PROJECT THEME:

DIGITAL SOLUTIONS FOR THE AUTISM COMMUNITY

GROUP 4

GROUP MEMBER:

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SUBJECT: TECHNOLOGY AND INFORMATION SYSTEM (SECP1513-01)

LECTURER: PROF DR AZURAH BINTI A SAMAH

VIDEO LINK: https://youtu.be/iEVlf4avv_I

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INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that affects how individuals communicate, engage with others and experience the world around them. It typically appears in early childhood and it can be heavily influences their social interaction, communication skills, behaviour and sensory processing. It is called a “spectrum” because autism can exist differently in everyone, with a wide range of abilities, strengths, and challenges. Some individuals may require significant support in daily life, while others are able to live independently and demonstrate strong skills in areas such as memory, creativity or problem-solving.

Therefore, understanding autism is crucial for the society to promote acceptance, inclusion and appropriate support for autistic individuals. Assistance can be given in educational and social environments to ensure they can go through their daily life and interact with people smoothly in reality. Early identification, appropriate interventions and supportive environments can greatly improve learning skills, communication and overall quality of life for them.

FLOW OF DESIGN THINKING

Empathy Phase

Empathy Research

Autism typically manifests in the first three years of life, at the latest. Even when a toddler says the alphabet or recites sections from videotapes, parents frequently start to worry since their child is not utilizing words to communicate. Even these social deficiencies might not be immediately apparent in the early years, they progressively become more noticeable as a child grows more active and as other kids develop higher social skills. Repetitive behaviors, like looking at lines or wheels with peripheral vision or doing particular hand and finger motions, start to emerge during the preschool years.

Empathy interviews through google form

Age: 11 years old
Condititon: Autism Spectrum Disorder
Background: An 11-year-old autistic child who studies in a special education school. He enjoys playing with physical toys and prefers calm, predictable activities.

Challenges:

- Finds it hard to stay focused for long periods
- Gets overwhelmed by loud sounds and fast animations
- Struggles with coordination and sudden transitions

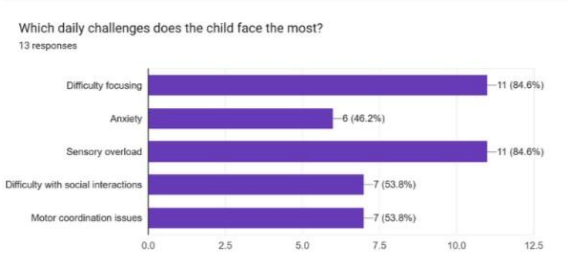
Needs:

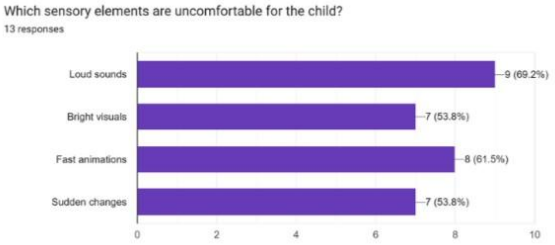
- Simple and calm activities
- Clear routines
- Hands-on play instead of too much screen time
- Gentle feedback

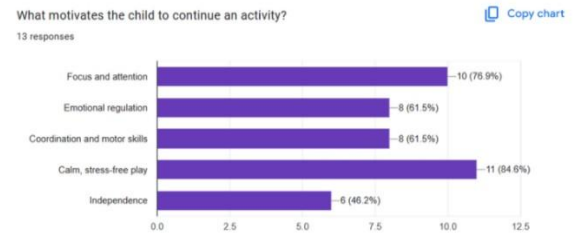
Goals:

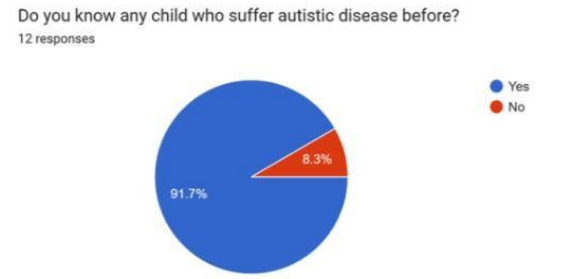
- Stay focus for longer
- Improve hand-eye coordination
- Feel calm and confident while playing

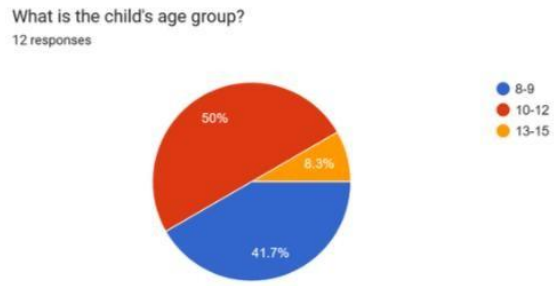
Data gained by interviews via google form:











Google Form link:

https://forms.gle/H6K6tQw5uyjspmeS8

Define Phase

The challenges faced by autistic children in maintaining focus, regulating motor control and remaining engaged are not sufficiently addressed by existing learning and activity tools. Highly stimulating digital applications often overwhelm autistic children whereas repetitive traditional activities may fail to sustain interest over time. This imbalance limits the effectiveness of current approaches in supporting meaningful and consistent engagement.

Consequently, there is a lack of interactions that can support focus and motor-related skills without increasing sensory stress. This gap contributes to ongoing difficulties for autistic children in developing essential skills in a manner that aligns with their learning preferences and sensory needs.

Problem statement: Autistic primary school children experience difficulties in maintaining focus and developing motor-related skills due to the absence of supportive interactions that can sustain engagement without causing sensory overload.

Ideate Phase

Idea 1: Physical Toy + Digital App Integration

Instead of keeping children glued to a screen, this idea combines real wooden toys with a digital app. The child plays using familiar, tactile toys while the app quietly guides the activity in the background. This helps autistic children stay engaged, improve focus, and practice coordination in a way that feels like play, not therapy.

Idea 2: Routine (Based Gameplay Flow)

Many autistic children feel anxious when activities change suddenly. To address this, every game follows the same simple routine:
Start → Play → Finish.
Because the structure never changes, children know what to expect, which helps them feel safe, calm, and more willing to participate.

Idea 3: Sensory (Safe Visual Feedback)

Instead of stressful scores, timers, or loud rewards, the app uses gentle visual feedback. Progress is shown through calming visuals like a plant slowly growing, a sun softly filling with light, or a rainbow expanding. This encourages the child without pressure or competition.

During the ideation stage, multiple game concepts were developed focusing on focus, coordination, sequencing, and emotional regulation, all designed to be sensory-safe, predictable, and routine-based for autistic children.

Idea 4: Movement (Based Focus Tracking)

Rather than using cameras or wearable devices, the app understands focus by observing how the child moves the toy. Smooth, consistent movements and time spent on the task help indicate focus levels. This approach respects the child's comfort, privacy, and sensory needs.

Idea 5: Automatic Sensory Pause System

If the child becomes overstimulated or starts moving erratically, the app does not show errors or warnings. Instead, it gently pauses the activity and displays calming visuals. This gives the child time to regulate themselves before continuing, without feeling punished or overwhelmed.

These ideas focus on creating a calm, predictable, and supportive play experience that helps autistic children build focus and coordination without pressure or overstimulation. The targeted user for this prototype is ASD level 1 (AGE 7-12).

Selected Solution

After exploring multiple ideas and understanding the needs of autistic children, we selected a solution that feels safe, familiar, and engaging.

The final solution is a sensory-safe mobile app that connects with physical wooden toys to support focus, coordination, and emotional regulation through simple, predictable play.

By combining hands-on toys with a calm digital experience, the app feels more like guided play than a traditional game or therapy tool.

Key Features of the Final Idea

- Physical wooden toys with built-in sensors
  Children interact with real toys they can touch and feel, reducing over-reliance on screens.
- Automatic Bluetooth connection
  The toy connects to the app on its own, so children don't need to deal with confusing setup steps.
- Minimal and calm user interface
  Soft colors, simple shapes, and clear visuals help avoid sensory overload.
- Fixed screen layouts
  Each game screen looks familiar every time, helping children feel secure and confident.
- No timers, scores, or loud sounds
  This removes pressure, competition, and stress from the experience.
- Visual schedules and routines
  Games always follow the same flow (Start → Play → Finish), so children know what to expect.
- Gentle pause and reset system
  If a child becomes overwhelmed, the app calmly pauses instead of showing errors or warnings.
- Parent and therapist progress dashboard
  Caregivers can view progress in a simple, non-judgmental way to better support the child.

Why This Idea Was Chosen

Criteria	Reason
Desirability	Children naturally enjoy playing with physical toys and hands-on activities
Feasibility	The solution uses existing and reliable Bluetooth technology
Viability	It can be used both at home and in therapy settings
Autism-Friendly	The experience is calm, predictable, and designed to avoid overstimulation

Ideation Outcome

The ideation phase led to the development of a physical–digital play system that helps autistic children build focus and coordination in a calm, structured, and supportive environment, without pressure, competition, or sensory overload.

Prototype Phase

1. **TOYS PROTOTYPE**

The toy prototype is designed to feel like a simple, friendly wooden toy, not a piece of technology. It is smooth, lightweight, and comfortable to hold, helping children feel safe and familiar while playing. There are no buttons or instructions—children can play naturally in their own way.

The toy automatically connects to the CalmFocus app, which provides gentle visual feedback, such as a growing plant or soft light, without requiring screen interaction from the child. The toy quietly responds to movements in the background.

If the child becomes overwhelmed or moves too quickly, the system gently pauses instead of showing errors. Overall, the toy acts as a calm companion, supporting focus and coordination through stress-free, hands-on play.

Inside EACH toy:

Component	Purpose
BLE microcontroller (ESP32-C3 / Nordic nRF52)	Wireless connection: It allows the toy to talk wirelessly to the mobile app using Bluetooth.
Accelerometer	Detect movement smoothness: It detects how fast or slow the toy is moved and whether the movement is smooth or shaky. This helps the app gently understand the child's focus level without using cameras or screens.
Pressure sensor	Grip force: This supports coordination-based activities and helps the app respond accurately to how the child is playing.
Coin cell / Li-ion battery	Power (can be charged using phone charger): A tight grip may suggest tension or stress, while a relaxed grip suggests calm engagement. This allows the app to respond gently if the child starts feeling overwhelmed.
Gyroscope (optional)	Detect rotation: It is lightweight and long-lasting, and it can be recharged easily using a phone charger. This keeps the toy portable and safe for everyday use.
Tiny vibration motor (optional)	Gentle feedback: The vibration is subtle and calming, designed to avoid sensory overload.

What the CHILD sees:

1. Places toy on base
2. App screen shows toy picture
3. Green glow = connected
4. Game starts

What actually happens:

- App scans for BLE device
- Reads toy ID (NFC/BLE UUID)
- Auto-connects silently
- No buttons, no settings

Signal	**What does it tell you**
Smooth motion	Regulation
Jerky movement	Overstimulation
Idle time	Disengagement
Consistent speed	Focus
Grip pressure	**Anxiety level**

Why BLE is the best choice

Child-safe & invisible

- No cables
- No pairing screens for kids
- Auto-connect in background

Low power

- Weeks/months of battery life
- Perfect for wooden toys

Supported everywhere

- iOS
- Android
- Tablets
- Future-proof

Smooth real-time tracking

- Movement
- Tilt
- Stillness
- Gentle pressure

2) APP PROTOTYPE

Screen 1 – Welcome Screen

The app opens with a friendly welcome screen showing familiar toy characters and a single Start button. There are no distractions or choices, helping the child feel calm and ready to begin.

Screen 2 – Instruction Screen

The app gives one clear instruction at a time, such as *"Hold the toy gently and follow the path."* Visual cues guide the child instead of text-heavy instructions.

Screen 3 – Gameplay Screen

As the child moves the physical toy, the app responds with calm animations. The child focuses on guiding the toy along a path, improving coordination and attention without pressure.

Screen 4 – Positive Feedback Screen

When the task is completed, the app celebrates gently with messages like *"Great job!"* There are no scores or timers—only encouragement.

Screen 5 – Game Menu

The child can choose from multiple games, each represented by a friendly image. All games follow the same structure so the child always knows what will happen next.

Screen 6 – Multiple Game Options

The menu shows different activities such as balance, sequencing, and pattern play. Each game uses a different physical toy but keeps the same calm visual style.

Screen 7 – Parent Dashboard

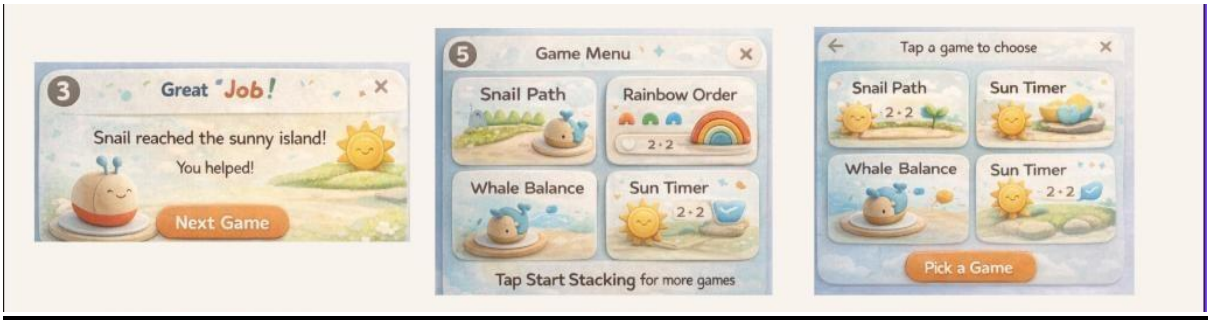
This screen is for parents or therapists. It shows simple progress information like time spent playing and consistency, without labels or comparisons.

Screen 8 – Session Summary

At the end of a session, the app shows a soft summary of what the child achieved, using visuals like rainbows or plants instead of numbers.

Screen 9 – Finish Screen

The session ends with a reassuring message like *"All done!"* The child can either play again or stop, making transitions easy and stress-free.



13. Types of games

1. Snail Path

Move the snail slowly along a glowing path.

Smooth movement continues the path; fast movement pauses it.

Skills: Focus, self-control

2. Sun Hold

Hold the sun toy still to make it slowly brighten.

Skills: Sustained attention, calm control

3. Calm Breathing Buddy

Move the toy up and down to match slow breathing on screen.

Skills: Emotional regulation, relaxation

4. Whale Balance

Gently tilt the whale to match the screen.

Skills: Coordination, balance

5. Follow the Wave

Move the toy in a smooth wave pattern.

Skills: Movement imitation, motor control

6. Path Builder

Place the toy on soft glowing points in order.

Skills: Spatial awareness, sequencing

7. Rainbow Order

Stack rainbow pieces in the correct order.

Skills: Sequencing, planning

8. Pattern Match

Copy simple color or shape patterns.

Skills: Memory, pattern recognition

9. One-Step Then Two

Start with one action, then move to two simple actions.

Skills: Executive function, flexibility

10. Start → Play → Finish

Complete one short task per stage.

Skills: Transitions, task completion

11. End Calmly

A calming animation plays after games.

Skills: Emotional regulation after activity

12. Pick One

Choose between only two toys.

Skills: Decision-making, independence

13. Repeat & Relax

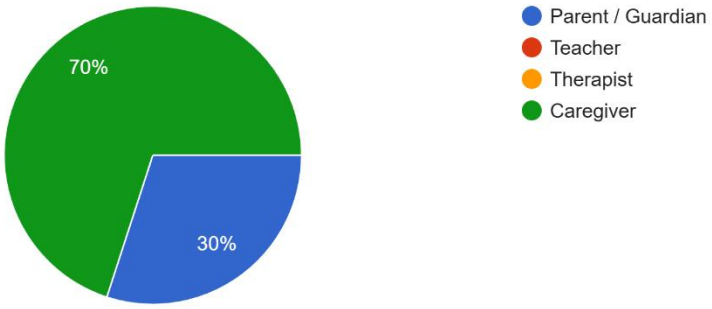
Repeat any game without pressure to move on.

Skills: Confidence, comfort through repetition

Test Phase

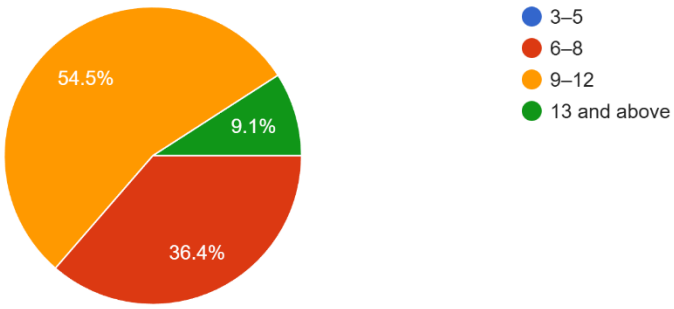
Your role

10 responses



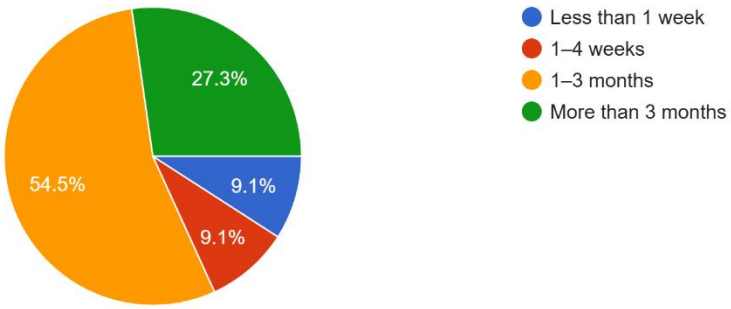
Age of the autistic child you know

11 responses



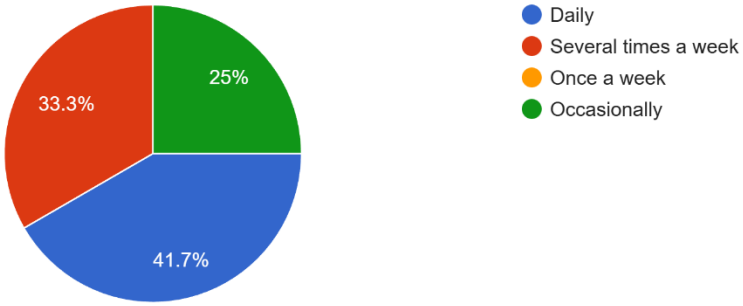
How long would you think the child will use this hybrid toy system?

11 responses



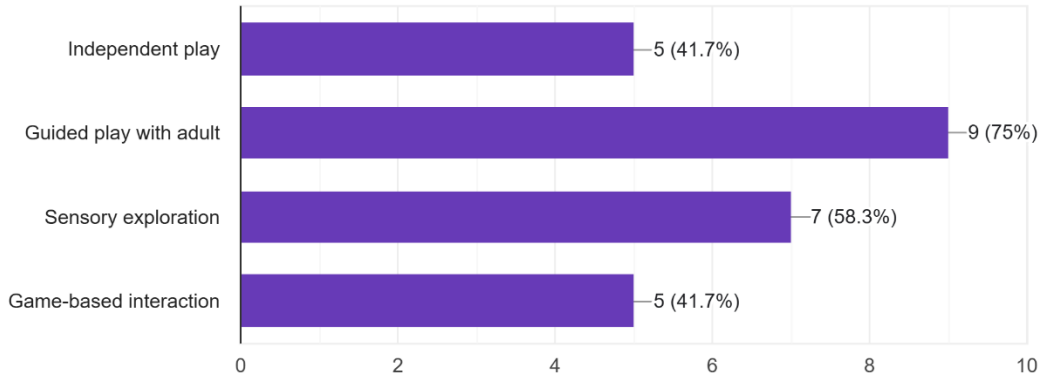
How often will the child use the toy?

12 responses



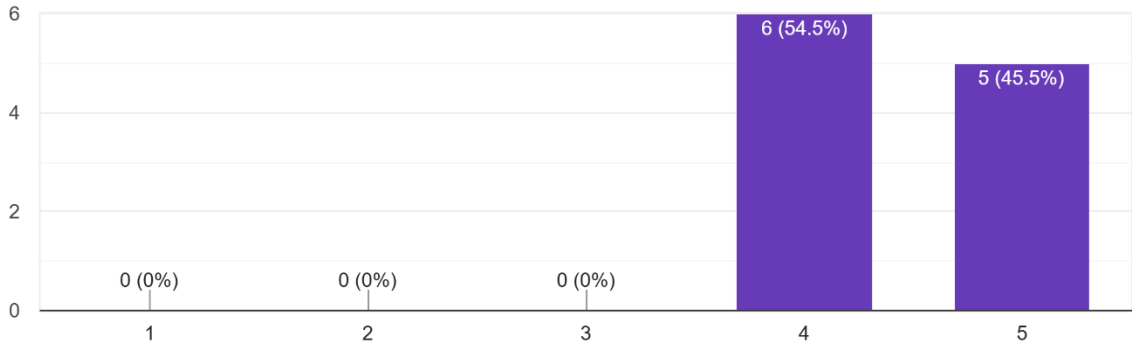
Type of play considered

12 responses



The toy is easy for the child to understand and use

11 responses



Google Form link:
https://docs.google.com/forms/d/1ops94kwUp0QiGTpMzerOj6XfkIkv38iRF5odsb-65-s/edit?pli=1

DETAILED DESCRIPTION OF DESIGN THINKING

a) Problem

From the research, autistic children may focus intensely on preferred activities or topics but show limited attention to tasks that they find less engaging. There are also a few autistic children that cannot pay attention at all. The children find it very hard to follow instruction or pay attention while learning a new concept. It is a challenge to involve them in activities that require shared intentions, such as reading books together. If they cannot focus on something that they are not familiar with, it will impact them in a serious way and it will be hard for them to blend into the society as they grow up. Therefore, we are going to aim our focus on primary children.

From the Internet, Healis Autism Centre reported that about 50% or more of autistic children show attention or focus problems when observed by their teachers and parents. In that study, around 60% were easily distracted and about 50% had trouble in concentrate.

b) Solution

Our team had come up with a solution that uses a hybrid toy system to help autistic children to enhance their focusing issues and make them more concentrated on things they are doing now. In Healis Autism Centre's article, it mentioned that children's attention can be raised by eye contact, play and sensory integration.

In the beginning, our team decided to use a toy and link it to an app. This is because by having a physical toy in hand, the child can actually touch, move and interact with the toy itself. Not to mention, toys are always the things that a child cannot reject, especially when the toys have a very attractive appearance. When we link the toys to an app, the child can move the toys physically. At the same time, the toys will also move in the app as well. Our app will have different levels and instructions as well to help autistic children to focus and prevent them from getting easily bored. By using games, we try to make children follow the instruction and pay attention to the scenario of each level in the game.

c) Team Working

We distribute the work strategically to ensure that the project progresses smoothly and steadily. First and foremost, we address our basic idea, which is a toy. Then we are trying to link toys to digital technology, making it both fun and useful for autistic children and their parents. We conduct extensive study to fully understand the challenges that autistic children encounter. After that, we create a slideshow to present our proposal to our lecturer, with two persons designing the slide and another two looking for information and data. After presenting, we are doing report and completing our slideshow as well to submit it before the due date. We having two person in charge in video and the other two doing report as well.

ASSESSMENT POINT

During the transition between design thinking phases

The assessment conducted at K01 on 10 January 2026 focused on discussing new ideas for the design thinking project and planning the overall workflow. The group also carried out task division, assigning specific roles for the written report and the project video, such as research, content writing, editing, and presentation. This assessment point helped ensure clear responsibilities, effective collaboration.

Empathy to Define:
Insight from persona and research guided our problem statement.

Define to Ideate:
Brainstormed multiple ideas based on defined problems.

Ideate to Prototype:
Selected the best idea and developed the Calm Focus prototype.

During the end of the project demonstration

The end-of-project assessment evaluated the final solution, project report, and video presentation. It focused on how well the project met its objectives, applied design thinking principles, and demonstrated effective teamwork.

REFLECTIONS

AHNAF BIN ZAIZAL

I believe that this project has helped me enhance my understanding of autism. I know how to relate my ideas to assist them with a digital solution. This makes use of the advances of technology in order to support our new generation. This project has impacted me in how data and technology can play a role in developing a digital solution to help kids with disorders. To have sufficient evidence, we need to have statistics to support us.

EMILY TAI PEI EN

In learning this course, I gained a lot of insight into computer software and hardware. Through this program, I dream of being an expert in data analysis. This project has impacted me on how data and technology can play a role in developing a digital solution to help kids with disorders. As a result, this project helped me to boost my research skills and the technique to analyze the information and data as well. Therefore, in order to get an offer from my desired company, I wish that I could gain more skills in future courses.

NUR AZIZAH BINTI SAMIUN

This design thinking project has helped me to boost my research skills and the technique to analyse the information and data as well. Therefore, I can make use of these skills when I have the opportunity to work in my desired industry. In order to get the offer from my desired company, I need to improve my communication skills to collaborate with people and enhance my analytical skills to analyse the enormous amount of information and statistics on the internet.

SHAMITA A/P DHEEVAN RAO

My research abilities and data analysis methodology have both improved as a result of this design thinking project. I can therefore put these skills to use when I get the chance to work in the industry of my choice. I must develop my analytical abilities to evaluate the vast quantity of data and statistics on the internet and my communication skills to work with others in order to receive the offer from the organization I want.

TASK DIVISION

TASKS	GROUP MEMBERS INVOLVED
Do research on autism	Ahnaf, Shamita, Emily, Azizah
Do research on prototype	Emily, Azizah
Identify the main challenge of autistic child	Shamita, Ahnaf
Discuss the feature of prototype	Ahnaf, Shamita, Emily, Azizah
Create prototype	Emily, Shamita
Create proposal	Azizah, Ahnaf
Shoot video	Ahnaf, Shamita, Emily, Azizah
Edit video	Azizah, Shamita
Discuss report and details of project	Ahnaf, Shamita, Emily, Azizah
Write report	Ahnaf, Emily
Double check report and video	Ahnaf, Shamita, Emily, Azizah

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