             ata.documents[index].dat
             a["task_experience".toSt
             ring()]}" +" Exp"),

          trailing: Row(mainAxisSize:
               MainAxisSize.min,
               children: [
               RaisedButton(
               child: Text('Done',
          style: TextStyle(color:
          Colors.white,),
          ),
```

```
                                color: Color(0xFF03164d),
                                onPressed: () {

                                if(index == 0)
                                {
                                     showDialog(context:
                                     context,builder:
                                     (BuildContext context)
                                     =>_buildPopupDialog(con
                                     text),);
                                }

                                      else
                                {
                                     showDialog(context:
                                     context,builder:
                                     (BuildContext context)
                                     =>
                                     _buildPopupDialog_Fifo(
                                     context),);
                                }
                                },),],),
                           ),
                      ),
                 );
            }),
       );
}
```

Appendix K

Child Questionnaire

Wisp Parent & Child Questionnaire

* Required

1. ROLE *

Mark only one oval.

- ◯ Parent *Skip to parent questionnaire.*
- ◯ Child *Skip to child questionnaire.*

Child Questionnaire

2. Name(Optional)

_____

3. Age *

_____

4. Sex *

Mark only one oval.

- ◯ Male
- ◯ Female

1. I felt capable of doing tasks. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

2. The application motivates me in doing chores at home *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

3. The application characters are good for me *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

4. I was motivated to achieve the goals I had in the application *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

5. The application is fun to use *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

6. The application is cool and entertaining *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

7. I feel motivated when my pet is gaining experience *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

8. The application is easy to use and navigate *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

9. I was motivated to use the application because of the visual aid. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

10. Chores would have been more fun if I had used the application *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

Appendix L

Parent Questionnaire

1. Name(Optional)

2. Age *

3. Sex *

Mark only one oval.

- Male
- Female

1. My child/children is/are doing the chores when they use the application *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree						Strongly Agree

2. The functionality or features of the application is easy to understand. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree						Strongly Agree

3. The application helps my relationship towards my child. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

4. The application runs smoothly on my device. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

5. Creating or adding tasks for my child is easy. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

6. The first-in-first-out (FIFO) feature makes it easy for me to prioritize tasks that should come first. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

7. I was easily taught how the application worked. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

8. I felt in control of what I was doing in the application. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

9. Generating my account and for my child is easy to understand and create. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

Appendix M

ISO Questionnaire

Using the scale below evaluate the system by placing a check (✓) mark on the appropriate column.

5 — Very Good 4 — Good 3 — Fair 2 — Poor 1— Very Poor

1. Functional Stability

Indicators		5	4	3	2	1
Completeness	The set of instructions all the specified task and user objectives.					
Correctness	The system provides correct results with the needed degree of precision.					
Appropriateness	The system provides the accomplishment of specified tasks and objectives.					

2. Reliability

Indicators		5	4	3	2	1
Maturity	A system, product or component meets for reliability under normal operation.					

Availability	A product or system is operational and accessible when required for use.					
Fault tolerance	A system, product or component operates as intended despite the presence of hardware or software results.					
Recoverability	In the event of an interruption or a failure, a product or system can recover the data and establish the desired state of the system.					

3. Portability

Indicators		5	4	3	2	1
Adaptability	A product or system can effectively and efficiently be adapted for different or evolving hardware, software or other operational or usage environments.					
Durability	A product or system can withstand technology evolution and changes without costly redesign, reconfiguration or recoding.					

Installability	A product or system can be successfully installed and/or uninstalled in a specified environment.					
Replaceability	A product can replace another specified software product for the same purpose in the same environment.					
Affordability	A product or system can increase efficiency and productivity by reducing the time and costs involved in delivering instruction.					

4. Usability

Indicators		5	4	3	2	1
AppropriatenessRecognizability	Users can recognize whether a product or system is appropriate for their needs.					

Learnability	A product or system enables the user to learn how to use it with effectiveness, efficiency in emergency situations.					
Operability	A product or system is easy to operate, control and appropriate to use.					
User error protection	A product or system protects users against making errors.					
User interface aesthetics	A user interface enables pleasing and satisfying interactions for the user.					

Accessibility	A product or system can be used by people with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use.					

5. Performance Efficiency

Indicators		5	4	3	2	1
Time-behavior	The response and processing times and throughput rates of a product or system, when performing its functions, meet requirements.					
Resource utilization	The amounts and types of resources used by a product or system, when performing its functions, meet requirements.					
Capacity	The maximum limits of the product or system parameters meet requirements.					

6. Security

Indicators		5	4	3	2	1
Confidentiality	The prototype ensures that data are accessible only to those authorized to have access.					
Integrity	A system, product or component prevents unauthorized access to, or modification of, computer programs or data.					
Non-repudiation	Actions or events can be proven to have taken place, so that the events or actions cannot be repudiated later.					
Accountability	The actions of an entity can be traced uniquely to the entity.					
Authenticity	The identity of a subject or resources can be proved to be the one claimed.					

7. Compatibility

Indicators	5	4	3	2	1

Co-existence	A product can perform its required functions efficiently while sharing a common environment and resources with other products, without detrimental impact on any other product.					
Interoperability	Two or more systems, products or components can exchange information and use the information that has been exchanged.					

8. Maintainability

Indicators		5	4	3	2	1
Modularity	The application is composed of discrete components such that a change to one component has minimal impact on other components.					
Reusability	An asset can be used in more than one system, or in building other assets.					

Analyzability	It is possible to assess the impact on a product or system of an intended change to one or more of its parts, or to diagnose a product for deficiencies or causes of failures, or to identify parts to be modified.					
Modifiability	The application can be effectively and efficiently modified without introducing defects or degrading existing product quality.					
Testability	Test criteria can be established for an application, product or component and tests can be performed to determine whether those criteria have been met.					

Appendix N

Disclaimer

This software project and its corresponding documentation titled "Implementing First-in-First-out (FIFO) Queue Algorithm for Task Scheduling of Wisp: An Assistive Application" is submitted to the College of Information and Communications Technology, West Visayas State University, in partial fulfillment of the requirements for the degree, Bachelor of Science in Information Technology. It is the product of our own work, except where indicated text.

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